

# *National ITS Architecture Physical Architecture*

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## Executive Summary

The National ITS Architecture is a framework of physical elements on which ITS deployment, standards, and evaluation can be built. The framework consists of three layers: a transportation layer including functions required to implement ITS user services, a communication layer including identification of communication technologies and systems which will be used to exchange data required by the transportation layer, and an institutional layer which provides structure to the forces specifying requirements and deploying the architecture over time. The communications analysis is expanded in the *Communications Document*. The institutional layer is defined in the *Implementation Strategy*.

The transportation layer contains subsystems, terminators, and physical architecture flows between these entities. There are 22 subsystems representing groupings of functions defined in the logical architecture that may be operated by single entities. These 22 subsystems are grouped into four classes: Centers, Field, Vehicles, and Travelers. The interfaces between these subsystems represent not only physical interfaces between equipment and computers but between operating agencies in the real world. Careful definition of these interfaces provides developers with an understanding of how to build components which will reliably integrate with other components in future ITS deployments. While specifying the groupings of functionality and the interfaces between entities, the architecture development team has been careful to not over specify an ITS design. It is impossible to foresee what technology will be forthcoming or what roles agencies wish to play in ITS. Therefore, the architecture remains flexible indicating top level types of data that is exchanged and basic functions which are performed. It leaves the specific system design up to implementers and the interface standards development up to standards development bodies and stakeholders with specific domain knowledge and vested interest in the outcome.

Similarly, the communication layer specifies general requirements to make ITS functions able to communicate with each other. Users will adopt existing and emerging technologies as they develop. For instance, beacon technologies may be suited to several types of ITS communication requirements where it is desirable to communicate with a vehicle within the immediate proximity in a very short period of time. More general communication requirements between vehicles and the transportation centers are accommodated with existing deployed wide area wireless technology. Other communications involve advanced vehicle-vehicle and traditional fixed-point to fixed-point communications. Specific requirements for each type of communication are identified in the physical architecture in support of data loading and communication performance analysis in other documents.

Deployment of ITS will be by the operating agencies currently in existence and by entrepreneurs who see a chance to better support travel needs with new technology. Market Packages represent a service which could be deployed as an integrated capability. Looking at the architecture structure, one can decompose each of these services into high-level functions, or Equipment Packages, which will be performed by each of the defined subsystems. These Equipment Packages are the basic functions which implementers will develop or buy. The architecture specifies the general capabilities of each of these functions and the interface of the function with other relevant functions.

The subsystems, architecture flows, market packages, and equipment packages presented in this document are maintained in a database, thus providing a tool for easy retrieval of information, consistency checking, and ready documentation. The databases can be shared with other groups developing more detailed versions of special applications such as Commercial Vehicle Operations, Transit, Traffic Management, and Traveler Information. In this way, it is possible to maintain a coherent, integrated ITS database of functions, data flows, standards, and performance.

# 1 INTRODUCTION

The Physical Architecture identifies the physical subsystems and architecture flows between subsystems that will implement the processes and support the data flows of the ITS Logical Architecture. The Physical Architecture further identifies the system terminator inputs (sources) and system terminator outputs (destinations) for architecture flows into and out of the system.

## 1.1 System Overview

The Architecture is structured in 3 layers as shown in Figure 1. A transportation layer performs transportation functions such as traffic management and traveler information provision. Functions (process specifications in the Logical Architecture) are assigned to subsystems such that the interfaces between subsystems represent candidate interfaces in the physical world. Subsystems were selected based on a limited set of criteria in order to:

- \* represent the functions of each major stakeholder group at a high level in the physical architecture (e.g. Transit agencies, Emergency Services, Commercial Vehicle Operators all see both infrastructure and vehicle components)
- \* explicitly specify those functions that are performed in centers and those functions performed in vehicles (e.g. Route Planning could be performed either in the vehicle or by a service provider, route selection and turn-by-turn guidance is always done in the vehicle)
- \* collect functions currently performed by a single agency together (e.g. transit center functions are all performed in the Transit Management Subsystem, traffic management is performed in the Traffic Management Subsystem)
- \* separate functions that may in the future be split out to third party providers (e.g. provision of information in the Information Service Provider Subsystem, and data brokering in the Commercial Vehicle Administration Subsystem)

In order to provide for enough flexibility to stimulate market growth, the subsystems may be combined during system design within agencies, buildings, vehicles and so on. That means that a Traffic Management Center may include in addition to the Traffic Management Subsystem, an Information Service Provider Subsystem, and possibly an Emergency Management Subsystem.

The Communication layer represents the technology which will support the interfaces between transportation functions. Each data flow required by the transportation functions is evaluated with respect to the type of communication service which will be needed.

The Institutional layer represents the policy makers, planners and other users of the ITS services. These agencies and organizations are further addressed in Implementation Strategy Document.

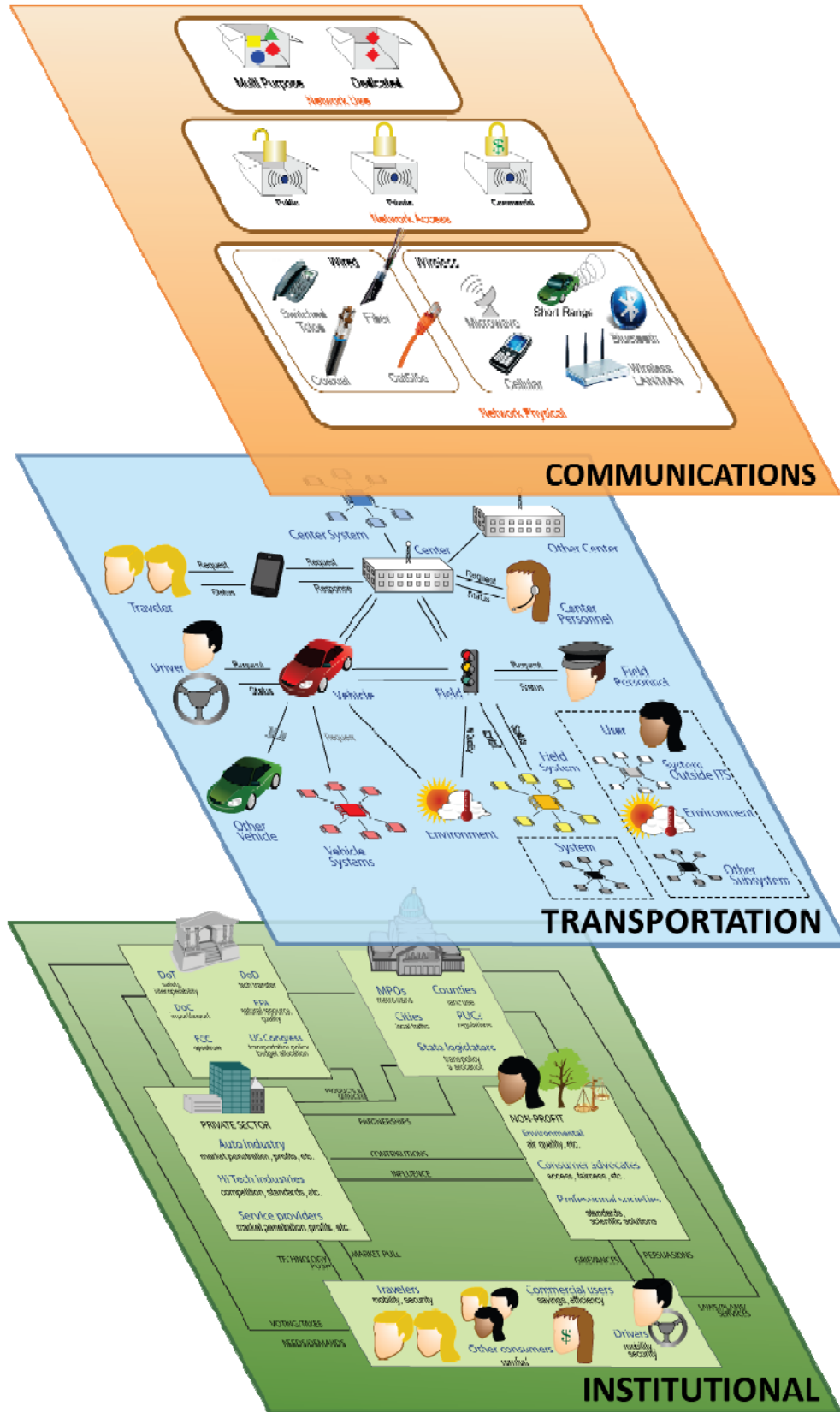


Figure 1: 3 Layer Architecture



## 1.2 Strategies and Principles

The following are the strategies and principles that the Architecture team has followed in developing its ITS logical and physical architecture so as to best achieve the goals of ITS and the requirements of the User Services.

A summary of the strategies and principles is given below.

### 1. Low Entry Cost

Our architecture provides immediate service to all users, regardless of the degree of special instrumentation available to them. It does so by using all the information available from all terminators in order to devise the management strategy, and then disseminate the necessary information to the users through the information channels available to them. The fact that users having access to advanced channels can receive improved service will provide incentives for deployment of ITS instrumentation, but will not totally deny service to those users who do not own such channels. Basic service will be provided to the latter users through publicly available channels such as Dynamic Message Signs (DMS) and Highway Advisory Radio (HAR).

The Architecture team is concerned that ITS benefits should be available to large numbers of commercial and private travelers at no cost or a small cost. Some examples of how we have designed this into the architecture are:

- a. CVO with an ID tag. The architecture allows that a commercial vehicle have only an inexpensive electronic ID-tag in order to participate in the electronic clearance at roadside stations. The architecture further allows for enhanced tag technologies which may store detailed cargo and safety information for special purposes
- b. Low/no cost traveler information services.  
Travelers will benefit from better regional travel information broadcast by commercial AM/FM/Cable operators if these operators use the travel information that is available from local TMCs and ISPs via ITS media interfaces. Also, extensive Highway Advisory Radio (HAR) can be deployed for local advisory information based on real-time TMC surveillance. Information will also be available to travelers from publicly provided kiosks.
- c. Traditional Toll-tag services-The Architecture supports the current deployment of toll-tags.

### 2. Provide Choices (in price/ performance) for travelers to receive user services

The ITS architecture provides not just a single implementation of each user service, but in many cases supports a multiplicity of implementations with varying performance and associated costs to the user.

For example, in the area of route guidance the architecture supports three distinct modes of operation:

- a. Traveler-based route selection, where all route selection processing equipment as well as the navigable database that route selection is based on is included in equipment located with the traveler (either in their vehicle or in their portable device).

- b. Traveler-based route selection coupled to infrastructure-based and provided link/queue-times. In this method, the traveler-based route selection system is augmented by data from the infrastructure about current and possibly estimated future (predicted) link transit times and intersection queue delays. Using this type of data, the traveler will be able to use his equipment to compute better routes since his navigable road database will be augmented with information about current and future congestion conditions.
- c. In-vehicle route guidance coupled to infrastructure based route selection. In this approach the infrastructure (in our architecture, the ISP) selects the route based upon the traveler route request. Because of this approach the traveler equipment is simplified since it no longer requires a navigable map database, or the processing power to calculate a best route (only the processing power to display the route guidance).

### **3. Provide travelers with Privacy**

In the area of privacy the ITS architecture takes into account that travelers have many distinct needs or desires with respect to privacy and the architecture provides the capability for these needs to be met: The route selection choices above offer a spectrum of options with respect to privacy for the traveler using ITS . The traveler can select routes totally independently of any infrastructure based entity, or they can choose a higher level of service that requires allowing the infrastructure to provide personalized service which requires sending personalized messages to their traveler based equipment.

### **4. Accommodate increasing levels of system integration**

The ITS architecture is designed not only to support the introduction of new technologies, but has been designed in order to facility the ability of advances in technology to provide ever higher levels of system integration and hence ever higher levels of system performance. Such advanced concepts as Dynamic Traffic Assignment can be supported by the architecture. Through the coupling of Traffic Control and infrastructure based Route Selection the architecture can, when the technology permits approach optimum performance.

### **5. Assure equity**

Providing an equitable division of benefits and costs is a key design strategy for the Architecture team. By splitting the key ITS infrastructure elements between private and public entities, the Architecture is able to assure equity in expenditures/payments. Public funds are used by public agencies (for example by running TMCs and roadside facilities) to benefit all travelers equally, and private funds (and fees) are used to supply additional “value added” services to those individuals willing to pay for those services.

### **6. Detailed, Open Standardization to maximize Interoperability reduces market entry risk.**

One of the most important requirements on the ITS architecture is interoperability- the ability for the user to obtain the user services nationwide with a single set of equipment. To do this the architecture effort must choose limited areas of detailed national standardization to maximize interoperability and market breadth for travelers and manufacturers. In particular, the traveler to infrastructure interface should be specified.

**7. Leverage the existing and emerging open infrastructures.**

Communications is key to providing ITS user services to the wide range of users. The Architecture strategy is to maximize use of the existing (and planned future) communications infrastructure. This approach has the following benefits:

a. Minimize capital investment.

A national communications infrastructure to support ITS would be costly to deploy if it were only to be used for ITS. The capital formation necessary for this hypothetical ITS only infrastructure could substantially limit or slow the deployment of ITS.

b. Leverage existing infrastructure.

The ITS Architecture makes use of existing commercially available wired and wireless data communications services.

c. Limit dependence on new spectrum allocations. New spectrum requirements which require FCC approval could delay and add considerable risk to the ITS evolutionary deployment.

**8. Facilitate profitability for Private Industry to speed early deployment.**

New travel information technologies will require capital investments to deploy. The private sector is best prepared to rapidly form capital and efficiently deploy advanced technologies.

Several subsystems in the architecture including the Commercial Vehicle Administration Subsystem and Information Service Provider Subsystem allow for a multiplicity of vendors to compete for the traveler and commercial vehicle business. Users will benefit from a competitive environment that will supply choices of service levels, privacy levels and cost levels.

**9. Architecture is open and not biased towards any particular products.**

Use of open standards is a priority of the architecture. All subsystems in the architecture will support a range of existing or anticipated product offerings from an unlimited range of hardware or service providers.

**10. Encourage public-private infrastructure cooperation.**

By carefully allocating processes to public and private subsystems, the Architecture has been designed to encourage mutually beneficial cooperation between public and private institutions through transportation surveillance and predictive model data exchange.

Examples of this are TMCs providing surveillance data to ISPs which will allow the ISPs to compute better routes for their clients, and the ISPs providing (anonymous) probe data to the TMCs so that their surveillance of non-instrumented roadways is enhanced and thus their ability to manage traffic for all travelers is enhanced. Similarly, TMCs can access traffic data stored at neighboring TMCs over the data network.

### **11. Enhance traveler safety.**

The Architecture team believes that enhancing traveler safety is a key requirement for the architecture. There are many ways in which the Architecture will enhance safety. Some of these are:

a. Reduce emergency response time.

Our early safety analysis leads us to believe that any reduction in time between the occurrence of an injury accident and the arrival of medical help has a substantial impact on survivability. In the high-end state architecture, emergency vehicles will have their routes selected by the infrastructure, and those routes will be communicated to the TMC Traffic Management service package for priority signal service for the emergency vehicles (with minimal disruption to the rest of the transportation network). In addition, rapid data based deployment of emergency response vehicles via the Emergency Management Subsystem will get help to incidents faster, and will enhance traveler safety as a direct consequence.

b. Reduce congestion.

By using standardized interfaces that the architecture identifies, demand management strategies and policies can be effectively implemented, congestion can be reduced, thus reducing the number of transitions from free-flow to stop-and-go traffic conditions. These transitions have been identified in our preliminary safety analysis as a cause of traffic accidents.

c. Fail-safe infrastructure architecture.

The Architecture has not allocated any new life threatening functions to the infrastructure. Vehicle control (for collision avoidance) remains entirely within the vehicle subsystem (and in the case of platooning and Automated Highway System (AHS) related functions, is based on communication directly between adjacent vehicles). In the event of a total infrastructure failure, signals would fall back to local sensor based signal control or fixed time plans, exactly as they do today.

### **12. Provide Locally determined Management Capabilities**

For ITS to be desirable in some areas and in some time frames it must be able to address demand management (in addition to supply management). The architecture gives local agencies (and ultimately elected officials) enormous latitude to decide how limited transportation resources are to be allocated.

The Architecture team has designed the architecture so that any particular form of demand management is optional, and a local decision to deploy. Examples include congestion pricing, vehicle class preferences, and extensions of ramp metering, HOV management, and lane management.

## **1.3 Development Methodology**

The Physical architecture contains the components on which the evaluations, standards, and deployment and implementation strategies are built. It defines the framework for the whole architecture.

## Architecture Definition

- **Subsystems** - Subsystems are the primary structural components of the Physical Architecture. Focus group concerns, institutional issues, and technology constraints and capabilities are used to determine subsystems that can most likely be supported by a single institution, which perform functions that “belong” together, and whose interfaces may require standards to promote interoperability and compatibility. Processes from the logical architecture are assigned to each of the subsystems according to stakeholder inputs.
- **Physical Architecture Flows** - Architecture flows between subsystems are determined based on the data exchange implied by the process specification assignments and the data flows in the logical architecture.
- **Physical Architecture Interconnections** - Each type of data flowing between subsystems requires a specific type of interconnect. The collection of interconnects which support all data flows are defined in the communications layer of the architecture. The data loading analysis compares the capabilities of these interconnects with expected requirements under various deployments. This information is reported in the communication analysis documentation.

## Iterative Architecture Refinement

Our approach to iterative architecture refinement exploits a technical methodology that rapidly and easily enables changes to the logical and physical architectures and easily regenerates data loading and other analysis. We have demonstrated that we can use this methodology to rapidly adapt our architecture based on consensus feedback and other architecture design analysis. We accept feedback in a number of different ways:

Customer inputs are collected based on the following:

1. Formally documented customer requirements. E.g. the *User Services*. These inputs were used as a starting basis for designing the architecture (as well as our own initial analysis).
2. Written feedback from the customer on the Architecture.
3. Direct dialog at Program Reviews.

Stakeholder feedback is included as well from:

1. *Customer initiated interactions*. E.g. Stakeholder Consensus Forum meetings sponsored and facilitated by the customer.
2. *Team initiated informal interactions*. Our own team meetings with stakeholders and stakeholder groups and visits to ITS demonstration sites.
3. *Team initiated Stakeholder Focus Groups*. The Team held a number of formal focus groups with selected stakeholders at the University of Michigan. These focus groups gauged stakeholder perceptions and reactions to specific ITS benefits, costs, and solutions.

## Introduction

### Other Team Analysis:

We held periodic team review meetings where the current status of the architecture is reviewed with all team members. Discussion at these meetings often focused on identifying features and detractors of the architecture based on various analyses that are proceeding as well as identifying changes to the architecture that can enhance its overall value.

## 1.4 Document Organization

The Physical Architecture is made up of many real components. The remainder of this document presents the Transportation Layer of the Architecture. It includes definitions of all of the Physical Architecture entities and interfaces. Each of the subsystems is further decomposed into component Equipment Packages and Process Specifications. The architecture flows and composite data flows entering and leaving each subsystem are also presented.

Section 3 includes the detailed listing of all of the architecture flows including their source, destination, name, interoperability rating, interconnect type, and type of communication service.

## 2 TRANSPORTATION LAYER

This layer of the architecture provides for the transportation related functions. Section 2.1 describes the architecture context, that is, what functions are defined in the architecture and what is considered outside the scope of the architecture. The functions defined in the architecture are contained within subsystems. The functions outside the scope of the architecture are represented by terminators. These two types of architectural components (subsystems and terminators) are called entities. Classes bundle entities together into different categories such as humans, computers, and the physical world. Interfaces between these entities are sometimes very clearly data flows which can be carried by communication media. Some interfaces are fuzzier representing physical observation, contact, or human interaction.

Section 2.2 defines the principal Physical Architecture components including subsystems, terminators, and architecture flows.

The sections following section 2.2 contain descriptions of each subsystem (functions in the scope of the architecture). They begin with a brief summary of how to deploy the subsystem with other subsystems. It describes how the subsystem may logically be combined with other subsystems within one jurisdiction. Alternative implementations of the subsystem itself within one operating agency are also described.

Next, the equipment packages assigned to each subsystem are described. Equipment packages are a functional capability that may be deployed at some specific time. Each equipment package is composed of a collection of process specifications from the logical architecture. These assigned process specifications are listed with each equipment package..

Logical data flows between subsystems are assigned by identifying the connections between process specifications assigned to different subsystems. Assignment of logical data flows between subsystems leads to the description of physical interconnections between subsystems. For each architecture flow identified in the physical architecture, the list of associated logical architecture data flows is provided. The architecture flows indicate the type of information that is expected to be exchanged between subsystems. The logical data flows provide the detailed data required to execute the process specifications assigned to each subsystem.

### 2.1 Physical Architecture Context

The scope of “Context” of the physical architecture is identical to the scope of the logical architecture. The identical set of terminators establish exactly the same boundary. The physical architecture adds a broad structural overlay to the structured analysis model documented in the logical architecture.

### 2.2 Physical Architecture Dictionary

#### 2.2.1 *Physical Entities*

The physical architecture can be viewed at several levels of detail. In the physical architecture, entities include subsystems and terminators, and are listed in Table 1.

The entities may be grouped into four classes (shown as EntityClass in Table 1):

- Centers, which collect and store information within the infrastructure
- Field, which are functions typically deployed along the transportation network

- Vehicles
- Travelers, representing ITS users with transportation needs

Another way of categorizing entities is by the entity type. There are four types of physical entities defined in the National ITS Architecture (shown as EntityType in Table 1):

- System – a computer system that accepts inputs, produces outputs, and performs some function, whether transportation-related or not. For example, a Traffic Management Subsystem manages traffic, and financial transactions are handled by a Financial Institution terminator.
- Human – people who interact with the architecture implementation. These people could either be travelers who use ITS to achieve travel goals, or operators of ITS who use features to streamline their operations, improve service, or make money. Each interface to a user involves human interaction with the system.
- Other System – there may be a multiplicity of instantiations of each of the architecture subsystems. To adequately model the interaction between these multiple implementations, this type is used.
- Environment – the physical world of pavement, air, obstacles and so on.

**Table 1: Subsystems and Terminators**

Entity	Entity Name	EntityKind	EntityClass	EntityType
ADMS	Archived Data Management	Subsystem	Center	System
CVS	Commercial Vehicle	Subsystem	Vehicle	System
CVAS	Commercial Vehicle Administration	Subsystem	Center	System
CVCS	Commercial Vehicle Check	Subsystem	Field	System
EM	Emergency Management	Subsystem	Center	System
EVS	Emergency Vehicle	Subsystem	Vehicle	System
EMMS	Emissions Management	Subsystem	Center	System
FFMS	Fleet and Freight Management	Subsystem	Center	System
ISPS	Information Service Provider	Subsystem	Center	System
MCMS	Maintenance and Construction Management	Subsystem	Center	System
MCVS	Maintenance and Construction Vehicle	Subsystem	Vehicle	System
PMS	Parking Management	Subsystem	Field	System
PAS	Payment Administration	Subsystem	Center	System
PIAS	Personal Information Access	Subsystem	Traveler	System
RTSS	Remote Traveler Support	Subsystem	Traveler	System
RS	Roadway	Subsystem	Field	System
RPS	Roadway Payment	Subsystem	Field	System
SMS	Security Monitoring	Subsystem	Field	System
TMS	Traffic Management	Subsystem	Center	System
TRMS	Transit Management	Subsystem	Center	System
TRVS	Transit Vehicle	Subsystem	Vehicle	System
VS	Vehicle	Subsystem	Vehicle	System
X95	Alerting and Advisory Systems	Terminator	Center	System
X70	Archived Data Administrator	Terminator	Center	Human
X69	Archived Data User Systems	Terminator	Center	System
X79	Asset Management	Terminator	Center	System
X08	Basic Commercial Vehicle	Terminator	Vehicle	System
X87	Basic Maintenance and Construction Vehicle	Terminator	Vehicle	System
X51	Basic Transit Vehicle	Terminator	Vehicle	System



## Physical Architecture Dictionary

Entity	Entity Name	EntityKind	EntityClass	EntityType
X03	Basic Vehicle	Terminator	Vehicle	System
X92	Border Inspection Administration	Terminator	Center	System
X101	Border Inspection Systems	Terminator	Field	System
X93	Care Facility	Terminator	Center	System
X06	Commercial Vehicle Driver	Terminator	Vehicle	Human
X65	CVO Information Requestor	Terminator	Center	System
X10	CVO Inspector	Terminator	Field	Human
X64	DMV	Terminator	Center	System
X12	Driver	Terminator	Vehicle	Human
X102	Driver Identification Card	Terminator	Traveler	System
X15	Emergency Personnel	Terminator	Vehicle	Human
X14	Emergency System Operator	Terminator	Center	Human
X13	Emergency Telecommunications System	Terminator	Center	System
X98	Emissions Management Operator	Terminator	Center	Human
X62	Enforcement Agency	Terminator	Center	System
X18	Environment	Terminator	Field	Environment
X89	Equipment Repair Facility	Terminator	Center	System
X19	Event Promoters	Terminator	Center	System
X21	Financial Institution	Terminator	Center	System
X07	Fleet-Freight Manager	Terminator	Center	Human
X99	Freight Equipment	Terminator	Vehicle	System
X72	Government Reporting Systems	Terminator	Center	System
X60	Intermodal Freight Depot	Terminator	Center	System
X01	Intermodal Freight Shipper	Terminator	Center	System
X63	ISP Operator	Terminator	Center	Human
X26	Location Data Source	Terminator	Vehicle	System
X88	Maintenance and Construction Administrative Systems	Terminator	Center	System
X75	Maintenance and Construction Center Personnel	Terminator	Center	Human
X76	Maintenance and Construction Field Personnel	Terminator	Vehicle	Human
X23	Map Update Provider	Terminator	Center	System
X27	Media	Terminator	Center	System
X29	Multimodal Crossings	Terminator	Field	System
X02	Multimodal Transportation Service Provider	Terminator	Center	System
X68	Other Archives	Terminator	Center	Other System
X59	Other CVAS	Terminator	Center	Other System
X71	Other Data Sources	Terminator	Center	System
X30	Other Emergency Management	Terminator	Center	Other System
X31	Other ISP	Terminator	Center	Other System
X78	Other MCM	Terminator	Center	Other System
X90	Other MCV	Terminator	Vehicle	Other System
X73	Other Parking	Terminator	Field	Other System
X94	Other Payment Administration	Terminator	Center	Other System
X74	Other Roadway	Terminator	Field	Other System
X35	Other Traffic Management	Terminator	Center	Other System
X33	Other Transit Management	Terminator	Center	Other System
X34	Other Vehicle	Terminator	Vehicle	Other System
X36	Parking Operator	Terminator	Field	Human
X44	Payment Administrator	Terminator	Center	Human
X38	Pedestrians	Terminator	Traveler	Human
X39	Potential Obstacles	Terminator	Field	Environment
X103	Public Health System	Terminator	Center	System

Physical Architecture Dictionary

Entity	Entity Name	EntityKind	EntityClass	EntityType
X67	Rail Operations	Terminator	Center	System
X41	Roadway Environment	Terminator	Field	Environment
X42	Secure Area Environment	Terminator	Field	Environment
X97	Shelter Providers	Terminator	Traveler	System
X91	Storage Facility	Terminator	Center	System
X77	Surface Transportation Weather Service	Terminator	Center	System
X100	Telecommunications System for Traveler Information	Terminator	Center	System
X43	Toll Operator	Terminator	Field	Human
X45	Traffic	Terminator	Field	Environment
X46	Traffic Operations Personnel	Terminator	Center	Human
X49	Transit Operations Personnel	Terminator	Center	Human
X52	Transit Vehicle Operator	Terminator	Vehicle	Human
X24	Travel Services Provider	Terminator	Center	System
X56	Traveler	Terminator	Traveler	Human
X61	Traveler Card	Terminator	Traveler	System
X57	Vehicle Characteristics	Terminator	Field	Environment
X66	Wayside Equipment	Terminator	Field	System
X58	Weather Service	Terminator	Center	System

### 2.2.2 Subsystem Definitions

The ITS architecture subsystems may be grouped into four distinct subsystem classes that share basic functional, deployment, and institutional characteristics. These classes are used to frame top level descriptions for each of the subsystems in the following material.

#### Center Subsystems

These subsystems presented in Table 2 , provide management, administration, and support functions for the transportation system. The center subsystems each communicate with other centers to enable coordination between modes and across jurisdictions within a region. The center subsystems also communicate with field and vehicle subsystems to gather information and provide information and control that is coordinated by the center subsystems.

**Table 2: Center Subsystem Descriptions**

Entity Name	Entity Description
Archived Data Management	The Archived Data Management Subsystem (ADMS) collects, archives, manages, and distributes data generated from ITS sources for use in transportation administration, policy evaluation, safety, planning, performance monitoring, program assessment, operations, and research applications. The data received is formatted and tagged with attributes that define the data source, conditions under which it was collected, data transformations, and other information (i.e. meta data) necessary to interpret the data. The subsystem can fuse ITS generated data with data from non-ITS sources and other archives to generate information products utilizing data from multiple functional areas, modes, and jurisdictions. The subsystem prepares data products that can serve as inputs to federal, state, and local data reporting systems. This subsystem may be implemented in many different ways. It may reside within an operational center and provide focused access to a particular agency's data archives. Alternatively, it may operate as a distinct center that collects data from multiple agencies and sources and provides a general data warehouse service for a region.
Commercial Vehicle Administration	The Commercial Vehicle Administration Subsystem (CVAS) will operate at one or more fixed locations within a region. This subsystem performs administrative functions supporting credentials, tax, and safety regulations. It issues credentials, collects fees and taxes, and supports enforcement of credential requirements. This subsystem communicates with the Fleet Management Subsystems associated with the motor carriers to process credentials applications and collect fuel taxes, weight/distance taxes, and other taxes and fees associated with commercial vehicle operations. The subsystem also receives applications for, and issues special Oversize/Overweight and HAZMAT permits in coordination with other cognizant authorities. The subsystem coordinates with other Commercial Vehicle Administration Subsystems (in other states/regions) to support nationwide access to credentials and safety information for administration and enforcement functions. This subsystem supports communications with Commercial Vehicle Check Subsystems operating at the roadside to enable credential checking and safety information collection. The collected safety information is processed, stored, and made available to qualified stakeholders to identify carriers and drivers that operate unsafely.
Emergency Management	The Emergency Management (EM) Subsystem represents public safety, emergency management, and other allied agency systems that support incident management, disaster response and evacuation, security monitoring, and other security and public safety-oriented ITS applications. The subsystem includes the functions associated with fixed and mobile public safety communications centers including public safety call taker and dispatch centers operated by police (including transit police), fire, and emergency medical services. It includes the functions associated with Emergency Operations Centers that are activated at local, regional, state, and federal levels for emergencies and the portable and transportable systems that support Incident Command System operations at an incident. This subsystem

Entity Name	Entity Description
	<p>also represents other allied systems including centers associated with towing and recovery, freeway service patrols, HAZMAT response teams, and mayday service providers.</p> <p>The subsystem manages sensor and surveillance equipment used to enhance transportation security of the roadway infrastructure (including bridges, tunnels, interchanges, and other key roadway segments) and the public transportation system (including transit vehicles, public areas such as transit stops and stations, facilities such as transit yards, and transit infrastructure such as rail, bridges, tunnels, or bus guideways). The subsystem provides security/surveillance services to improve traveler security in public areas not a part of the public transportation system.</p> <p>This subsystem monitors alerts, advisories, and other threat information and prepares for and responds to identified emergencies. It interfaces with other Emergency Management Subsystems to support coordinated emergency response involving multiple agencies. The subsystem stores, coordinates, and utilizes emergency response and evacuation plans to facilitate this coordinated response. As the response progresses, situation information including damage assessments, response status, evacuation information, and resource information are shared to keep all allied agencies apprised of the response. Interface with the Transit Management Subsystem allows coordinated use of transit vehicles to facilitate response to major emergencies and to support evacuation efforts. The Emergency Management Subsystem also provides a focal point for coordination of the emergency and evacuation information that is provided to the traveling public, including wide-area alerts when immediate public notification is warranted.</p> <p>The subsystem tracks and manages emergency vehicle fleets using real-time road network status and routing information from the other center subsystems to aide in selecting the emergency vehicle(s) and routes that will provide the most timely response. Interface with the Traffic Management Subsystem allows strategic coordination in tailoring traffic control to support emergency vehicle ingress and egress, implementation of special traffic restrictions and closures, evacuation traffic control plans, and other special strategies that adapt the transportation system to better meet the unique demands of an emergency.</p>
Emissions Management	<p>This Emissions Management Subsystem (EMMS) operates at a fixed location and may co-reside with the Traffic Management Subsystem or may operate in its own distinct location depending on regional preferences and priorities. This subsystem provides the capabilities for air quality managers to monitor and manage air quality. These capabilities include collecting emissions data from distributed emissions sensors within the roadway subsystem. These sensors monitor general air quality within each sector of the area and also monitor the emissions of individual vehicles on the roadway. The sector emissions measures are collected, processed, and used to identify sectors exceeding safe pollution levels. This information is provided to traffic management to implement strategies intended to reduce emissions in and around the problem areas. Emissions data associated with individual vehicles, supplied by the Roadway Subsystem, is also processed and monitored to identify vehicles that exceed standards. This subsystem provides any functions necessary to inform the violators and otherwise ensure timely compliance with emissions standards.</p>
Fleet and Freight Management	<p>The Fleet and Freight Management Subsystem (FFMS) provides the capability for commercial drivers and fleet or freight managers to receive real-time routing information and access databases containing vehicle and/or freight equipment locations as well as carrier, vehicle, freight equipment and driver information. In addition, the capability to purchase credentials electronically shall also be provided, with automated and efficient connections to financial institutions and regulatory agencies, along with post-trip automated mileage and fuel usage reporting. The Fleet and Freight Management Subsystem also provides the capability for fleet managers to monitor the safety and security of their commercial vehicle drivers and fleet. The subsystem also supports application for hazmat credentials and makes information about hazmat cargo available to agencies as required. Within this subsystem lies all the functionality associated with subsystems and components necessary to enroll and</p>

Entity Name	Entity Description
	participate in international goods movement programs aimed at enhancing trade and transportation safety and security.
Information Service Provider	<p>The Information Service Provider Subsystem (ISPS) collects, processes, stores, and disseminates transportation information to system operators and the traveling public. The subsystem can play several different roles in an integrated ITS. In one role, the ISP provides a data collection, fusing, and repackaging function, collecting information from transportation system operators and redistributing this information to other system operators in the region and other ISPs. In this information redistribution role, the ISP provides a bridge between the various transportation systems that produce the information and the other ISPs and their subscribers that use the information. The second role of an ISP is focused on delivery of traveler information to subscribers and the public at large. Information provided includes basic advisories, traffic and road conditions, transit schedule information, yellow pages information, ridematching information, and parking information. The subsystem also provides the capability to provide specific directions to travelers by receiving origin and destination requests from travelers, generating route plans, and returning the calculated plans to the users. In addition to general route planning for travelers, the ISP also supports specialized route planning for vehicle fleets. In this third role, the ISP function may be dedicated to, or even embedded within, the dispatch system. Reservation services are also provided in advanced implementations. The information is provided to the traveler through the Personal Information Access Subsystem, Remote Traveler Support Subsystem, and the Vehicle Subsystem through available communications links. Both basic one-way (broadcast) and personalized two-way information provision are supported. The ISP is most commonly implemented as an Internet web site, but it represents any traveler information distribution service including systems that broadcast digital transportation data (e.g., satellite radio networks) and systems that support distribution through Field-Vehicle Communications networks. The ISP accomplishes these roles using constantly evolving technologies like the Internet (World Wide Web pages), direct broadcast communications (email alerts, pagers, satellite radio network data broadcasts), communications through Field-Vehicle Communications networks, etc.</p>
Maintenance and Construction Management	<p>The Maintenance and Construction Management Subsystem (MCMS) monitors and manages roadway infrastructure construction and maintenance activities. Representing both public agencies and private contractors that provide these functions, this subsystem manages fleets of maintenance, construction, or special service vehicles (e.g., snow and ice control equipment). The subsystem receives a wide range of status information from these vehicles and performs vehicle dispatch, routing, and resource management for the vehicle fleets and associated equipment. The subsystem participates in incident response by deploying maintenance and construction resources to an incident scene, in coordination with other center subsystems. The subsystem manages equipment at the roadside, including environmental sensors and automated systems that monitor and mitigate adverse road and surface weather conditions. The subsystem manages the repair and maintenance of both non-ITS and ITS equipment including the traffic controllers, detectors, dynamic message signs, signals, and other equipment associated with the roadway infrastructure. Additional interfaces to weather information providers (the weather service and surface transportation weather service providers) provide current and forecast weather information that can be fused with other data sources and used to support advanced decision support systems that increase the efficiency and effectiveness of maintenance and construction operations.</p> <p>The subsystem remotely monitors and manages ITS capabilities in work zones, gathering, storing, and disseminating work zone information to other systems. It manages traffic in the vicinity of the work zone and advises drivers of work zone status (either directly at the roadside or through an interface with the Information Service Provider or Traffic Management subsystems.) It schedules and manages the location and usage of maintenance assets (such as portable dynamic message signs).</p> <p>Construction and maintenance activities are tracked and coordinated with other systems,</p>

Entity Name	Entity Description
	improving the quality and accuracy of information available regarding closures and other roadway construction and maintenance activities.
Payment Administration	The Payment Administration Subsystem (PAS) provides general payment administration capabilities and supports the electronic transfer of authenticated funds from the customer to the transportation system operator or other service provider. Charges can be recorded for tolls, vehicle-mileage charging, congestion charging, or other goods and services. This subsystem supports traveler enrollment and collection of both pre-payment and post-payment transportation fees in coordination with the existing, and evolving financial infrastructure supporting electronic payment transactions. The system may establish and administer escrow accounts depending on the clearinghouse scheme and the type of payments involved. This subsystem posts a transaction to the customer account and generates a bill (for post-payment accounts), debits an escrow account, or interfaces to the financial infrastructure to debit a customer designated account. It supports communications with the Roadway Payment Subsystem to support fee collection operations. As an alternative, a wide-area wireless interface can be used to communicate directly with vehicle equipment. The subsystem also sets and administers the pricing structures and includes the capability to implement road pricing policies in coordination with the Traffic Management Subsystem. The electronic financial transactions in which this subsystem is an intermediary between the customer and the financial infrastructure shall be cryptographically protected and authenticated to preserve privacy and ensure authenticity and auditability.
Traffic Management	The Traffic Management Subsystem (TMS) monitors and controls traffic and the road network. It represents centers that manage a broad range of transportation facilities including freeway systems, rural and suburban highway systems, and urban and suburban traffic control systems. This subsystem communicates with the Roadway Subsystem to monitor and manage traffic flow and monitor the condition of the roadway, surrounding environmental conditions, and field equipment status. This subsystem coordinates with the Maintenance and Construction Management Subsystem to maintain the road network and coordinate and adapt to maintenance activities, closures, and detours. Incidents are detected, verified, and incident information is provided to allied agencies, drivers (through Roadway Subsystem highway advisory radio and dynamic message signs), and information service providers. This subsystem also manages traffic and transportation resources to support allied agencies in responding to, and recovering from, incidents ranging from minor traffic incidents through major disasters. When required, special traffic management strategies are implemented to support evacuation and reentry. The Traffic Management Subsystem supports HOV lane management and coordination, road pricing, and other demand management policies that can alleviate congestion and influence mode selection. It also manages reversible lane facilities and barrier and safeguard systems that control access to transportation infrastructure. The subsystem communicates with other Traffic Management Subsystems to coordinate traffic information and control strategies in neighboring jurisdictions. It also coordinates with rail operations to support safer and more efficient highway traffic management at highway-rail intersections. Finally, the Traffic Management Subsystem provides the capabilities to exercise control over those devices utilized for automated highway system (AHS) traffic and vehicle control.
Transit Management	The Transit Management Subsystem (TRMS) manages transit vehicle fleets and coordinates with other modes and transportation services. It provides operations, maintenance, customer information, planning and management functions for the transit property. It spans distinct central dispatch and garage management systems and supports the spectrum of fixed route, flexible route, paratransit services, transit rail, and bus rapid transit (BRT) service. The subsystem's interfaces allow for communication between transit departments and with other operating entities such as emergency response services and traffic management systems. This subsystem receives special event and real-time incident data from the traffic management subsystem. It provides current transit operations data to other center subsystems. It interfaces with the Emergency Management Subsystem to allow coordinated use of transit vehicles to facilitate response to major emergencies or evacuations. The Transit Management Subsystem

Entity Name	Entity Description
	<p>collects and stores accurate ridership levels and implements fare structures for use in electronic fare collection. It collects operational and maintenance data from transit vehicles, manages vehicle service histories, and assigns vehicle operators and maintenance personnel to vehicles and routes. The Transit Management Subsystem also provides the capability for automated planning and scheduling of public transit operations. The scheduling capability includes schedule writing, block building and runcutting. The subsystem furnishes travelers with real-time travel information, continuously updated schedules, schedule adherence information, transfer options, and transit routes and fares. In addition, the subsystem supports transit security features. This includes monitoring silent alarms, both passenger and operator initiated, on-board transit vehicles. It also includes the capability to support transit vehicle operator authentication and the capability to remotely disable a transit vehicle. The subsystem includes the capability to monitor for a transit vehicle being off the assigned route. The subsystem also includes the capability to alert operators and police to potential incidents identified by these security features.</p>

## Field Subsystems

These infrastructure subsystems presented in Table 3 provide the direct interface to the roadway network, vehicles traveling on the roadway network, and travelers in transit. Each of the roadway subsystems includes functions that require distribution to the field to support direct surveillance, information provision, and control plan execution. All field subsystems interface to one or more of the center subsystems that govern overall operation of the field subsystems. The field subsystems also generally include direct user interfaces to drivers and transit users and short-range interfaces to the Vehicle Subsystems to support operations.

**Table 3: Field Subsystem Descriptions**

Entity Name	Entity Description
Commercial Vehicle Check	The Commercial Vehicle Check Subsystem (CVCS) supports automated vehicle identification at mainline speeds for credential checking, roadside safety inspections, and weigh-in-motion using two-way data exchange. These capabilities include providing warnings to the commercial vehicle drivers, their fleet managers, and proper authorities of any safety problems that have been identified, accessing and examining historical safety data, and automatically deciding whether to allow the vehicle to pass or require it to stop with operator manual override. The Commercial Vehicle Check Subsystem also provides supplemental inspection services to current capabilities by supporting expedited brake inspections, the use of operator hand-held devices, mobile screening sites, on-board safety database access, and the enrollment of vehicles and carriers in the electronic clearance program.
Parking Management	The Parking Management Subsystem (PMS) provides electronic monitoring and management of parking facilities. It supports a Field-Vehicle Communications link to the Vehicle Subsystem that allows electronic collection of parking fees and monitors and controls parking meters that support conventional parking fee collection. It also includes the instrumentation, signs, and other infrastructure that monitors parking lot usage and provides local information about parking availability and other general parking information. This portion of the subsystem functionality must be located in the parking facility where it can monitor, classify, and share information with customers and their vehicles. The subsystem also interfaces with the financial infrastructure and broadly disseminates parking information to other operational centers in the region. Note that the latter functionality may be located in a back office, remote from the parking facility.
Roadway	The Roadway Subsystem (RS) includes the equipment distributed on and along the roadway that monitors and controls traffic and monitors and manages the roadway itself. Equipment includes traffic detectors, environmental sensors, traffic signals, highway advisory radios, dynamic message signs, CCTV cameras and video image processing systems, grade crossing warning systems, and freeway ramp metering systems. HOV lane management, reversible lane management functions, and barrier systems that control access to transportation infrastructure such as roadways, bridges and tunnels are also supported. This subsystem also provides the capability for environmental monitoring including sensors that measure road conditions, surface weather, and vehicle emissions. In adverse conditions, automated systems can be used to apply anti-icing materials, disperse fog, etc. Work zone systems including work zone surveillance, traffic control, driver warning, and work crew safety systems are also included. To enhance security, safeguard systems such as blast shields, exhaust systems and other automated and remotely controlled systems to protect transportation infrastructure is also provided. In advanced implementations, this subsystem supports automated vehicle safety systems by safely controlling access to and egress from an Automated Highway System through monitoring of, and communications with, AHS vehicles. Intersection collision avoidance functions are provided by determining the probability of a collision in the intersection and sending appropriate warnings and/or control actions to the approaching vehicles.
Roadway Payment	The Roadway Payment Subsystem (RPS) represents the roadway components of a toll collection, vehicle miles traveled (VMT), congestion charging, and other systems that support payment from a vehicle. As a toll collection system, this subsystem provides the capability for vehicle operators



Entity Name	Entity Description
	<p>to pay tolls without stopping their vehicles. It supports use of locally determined pricing structures and includes the capability to implement various variable road pricing policies. Each transaction is accompanied by feedback to the customer indicating the general status of the customer account. A record of the transactions is provided to the Payment Administration Subsystem for reconciliation and so that the customer can periodically receive a detailed record of the transactions.</p> <p>The RPS can represent equipment at fixed locations or mobile equipment that supports spot inspection to verify the vehicle equipment is configured correctly and operational. Fixed roadway equipment supports relay of VMT data and equipment status to the Payment Administration Subsystem. RPS elements can be located at traditional toll collection locations (i.e. toll plazas) to support traditional roadway toll functions, as well as at gas stations or public or privately operated auto mechanic shops or vehicle inspection stations) for relaying VMT data.</p>
Security Monitoring	<p>The Security Monitoring Subsystem (SMS) includes surveillance and sensor equipment used to provide enhanced security and safety for transportation facilities or infrastructure. The equipment represented by this subsystem is located in non-public areas of transportation facilities (e.g. maintenance and transit yards) or located on or near non-roadway parts of the transportation infrastructure (e.g. transit railway and guideways). This subsystem also includes surveillance and sensor equipment located on or near major roadway features such as bridges, tunnels, and interchanges, when the equipment's primary function is one of security and safety. If the primary function of the equipment is traffic surveillance or incident detection, then the surveillance or sensors would be covered as part of the Roadway Subsystem. Similarly, the surveillance and sensor equipment for public areas of transportation facilities is covered in the Remote Traveler Support Subsystem. The surveillance equipment includes video (e.g. CCTV cameras) and/or audio systems. The sensor equipment includes threat sensors (e.g. chemical agent, toxic industrial chemical, biological, explosives, and radiological sensors), object detection (e.g. metal detectors), intrusion or motion detection, and infrastructure integrity monitoring (e.g. rail track continuity checking or bridge structural integrity monitoring). Limited processing of collected sensor and surveillance data is also included in this subsystem to support threat detection and classification.</p>

## Vehicle Subsystems

These subsystems presented in Table 4 are all vehicle-based and share many general driver information, vehicle navigation, and advanced safety systems functions. The vehicle subsystems communicate with the field subsystems and center subsystems for provision of information to the driver. In the following descriptions, the Vehicle Subsystem description includes general traveler information and vehicle safety functions that are also applicable to the three fleet vehicle subsystems (Commercial Vehicle Subsystem, Emergency Vehicle Subsystem, Maintenance and Construction Vehicle, and Transit Vehicle Subsystem). The fleet vehicle subsystems all include vehicle location and two-way communications functions that support efficient fleet operations. Each of the three fleet vehicle subsystems also include functions that support their specific service area.

**Table 4: Vehicle Subsystem Descriptions**

Entity Name	Entity Description
Commercial Vehicle	The Commercial Vehicle Subsystem (CVS) resides in a commercial vehicle and provides the sensory, processing, storage, and communications functions necessary to support safe and efficient commercial vehicle operations. The Commercial Vehicle Subsystem provides two-way communications between the commercial vehicle drivers, their fleet managers, attached freight equipment, and roadside officials, and provides HAZMAT response teams with timely and accurate cargo contents information after a vehicle incident. This subsystem provides the capability to collect and process vehicle, cargo information from the attached freight equipment, and driver safety data and status and alert the driver whenever there is a potential safety or security problem. Basic identification, security and safety status data are supplied to inspection facilities at mainline speeds. In addition, the subsystem will automatically collect and record mileage, fuel usage, and border crossings.
Emergency Vehicle	The Emergency Vehicle Subsystem (EVS) resides in an emergency vehicle and provides the sensory, processing, storage, and communications functions necessary to support safe and efficient incident response. The subsystem represents a range of vehicles including those operated by police, fire, and emergency medical services. In addition, this subsystem represents other incident response vehicles including towing and recovery vehicles and freeway service patrols. The Emergency Vehicle Subsystem includes two-way communications to support coordinated response to emergencies in accordance with an associated Emergency Management Subsystem. Emergency vehicles are equipped with automated vehicle location capability for monitoring by vehicle tracking and fleet management functions in the Emergency Management Subsystem. Using these capabilities, the appropriate emergency vehicle to respond to each emergency is determined. Route guidance capabilities within the vehicle enable safe and efficient routing to the emergency. In addition, the emergency vehicle may be equipped to support signal preemption through communications with the Roadway Subsystem.
Maintenance and Construction Vehicle	The Maintenance and Construction Vehicle Subsystem (MCVS) resides in a maintenance, construction, or other specialized service vehicle or equipment and provides the sensory, processing, storage, and communications functions necessary to support highway maintenance and construction. All types of maintenance and construction vehicles are covered, including heavy equipment and supervisory vehicles. The subsystem provides two-way communications between drivers/operators and dispatchers and maintains and communicates current location and status information. A wide range of operational status is monitored, measured, and made available, depending on the specific type of vehicle or equipment. For example, for a snow plow, the information would include whether the plow is up or down and material usage information. The subsystem may also contain capabilities to monitor vehicle systems to support maintenance of the vehicle itself and other sensors that monitor environmental conditions including the road condition and surface weather information. This subsystem can represent a diverse set of mobile environmental sensing platforms, including wheeled vehicles and any other vehicle that collects and reports environmental information.

Entity Name	Entity Description
Transit Vehicle	<p>The Transit Vehicle Subsystem (TRVS) resides in a transit vehicle and provides the sensory, processing, storage, and communications functions necessary to support safe and efficient movement of passengers. The types of transit vehicles containing this subsystem include buses, paratransit vehicles, light rail vehicles, other vehicles designed to carry passengers, and supervisory vehicles. The subsystem collects accurate ridership levels and supports electronic fare collection. The subsystem supports a traffic signal prioritization function that communicates with the roadside subsystem to improve on-schedule performance. Automated vehicle location functions enhance the information available to the Transit Management Subsystem enabling more efficient operations. On-board sensors support transit vehicle maintenance. The subsystem supports on-board security and safety monitoring. This monitoring includes transit user or vehicle operator activated alarms (silent or audible), as well as surveillance and sensor equipment. The surveillance equipment includes video (e.g. CCTV cameras), audio systems and/or event recorder systems. The sensor equipment includes threat sensors (e.g. chemical agent, toxic industrial chemical, biological, explosives, and radiological sensors) and object detection sensors (e.g. metal detectors). In addition, the subsystem supports vehicle operator authentication prior to operation of the vehicle and remote vehicle disabling. The subsystem also furnishes travelers with real-time travel information, continuously updated schedules, transfer options, routes, and fares.</p>
Vehicle	<p>The Vehicle Subsystem (VS) provides the sensory, processing, storage, and communications functions necessary to support efficient, safe, and convenient travel. These functions reside in general vehicles including personal automobiles, commercial vehicles, emergency vehicles, transit vehicles, or other vehicle types. Information services provide the driver with current travel conditions and the availability of services along the route and at the destination. Both one-way and two-way communications options support a spectrum of information services from low-cost broadcast services to advanced, pay for use personalized information services. Route guidance capabilities assist in formulation of an optimal route and step by step guidance along the travel route. Advanced sensors, processors, enhanced driver interfaces, and actuators complement the driver information services so that, in addition to making informed mode and route selections, the driver travels these routes in a safer and more consistent manner. Initial collision avoidance functions provide 'vigilant co-pilot' driver warning capabilities. More advanced functions assume limited control of the vehicle to maintain safe headway. Ultimately, this subsystem supports completely automated vehicle operation through advanced communications with other vehicles in the vicinity and in coordination with supporting infrastructure subsystems. Pre-crash safety systems are deployed and emergency notification messages are issued when unavoidable collisions do occur.</p>

## Traveler Subsystems

Table 5 includes the equipment that is typically owned and operated by the traveler. Though this equipment is often general purpose in nature and used for a variety of tasks, this equipment is specifically used for gaining access to traveler information within the scope of the ITS architecture. These subsystems interface to the information provider (one of the center subsystems, most commonly the Information Service Provider Subsystem) to access the traveler information. A range of service options and levels of equipment sophistication are considered and supported. Specific equipment included in this subsystem class includes personal computers, personal digital assistants (PDAs), and any other communications-capable consumer products that can be used to supply information to the traveler.

**Table 5: Traveler Subsystem Descriptions**

Entity Name	Entity Description
Personal Information Access	<p>The Personal Information Access Subsystem (PIAS) provides the capability for travelers to receive formatted traffic advisories from their homes, place of work, major trip generation sites, personal portable devices, over multiple types of electronic media. These capabilities also provide basic routing information and allow users to select those transportation modes that allow them to avoid congestion, or more advanced capabilities to allow users to specify those transportation parameters that are unique to their individual needs and receive travel information. This subsystem provides travelers with the capability to receive route planning from the infrastructure at fixed locations such as in their homes, their place of work, and at mobile locations using personal portable devices and vehicle-based devices. In addition to end user devices, this subsystem may also represent a device that is used by a merchant or other service provider to receive traveler information and relay important information to their customers. This subsystem also provides the capability to initiate a distress signal and cancel a prior-issued manual request for help.</p>
Remote Traveler Support	<p>The Remote Traveler Support Subsystem (RTSS) provides access to traveler information at transit stations, transit stops, other fixed sites along travel routes (e.g., rest stops, merchant locations), and major trip generation locations such as special event centers, hotels, office complexes, amusement parks, and theaters. Traveler information access points include kiosks and informational displays supporting varied levels of interaction and information access. At transit stops, simple displays providing schedule information and imminent arrival signals can be provided. This basic information may be extended to include multi-modal information including traffic conditions and transit schedules along with yellow pages information to support mode and route selection at major trip generation sites. Personalized route planning and route guidance information can also be provided based on criteria supplied by the traveler. The subsystem also supports electronic payment of transit fares.</p> <p>In addition to the traveler information provisions, this subsystem also supports security and safety monitoring of public areas. This monitoring includes traveler activated silent alarms, as well as surveillance and sensor equipment. The surveillance equipment includes video (e.g. CCTV cameras) and/or audio systems. The sensor equipment includes threat sensors (e.g. chemical agent, toxic industrial chemical, biological, explosives, and radiological sensors) and object detection sensors (e.g. metal detectors).</p>

## 2.2.3 Terminator Descriptions

Entities that establish the boundary of the architecture are defined in the Physical Architecture as terminators and are described in Table 6.

**Table 6: Terminator Descriptions**

<b>Entity Name</b>	<b>Entity Description</b>
Alerting and Advisory Systems	<p>This terminator represents the federal, state, and local alerting and advisory systems that provide alerts, advisories, and other potential threat information that is relevant to surface transportation systems. This includes systems such as the Information Sharing and Analysis Centers (ISACS), the National Infrastructure Protection Center (NIPC), the Homeland Security Advisory System (HSAS), and other systems that provide intelligence about potential, imminent, or actual attacks on the transportation infrastructure or its supporting information systems.</p> <p>This terminator also represents the early warning and emergency alert systems operated by federal, state, county, and local agencies that provide advisories and alerts regarding all types of emergencies including natural hazards (floods, hurricanes, tornados, earthquakes), accidents (chemical spills, nuclear power plant emergencies) and other civil emergencies such as child abduction alerts that impact transportation system operation and/or require immediate public notification. Note that weather related watches and warnings, such as those issued by the National Hurricane Center, are provided by both this terminator and the Weather Service terminator since many alerting and advisory systems and the National Weather Service both provide severe weather and related hazards information.</p> <p>The alerts and advisories that are provided by the systems represented by this terminator are based on analysis of potential threat information that is collected from a variety of sources, including information collected by ITS systems. The bidirectional interface with this terminator allows potential threat information that is collected by ITS systems to be provided to the alerting and advisory systems to improve their ability to identify threats and provide useful and timely information.</p> <p>The types of information provided by this terminator include general assessments and incident awareness information, advisories that identify potential threats or recommendations to increase preparedness levels, alerts regarding imminent or in-progress emergencies, and specific threat information such as visual imagery used for biometric image processing.</p>
Archived Data Administrator	<p>This terminator represents the human operator who provides overall data management, administration, and monitoring duties for the ITS data archive. Unlike the manager of the operational databases, the archive data administrator's role is focused on the archive and covers areas such as establishing user authentication controls, monitoring data quality, and initiating data import requests.</p>
Archived Data User Systems	<p>This terminator represents the systems users employ to access archived data. The general interface provided from this terminator allows a broad range of users (e.g. planners, researchers, analysts, operators) and their systems (e.g. databases, models, analytical tools, user interface devices) to acquire data and analyses results from the archive.</p>
Asset Management	<p>This terminator represents the systems that support decision-making for maintenance, upgrade, and operation of physical transportation assets. Asset management integrates and includes the pavement management systems, bridge management systems, and other systems that inventory and manage the highway infrastructure and other transportation-related assets. The types of assets that are inventoried and managed will vary, and may include the maintenance and construction vehicles and equipment as</p>

Entity Name	Entity Description
	well as "soft" assets such as human resources and software. Asset management systems monitor the condition, performance, and availability of the infrastructure and evaluate and prioritize alternative reconstruction, rehabilitation, and maintenance strategies.
Basic Commercial Vehicle	This terminator represents the motorized commercial vehicle platform that interfaces with and hosts ITS electronics. This terminator represents a vehicle that is used to transport goods which are operated by professional drivers, typically administered as part of a larger fleet, and regulated by a Fleet-Freight Manager. This classification applies to all such vehicles ranging from small panel vans used in local pick-up and delivery services to large, multi-axle tractor-trailer rigs operating on long haul routes.
Basic Maintenance and Construction Vehicle	This terminator represents a specialized form of the Basic Vehicle used by maintenance fleets. It supports the on-board equipment that control the non-ITS systems such as the actual operation of the snow plow, as well as any non-ITS sensor equipment that monitors the amount of materials (e.g., sand or salt) on-board. The monitoring of the Basic Maintenance and Construction Vehicle mechanical condition and mileage provides the major inputs for maintenance vehicle activity scheduling.
Basic Transit Vehicle	This terminator represents a specialized form of the Basic Vehicle that interfaces with and hosts ITS electronics. The Basic Transit Vehicle may be a bus, paratransit vehicle, light rail vehicle, or other vehicle designed to carry passengers. The Basic Transit Vehicle includes the non-ITS on-board systems (e.g., engine, brakes, drive train, odometer). The monitoring of the Basic Transit Vehicle mechanical condition and mileage provides the major inputs for vehicle maintenance activity scheduling. The Basic Transit Vehicle can also accept disable commands resulting from a remote vehicle disable command or from a failure of the vehicle operator to be properly authenticated.
Basic Vehicle	This terminator represents the basic vehicle platform that interfaces with and hosts ITS electronics. The Basic Vehicle terminator provides an interface to drive train, driver convenience and entertainment systems, and other non-ITS electronics on-board the vehicle. This interface allows general vehicle systems (e.g., the stereo speaker system) to be shared by ITS and non-ITS systems. It also allows monitoring and control of the vehicle platform for advanced vehicle control system applications.
Border Inspection Administration	This terminator represents back-office systems and databases run by U.S. domestic and foreign governmental agencies responsible for the regulation of trade, and the enforcement of customs and immigration laws. These agencies include U.S. Department of Homeland Security (DHS) and its counterparts in Canada and Mexico. DHS includes components like Customs and Border Protection (CBP), Immigration and Customs Enforcement (ICE), and Transportation Security Administration (TSA). Other agencies include secondary trade agencies (e.g., U.S. Food and Drug Administration, U.S. Department of Agriculture, other USDOT departments, etc.), and agencies from other trading nations. The systems they manage coordinate activities related to the border crossings. Data is collected and disseminated to other government systems and users. These systems support import/export cargo processing and enforcement operations at the border, including programs such as FAST, Automated Commercial Environment (ACE), Nexus (Canada), SENTRI (Mexico), and US-VISIT.
Border Inspection Systems	This terminator represents data systems used at the border for the inspection of people or goods. Supports immigration, customs (trade), agricultural, and FDA inspections as applicable. Includes sensors and surveillance systems to identify and classify drivers and their cargo as it approaches a border crossing, the systems used to interface with the back-office administration systems and provide information on status of the crossing or events to other agency systems.
Care Facility	This terminator represents a hospital or another emergency care facility. It may also represent a third party quality of care information provider.
Commercial Vehicle Driver	This terminator represents the human entity that operates vehicles transporting goods including both long haul trucks and local pick up and delivery vans. This terminator is

Entity Name	Entity Description
	complementary to the Driver terminator in that it represents those interactions which are unique to Commercial Vehicle Operations. Data flowing from the Commercial Vehicle Driver terminator will include those system inputs specific to Commercial Vehicle Operations, such as information back to the Fleet-Freight Manager. Data flowing to the Commercial Vehicle Driver may include system outputs such as commands to pull into a roadside safety inspection facility. Showing the Driver as a terminator includes the user interface devices within the ITS architecture boundary. The Commercial Vehicle Driver will be expected to interact with the ITS interface devices designed to provide support for their usage.
CVO Information Requestor	This terminator represents any organization or individual requesting information from the CVO Information Exchange network. It typically represents insurance companies requesting safety information on carriers, a driver requesting his/her own driving record, etc.
CVO Inspector	This terminator represents the human entities who perform regulatory inspection of Commercial Vehicles in the field. CVO Inspectors support the roadside inspection, weighing, and checking of credentials either through automated preclearance or manual methods. The CVO Inspector is an inspection and enforcement arm of the regulatory agencies with frequent direct interface with the Commercial Vehicles and their Drivers.
DMV	This terminator represents a specific (state) public organization responsible for registering vehicles, e.g., the Department of Motor Vehicles.
Driver	This terminator represents the human entity that operates a licensed vehicle on the roadway. Included are operators of private, Transit, Commercial, and Emergency vehicles where the data being sent or received is not particular to the type of vehicle. Thus this terminator originates driver requests and receives driver information that reflects the interactions which might be useful to all drivers, regardless of vehicle classification. The Driver terminator is the operator of the Basic Vehicle terminator. Information and interactions which are unique to drivers of a specific vehicle type (e.g., fleet interactions with transit, commercial, or emergency vehicle drivers) are covered separately.
Driver Identification Card	This terminator represents the portable entity (e.g., a smart card) that enables the transfer of electronic identification information about a driver. This may include license information, biometrics, and other data to identify the driver. Typically the card will be issued by a government agency (e.g. a state driver licensing agency).
Emergency Personnel	This terminator represents personnel that are responsible for police, fire, emergency medical services, towing, service patrols, and other special response team (e.g., hazardous material clean-up) activities at an incident site. These personnel are associated with the Emergency Vehicle Subsystem during dispatch to the incident site, but often work independently of the Emergency Vehicle Subsystem while providing their incident response services. Emergency personnel may include an Officer in Charge (OIC) and a crew. When managing an incident following standard Incident Command System practices, the on-site emergency personnel form an organizational structure under the auspices of an Incident Commander.
Emergency System Operator	This terminator represents the human entity that monitors all ITS emergency requests, (including those from the E911 Operator) and sets up pre-defined responses to be executed by an emergency management system. The operator may also override predefined responses where it is observed that they are not achieving the desired result. This terminator includes dispatchers who manage an emergency fleet (police, fire, ambulance, HAZMAT, etc.) or higher order emergency managers who provide response coordination during emergencies.
Emergency Telecommunications System	This terminator represents the telecommunications systems that connect a caller with a Public Safety Answering Point (PSAP). These systems transparently support priority wireline and wireless caller access to the PSAP through 9-1-1 and other access mechanisms like 7 digit local access numbers, and motorist aid call boxes. The calls are routed to the appropriate PSAP, based on caller location when this information is

Entity Name	Entity Description
	available. When available, the caller's location and call-back number are also provided to the PSAP by this interface. This facility may also be used to notify the public - residents and businesses - of emergency situations using a Reverse 911 capability.
Emissions Management Operator	This terminator represents personnel that monitor, operate, and manage emissions monitoring and management systems. These personnel monitor system operation and monitor collected emissions and air quality information and direct system operation through data and command inputs.
Enforcement Agency	This terminator represents the systems that receive reports of violations detected by various ITS facilities including individual vehicle emissions, toll violations, CVO violations, excessive speed in work zones, etc.
Environment	This terminator represents the natural surroundings in which the ITS operates. These surroundings include conditions such as snow, rain, fog, pollution, dust, temperature, humidity, solar radiation, and man made electromagnetic (RF) effects. Environmental conditions must be monitored by the ITS Architecture so that Travelers may be informed and control strategies can reflect adverse environmental conditions in a timely fashion.
Equipment Repair Facility	This terminator represents the facilities that configure, service, and repair vehicles and other support equipment used in roadway infrastructure construction and maintenance. The equipment repair facility receives preventative and corrective maintenance schedules and vehicle configuration requirements, performs the necessary configuration and maintenance work on the vehicles and equipment, and provides vehicle and equipment status back to the architecture.
Event Promoters	This terminator represents Special Event Sponsors that have knowledge of events that may impact travel on roadways or other modal means. Examples of special event sponsors include sporting events, conventions, motorcades/parades, and public/political events. These promoters interface to the ITS to provide event information such as date, time, estimated duration, location, and any other information pertinent to traffic movement in the surrounding area.
Financial Institution	This terminator represents the organization that handles all electronic fund transfer requests to enable the transfer of funds from the user of the service to the provider of the service. The functions and activities of financial clearinghouses are subsumed by this entity.
Fleet-Freight Manager	This terminator represents the human entities that are responsible for the dispatching and management of Commercial Vehicle fleets (e.g. traditional Fleet Managers) and Freight Equipment assets. It may be many people in a large tracking organization but it can also be a single person (owner driver) in the case of single vehicle fleets. The Fleet-Freight Manager provides instructions and coordination for Commercial Vehicles and Freight Equipment, including electronic clearance and tax filing, and receives the status of the vehicles and freight equipment in the fleet that they manage. The Fleet-Freight Manager is expected to interface with ITS on a regular basis to enhance productivity. Many interfaces with the system are also provided through normal user interfaces.
Freight Equipment	This terminator represents a freight container, intermodal chassis or trailer and provides information to support safe, secure and efficient freight operations. This terminator provides equipment safety data and status and can alert the appropriate systems of an incident, breach, or tamper event. This terminator provides accurate position information to support in-transit visibility of freight equipment.
Government Reporting Systems	This terminator represents the system and associated personnel that prepare the inputs to support the various local, state, and federal government transportation data reporting requirements (e.g. Highway Performance Monitoring System, Fatality Analysis Reporting System) using data collected by ITS systems. This terminator represents a system interface that would provide access to the archived data that is relevant to these reports. In most cases, this terminator would manually combine data collected from the ITS archives with data from non ITS sources to assemble and submit the required information.



Entity Name	Entity Description
Intermodal Freight Depot	This terminator represents a depot operated either by a depot manager or an alternate mode freight shipper which represents the point of exchange where freight is moved from one mode to another. The depot has knowledge about activities that may impact travel on roadways such as large groups of trucks entering the highway after unloading a ship or freight train. The depot interfaces to the ITS to coordinate freight movement with Fleet-Freight Managers, gather information on traffic conditions affecting the depot, and to provide information on intermodal freight activities that is pertinent to traffic movement in the surrounding area.
Intermodal Freight Shipper	This terminator represents organizations that engage in the shipment of freight by multiple means, in addition to road-going trucks. They enable ITS to move goods on routes that require the use of other modes of transportation such as heavy rail, air, sea, etc. This terminator includes third party logistics providers (i.e. brokers, freight forwarders, etc.) that interface with Fleet-Freight Managers to transfer cargo from one mode to another. This definition includes those responsible for the movement of freight across international borders. These entities are responsible for filing required declarations, and have an acute interest in the status of international shipments.
ISP Operator	This terminator is the human entity that may be physically present at the ISP to monitor the operational status of the facility and provide human interface capabilities to travelers and other ISP subsystems.
Location Data Source	This terminator provides accurate position information. Systems which use GPS, terrestrial trilateration, or driver inputs are all potential examples of Location Data Sources. This terminator contains sensors such as radio position receivers (e.g. GPS) and/or dead reckoning sensors (e.g. odometer, differential odometer, magnetic compass, gyro, etc.). This terminator implies that some additional functionality associated with developing an absolute position is outside the system and will not be directly modeled by the logical or physical architecture representations of the system.
Maintenance and Construction Administrative Systems	This terminator represents the various administrative systems that support the operation of ITS systems for maintenance and construction operations. The interfaces to this terminator support general administrative data interchanges between ITS and non-ITS systems. This includes: interfaces to purchasing for equipment and consumables resupply, interfaces to human resources that manage training and special certification for field crews and other personnel, and interfaces to contract administration functions that administer and monitor the work performance for maintenance and construction contracts.
Maintenance and Construction Center Personnel	This terminator represents the people that directly interface with the systems in the Maintenance and Construction Management subsystem. These personnel interact with fleet dispatch and management systems, road maintenance systems, incident management systems, work plan scheduling systems, and work zone management systems. They provide operator data and command inputs to direct system operations to varying degrees depending on the type of system and the deployment scenario. All functionality associated with these services that might be automated in the course of ITS deployment is modeled as internal to the architecture.
Maintenance and Construction Field Personnel	This terminator represents the people that perform maintenance and construction field activities including vehicle and equipment operators, field supervisory personnel, field crews, and work zone safety personnel. Information flowing from the Maintenance and Construction Field Personnel terminator will include those system inputs specific to maintenance and construction operations, such as information regarding work zone status, or the status of maintenance actions. The field personnel are also monitored within the work zone to enhance work zone safety. Information provided to Maintenance and Construction Field Personnel includes system outputs such as dispatch requests, maintenance and construction actions to be performed, and work zone safety warnings.
Map Update Provider	This terminator represents a provider of map databases used to support ITS services. It supports the provision of the databases that are used by travelers (e.g., navigable maps

Entity Name	Entity Description
	used for route guidance and display maps used at traveler information points) as well as those that are used by system operators (e.g., map data used by Traffic Operators to monitor and manage the road network, map data used by Fleet Managers to manage a vehicle fleet). This terminator may represent a third-party provider or an internal organization that produces map data for agency use. Products may include simple display maps, map data sets that define road network topology, or full geographic information system databases that are used to support ITS.
Media	This terminator represents the information systems that provide traffic reports, travel conditions, and other transportation-related news services to the traveling public through radio, TV, and other media. Traffic and travel advisory information that are collected by ITS are provided to this terminator. It is also a source for traffic flow information, incident and special event information, and other events which may have implications for the transportation system.
Multimodal Crossings	This terminator represents the control equipment that interfaces to a non-road based transportation system at an interference crossing with the roadway. The majority of these crossings are railroad grade crossings that are more specifically addressed by the "Wayside Equipment" terminator. This multimodal crossing terminator addresses similar interface requirements, but for other specialized intersections like draw bridges at rivers and canals. These crossings carry traffic that may take priority over the road traffic at the intersection. The data provided will in its basic form be a simple "stop road traffic" indication. However more complex data flows may be provided that give the time at which right-of-way will be required and the duration of that right-of-way requirement.
Multimodal Transportation Service Provider	This terminator provides the interface through which Transportation Service Providers can exchange data with ITS. They are the operators of non-roadway transportation systems (e.g. airlines, ferry services, passenger carrying heavy rail) and providers of non-motorized transportation facilities. This two-way interface enables coordination for efficient movement of people across multiple transportation modes. It also enables the traveler to efficiently plan itineraries which include segments using modes not directly included in the ITS User Services.
Other Archives	This terminator represents distributed archived data systems or centers whose data can be accessed and shared with a local archive. The interface between the Other Archives Terminator and the Archived Data Management Subsystem allows data from multiple archives to be accessed on demand or imported and consolidated into a single repository.
Other CVAS	This terminator is intended to provide a source and destination for ITS data flows between peer (e.g. inter-regional) commercial vehicle administration functions. It enables commercial vehicle administration activities to be coordinated across different jurisdictional areas. In the Physical Architecture, this terminator is a reciprocal Commercial Vehicle Administration Subsystem (CVAS). This terminator encompasses all functions associated with commercial vehicle safety, registration, and operating authority for non-U.S. based commercial motor vehicle carriers. The agencies represented herein may include Federal, state, provincial, and local regulatory entities outside the U.S.
Other Data Sources	This terminator represents the myriad systems and databases containing data not generated from subsystems and terminators represented in the National ITS Architecture that can provide predefined data sets to the ITS archive. The terminator can provide economic, cost, demographic, land use, law enforcement, and other data that is not collected by ITS systems and would otherwise be unavailable within an ITS data archive.
Other Emergency Management	Representing other Emergency Management centers, systems or subsystems, this terminator provides a source and destination for ITS data flows between various communications centers operated by public safety agencies, emergency management agencies, other allied agencies, and private companies that participate in coordinated

Entity Name	Entity Description
	management of highway-related incidents, including disasters. The interface represented by this terminator enables emergency management activities to be coordinated across jurisdictional boundaries and between functional areas. In the Physical Architecture this terminator is a reciprocal Emergency Management Subsystem (EM) implying the requirements for general networks connecting many allied agencies. The interface between this terminator and the EM supports coordination of incident management information between many different centers providing Public Safety Answering Point (both public or private sector implementations), Public Safety Dispatch, Emergency Operations Centers, and other functions that participate in the detection, verification, response, recovery and clearance of incidents, including disasters. This terminator also supports interface to other allied agencies like utility companies that also participate in the coordinated response to selected highway-related incidents.
Other ISP	Representing other distinct Information Service Providers, this terminator is intended to provide a source and destination for ITS data flows between peer information and service provider functions. It enables cooperative information sharing between providers as conditions warrant. In the Physical Architecture this terminator is a reciprocal Information Service Provider (ISP) Subsystem.
Other MCM	Representing another Maintenance and Construction Management center or subsystem, this terminator is intended to provide a source and destination for ITS information flows between maintenance and construction management functions. It enables maintenance and construction operations to be coordinated across jurisdictions or between public and private sectors. In the Physical Architecture, this terminator is a reciprocal Maintenance and Construction Management Subsystem (MCMS).
Other MCV	This terminator represents another ITS Maintenance and Construction Vehicle Subsystem. It provides a source and destination for ITS information transfers between maintenance and construction vehicles. These information transfers allow vehicle operational status, environmental information, and work zone intrusion warnings or alarms to be shared between vehicles.
Other Parking	Representing another parking facility, system or subsystem, this terminator provides a source and destination for information that may be exchanged between peer parking systems. This terminator enables parking management activities to be coordinated between different parking operators or systems in a region. In the Physical Architecture this terminator is a reciprocal Parking Management Subsystem.
Other Payment Administration	Representing another Payment Administration center or subsystem, this terminator is intended to provide a source and destination for ITS information flows between payment administration functions. This interface allows reconciliation of toll charges and other payments across different agencies by allowing the exchange of information about clients who have incurred charges in jurisdictions other than their own (billing) customer service center. This interface enables apportioning charges and "reciprocity" between participating customer service centers. In the Physical Architecture, this terminator is a reciprocal Payment Administration Subsystem (PAS).
Other Roadway	Representing another roadway system or subsystem, this terminator supports 'field device' to 'field device' communication and coordination, and provides a source and destination for information that may be exchanged between roadway subsystems. The interface to this terminator enables direct coordination between field equipment. Examples include the direct interface between sensors and other roadway devices (e.g., Dynamic Message Signs) and the direct interface between roadway devices (e.g., between a Signal System Master and Signal System Local equipment).
Other Traffic Management	Representing another Traffic Management center, system or subsystem, this terminator is intended to provide a source and destination for ITS data flows between peer (e.g. inter-regional) traffic management functions. It enables traffic management activities to be coordinated across different jurisdictional areas. In the Physical Architecture, this terminator is a reciprocal Traffic Management Subsystem (TMS).

Entity Name	Entity Description
Other Transit Management	Representing another Transit Management center, system or subsystem, this terminator is intended to provide a source and destination for ITS data flows between peer (e.g. inter-regional) transit management functions. It enables transit management activities to be coordinated across geographic boundaries or different jurisdictional areas. In the Physical Architecture this terminator represents a reciprocal Transit Management Subsystem (TRMS).
Other Vehicle	This terminator represents another ITS vehicle system or subsystem and provides a source and destination for ITS information transfers between peer vehicle systems to support vehicle-to-vehicle communication and coordination. These features are associated with advanced vehicle safety systems and services that require communications between vehicles.
Parking Operator	This terminator is the human entity that may be physically present at the parking lot facility to monitor the operational status of the facility.
Payment Administrator	The Payment Administrator terminator represents the person(s) that manage the back office payment administration systems for electronic toll, VMT road use payment, and other services paid for from a vehicle. This terminator monitors the systems that support the electronic transfer of authenticated funds from the customer to the system operator. The terminator monitors customer enrollment and supports the establishment of escrow accounts depending on the clearinghouse scheme and the type of payments involved. The terminator also establishes and administers the pricing structures and policies.
Pedestrians	This terminator provides input (e.g. a request for right of way at an intersection) from a specialized form of the Traveler who is not using any type of vehicle (including bicycles) as a form of transport. Pedestrians may comprise those on foot and those in wheelchairs.
Potential Obstacles	Any object that possesses the potential of being sensed and struck and thus also possesses physical attributes. Potential Obstacles include roadside obstructions, other vehicles, pedestrians, infrastructure elements or any other element which is in a potential path of the vehicle. This terminator represents the physical obstacles which possess properties which enable detection using sensory functions included as part of the ITS architecture. These physical attributes are represented as a data input to the system.
Public Health System	This terminator represents the systems operated by hospitals or regional public health departments that can respond to requests for specific information regarding emergencies involving biohazards - such as biological attacks, hazardous materials spills, or other threats to public health. This terminator can provide recommended courses of action to emergency management to improve the response, quarantining, or evacuation based on the type of hazard involved.
Rail Operations	This terminator represents the (usually) centralized control point for a substantial segment of a freight railroad's operations and maintenance activities. It is roughly the railroad equivalent to a highway Traffic Management Center. It is the source and destination of information that can be used to coordinate rail and highway traffic management and maintenance operations. It is also the source and destination for incident, incident response, disaster, or evacuation information that is exchanged with Emergency Management. This terminator would also represent a railroad's management information system, if that system is the source or destination for this information. The use of a single terminator for multiple sources and destination for information exchange with railroads is meant to imply the need for a single, consistent interface between a given railroad's operations and maintenance activities and ITS.
Roadway Environment	This terminator represents the physical condition and geometry of the road surface and the conditions surrounding the roadway. The geometry of the roadway and the road surface characteristics must be sensed and interpreted to support automated vehicle control services. Surrounding conditions may include fog, ice, snow, rain, wind, etc. which will influence the way in which a vehicle can be safely operated on the roadway.

Entity Name	Entity Description
	The condition of the roadway must be monitored by the architecture to enable corrective action and information dissemination regarding roadway conditions which may adversely affect travel. This physical interface carries these physical condition and geometry attributes which must be sensed, interpreted, and processed by functions internal to the system to achieve ITS User Service functionality.
Secure Area Environment	This terminator represents the environment around any area that is monitored by surveillance or sensor equipment. These areas include public areas frequented by transit users or travelers as well as transportation facilities and infrastructure.
Shelter Providers	This terminator provides information about the shelters that open with the threat of a disaster and are operated and maintained until the threat has passed. This terminator may represent individual shelters if they have the capability to provide current information directly to ITS or it may represent a managing organization such as the American Red Cross that operates the shelters and collects and provides aggregate shelter information for a region.
Storage Facility	This terminator represents the facilities that provide storage and forward staging for equipment and materials used in maintenance and construction operations. It provides status information on the types and quantities of materials and equipment that are available at the facility.
Surface Transportation Weather Service	This terminator represents the providers of value-added sector specific meteorological services. These providers utilize National Weather Service data and predictions (including the qualified environmental data from the Clarus system), road condition information and local environmental data provided by the traffic management or maintenance organizations, and their own models to provide surface transportation related weather observations and forecasts including pavement temperature and conditions.
Telecommunications System for Traveler Information	This terminator provides the caller interface and voice processing (voice recognition/synthesis) that supports voice-enabled traveler telephone information systems. It provides wireline and wireless caller access to 511 systems and other telephone access mechanisms like 7 or 10 digit local access numbers. It represents the boundary of the architecture where a call is received and processed and includes voice portal capabilities in scenarios where a distinct voice portal exists between ITS Centers and telecommunications providers. The terminator gathers traveler information, alerts, and advisories from information service provider(s) and uses this information to support voice-based interactions with a traveler.
Toll Operator	The Toll Operator is the human entity that may be physically present at the toll plaza to monitor the operational status of the plaza.
Traffic	The Traffic terminator represents the collective body of vehicles that travel on surface streets, arterials, highways, expressways, tollways, freeways, or any other vehicle travel surface. Traffic depicts the vehicle population from which traffic flow surveillance information is collected (average occupancy, average speed, total volume, average delay, etc.), and to which traffic control indicators are applied (intersection signals, stop signs, ramp meters, lane control barriers, variable speed limit indicators, etc.). All sensory and control elements that interface to this vehicle population are internal to ITS.
Traffic Operations Personnel	This terminator represents the human entity that directly interfaces with vehicle traffic operations. These personnel interact with traffic control systems, traffic surveillance systems, incident management systems, work zone management systems, and travel demand management systems to accomplish ITS services. They provide operator data and command inputs to direct systems' operations to varying degrees depending on the type of system and the deployment scenario. All functionality associated with these services that might be automated in the course of ITS deployment is modeled as internal to the architecture.
Transit Operations Personnel	This terminator represents the human entities that are responsible for fleet management, maintenance operations, and scheduling activities of the transit system. These different

Entity Name	Entity Description
	<p>roles represent a variety of individuals in the transit industry. Within the transit industry the person responsible for fleet management is known by many names: Street Supervisor (most common), Starter, Dispatcher, Supervisor, Traffic Controller, Transportation Coordinator. This entity actively monitors, controls, and modifies the transit fleet routes and schedules on a day to day basis (dynamic scheduling). The modifications will be to take account of abnormal situations such as vehicle breakdown, vehicle delay, detours around work zones or incidents (detour management and service restoration), and other causes of route or schedule deviations. This entity may also be responsible for demand responsive transit operation and for managing emergency situations within the transit network such as silent alarms on board transit vehicles, or the remote disabling of the vehicle. In addition the Transit Operations Personnel may be responsible for assigning vehicle operators to routes, checking vehicle operators in and out, and managing transit stop issues. The Transit Operations Personnel terminator also represents the personnel in the transit garage that are responsible for maintenance of the transit fleets, including monitoring vehicle status, matching vehicles with operators, and maintenance checking of transit vehicles. Finally, the Transit Operations Personnel terminator represents the people responsible for planning, development, and management of transit routes and schedules.</p>
Transit Vehicle Operator	<p>This terminator represents the human entity that receives and provides additional information that is specific to operating the ITS functions in all types of transit vehicles. . To support transit vehicle security features, the Transit Vehicle Operator can input to the Transit Vehicle Subsystem a silent alarm. The operator can also be required to enter an authentication command (used to enable operation of the vehicle). The information received by the operator would include status of on-board systems. Additional information received depends upon the type of transit vehicle. In the case of fixed route transit vehicles, the Transit Vehicle Operator would receive operator instructions that might include actions to take to correct schedule deviations. In the case of flexible fixed routes and demand response routes the information would also include dynamic routing or passenger pickup information.</p>
Travel Services Provider	<p>This terminator represents the individual organizations that provide any service oriented towards the Traveler. Example services that could be included are gas, food, lodging, vehicle repair, points of interest, and recreation areas. Also included are services specifically directed toward bicyclists and pedestrians such as bicycle shops and parking locations and bicycle and pedestrian rest areas. The Service Providers may pay a fee to have their services advertised to travelers. The interface with the Service Provider is necessary so that accurate, up-to-date service information can be provided to the traveler and to support electronic reservation capabilities included in the ITS User Services.</p>
Traveler	<p>This terminator represents any individual who uses transportation services. The interfaces to the traveler provide general pre-trip and en-route information supporting trip planning, personal guidance, and requests for assistance in an emergency that are relevant to all transportation system users. The terminator represents users of a public transportation system and addresses interfaces these users have within a transit vehicle or at transit facilities such as roadside stops and transit centers. This general terminator is supplemented in the architecture by the specific "Driver" terminator that supports interfaces that are specific to drivers.</p>
Traveler Card	<p>This terminator represents the entity that enables the actual transfer of electronic information from the user of a service (I.e. a traveler) to the provider of the service. This may include the transfer of funds through means of an electronic payment instrument. The device, like a smart card, may also hold and update the traveler's information such as personal profiles or trip histories.</p>
Vehicle Characteristics	<p>This terminator represents the external view of an individual vehicle. It includes vehicle characteristics such as height, width, length, weight, and other properties (e.g., magnetic properties, number of axles) that allow an individual vehicle to be detected</p>

Entity Name	Entity Description
	<p>and measured or classified. This external view of an individual vehicle is also used as a source of visible data that supports individual vehicle imaging requirements in the architecture.</p> <p>ITS subsystems at the roadside sense these characteristics and generate ITS data flows. These individual vehicle characteristics are important for toll collection, parking management, and other applications that identify and measure individual vehicles. See also the related "Traffic" terminator which represents physical characteristics of many vehicles in the aggregate that is measured for general traffic applications.</p>
Wayside Equipment	<p>This terminator represents train interface equipment (usually) maintained and operated by the railroad and (usually) physically located at or near a grade crossing. This terminator is the source and destination for HRI information for, or about, approaching trains and their crews (e.g. the time at which the train will arrive and the time it will take to clear a crossing, crossing status or warnings, etc.). Generally one wayside equipment interface would be associated with one highway rail intersection. However, multiple crossings may be controlled using information based on data from one wayside equipment interface.</p>
Weather Service	<p>This terminator provides weather, hydrologic, and climate information and warnings of hazardous weather including thunderstorms, flooding, hurricanes, tornadoes, winter weather, tsunamis, and climate events. It provides atmospheric weather observations and forecasts that are collected and derived by the National Weather Service, private sector providers, and various research organizations. This terminator represents the Clarus system, which collects environmental data from ITS systems, assesses the quality of the data, and disseminates the qualified data upon request (including dissemination to ITS systems). The interface provides formatted weather data products suitable for on-line processing and integration with other ITS data products as well as Doppler radar images, satellite images, severe storm warnings, and other products that are formatted for presentation to various ITS users.</p>

### 2.2.4 Architecture Flow Descriptions

Architecture flows connect subsystems and terminators to each other and represent the actual information exchanged across those interfaces. Table 7 contains the descriptions of all physical architecture flows. The more detailed data comprising the architecture flows can be obtained from the appropriate logical data dictionary entries. Detailed timing information is implementation dependent and is provided in the evaluatory design.

In the sections following Table 7, detailed information is provided for each subsystem in the National ITS Architecture:

- A list and description of each of the subsystem's constituent Equipment Packages and the subfunctions that support each Equipment Package (process specifications from the Logical Architecture),
- A list and description for all subsystem interfaces, including all architecture flows input to and output from the subsystem and the more detailed composite data flows from the Logical Architecture,
- Subsystem Architecture Flow Diagram that shows graphically for each subsystem the inputs to and outputs from other subsystems, and
- Terminator Architecture Flow Diagram that shows graphically for each subsystem the inputs to and outputs from terminators.

**Table 7: Architecture Flow Descriptions**

Architecture Flow	Flow Description
access permission	Information returned indicating whether permission for access is granted and instructions for proceeding.
access request	Request for access to an access-controlled transportation facility.
accident report	Report of commercial vehicle safety accident. The information may be provided as a response to a real-time query or proactively by the source. The query flow is not explicitly shown.
air quality information	Aggregated region-wide measured air quality data and possible pollution incident information.
alarm	Information about a Commercial Vehicle or Freight Equipment breach, non-permitted security sensitive hazmat detected at the roadside, route deviation, or Commercial Vehicle Driver / Commercial Vehicle / Freight Equipment assignment mismatches which includes the location of the Commercial Vehicle and appropriate identities.
alarm acknowledge	Confirmation that alarm was received, instructions and additional information for the alarm initiator, and requests for additional information.
alarm notification	Notification of activation of an audible or silent alarm by a traveler in a public area or by a transit vehicle operator using an on-board device.
alert notification	Notification of a major emergency such as a natural or man-made disaster, civil emergency, or child abduction for distribution to the public. The flow identifies the alert originator, the nature of the emergency, the geographic area affected by the emergency, the effective time period, and information and instructions necessary for the public to respond to the alert. This flow may also identify specific information that should not be released to the public.
alert notification coordination	Coordination of emergency alerts to be distributed to the public. This includes notification of a major emergency such as a natural or man-made disaster, civil emergency, or child abduction for distribution to the public and status of the public notification.



Architecture Flow	Flow Description
alert response	This flow represents the tactile or auditory interface with ITS equipment containing the response by a Commercial Vehicle Driver or Fleet-Freight Manager that confirms or cancels an alert.
alert status	Information indicating the current status of the emergency alert including identification of the traveler and driver information systems that are being used to provide the alert.
alerts	This flow represents the visual or auditory interface with ITS equipment containing specific alerts and messages related to commercial vehicles (e.g. trucks not advised, trucks over 10 tons not allowed on bridge, route details). This also includes detected route deviations and warning indications detected by on-board sensors (e.g., safety) and freight equipment sensors (e.g., breach, cargo).
alerts and advisories	Assessments (general incident and vulnerability awareness information), advisories (identification of threats or recommendations to increase preparedness levels), and alerts (information on imminent or in-progress emergencies). This flow also provides supporting descriptive detail on incidents, threats, and vulnerabilities to increase preparedness and support effective response to threats against the surface transportation system.
archive analysis requests	A user request that initiates data mining, analytical processing, aggregation or summarization, report formulation, or other advanced processing and analysis of archived data. The request also includes information that is used to identify and authenticate the user and support electronic payment requirements, if any.
archive analysis results	Processed information products, supporting meta data, and any associated transaction information resulting from data mining, analytical processing, aggregation or summarization, report formulation, or other on-line processing and analysis of archived data.
archive coordination	Catalog data, meta data, published data, and other information exchanged between archives to support data synchronization and satisfy user data requests.
archive management data	Presentation of information to the administrator to support the management of an ITS archive including database reports on the condition and quality of the archived data, status of the import and collection process, reports that monitor archive usage, and any special requests that require direct action by the administrator (e.g., requests for access to new data sources).
archive management requests	User input from the administrator including commands, requests, and queries that support data collection, administration, and management of an ITS data archive.
archive request confirmation	Confirmation that an archive request has been received and processed with information on the disposition of the request.
archive requests	A request to a data source for information on available data (i.e. "catalog") or a request that defines the data to be archived. The request can be a general subscription intended to initiate a continuous or regular data stream or a specific request intended to initiate a one-time response from the recipient.
archive status	Notification that data provided to an archive contains erroneous, missing, or suspicious data or verification that the data provided appears valid. If an error has been detected, the offending data and the nature of the potential problem are identified.
archived data product requests	A user-specified request for archived data products (i.e. data, meta data, or data catalogs). The request also includes information that is used to identify and authenticate the user and support electronic payment requirements, if any.
archived data products	Raw or processed data, meta data, data catalogs and other data products provided to a user system upon request. The response may also include any associated transaction information.
area pollution data	Measured air quality data, including measured levels of atmospheric pollutants including ozone, particulate matter, carbon monoxide, and nitrogen oxides, and operational status of the sensors.
arrival notification	Notification of arrival (and departure) of a motor vehicle at the inspection station.
arriving train information	Information for a train approaching a highway-rail intersection that may include direction and allow calculation of approximate arrival time and closure duration.

Architecture Flow	Flow Description
asset archive data	Information describing transportation assets including pavements, bridges, and all other infrastructure included in the transportation network. In addition, information can cover support assets (support equipment and systems, software, etc.). Content may include a catalog of available information, the actual information to be archived, and associated meta data that describes the archived information.
asset damage assessment	Information indicating the damage sustained by transportation assets, derived from aerial surveillance, field reports, inspections, tests, and analyses.
asset inventory	Information on pavement, bridges, signs and other assets. This includes asset location, installation information, materials information, vendor/contractor information, current maintenance status, and a variety of other information (e.g., video logs) that define the transportation infrastructure.
asset restrictions	Restrictions levied on transportation asset usage based on infrastructure design, surveys, tests, or analyses. This includes standard height, width, and weight restrictions by facility as well as special restrictions such as spring weight restrictions and temporary bridge weight restrictions.
asset status update	Changes to status of pavement, bridges, signs and other assets resulting from maintenance or construction activities or infrastructure monitoring. The updates may include changes in installation information, materials information, vendor/contractor information, condition, and current maintenance status. In addition to infrastructure asset updates, the information provided may also include status of the maintenance and construction support assets, including vehicle and equipment utilization and repair records.
audit data	Information to support a tax audit.
automated roadway control data	Control commands and operating parameters provided to field equipment that controls and monitors automated vehicle operations.
automated roadway status	Current operational status of an automated vehicle operations facility, including the status of the field equipment and vehicles using the facility.
automated vehicle control data	Instructions and control parameters for automated vehicle operation including current system conditions and advisories, control parameters (e.g., speed and performance profiles, headways), maneuver coordination, and check in/checkout instructions.
automated vehicle status	Data provided by an automated vehicle identifying it's current mode and operational status, current position and motion, preferred route, and information provided to support checking/checkout and coordinated maneuvers while on the automated facility.
bad tag list	List of invalid transit user tags which may have previously failed a fare payment transaction.
barrier system control	Information used to configure and control barrier systems that are represented by gates, barriers and other automated or remotely controlled systems used to manage entry to roadways.
barrier system status	Current operating status of barrier systems. Barrier systems represent gates, barriers and other automated or remotely controlled systems used to manage entry to roadways. Status of the systems includes operating condition and current operational state.
basic transit vehicle controls	Control signal disabling or enabling transit vehicle sent as a result of a transit vehicle operator authentication action or a remote disable command.
basic vehicle measures	Information provided to on-board ITS equipment from the vehicle platform indicating current vehicle status.
boarding and alighting	Detection of transit passenger boarding and alighting. This flow represents the travelers' physical presence as they board a transit vehicle that can be detected or monitored by on-board sensors.
booking status	Status of the freight transport booking that includes the identities of the Commercial Vehicle and driver who will pick-up the freight or a request for more information from the originator.
border agency clearance results	Notification regarding the granting of permission for commercial freight shipment to enter the U.S.

Architecture Flow	Flow Description
border clearance data	Trip specific data regarding the movement of goods across international borders. Includes trip identification number. May also include results from recent border crossing screening events.
border clearance data request	Request for trip specific data regarding the movement of goods across international borders. Includes trip identification number. May also include results from recent border crossing screening events.
border clearance event	Reports clearance event data regarding action taken at border, including acceptance or override of system decision, and date/time stamp
border clearance status	Notification regarding the crossing status of commercial freight shipment scheduled to enter the U.S. Includes portions of border agency and transportation agency clearance results, as they become available.
border crossing status information	Port of entry status including current wait-times, lane configuration and status including closures and restrictions, and notification of incidents at the border
border incident information	Notification of existence of incident in the vicinity of the border. Information would include expected severity, location, time and nature of incident. As additional information is gathered and the incident evolves, updated incident information is provided.
border incident response status	Status of the current incident response at a border crossing, including a summary of incident status and its impact on the transportation system, traffic management strategies implemented at the site (e.g., closures, diversions, traffic signal control overrides), and current and planned response activities.
border information archive data	Border inspection activities data. Content may include a catalog of available information, the actual information to be archived, and associated meta data that describes the archived information.
border pass/pull-in	Command to commercial vehicle to pull into or bypass border inspection station
border wait times archived data	Wait time data to be archived and used for planning and analysis activities.
border wait times data	Measure of current, actual, or predicted wait time at border. Measurement provided by vehicle type, lane, and type of lane (e.g. NEXUS vs. regular).
breach response	This is an Intermodal Freight Shipper's response to a breach or tamper event of their freight equipment. There maybe instructions for handling of the shipment, possible re-routing or pickup.
broadcast advisories	General broadcast advisories that are provided over wide-area wireless communications direct to the vehicle radio. These analog advisory messages may provide similar content to ITS broadcast information flows, but include no digital data component. Existing Highway-Advisory Radio (HAR) advisory messages are a prime example of this flow.
broadcast traveler information	General traveler information that contains traffic and road conditions, link travel times, incidents, advisories, restrictions, transit service information, weather information, parking information, and other related traveler information.
care facility status	Information regarding facility type and capabilities, facility status, and its ability to admit new patients.
care facility status request	Request for information regarding care facility availability and status.
carrier participation report	Report that summarizes motor carrier participation in CVO programs. Used to identify the level of active participation and to report which enrolled carriers are not participating as expected.
citation	Report of commercial vehicle citation. The citation includes references to the statute(s) that was (were) violated. It includes information on the violator and the officer issuing the citation. A citation differs from a violation because it is adjudicated by the courts. The information may be provided as a response to a real-time query or proactively by the source. The query flow is not explicitly shown.
clearance notification	Notification that cargo has been cleared through customs.
client id	A common identification number that can be used by all BIFA agencies and organizations to reference the carrier.

Architecture Flow	Flow Description
client verification information	Information about carriers who have made border credential applications such as commercial drivers license information and carrier safety status.
client verification request	Request for information such as commercial drivers license information and carrier safety status.
commercial vehicle archive data	Information describing commercial vehicle travel and commodity flow characteristics. Content may include a catalog of available information, the actual information to be archived, and associated meta data that describes the archived information.
commercial vehicle breach	Information about a breach or tamper event on a Commercial Vehicle or its attached freight equipment which includes identity, type of breach, location, and time.
commercial vehicle data	Information about the commercial vehicles cargo, credentials, and payments.
commercial vehicle data request	Requests from the vehicle for information about the commercial vehicle's cargo, credentials, and payments.
commercial vehicle disable	This flow safely disables a specific commercial vehicle.
commercial vehicle disable status	This flow provides the status of the disable flag in the commercial vehicle.
commercial vehicle measures	Commercial vehicle and driver status measured by on-board ITS equipment.
commercial vehicle permit	Permit for oversize, overweight, or hazmat shipments.
commercial vehicle permit coordination	Information for the coordination of commercial vehicle permits for oversize, overweight, or for dangerous goods.
compliance review report	Report containing results of carrier compliance review, including concomitant out-of-service notifications, carrier warnings/notifications. The information may be provided as a response to a real-time query of proactively by the source. The query flow is not explicitly shown.
credential application	Application for commercial vehicle credentials. Authorization for payment is included.
credential fee coordination	Jurisdiction's rates for various credentials (IRP, IFTA, etc.) that are exchanged between agencies.
credentials information	Response containing full vehicle fuel tax and registration credentials information. "Response" may be provided in reaction to a real-time query or a standing request for updated information. The query flow is not explicitly shown.
credentials status information	Credentials information such as registration, licensing, insurance, check flags, and electronic screening enrollment data. A unique identifier is included. Corresponds to the credentials portion of CVISN "snapshots." The status information may be provided as a response to a real-time query or as a result of a standing request for updated information (subscription). This may also include information about non-U.S. fleets for use by U.S. authorities, and information regarding U.S. fleets made available to Mexican and Canadian authorities. The query flow is not explicitly shown.
crew movements	Visual or sensed presence of field crew location within a work zone that is monitored to enhance work zone safety.
crossing call	Pedestrian request to cross the roadway. This may be an overt (e.g., push button) request from a pedestrian or the physical presence of a pedestrian that can be detected by sensors or surveillance systems.
crossing permission	Signal to pedestrians indicating permission to cross roadway.
current asset restrictions	Restrictions levied on transportation asset usage based on infrastructure design, surveys, tests, or analyses. This includes standard facility design height, width, and weight restrictions, special restrictions such as spring weight restrictions, and temporary facility restrictions that are imposed during maintenance and construction.
cv driver credential	Driver information (e.g., identity, biometrics, address, date of birth, endorsements, restrictions) stored on a driver's license or other official identification card used to identify a driver of commercial vehicles.

Architecture Flow	Flow Description
cv driver record	Information typically maintained by a state driver licensing agency about a driver of a commercial vehicle including driver identification data, license data, permit data, and driving history details. The query flow is not explicitly shown.
cv repair status	Information about the completion of a repair to a commercial vehicle.
CVC override mode	This flow represents the tactile or auditory interface with ITS equipment containing the manual override of automated pass/pull-in decisions generated by the Commercial Vehicle Check station.
CVO driver initialization	This flow represents the tactile or auditory interface with ITS equipment containing the commercial vehicle driver and vehicle information. This flow contains inquiries to the commercial vehicle managing system, interaction with on-board equipment including setup, configuration, and initiation of self tests, and entry of carrier, driver, vehicle, and route information.
CVO inspector information	This flow represents the visual or auditory interface with ITS equipment containing credential, safety, and preclearance information and instructions to the commercial vehicle inspector.
CVO inspector input	This flow represents the tactile or auditory interface with ITS equipment containing requests from the commercial vehicle inspector to operate the commercial vehicle inspection station.
CVO pass/pull-in message	This flow represents the visual or auditory interface with ITS equipment containing a message sent to commercial vehicle driver indicating whether to bypass or requesting pull in to inspection/verification stop along with inspection results (e. g., LED indicator on transponder or variable message sign).
CVO weight and presence	Physical attribute of commercial vehicle that can be measured (for example, weight, number of axels, axel spacing, etc.).
daily site activity data	Record of daily activities at commercial vehicle check stations including summaries of screening events and inspections.
data collection and monitoring control	Information used to configure and control data collection and monitoring systems.
decision support information	Information provided to support effective and safe incident response, including local traffic, road, and weather conditions, hazardous material information, and the current status of resources that have been allocated to an incident.
demand response passenger and use data	Data collected on board a demand response vehicle relating to the picking up and discharging of passengers.
demand responsive transit plan	Plan regarding overall demand responsive transit schedules and deployment.
demand responsive transit request	Request for paratransit support.
device control request	Request for device control action
device data	Data from detectors, environmental sensor stations, and traffic control devices including device inventory information.
device status	Status information from devices
disable commercial vehicle	A request that a specific commercial vehicle should be safely disabled.
driver alert response	Commercial Vehicle Driver response to a breach alert for a Freight Equipment breach or tamper event.
driver identity characteristics	The physical or visible characteristics of a commercial vehicle driver that can be measured to uniquely identify a driver. Could be an Identification Card with a Personal Identification Number, biometrics, or visual verification by an operator.
driver information	Regulatory, warning, and guidance information provided to the driver while en route to support safe and efficient vehicle operation.
driver inputs	Driver input to the vehicle including configuration data, settings and preferences, interactive requests, and control commands.

Architecture Flow	Flow Description
driver log	A daily log showing hours in service for the current driver. The query flow is not explicitly shown.
driver parking information	Presentation of general parking information to drivers including lot status, parking availability, and directions to available spaces, entrances, and exits.
driver to fleet request	Requests from the driver and vehicle for routing, payment, and enrollment information.
driver updates	Information displayed or otherwise conveyed by the vehicle to the driver.
electronic lock data	Notification to roadside (via transponder) of the presence and status of electronic cargo locks.
electronic lock data request	Request from roadside for data regarding presence and status of electronic cargo locks.
electronic screening request	Request for identification data to support electronic screening.
emergency acknowledge	Acknowledge request for emergency assistance and provide additional details regarding actions and verification requirements.
emergency archive data	Logged emergency information including information that characterizes identified incidents (routine highway incidents through disasters), corresponding incident response information, evacuation information, surveillance data, threat data, and resource information. Content may include a catalog of available information, the actual information to be archived, and associated meta data that describes the archived information.
emergency data request	A request for additional information or a control command issued by the emergency response agency in response to an emergency request for assistance from a traveler.
emergency dispatch requests	Emergency vehicle dispatch instructions including incident location and available information concerning the incident.
emergency dispatch response	Request for additional emergency dispatch information and provision of en route status.
emergency notification	An emergency request for assistance automatically initiated by a vehicle or originated by a traveler using an in-vehicle or personal device.
emergency operations inputs	Emergency operator inputs supporting call taking, dispatch, emergency operations, security monitoring, and other operations and communications center operator functions.
emergency operations status	Presentation of information to the operator including emergency operations data, supporting a range of emergency operating positions including call taker, dispatch, emergency operations, security monitoring, and various other operations and communications center operator positions.
emergency personnel information presentation	Presentation of information to emergency personnel in the field including dispatch information, incident information, current road network conditions, device status, and other supporting information.
emergency personnel inputs	User input from emergency personnel in the field including dispatch coordination, incident status information, and remote device control requests.
emergency plan coordination	Information that supports coordination of emergency management plans, continuity of operations plans, emergency response and recovery plans, evacuation plans, and other emergency plans between agencies. This includes general plans that are coordinated prior to an incident and shorter duration tactical plans that are prepared during an incident.
emergency route request	Request for access routes for emergency response vehicles and equipment. This may be a request for ingress or egress routes or other emergency routes.
emergency routes	Suggested ingress and egress routes for access to and between the scene and staging areas or other specialized emergency access routes.
emergency traffic control information	Status of a special traffic control strategy or system activation implemented in response to an emergency traffic control request, a request for emergency access routes, a request for evacuation, a request to activate closure systems, a request to employ driver information systems to support public safety objectives, or other special requests. Identifies the selected traffic control strategy and system control status.

Architecture Flow	Flow Description
emergency traffic control request	Special request to preempt the current traffic control strategy in effect at one or more signalized intersections or highway segments, activate traffic control and closure systems such as gates and barriers, activate safeguard systems, or use driver information systems. For example, this flow can request all signals to red-flash, request a progression of traffic control preemptions along an emergency vehicle route, request a specific evacuation traffic control plan, request activation of a road closure barrier system, or place a public safety or emergency-related message on a dynamic message sign.
emergency traffic coordination	Coordination supporting disaster response including evacuation and reentry. Includes coordination of special traffic control strategies that support efficient evacuation and reentry while protecting and optimizing movement of response vehicles and other resources responding to the emergency.
emergency transit schedule information	Information on transit schedule and service changes that adapt the service to better meet needs of responders and the general public in an emergency situation, including special service schedules supporting evacuation.
emergency transit service request	Request to modify transit service and fare schedules to address emergencies, including requests for transit services to evacuate people from and/or deploy response agency personnel to an emergency scene. The request may poll for resource availability or request pre-staging, staging, or immediate dispatch of transit resources.
emergency transit service response	Response indicating changes to transit service, fares, and/or restrictions that will be made and status of transit resources to be deployed to support emergency response and/or evacuation.
emergency traveler information	Public notification of an emergency such as a natural or man-made disaster, civil emergency, or child abduction. This flow also includes evacuation information including evacuation instructions, evacuation zones, recommended evacuation times, tailored evacuation routes and destinations, traffic and road conditions along the evacuation routes, traveler services and shelter information, and reentry times and instructions.
emergency traveler information request	Request for alerts, evacuation information, and other emergency information provided to the traveling public.
emergency vehicle alert	Notification to vehicles in the area that an emergency vehicle is in the vicinity. The number of responding vehicles, their status, location, speed, and direction are provided.
emergency vehicle tracking data	The current location and operating status of the emergency vehicle.
emissions archive data	Air quality and vehicle emissions information that is collected by sensors or derived from models. Content may include a catalog of available information, the actual information to be archived, and associated meta data that describes the archived information.
emissions sensor control	Data used to configure and control vehicle emissions sensors.
emissions violation notification	Notification to enforcement agency of a detected vehicle emissions violation.
environmental conditions	Current road conditions (e.g., surface temperature, subsurface temperature, moisture, icing, treatment status) and surface weather conditions (e.g., air temperature, wind speed, precipitation, visibility) that are measured by environmental sensors.
environmental conditions data	Current road conditions (e.g., surface temperature, subsurface temperature, moisture, icing, treatment status) and surface weather conditions (e.g., air temperature, wind speed, precipitation, visibility) as measured and reported by fixed and/or mobile environmental sensors and aggregated by the data collector. Attributes relating to the data collection (and aggregation) are also included.
environmental conditions data status	Status of the data quality of environmental conditions data provided by a data contributor. Includes not only status by sensor, but statistical data regarding the quality checking of data provided.

Architecture Flow	Flow Description
environmental probe data	Data from vehicle safety and convenience systems that can be used to estimate environmental conditions, including measured air temperature, exterior light status, wiper status, sun sensor status, rain sensor status, traction control status, anti-lock brake status, and other collected vehicle system status and sensor information. The collected data is reported along with the location, heading, and time that the data was collected. Both current data and snapshots of recent events (e.g., traction control or anti-lock brake system activations) may be reported.
environmental sensor data	Current road conditions (e.g., surface temperature, subsurface temperature, moisture, icing, treatment status) and surface weather conditions (e.g., air temperature, wind speed, precipitation, visibility) as measured and reported by fixed and/or mobile environmental sensors. Operational status of the sensors is also included.
environmental sensors control	Data used to configure and control environmental sensors.
equipment availability	An inventory of the maintenance and construction equipment available at the storage facility. This flow includes the type of equipment, enough descriptive information to indicate its suitability for use, and its current status. This flow may contain information for a specific type of equipment or include all equipment available at the facility.
equipment maintenance status	Current status of field equipment maintenance actions.
evacuation coordination	Coordination of information regarding a pending or in-process evacuation. Includes evacuation zones, evacuation times, evacuation routes, forecast network conditions, and reentry times.
evacuation information	Evacuation instructions and information including evacuation zones, evacuation times, and reentry times.
event confirmation	Confirmation that special event details have been received and processed.
event information	Special event information for travelers. This would include a broader array of information than the similar "event plans" that conveys only information necessary to support traffic management for the event.
event information request	Request for special event information.
event plans	Plans for major events possibly impacting traffic.
expected driver identity characteristics	Driver identification information e.g. encrypted PIN codes issued to drivers, encrypted driver biometric parameters.
expedited clearance information	Includes carrier ID, importer ID, broker ID, conveyance ID, driver ID, service options, and associated information that is used to support expedited border clearance.
expedited clearance registration	Registration of the importer, carrier, conveyance, and driver, as applicable, for border clearance programs such as FAST, Customs Self Assessment (Canada), C-TPAT (US), PIP (Canada), ACI (Canada), and ACE (US). Includes electronic filing of forms and associated payment.
expedited clearance status	Status of expedited clearance registration.
external reports	Traffic and incident information that is collected by the media through a variety of mechanisms (e.g., radio station call-in programs, air surveillance).
fare and price information	Current transit, parking, and toll fee schedule information.
fare collection data	Fare collection information including the summary of on-board fare system data and financial payment transaction data.
fare management information	Transit fare information and transaction data used to manage transit fare processing on the transit vehicle.
field device status	Reports from field equipment (sensors, signals, signs, controllers, etc.) which indicate current operational status.
field device status presentation	Presentation of operational status of field equipment (sensors, signals, signs, controllers, etc.) to field personnel.



Architecture Flow	Flow Description
field device status request	User input from field personnel requesting operational status of field equipment (sensors, signals, signs, controllers, etc.).
field equipment status	Identification of field equipment requiring repair and known information about the associated faults.
fleet and freight alerts	This flow represents the visual or auditory interface with ITS equipment containing security alert status information regarding commercial vehicle fleets and freight equipment.
fleet and freight threat information	Information about threats detected by commercial vehicle fleet and freight operators. The threats include incidents involving commercial vehicles (i.e. hijacking), unusual activities observed by commercial vehicle operators (i.e. truck parked under a bridge), and incidents involving freight equipment (i.e. freight equipment tampering).
fleet manager inquiry	This flow represents the tactile or auditory interface with ITS equipment containing an inquiry from fleet manager requesting data from commercial vehicle management system.
fleet status	This flow represents the visual or auditory interface with ITS equipment containing fleet status information including enrollment status, safety status including inspection summaries, detailed inspection reports, and safety ratings, routing information, current vehicle information, and emergency information.
fleet to driver update	Updated instructions to the driver including dispatch, routing, and special instructions.
freight breach	Information about a breach or tamper event on Freight Equipment which includes identity, type of breach, location, and time.
freight equipment information	Container, trailer, or chassis information regarding identity, type, location, brake wear data, mileage, seal #, seal type, door open/close status, chassis bare/covered status, tethered / untethered status, Bill of Lading, and sensor status.
freight monitoring parameters	Parameters to configure the Freight Equipment for event reporting and keep alive functions.
freight transport booking	Booking information for the transport of freight that includes company, contact information, point of origin, pick-up location, drop-off location, and freight equipment identifier.
freight transportation status	A time-stamped status of a freight shipment as it passes through the supply chain from manufacturer through arrival at its final destination; including cargo movement logs, routing information, and cargo ID's.
government reporting data receipt	The acknowledgement of satisfactory receipt of information used as input to government data systems or a report identifying problems or issues with the data submittal.
government reporting system data	Information provided by an ITS archive, formatted as appropriate, that can be used as input to government data reporting systems.
hazmat environmental factors	Sensed characteristics of a vehicle that are analyzed to indicate if the vehicle is carrying a security sensitive substance, e.g. detection of radiation or ammonia compounds.
hazmat information	Information about a particular hazmat load including nature of the load and unloading instructions. May also include hazmat vehicle route and route update information.
hazmat information request	Request for information about a particular hazmat load.
hazmat spill notification	Information provided to emergency response organizations when cargo sensors detect a release of hazardous material. This information will include sensor information, vehicle location and identification, and carrier identification.
highway control status	Current traffic control equipment status that indicates operational status and right-of-way availability to the non-highway transportation mode at a multimodal crossing.
hov data	Current HOV lane information including both standard traffic flow measures and information regarding vehicle occupancy in HOV lanes, and operational status of the HOV monitoring equipment.
hri advisories	Notification of Highway-Rail Intersection equipment failure, intersection blockage, or other condition requiring attention, and maintenance activities at or near highway rail intersections.

Architecture Flow	Flow Description
hri control data	Data required for HRI information transmitted at railroad grade crossings and within railroad operations.
hri operational status	Status of the highway-rail grade crossing equipment including both the current state or mode of operation and the current equipment condition.
hri request	A request for highway-rail intersection status or a specific control request intended to modify HRI operation.
hri status	Status of the highway-rail intersection equipment including both the current state or mode of operation and the current equipment condition.
identification information	The physical characteristics of a commercial vehicle that can be used to determine a vehicle's identity, such as a license plate number, USDOT number, ICC number, bar code, etc.
identities	Identification information for the Commercial Vehicle (e.g., license plate number or USDOT number), Freight Equipment (e.g., container, chassis, or trailer identification), and Driver.
incident command information coordination	Information that supports local management of an incident. It includes resource deployment status, hazardous material information, traffic, road, and weather conditions, evacuation advice, and other information that enables emergency or maintenance personnel in the field to implement an effective, safe incident response.
incident command information presentation	Presentation of information to emergency personnel in the field that supports local tactical decision-making within an incident command system structure.
incident command inputs	User input from emergency personnel including incident command status, incident information and resource coordination.
incident information	Notification of existence of incident and expected severity, location, time and nature of incident. As additional information is gathered and the incident evolves, updated incident information is provided. Incidents include any event that impacts transportation system operation ranging from routine incidents (e.g., disabled vehicle at the side of the road) through large-scale natural or human-caused disasters that involve loss of life, injuries, extensive property damage, and multi-jurisdictional response. This also includes special events, closures, and other planned events that may impact the transportation system.
incident information for media	Report of current desensitized incident information prepared for public dissemination through the media.
incident information for public	Report of current desensitized incident information prepared for public dissemination through the telecommunications system.
incident notification	The notification of an incident including its nature, severity, and location.
incident notification response	Interactive acknowledgement and verification of the incident information received, requests for additional information, and general information on incident response status.
incident report	Report of an identified incident including incident location, type, severity and other information necessary to initiate an appropriate incident response.
incident response coordination	Incident response procedures and current incident response status that are shared between allied response agencies to support a coordinated response to incidents. This flow provides current situation information, including a summary of incident status and its impact on the transportation system and other infrastructure, and current and planned response activities. This flow also coordinates a positive hand off of responsibility for all or part of an incident response between agencies.
incident response status	Status of the current incident response including a summary of incident status and its impact on the transportation system, traffic management strategies implemented at the site (e.g., closures, diversions, traffic signal control overrides), and current and planned response activities.
incident status	Information gathered at the incident site that more completely characterizes the incident and provides current incident response status.

Architecture Flow	Flow Description
information on violators	Information on violators provided by a law enforcement agency. May include information about commercial vehicle violations or other kinds of violations associated with the particular entity. The information may be provided as a response to a real-time query or proactively by the source. The query flow is not explicitly shown.
infrastructure conditions data	Current condition of pavement, bridges, culverts, signs, and other roadway infrastructure as measured by on-board sensors or read from infrastructure-based sensors. The data may include raw data or images (e.g., photo logs) that indicate the current status of the infrastructure.
infrastructure monitoring sensor control	Data used to configure and control infrastructure monitoring sensors.
infrastructure monitoring sensor data	Data read from infrastructure-based sensors that monitor the condition or integrity of transportation infrastructure including bridges, tunnels, interchanges, pavement, culverts, signs, transit rail or guideway, and other roadway infrastructure. Includes sensor data and the operational status of the sensors.
inspection results	Report of results of border inspection on a particular load.
interactive traveler information	Traveler information provided in response to a traveler request. The provided information includes traffic and road conditions, advisories, incidents, payment information, transit services, parking information, weather information, and other travel-related data updates and confirmations.
intermodal freight archive data	Information describing demand at intermodal freight terminals including loading/unloading activities of trailers and containers. Content may include a catalog of available information, the actual information to be archived, and associated meta data that describes the archived information.
intermodal freight event information	Plans for movement of intermodal freight from the depot area possibly impacting traffic. May also include requests for special treatment at traffic signals or dynamic lane management systems.
intermodal freight traffic confirmation	Confirmation that details concerning the movement of intermodal freight on the roadway network have been received and processed. May also include information on traffic conditions affecting the depot including information concerning any special traffic control accommodations or restrictions for commercial vehicles.
intersection blockage notification	Notification that a highway-rail intersection is obstructed and supporting information.
intersection status	Intersection status including current operational status, signal phase and timing information, intersection geometry, surface conditions, warnings of potential violations or hazardous conditions, and approaching vehicle information. This may include information about the position, velocity, acceleration, and turning status of approaching vehicles.
in-vehicle transaction status	The status of an electronic payment transaction presented to the driver by in-vehicle equipment.
ISP operations information presentation	Presentation of information to the ISP Operator including current operational status, parameters for broadcast information settings, route selection controls, and travel optimization algorithms.
ISP operator inputs	User input from the ISP system operator including requests to monitor current system operation and inputs to affect system operation including tuning and performance enhancement parameters to ISP algorithms.
lane management control	Information used to configure and control dynamic lane management systems.
lane management information	System status including current operational state, violations, and logged information.
lane management inputs	This flow provides inputs to dynamic lane management systems including the types of vehicles to allow in each lane.
license request	Request supporting registration data based on license plate read during violation.

<b>Architecture Flow</b>	<b>Flow Description</b>
lighting system control data	Information used to configure and control roadside lighting systems.
lighting system status	Status of roadside lighting controls including operating condition and current operational state.
local signal preemption request	Direct control signal or message to a signalized intersection that results in preemption of the current control plan and grants right-of-way to the requesting vehicle.
local signal priority request	Request from a vehicle to a signalized intersection for priority at that intersection.
logged vehicle routes	Anticipated route information for guided vehicles, special vehicles (e.g., oversize vehicles) or groups of vehicles (e.g., governor's motorcade) that may require changes in traffic control strategy.
maint and constr administrative information	Administrative information that is provided to support maintenance and construction operations. This information includes: equipment and consumables resupply purchase request status, personnel qualifications including training and special certifications, environmental regulations and rules that may impact maintenance activities, and requests and project requirements from contract administration.
maint and constr administrative request	Requests for maintenance and construction administrative information or services. Requests include: requests to purchasing for equipment and consumables resupply and requests to human resources that manage training and special certification for field crews and other personnel.
maint and constr archive data	Information describing road construction and maintenance activities identifying the type of activity, the work performed, and work zone information including work zone configuration and safety (e.g., a record of intrusions and vehicle speeds) information. For construction activities, this information also includes a description of the completed infrastructure, including as-built plans as applicable. Content may include a catalog of available information, the actual information to be archived, and associated meta data that describes the archived information.
maint and constr center personnel inputs	User input from maintenance and construction center personnel including routing information, scheduling data, dispatch instructions, device configuration and control, resource allocations, alerts, incident and emergency response plan coordination.
maint and constr dispatch information	Information used to dispatch maintenance and construction vehicles, equipment, and crews and information used to keep work zone crews informed. This information includes routing information, traffic information, road restrictions, incident information, environmental information, decision support information, maintenance schedule data, dispatch instructions, personnel assignments, alert notifications, and corrective actions.
maint and constr dispatch status	Current maintenance and construction status including work data, operator status, crew status, and equipment status.
maint and constr equipment repair status	Current maintenance and repair status of the maintenance and construction vehicle fleet and other support equipment. This information includes a record of all maintenance and repair activities performed.
maint and constr field personnel information presentation	Information presented to maintenance and construction field personnel including vehicle routing and traffic information, road restrictions, environmental information, decision support information, maintenance schedules, dispatch instructions, maintenance personnel assignments, vehicle maintenance information, work zone status information, and corrective actions.
maint and constr field personnel inputs	User input from field personnel including current maintenance and construction status information as well as on-board device control.
maint and constr fleet information	Information supporting maintenance of the maintenance and construction vehicle fleet and other support equipment. This information includes vehicle status and diagnostic information, vehicle utilization, and coordination of when vehicles will be available for preventative and corrective maintenance.
maint and constr material information	Information on materials stored on the vehicle including quantity and current application rate.

Architecture Flow	Flow Description
maint and constr operations information presentation	Presentation of maintenance and construction operations information to center personnel. This information includes maintenance resource status (vehicles, equipment, and personnel), work schedule information, work status, road and weather conditions, traffic information, incident information and associated resource requests, security alerts, emergency response plans and a range of other information that supports efficient maintenance and construction operations and planning.
maint and constr resource coordination	Request for road maintenance and construction resources that can be used in the diversion of traffic (cones, portable signs), clearance of a road hazard, repair of ancillary damage, or any other incident response.
maint and constr resource request	Request for road maintenance and construction resources that can be used in the diversion of traffic (cones, portable signs), clearance of a road hazard, repair of ancillary damage, or any other incident response. The request may poll for resource availability or request pre-staging, staging, or immediate dispatch of resources.
maint and constr resource response	Current status of maintenance and construction resources including availability and deployment status. General resource inventory information covering vehicles, equipment, materials, and people and specific resource deployment status may be included.
maint and constr vehicle condition presentation	Presentation of vehicle diagnostics and operating status information to maintenance and construction field personnel including speed, engine temperature, mileage, tire wear, brake wear, belt wear, maintenance and construction system status, environmental sensor information, and other measures associated with the operation of a maintenance vehicle.
maint and constr vehicle conditions	Vehicle diagnostics information that is collected, filtered, and selectively reported by a maintenance and construction vehicle. The information includes engine temperature, mileage, tire wear, brake wear, belt wear, and any warnings or alarms concerning the operational condition of the vehicle and ancillary equipment.
maint and constr vehicle control	Control data sent from on-board ITS systems to control maintenance and construction vehicle equipment, including control of materials dispersion rate and other control functions that will vary with vehicle type and application.
maint and constr vehicle location data	The current location and related status (e.g., direction and speed) of the maintenance/construction vehicle.
maint and constr vehicle measures	Raw vehicle diagnostics and operating status data reported by the maintenance vehicle platform including engine temperature, mileage, tire wear, brake wear, belt wear, and other operational status measures. In addition to this general vehicle status, this flow also includes the status of maintenance and construction-specific systems on the vehicle.
maint and constr vehicle operational data	Data that describes the maintenance and construction activity performed by the vehicle. Operational data includes materials usage (amount stored and current application rate), operational state of the maintenance equipment (e.g., blade up/down, spreader pattern), vehicle safety status, and other measures associated with the operation of a maintenance, construction, or other special purpose vehicle. Operational data may include basic operational status of the vehicle equipment or a more precise record of the work performed (e.g., application of crack sealant with precise locations and application characteristics).
maint and constr vehicle status coordination	Maintenance and construction vehicle status information that is shared between vehicles. This includes environmental conditions and the operational status of the vehicles.
maint and constr vehicle system control	Configure and control data that supports remote control of on-board maintenance and construction vehicle systems and field equipment that is remotely controlled by the vehicle. For example, the data can be used to adjust material application rates and spread patterns.
maint and constr work performance	Overall project status and work performance information provided to support contract administration.
maint and constr work plans	Future construction and maintenance work schedules and activities including anticipated closures with anticipated impact to the roadway, alternate routes, anticipated delays, closure times, and durations.

Architecture Flow	Flow Description
maintenance and repair needs	Recommended strategies and schedules for maintenance of the transportation infrastructure.
maintenance materials storage status	The amount and availability of maintenance materials in storage facilities.
manifest data	Identifies Port of Entry, date, and information on carrier and goods, origin, etc.
manifest receipt confirmation	Confirmation that a shippers manifest has been received.
map update request	Request for a map update which could include a new underlying map or map layer updates.
map updates	Map update which could include a new underlying static or real-time map or map layer(s) update.
multimodal archive data	Operational information from alternate passenger transportation modes including air, rail transit, taxis, and ferries. Content may include a catalog of available information, the actual information to be archived, and associated meta data that describes the archived information.
multimodal crossing status	Indication of operational status and pending requests for right-of-way from equipment supporting the non-highway mode at multimodal crossings.
multimodal information	Schedule information for alternate mode transportation providers such as train, ferry, air and bus.
multimodal information request	Information request for alternate mode transportation providers such as train, ferry, air and bus.
multimodal service data	Multimodal transportation schedules and other service information.
non-vehicular presence	Sensed presence of pedestrians and other non-motor vehicle travelers at roadway crossing or control points.
on-board safety data	Safety data measured by on-board sensors. Includes information about the vehicle, vehicle components, cargo, and driver. The query flow is not explicitly shown.
on-board vehicle data	Information about the commercial vehicle stored on-board (for maintenance purposes, gate access, cargo status, lock status, etc.).
on-board vehicle request	Request for on-board vehicle data.
other data source archive data	Data extracted from other data sources. A wide range of ITS and non-ITS data and associated meta data may be provided.
parking archive data	Data used to analyze and monitor trends in parking demand, pricing, and operational actions. Content may include a catalog of available information, the actual information to be archived, and associated meta data that describes the archived information.
parking coordination	Information that enables parking management activities to be coordinated between different parking operators or systems in a region.
parking demand management request	Request to change the demand for parking facility use through pricing or other mechanisms.
parking demand management response	Response to parking demand management change requests indicating level of compliance with request.
parking information	General parking information and status, including current parking availability.
parking lot data request	Request for parking lot occupancy, fares, and availability. The request can be a subscription that initiates as-needed information updates as well as a one-time request for information.
parking lot inputs	Instructions for operation of local parking facilities to support regional traffic management objectives (e.g. which parking lot exits to use). Also, includes inputs from traffic sensors to support calculation of parking lot occupancy and support more effective management of parking entrances and exits.
parking lot reservation confirmation	Confirmation for parking lot reservation.

Architecture Flow	Flow Description
parking operator inputs	User input from the parking operator to query current status and control the operation of the parking management system.
parking reservations request	Reservation request for parking lot.
parking status	Presentation of information to the parking operator including operational status and transaction reports.
pass/pull-in	Command to commercial vehicle to pull into or bypass inspection station.
patient status	Information that supports assessment of the patient's condition. Information could include general categorization of patient status, patient vital signs, pertinent medical history, and emergency care information.
payment	Payment of some kind (e.g., toll, parking, fare) by traveler which, in most cases, can be related to a credit account.
payment administration requests	Personnel inputs that control system operations, including requests to change toll fees, confirmation that alerts should be provided to toll operators, management of VMT charge policies and management of VMT account processing, etc.
payment information presentation	Presentation of information to personnel including revenues, reports, operational status information, and alert information.
payment request	Request for payment from financial institution.
payment violation notification	Notification to enforcement agency of a toll, parking, or transit fare payment violation.
personal transit information	General and personalized transit information for a particular fixed route, flexible route, or paratransit system.
physical presence	Detection of an obstacle. Obstacle could include animals, vehicles, pedestrians, rocks in roadway etc.
pollutant levels	Atmospheric pollutant levels as monitored by air quality sensors.
pollution data display	Presentation of information to the operator supporting both area-wide air quality monitoring and vehicle emissions monitoring. Includes both reference and current pollution status details for a given geographic area.
pollution data parameters	User input from the system operator including nominal pollution data compliance (reference) levels for each sector of an urban area.
pollution sensor control	Data used to configure and control area pollution and air quality sensors.
pollution state data request	Aggregated emissions data information request.
position fix	Information which provides a traveler's or vehicle's geographical position.
pre-arrival notification	Identification of a vehicle or driver that is approaching a border crossing.
probe archive data	Probe data that allows calculation of travel times, volumes, and other measures that support transportation planning. Optionally, this flow also includes origin and destination information for vehicles that opt to provide this information.
public health request	Request for specific information or recommended response concerning an emergency involving biological or other medically related emergency.
public health response	Specific information or recommendation on how to treat or respond to an emergency involving biological or other medically related emergency.
qualified environmental conditions data	Current road conditions (e.g., surface temperature, subsurface temperature, moisture, icing, treatment status) and surface weather conditions (e.g., air temperature, wind speed, precipitation, visibility) that has had quality checks performed on it and has been formatted and consolidated by the Clarus system. Attributes relating to the data collection (and aggregation) are also included.
rail incident response status	Status of the rail system's response to current incidents.
rail system status assessment	Assessment of damage sustained by rail lines and associated railroad infrastructure including location and extent of the damage, impact on current operations and necessary restrictions, and time frame for repair and recovery.
railroad advisories	Real-time notification of railway-related incident or advisory.

Architecture Flow	Flow Description
railroad schedules	Train schedules, maintenance schedules, and other information from the railroad that supports forecast of HRI closures.
registration	Registered owner of vehicle and associated vehicle information.
remote surveillance control	The control commands used to remotely operate another center's sensors or surveillance equipment so that roadside surveillance assets can be shared by more than one agency.
remote vehicle disable	Signal used to remotely disable a transit vehicle.
request for bad tag list	Request for list of bad vehicle tag IDs.
request for data review	Request that data reported about a motor carrier or driver be reviewed for potential mis-assignment or other error.
request for enforcement	Request for traffic enforcement of speed limits, lane controls, etc. on a roadway including in a work zone or other special situations.
request for payment	Request to deduct cost of service from user's payment account.
request for performance data	User input from the parking operator to request current parking service performance data.
request for permit	Request by fleet management for oversize, overweight, or hazmat permit.
request for service	Driver inputs that summon an emergency response, request a financial transaction, or initiate other services.
request for vehicle measures	Request for vehicle performance and maintenance data collected by onboard sensors.
request tag data	Request for tag information including credit identity, stored value card cash, etc.
request transit information	Request for transit service information and current transit status.
resource coordination	Coordination of resource inventory information, specific resource status information, resource prioritization and reallocation between jurisdictions, and specific requests for resources and responses that service those requests.
resource deployment status	Status of resource deployment identifying the resources (vehicles, equipment, materials, and personnel) available and their current status. General resource inventory information and specific status of deployed resources may be included.
resource request	A request for resources to implement special traffic control measures, assist in clean up, verify an incident, etc. The request may poll for resource availability or request pre-staging, staging, or immediate deployment of resources. Resources may be explicitly requested or a service may be requested and the specific resource deployment may be determined by the responding agency.
reversible lane control	Control of automated reversible lane configuration and driver information systems.
reversible lane status	Current reversible lane status including traffic sensor and surveillance data and the operational status and mode of the reversible lane control equipment.
right-of-way request notification	Notice that a request has occurred for signal prioritization, signal preemption, pedestrian call, multi-modal crossing activation, or other source for right-of-way.
road closure notification	Notification that agency personnel have closed a road due to adverse weather, major incident, or other reason.
road data	Basic road facility and treatment information that supports road conditions forecasts.
road network conditions	Current and forecasted traffic information, road and weather conditions, and other road network status. Either raw data, processed data, or some combination of both may be provided by this architecture flow. Information on diversions and alternate routes, closures, and special traffic restrictions (lane/shoulder use, weight restrictions, width restrictions, HOV requirements) in effect is included along with a definition of the links, nodes, and routes that make up the road network.
road network environmental probe data	Aggregated vehicle probe information that can be used to estimate current environmental conditions. Collected information would include measured air temperature, exterior light status, wiper status, sun sensor status, rain sensor status, traction control status, ALB status, and other collected vehicle system status and sensor information.



Architecture Flow	Flow Description
road network status assessment	Assessment of damage sustained by the road network including location and extent of the damage, estimate of remaining capacity, required closures, alternate routes, necessary restrictions, and time frame for repair and recovery.
road network traffic probe data	Aggregated route usage, travel times, and other aggregated data collected from probe vehicles that can be used to estimate current traffic conditions.
road user protection data	Current data as well as operational status from mixed roadway and right-of-way systems.
road user protection device control	Control requests and operating parameters for mixed roadway and right-of-way systems.
road weather information	Road conditions and weather information that are made available by road maintenance operations to other transportation system operators.
roadside archive data	A broad set of data derived from roadside sensors that includes current traffic conditions, environmental conditions, and any other data that can be directly collected by roadside sensors. This data also indicates the status of the sensors and reports of any identified sensor faults.
roadside data message	Data set collected by roadside sensors to identify and characterize a vehicle, carrier, and (potentially) driver.
roadside transaction status	The status of an electronic payment transaction provided directly to the driver via sign or other roadside infrastructure.
roadway characteristics	Detectable or measurable road characteristics such as friction coefficient and general surface conditions, road geometry and markings, etc. These characteristics are monitored or measured by ITS sensors and used to support advanced vehicle safety and control and road maintenance capabilities.
roadway equipment coordination	The direct flow of information between field equipment. This includes transfer of information between sensors and driver information systems (e.g., DMS, HAR, variable speed limit signs, dynamic lane signs) or control devices (e.g., traffic signals, ramp meters), direct coordination between adjacent control devices, interfaces between detection and warning or alarm systems, and any other direct communications between field equipment.
roadway information system data	Information used to initialize, configure, and control roadside systems that provide driver information (e.g., dynamic message signs, highway advisory radio, beacon systems). This flow can provide message content and delivery attributes, local message store maintenance requests, control mode commands, status queries, and all other commands and associated parameters that support remote management of these systems.
roadway information system status	Current operating status of dynamic message signs, highway advisory radios, beacon systems, or other configurable field equipment that provides dynamic information to the driver.
roadway maintenance status	Summary of maintenance fleet operations affecting the road network. This includes the status of winter maintenance (snow plow schedule and current status).
roadway safety data	Information about potential safety hazards in the vehicle path such as stalled vehicles, wrong way drivers, debris, or standing water.
roadway treatment system control	Control data for remotely located, automated devices, that affect the roadway surface (e.g. de-icing applications).
roadway treatment system status	Current operational status of automated roadway treatment devices (e.g., anti-icing systems).
roadway warning system control	Information used to configure and control roadway warning systems.
roadway warning system status	Current operating status of roadway warning systems.
route assignment	Route assignment information for transit vehicle operator.
route deviation alert	An alert that indicates a deviation from a planned route has been detected. The alert will contain the current Commercial Vehicle location and identity.
route plan	Tailored route provided by ISP in response to a specific request.

Architecture Flow	Flow Description
route request	Request for a tailored route based on given constraints.
route restrictions	Information about routes, road segments, and areas that do not allow the transport of security sensitive hazmat cargoes or include other restrictions (such as height or weight limits).
safe vehicle disable	Control signal disabling or enabling commercial vehicle.
safeguard system control	Data that controls safeguard systems (remotely controlled equipment used to mitigate the impact of incidents on transportation infrastructure, such as blast shields, exhaust systems, etc.).
safeguard system status	Current operating status of safeguard systems (remotely controlled equipment used to mitigate the impact of incidents on transportation infrastructure, such as blast shields, exhaust systems, etc.). Status of the systems includes operating condition and current operational state.
safety inspection record	Record containing results of commercial vehicle safety inspection.
safety inspection report	Report containing results of commercial vehicle safety inspection. The information may be provided as a response to a real-time query or proactively by the source. The query flow is not explicitly shown.
safety inspection request	Request for safety inspection record.
safety status information	Safety information such as safety ratings, security ratings or flags, inspection summaries, and violation summaries. A unique identifier is included. Corresponds to the safety and security portion of CVISN "snapshots." The status information may be provided as a response to a real-time query or as a result of a standing request for updated information (subscription). This may also include information about non-U.S. fleets for use by U.S. authorities, and information regarding U.S. fleets made available to Mexican and Canadian authorities. The query flow is not explicitly shown.
safety system status	Current vehicle safety system status indicating the operating condition of these systems and the safety status of the vehicle and driver.
screening event record	Results of CVO electronic screening activity.
screening results	Results of commercial vehicle screening event at a border crossing - reports clearance event data regarding action taken at border, including acceptance or override of system decision, and date/time stamp.
secure area characteristics	The range of physical and environmental characteristics (visual, audible, presence, motion, chemical, biological, radiological, other) that are monitored by surveillance and sensor systems.
secure area sensor control	Information used to configure and control threat sensors (e.g., thermal, acoustic, radiological, chemical), object, motion and intrusion detection sensors. The provided information controls sensor data collection, aggregation, filtering, and other local processing.
secure area sensor data	Data provided by threat sensors (e.g., thermal, acoustic, radiological, chemical), and intrusion, motion, and object detection sensors in secure areas indicating the sensor's operational status, raw and processed sensor data, and alarm indicators when a threat has been detected.
secure area surveillance control	Information used to configure and control audio and video surveillance systems used for transportation infrastructure security in secure areas. The provided information controls surveillance data collection, aggregation, filtering, and other local processing.
secure area surveillance data	Data collected from surveillance systems used to monitor secure areas. Includes video, audio, processed surveillance data, equipment operational status, and alarm indicators when a threat has been detected.
security equipment maintenance status	Current status of security surveillance and sensor field equipment maintenance actions.
security field equipment status	Identification of security sensors and surveillance equipment requiring repair and known information about the associated faults.

<b>Architecture Flow</b>	<b>Flow Description</b>
selected routes	Routes selected based on route request criteria.
service request	Request to multimodal (possibly non-roadway) transit provider for general services information and specific trip information or reservation.
service response	Multimodal (possibly non-roadway) transit provider services information and trip reservation confirmations.
shelter information	Evacuation shelter information including location, hours of operation, special accommodations, and current vacancy/availability information.
short range communications status	Status of the short range communications equipment including the current state or mode of operation and the current equipment status.
shoulder management control	Information used to configure and control systems that allow use of a shoulder as a lane for vehicular traffic.
shoulder management information	System status including current operational state, violations and logged information.
signal control commands	Control of traffic signal controllers or field masters including clock synchronization.
signal control data	Information used to configure local traffic signal controllers.
signal control device configuration	Data used to configure traffic signal control equipment including local controllers and system masters.
signal control plans	Traffic signal timing parameters including minimum green time and interval durations for basic operation and cycle length, splits, offset, phase sequence, etc. for coordinated systems.
signal control status	Operational and status data of traffic signal control equipment including operating condition and current indications.
signal fault data	Faults from traffic signal control equipment.
signal system configuration	Data used to configure traffic signal systems including configuring control sections and mode of operation (time based or traffic responsive).
speed monitoring control	Information used to configure and control automated speed monitoring, speed warning, and speed enforcement systems.
speed monitoring information	System status including current operational state and logged information including measured speeds, warning messages displayed, and violation records.
storage facility request	Request for information about the equipment and/or materials available at a maintenance storage facility.
suggested route	Suggested route for a dispatched emergency or maintenance vehicle that may reflect current network conditions and the additional routing options available to en route emergency or maintenance vehicles that are not available to the general public.
tag data	Unique tag ID and related vehicle information.
targeted list	List of carriers, drivers, and/or vehicles of interest for enforcement purposes.
tax filing	Commercial vehicle tax filing data. Authorization for payment is included.
threat data for analysis	Data from surveillance or sensor equipment in secure areas provided for further analysis.
threat information	Threats regarding transportation infrastructure, facilities, or systems detected by a variety of methods (sensors, surveillance, threat analysis of advisories from outside agencies, etc.
threat information coordination	Sensor, surveillance, and threat data including raw and processed data that is collected by sensor and surveillance equipment located in secure areas.
threat support data	Information provided to help receiving agency identify possible threats, including biometric image processing support data.
toll advisories	Alerts and advisories provided to toll plazas to keep toll operators informed of identified threats that may impact toll operations or public safety on a toll facility.
toll archive data	Data indicating toll facility usage and pricing schedules. Content may include a catalog of available information, the actual information to be archived, and associated meta data that describes the archived information.

Architecture Flow	Flow Description
toll coordination	This flow supports reciprocity between toll agencies/service centers by exchanging information that supports reconciliation of toll charges by customers that are enrolled with other toll service centers. In addition to toll charge reconciliation, exchanged information may include toll schedule information, customer information and other toll service information that is coordinated between toll agencies or centers.
toll data	Current toll schedules for different types of vehicles as well as advanced toll payment information.
toll data request	Request made to obtain toll schedule information or pay a toll in advance. The request can be a subscription that initiates as-needed information updates as well as a one-time request for information.
toll instructions	Information provided to configure and support toll plaza operations including toll pricing information.
toll operator information presentation	Information presented to the toll collection point operator, including toll transaction information, alerts, and advisories.
toll operator requests	User input from the toll operator to request information at the toll collection site.
toll probe data	Aggregate probe data derived from electronic toll collection operations. Data collected could include vehicle speeds and travel times for a given link or collection of links.
toll service change request	Request to change pricing, modify restrictions, or modify operations of a toll road facility
toll service change response	Response to toll service change requests indicating level of compliance with request.
toll transactions	Detailed list of transactions from a toll station.
track status	Current status of the wayside equipment and notification of an arriving train.
traffic archive data	Information describing the use and vehicle composition on transportation facilities and the traffic control strategies employed. Content may include a catalog of available information, the actual information to be archived, and associated meta data that describes the archived information.
traffic characteristics	Physical traffic characteristics which are monitored and translated into macroscopic measures like occupancy, volume, density, and average speed. Point measures support presence detection and individual vehicle measures like speed.
traffic control priority request	Request for signal priority at one or more intersections along a particular route.
traffic control priority status	Status of signal priority request functions at the roadside (e.g. enabled or disabled).
traffic flow	Raw and/or processed traffic detector data which allows derivation of traffic flow variables (e.g., speed, volume, and density measures) and associated information (e.g., congestion, potential incidents). This flow includes the traffic data and the operational status of the traffic detectors.
traffic images	High fidelity, real-time traffic images suitable for surveillance monitoring by the operator or for use in machine vision applications.
traffic information for media	Report of traffic conditions including traffic incident reports and traffic images for public dissemination through the media. The reports may also include information on diversions and alternate routes, closures, and special traffic restrictions in effect.
traffic metering control	Control commands and operating parameters for ramp meters, interchange meters, mainline meters, and other systems equipment associated with roadway metering operations.
traffic metering status	Current operational status and operating parameters for ramp meters, interchange meters, mainline meters and other control equipment associated with roadway metering operations.

Architecture Flow	Flow Description
traffic operator data	Presentation of traffic operations data to the operator including traffic conditions, current operating status of field equipment, maintenance activity status, incident status, video images, security alerts, emergency response plan updates and other information. This data keeps the operator apprised of current road network status, provides feedback to the operator as traffic control actions are implemented, provides transportation security inputs, and supports review of historical data and preparation for future traffic operations activities.
traffic operator inputs	User input from traffic operations personnel including requests for information, configuration changes, commands to adjust current traffic control strategies (e.g., adjust signal timing plans, change DMS messages), and other traffic operations data entry.
traffic probe data	Vehicle data that is used to determine traffic conditions. In a basic implementation, the data could be limited to time stamped unique identifiers that can be used to measure a vehicle's progress through the network. In more advanced implementations, the vehicle may report current position, speed, and heading and snapshots of recent events including route information, starts and stops, speed changes, and other information that can be used to estimate traffic conditions.
traffic probe reporting management	Data used to manage probe data reporting by vehicles. This flow indicates to the vehicle when to report probe data, the type of probe data to send, and thresholds for nominal conditions when sending data can be skipped.
traffic sensor control	Information used to configure and control traffic sensor systems.
traffic violation notification	Notification to enforcement agency of a detected traffic violation including speed violations, HOV violations, and dynamic lane violations.
transaction status	Response to transaction request. Normally dealing with a request for payment.
transit and fare schedules	Transit service information including routes, schedules, and fare information.
transit archive data	Data used to describe and monitor transit demand, fares, operations, and system performance. Content may include a catalog of available information, the actual information to be archived, and associated meta data that describes the archived information.
transit demand management request	Request to change the demand for transit facility use through pricing or other mechanisms.
transit demand management response	Response to transit demand management change requests indicating level of compliance with request.
transit emergency data	Initial notification of transit emergency at a transit stop or on transit vehicles and further coordination as additional details become available and the response is coordinated.
transit fare and passenger status	Information provided from the traveler location that supports fare payments, passenger data, and associated record-keeping.
transit fare coordination	Fare and pricing information shared between local/regional transit organizations.
transit fare information	Information provided by transit management that supports fare payment transactions and passenger data collection.
transit incident information	Information on transit incidents that impact transit services for public dissemination.
transit incidents for media	Report of an incident impacting transit operations for public dissemination through the media.
transit information for media	Report of transit schedule deviations for public dissemination through the media.
transit information request	Request for transit operations information including schedule and fare information. The request can be a subscription that initiates as-needed information updates as well as a one-time request for information.
transit information user request	Request for special transit routing, real-time schedule information, and availability information.

Architecture Flow	Flow Description
transit multimodal information	Transit schedule information for coordination at modal interchange points.
transit operations personnel inputs	User input from transit operations personnel including instructions governing service availability, schedules, emergency response plans, transit personnel assignments, transit maintenance requirements, and other inputs that establish general system operating requirements and procedures.
transit operations status	Presentation of information to transit operations personnel including accumulated schedule and fare information, ridership and on-time performance information, emergency response plans, transit personnel information, maintenance records, and other information intended to support overall planning and management of a transit property.
transit probe data	Aggregate probe data derived from tracking transit vehicles. Data collected could include transit vehicle speeds and travel times for a given link or collection of links.
transit request confirmation	Confirmation of a request for transit information or service.
transit schedule adherence information	Dynamic transit schedule adherence and transit vehicle location information.
transit schedule information	Current and projected transit schedule information used to initialize the transit vehicle with a vehicle assignment, monitor schedule performance, and develop corrective actions on-board.
transit service coordination	Schedule coordination information shared between local/regional transit organizations.
transit service information	Transit service information including routes, schedules, and fare information as well as dynamic transit schedule adherence and transit vehicle location information.
transit system data	Current transit system operations information indicating current transit routes, the level of service on each route, and the progress of individual vehicles along their routes for use in forecasting demand and estimating current transportation network performance.
transit system status assessment	Assessment of damage sustained by the public transportation system including location and extent of the damage, current operational status including an estimate of remaining capacity and necessary restrictions, and time frame for repair and recovery.
transit traveler information	Transit information prepared to support transit users and other travelers. It contains transit schedules, real-time arrival information, fare schedules, alerts and advisories, and general transit service information.
transit traveler information coordination	Transit schedules, real-time arrival information, fare schedules, and general transit service information shared between transit organizations to support transit traveler information systems.
transit traveler request	Request by a Transit traveler to summon assistance, request transit information, or request any other transit services.
transit trip plan	An origin-destination transit trip that may involve multiple modes and connections. (could use current trip plan that is PIAS to ISP, but since this is center to center a separate AF might be called for).
transit trip request	Request for a transit trip plan that is responsive to traveler requirements such as schedule, cost, or duration.
transit user information	Information about individual transit users boarding a transit vehicle, used to track a user's progress on a scheduled transit trip.
transit vehicle conditions	Operating conditions of transit vehicle (e.g., engine running, oil pressure, fuel level and usage).
transit vehicle loading data	Data collected on board the transit vehicle relating to passenger boarding and alighting.
transit vehicle location data	Current transit vehicle location and related operational conditions data provided by a transit vehicle.
transit vehicle measures	Transit vehicle status measured by on-board ITS equipment.

Architecture Flow	Flow Description
transit vehicle operator authentication information	Information regarding on-board transit operator authentication
transit vehicle operator authentication update	Results of authentication process or update of on-board authentication database.
transit vehicle operator availability	Transit vehicle operator availability data that can be used to develop vehicle operator assignments and detailed operations schedules.
transit vehicle operator display	Visual and audible outputs to the transit vehicle operator including vehicle surveillance information, alarm information, vehicle system status, information from the operations center, and information indicating the status of all other on-board ITS services.
transit vehicle operator information	Transit service instructions, wide area alerts, traffic information, road conditions, and other information for both transit and paratransit operators.
transit vehicle operator inputs	Transit vehicle operator inputs to on-board ITS equipment, including tactile and verbal inputs. Includes authentication information, on-board system control, emergency requests, and fare transaction data.
transit vehicle schedule performance	Estimated times of arrival and anticipated schedule deviations reported by a transit vehicle.
transportation border clearance assessment	Includes directions for commercial driver to proceed to nearest vehicle weigh and inspection station for further review if required.
transportation information for operations	Information on the state of transportation system operations including traffic and road conditions, advisories, incidents, transit service information, weather information, parking information, and other related data.
transportation system status	Current status and condition of transportation infrastructure (e.g., tunnels, bridges, interchanges, TMC offices, maintenance facilities). In case of disaster or major incident, this flow provides an assessment of damage sustained by the surface transportation system including location and extent of the damage, estimate of remaining capacity and necessary restrictions, and time frame for repair and recovery.
transportation weather information	Current and forecast road conditions and weather information (e.g., surface condition, flooding, wind advisories, visibility, etc.) associated with the transportation network. This information is of a resolution, timeliness, and accuracy to be useful in transportation decision making.
transportation weather information request	A request for transportation weather information that may specify the area of interest (a geographic region, particular routes within a region, specific road segments), the type of information that is required, the desired spatial resolution of the information, and time horizon.
travel service information	Information supplied by a service provider (e.g., a hotel or restaurant) that identifies the service provider and provides details of the service offering. This flow covers initial registration of a service provider and subsequent submittal of new information and status updates so that data currency is maintained.
travel service information request	Requests for travel service information. This flow supports initial registration of service providers and requests for additional traveler service information from registered providers.
travel service reservation request	Reservation request for traveler services (e.g. for a hotel or restaurant) including billing information when applicable.
travel service reservations	Traveler service (e.g., for a hotel or restaurant) reservation information and status, including information on associated billing transactions, when applicable.
travel services information	Travel service information and reservations for tourist attractions, lodging, dining, service stations, emergency services, and other services and businesses of interest to the traveler.
travel services request	Request for travel service information including tourist attractions, lodging, restaurants, service stations, and emergency services. The request identifies the type of service, the area of interest, optional reservation request information, parameters that are used to prioritize or filter the returned information, and sorting preferences.

Architecture Flow	Flow Description
traveler alerts	Traveler information alerts reporting congestion, incidents, adverse road or weather conditions, parking availability, transit service delays or interruptions, and other information that may impact the traveler. Relevant alerts are provided based on traveler-supplied profile information including trip characteristics and preferences.
traveler archive data	Data associated with traveler information services including service requests, facility usage, rideshare, routing, and traveler payment transaction data. Content may include a catalog of available information, the actual information to be archived, and associated meta data that describes the archived information.
traveler card information	The traveler personal information such as name, address, license number, and trip records and profile data.
traveler card update	Information updated concerning traveler's personal data including items such as address, trip records, and profile data.
traveler information for media	General traveler information regarding incidents, unusual traffic conditions, transit issues, or other advisory information that has been desensitized and provided to the media.
traveler inputs	User input from a traveler to summon assistance, request travel information, make a reservation, or request any other traveler service.
traveler interface updates	Visual or audio information (e.g., routes, messages, guidance, emergency information) that is provided to the traveler.
traveler payment information	Payment information for road use charges.
traveler payment request	Request for payment for road use charges.
traveler profile	Information about a traveler including equipment capabilities, personal preferences, and traveler alert subscriptions.
traveler request	A request for traveler information including traffic, transit, toll, parking, road weather conditions, event, and passenger rail information. The request identifies the type of information, the area of interest, parameters that are used to prioritize or filter the returned information, and sorting preferences.
trigger area	A geographic area a commercial motor vehicle crosses into, which initiates a request to compile and transmit a safety data message. May be associated with a time period.
trigger area definition	Information that defines the desired trigger area for wireless roadside inspection safety data message submission.
trigger area notification	Notification to activate wireless roadside inspection safety data message collection.
trigger control	Controls to enable or disable a particular trigger.
trip confirmation	Acknowledgement by the driver/traveler of acceptance of a trip plan with associated personal and payment information required to confirm reservations.
trip declaration identifiers	Specific identifiers extracted from notification containing information regarding pending commercial freight shipment into the U.S. Includes carrier, vehicle, and driver identification data.
trip identification number	The unique trip load number for a specific cross-border shipment.
trip identification number input	Commercial vehicle driver input containing the unique trip load number for a specific cross-border shipment.
trip log	Driver's daily log, vehicle location, mileage, and trip activity (includes screening, inspection and border clearance event data as well as fare payments).
trip log information	This flow represents the tactile or auditory interface with ITS equipment containing the information entered into the trip log, or request for update.
trip log request	Request for trip log.
trip plan	A travel itinerary identifying a route and associated traveler information and instructions identifying recommended modes and transfer information, ride sharing options, and transit and parking reservation information.



Architecture Flow	Flow Description
trip request	Request for trip planning services that identifies the trip origin, destination(s), timing, preferences, and constraints. The request may also include a request for transit and parking reservations and ridesharing options associated with the trip.
user VMT account reports	Reports on VMT charges
user VMT account setup	Billing information, vehicle information (or registration information), and requests for reports.
variable speed limit control	Information used to configure and control variable speed limit systems including the equipment used to provide current speed limits and other information to drivers and the equipment used to monitor traffic and environmental conditions along the roadway.
variable speed limit status	Current operating status of the variable speed limit systems including the state of the equipment.
vehicle characteristics	The physical or visible characteristics of an individual vehicle that can be measured to classify a vehicle and imaged to uniquely identify a vehicle.
vehicle control	Vehicular control commands
vehicle control coordination	Coordination of control commands between leader and follower vehicles allowing vehicles to join and separate from groups of cooperative vehicles, sharing performance capabilities, and coordinating maneuvers between lead and following vehicles.
vehicle diagnostics data	Information about the vehicle and its current operational status that supports vehicle performance monitoring, service, and repair. The flow identifies the vehicle and vehicle type and provides information about the vehicle's current operational status, the current performance of engine-related components, and notification of any identified malfunctions.
vehicle emissions data	Measured emissions of specific vehicles comprised of exhaust pollutants including hydrocarbons, carbon monoxide, and nitrogen oxides.
vehicle intersection safety data	Vehicle path and acceleration data provided by vehicles approaching or occupying an intersection. It identifies the intersection, vehicle position and motion, the anticipated lane and movement that will be used in the intersection, and notification of potential violations or other detected safety hazards.
vehicle occupancy	The number of occupants detected by the vehicle.
vehicle parking information	Parking information for in-vehicle display that is provided to vehicles approaching or in parking facilities. The information provided would include static sign information (e.g., guide signs, service signs, height, width, and weight restrictions, and directional signs) and dynamic information (e.g., current parking availability and locations).
vehicle payment information	Information provided for payment of tolls and parking fees including identification that can be used to identify the payment account or source and related vehicle and service information that are used to determine the type and price of service requested.
vehicle payment request	Request for information supporting toll and parking payments.
vehicle payment update	Data written to vehicle equipment to support electronic toll collection or parking payment.
vehicle profile	Information about a vehicle including vehicle type and equipment capabilities.
vehicle safety data	Vehicle safety data indicating vehicle location, vehicle motion (speed, heading, acceleration), vehicle control (brakes, steering, throttle, exterior lights), basic vehicle characteristics (length, width). May also include additional vehicle status (e.g., anti-lock brake activation, stability control system activation).
vehicle signage data	In-vehicle signing data that augments regulatory, warning, and informational road signs and signals. The information provided would include static sign information (e.g., stop, curve warning, guide signs, service signs, and directional signs) and dynamic information (e.g., current signal states, grade crossing information, local traffic and road conditions, advisories, and detours).
video surveillance control	Information used to configure and control video surveillance systems.

Architecture Flow	Flow Description
violation notification	Notification to enforcement agency of a violation. The violation notification flow describes the statute or regulation that was violated and how it was violated (e. g., overweight on specific axle by xxx pounds or which brake was out of adjustment and how far out of adjustment it was). A violation differs from a citation because it is not adjudicated by the courts.
VMT cost data	VMT charges per link.
VMT data	A vehicle's road use history that records where the vehicle has traveled over time. Optionally includes vehicle speeds as well as distance traveled for some applications. Information is accurate enough to distinguish between adjacent roads, adjacent lanes, and identify direction of travel on the roads.
VMT data for ISP	Road use charge rate policies for distribution to travelers.
VMT equipment fault	Provides fault status of the VMT data collection equipment in a vehicle and vehicle image and other characteristics to allow independent identification of the vehicle and its owner.
VMT equipment status	Provides an indication of the operational status of the VMT data collection equipment in a vehicle. Also indicates vehicle ID (VIN) so that the registration of the equipment to a specific vehicle can be verified and confirmed by comparison with vehicle characteristics.
VMT payment coordination	Coordinate apportionment of VMT data or charges between jurisdictions (e.g. federal government, states, various jurisdictions that might be public or private within a state). Apportionment reconciliation includes either sharing information about VMT data in other jurisdictions (so that the Other Payment Administration subsystems can make appropriate charges), or sharing revenue collected. When sharing revenue, this flow also includes VMT charging rate policies
voice-based alert notification	Information to be distributed to the traveling public via voice regarding a major emergency such as a natural or man-made disaster, civil emergency, severe weather or child abduction. The flow may identify the alert originator, the nature of the emergency, the geographic area affected by the emergency, the effective time period, and information and instructions necessary for the public to respond to the alert. The content of this architecture flow may be specially formatted for voice-based traveler information.
voice-based traveler information	Traveler information sent to the telecommunications systems for traveler information terminator. This flow may represent the bulk transfer of traveler information, including traffic conditions, incident information, transit information and weather and road condition information. It may be specially formatted for voice-based traveler information.
voice-based traveler request	The electronic traveler information request from the telecommunications systems for traveler information terminator. It may be specifically formatted for voice-based traveler requests. The request can be a general subscription intended to initiate a continuous or regular data stream or a specific request intended to initiate a one-time response from the recipient.
weather archive data	Accumulated forecasted and current weather data (e.g., temperature, pressure, wind speed, wind direction, humidity, precipitation, visibility, light conditions, etc.) as well as qualified environmental sensor data. Content may include a catalog of available information, the actual information to be archived, and associated meta data that describes the archived information.
weather information	Accumulated forecasted and current weather data (e.g., temperature, pressure, wind speed, wind direction, humidity, precipitation, visibility, light conditions, etc.).
widearea statistical pollution information	Aggregated region-wide measured emissions data and possible pollution incident information.
work plan coordination	Coordination of work plan schedules and activities between maintenance and construction organizations or systems. This information includes the work plan schedules and comments and suggested changes that are exchanged as work plans are coordinated and finalized.
work plan feedback	Comments and suggested changes to proposed construction and maintenance work schedules and activities. This information influences work plan schedules so that they minimize impact to other system operations and the overall transportation system.

Architecture Flow	Flow Description
work zone information	Summary of maintenance and construction work zone activities affecting the road network including the nature of the maintenance or construction activity, location, impact to the roadway, expected time(s) and duration of impact, anticipated delays, alternate routes, and suggested speed limits. This information may be augmented with images that provide a visual indication of current work zone status and traffic impacts.
work zone status	Current work zone status including current location (and future locations for moving work zones), impact to the roadway, required lane shifts, expected time(s) and duration of impact, anticipated delays, alternate routes, and suggested speed limits.
work zone warning	Warnings provided to maintenance and construction field personnel, indicating a work zone emergency or safety issue such as the intrusion of a vehicle into the work zone area or movement of field crew into the travel lanes.
work zone warning device control	Data used to configure and control work zone safety monitoring and warning devices.
work zone warning notification	Notification of a work zone emergency or safety issue. This flow identifies that a work zone emergency or safety issue has occurred so that warnings may be generated by more than one system in the work zone.
work zone warning status	Status of a work zone safety monitoring and warning devices. This flow documents system activations and includes additional supporting information (e.g., an image) that allows verification of the alarm.

## 2.3 Archived Data Management

The Archived Data Management Subsystem (ADMS) collects, archives, manages, and distributes data generated from ITS sources for use in transportation administration, policy evaluation, safety, planning, performance monitoring, program assessment, operations, and research applications. The data received is formatted and tagged with attributes that define the data source, conditions under which it was collected, data transformations, and other information (i.e. meta data) necessary to interpret the data. The subsystem can fuse ITS generated data with data from non-ITS sources and other archives to generate information products utilizing data from multiple functional areas, modes, and jurisdictions. The subsystem prepares data products that can serve as inputs to federal, state, and local data reporting systems. This subsystem may be implemented in many different ways. It may reside within an operational center and provide focused access to a particular agency's data archives. Alternatively, it may operate as a distinct center that collects data from multiple agencies and sources and provides a general data warehouse service for a region.

### 2.3.1 *Equipment Packages and Process Specifications for ADMS*

#### **Equipment Package: Government Reporting Systems Support**

This equipment package selects and formats data residing in an ITS archive to facilitate local, state, and federal government data reporting requirements.

##### **Process Specifications**

##### **8.8 Prepare Government Reporting Inputs**

#### **Equipment Package: ITS Data Repository**

This equipment package collects data and data catalogs from one or more data sources and stores the data in a focused repository that is suited to a particular set of ITS data users. This equipment package includes capabilities for performing quality checks on the incoming data, error notification, and archive to archive coordination. This equipment package supports a broad range of implementations, ranging from simple data marts that collect a focused set of data and serve a particular user community to large-scale data warehouses that collect, integrate, and summarize transportation data from multiple sources and serve a broad array of users within a region.

##### **Process Specifications**

##### **8.1 Get Archive Data**

##### **8.2 Manage Archive**

##### **8.3 Manage Archive Data Administrator Interface**

##### **8.5 Process Archived Data User System Requests**

##### **8.7 Process On Demand Archive Requests**

##### **8.9 Manage Roadside Data Collection**

#### **Equipment Package: On-Line Analysis and Mining**

This equipment package provides advanced data analysis, summarization, and mining features that facilitate discovery of information, patterns, and correlations in large data sets. Multidimensional analysis, selective summarization and expansion of data details, and many other advanced analysis services may be offered by various implementations of this equipment package.

##### **Process Specifications**

##### **8.6 Analyze Archive**

#### **Equipment Package: Traffic and Roadside Data Archival**

This equipment package collects and archives traffic, roadway, and environmental information for use in off-line planning, research, and analysis. The equipment package controls and collects information directly from equipment at the roadside, reflecting the deployment of traffic detectors that are used primarily for traffic monitoring and planning purposes rather than for traffic management.

##### **Process Specifications**

##### **8.9 Manage Roadside Data Collection**

#### **Equipment Package: Virtual Data Warehouse Services**

## Archived Data Management

This equipment package provides capabilities to access "in-place" data from geographically dispersed archives and coordinate information exchange with a local data warehouse. While many of the functions performed by this equipment package are similar to the functions inherent in other archived data management subsystem equipment packages (e.g. data management, fusion, analysis) this equipment package also provides the specialized publishing, directory services, and transaction management functions associated with coordinating remote archives. In addition, this equipment package performs functions on an as-needed basis, thereby negating the need to maintain the comprehensive set of data from the remote archives in the local data warehouse.

### Process Specifications 8.4 Coordinate Archives

#### 2.3.2 Interfaces for ADMS

##### Archived Data Administrator => Archived Data Management

**Physical Architecture Flow Name:** archive management requests

User input from the administrator including commands, requests, and queries that support data collection, administration, and management of an ITS data archive.

**Logical Architecture Data Flow(s):**  
fada-archive\_administration\_requests  
fada-data\_collection\_device\_control

##### Archived Data Management => Archived Data Administrator

**Physical Architecture Flow Name:** archive management data

Presentation of information to the administrator to support the management of an ITS archive including database reports on the condition and quality of the archived data, status of the import and collection process, reports that monitor archive usage, and any special requests that require direct action by the administrator (e.g., requests for access to new data sources).

**Logical Architecture Data Flow(s):**  
tada-data\_collection\_device\_status  
tada-archive\_administration\_data

##### Archived Data Management => Archived Data User Systems

**Physical Architecture Flow Name:** archive analysis results

Processed information products, supporting meta data, and any associated transaction information resulting from data mining, analytical processing, aggregation or summarization, report formulation, or other on-line processing and analysis of archived data.

**Logical Architecture Data Flow(s):**  
tadu-archive\_analysis\_results

**Physical Architecture Flow Name:** archive request confirmation

Confirmation that an archive request has been received and processed with information on the disposition of the request.

**Logical Architecture Data Flow(s):**  
tadu-on\_demand\_confirmation

**Physical Architecture Flow Name:** archived data products

Raw or processed data, meta data, data catalogs and other data products provided to a user system upon request. The response may also include any associated transaction information.

**Logical Architecture Data Flow(s):**  
tadu-archive\_data\_product

## Archived Data Management

### Archived Data Management => Asset Management

**Physical Architecture Flow Name:** archive requests

A request to a data source for information on available data (i.e. "catalog") or a request that defines the data to be archived. The request can be a general subscription intended to initiate a continuous or regular data stream or a specific request intended to initiate a one-time response from the recipient.

**Logical Architecture Data Flow(s):**

tam-archive\_request

**Physical Architecture Flow Name:** archive status

Notification that data provided to an archive contains erroneous, missing, or suspicious data or verification that the data provided appears valid. If an error has been detected, the offending data and the nature of the potential problem are identified.

**Logical Architecture Data Flow(s):**

tam-asset\_archive\_status

### Archived Data Management => Border Inspection Administration

**Physical Architecture Flow Name:** archive requests

A request to a data source for information on available data (i.e. "catalog") or a request that defines the data to be archived. The request can be a general subscription intended to initiate a continuous or regular data stream or a specific request intended to initiate a one-time response from the recipient.

**Logical Architecture Data Flow(s):**

tbia-archive\_request

**Physical Architecture Flow Name:** archive status

Notification that data provided to an archive contains erroneous, missing, or suspicious data or verification that the data provided appears valid. If an error has been detected, the offending data and the nature of the potential problem are identified.

**Logical Architecture Data Flow(s):**

tbia-border\_archive\_status

### Archived Data Management => Commercial Vehicle Administration

**Physical Architecture Flow Name:** archive requests

A request to a data source for information on available data (i.e. "catalog") or a request that defines the data to be archived. The request can be a general subscription intended to initiate a continuous or regular data stream or a specific request intended to initiate a one-time response from the recipient.

**Logical Architecture Data Flow(s):**

cv\_archive\_request

**Physical Architecture Flow Name:** archive status

Notification that data provided to an archive contains erroneous, missing, or suspicious data or verification that the data provided appears valid. If an error has been detected, the offending data and the nature of the potential problem are identified.

**Logical Architecture Data Flow(s):**

cv\_archive\_status

### Archived Data Management => Emergency Management

## Archived Data Management

**Physical Architecture Flow Name:** archive requests

A request to a data source for information on available data (i.e. "catalog") or a request that defines the data to be archived. The request can be a general subscription intended to initiate a continuous or regular data stream or a specific request intended to initiate a one-time response from the recipient.

**Logical Architecture Data Flow(s):**  
em\_archive\_request

**Physical Architecture Flow Name:** archive status

Notification that data provided to an archive contains erroneous, missing, or suspicious data or verification that the data provided appears valid. If an error has been detected, the offending data and the nature of the potential problem are identified.

**Logical Architecture Data Flow(s):**  
em\_archive\_status

**Archived Data Management** => **Emissions Management**

**Physical Architecture Flow Name:** archive requests

A request to a data source for information on available data (i.e. "catalog") or a request that defines the data to be archived. The request can be a general subscription intended to initiate a continuous or regular data stream or a specific request intended to initiate a one-time response from the recipient.

**Logical Architecture Data Flow(s):**  
emissions\_archive\_request

**Physical Architecture Flow Name:** archive status

Notification that data provided to an archive contains erroneous, missing, or suspicious data or verification that the data provided appears valid. If an error has been detected, the offending data and the nature of the potential problem are identified.

**Logical Architecture Data Flow(s):**  
emissions\_archive\_status

**Archived Data Management** => **Financial Institution**

**Physical Architecture Flow Name:** payment request

Request for payment from financial institution.

**Logical Architecture Data Flow(s):**  
tfi-archive\_analysis\_payment\_request  
tfi-archive\_payment\_request

**Archived Data Management** => **Government Reporting Systems**

**Physical Architecture Flow Name:** government reporting system data

Information provided by an ITS archive, formatted as appropriate, that can be used as input to government data reporting systems.

**Logical Architecture Data Flow(s):**  
tgrs-government\_data\_report\_input

**Archived Data Management** => **Information Service Provider**

**Physical Architecture Flow Name:** archive requests

A request to a data source for information on available data (i.e. "catalog") or a request that defines the data to be archived. The request can be a general subscription intended to initiate a

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continuous or regular data stream or a specific request intended to initiate a one-time response from the recipient.

### Logical Architecture Data Flow(s):

traveler\_archive\_request

**Physical Architecture Flow Name:** archive status

Notification that data provided to an archive contains erroneous, missing, or suspicious data or verification that the data provided appears valid. If an error has been detected, the offending data and the nature of the potential problem are identified.

### Logical Architecture Data Flow(s):

traveler\_archive\_status

**Archived Data Management** => **Intermodal Freight Depot**

**Physical Architecture Flow Name:** archive requests

A request to a data source for information on available data (i.e. "catalog") or a request that defines the data to be archived. The request can be a general subscription intended to initiate a continuous or regular data stream or a specific request intended to initiate a one-time response from the recipient.

### Logical Architecture Data Flow(s):

tifd-intermodal\_archive\_request

**Physical Architecture Flow Name:** archive status

Notification that data provided to an archive contains erroneous, missing, or suspicious data or verification that the data provided appears valid. If an error has been detected, the offending data and the nature of the potential problem are identified.

### Logical Architecture Data Flow(s):

tifd-intermodal\_archive\_status

**Archived Data Management** => **Maintenance and Construction Management**

**Physical Architecture Flow Name:** archive requests

A request to a data source for information on available data (i.e. "catalog") or a request that defines the data to be archived. The request can be a general subscription intended to initiate a continuous or regular data stream or a specific request intended to initiate a one-time response from the recipient.

### Logical Architecture Data Flow(s):

m\_and\_c\_archive\_request

**Physical Architecture Flow Name:** archive status

Notification that data provided to an archive contains erroneous, missing, or suspicious data or verification that the data provided appears valid. If an error has been detected, the offending data and the nature of the potential problem are identified.

### Logical Architecture Data Flow(s):

m\_and\_c\_archive\_status

**Archived Data Management** => **Map Update Provider**

**Physical Architecture Flow Name:** map update request

Request for a map update which could include a new underlying map or map layer updates.

### Logical Architecture Data Flow(s):

tmup-map\_archive\_status



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tmup-map\_archive\_request

### **Archived Data Management** => **Multimodal Transportation Service Provider**

**Physical Architecture Flow Name:** archive requests

A request to a data source for information on available data (i.e. "catalog") or a request that defines the data to be archived. The request can be a general subscription intended to initiate a continuous or regular data stream or a specific request intended to initiate a one-time response from the recipient.

**Logical Architecture Data Flow(s):**  
tmtsp-multimodal\_archive\_request

**Physical Architecture Flow Name:** archive status

Notification that data provided to an archive contains erroneous, missing, or suspicious data or verification that the data provided appears valid. If an error has been detected, the offending data and the nature of the potential problem are identified.

**Logical Architecture Data Flow(s):**  
tmtsp-multimodal\_archive\_status

### **Archived Data Management** => **Other Archives**

**Physical Architecture Flow Name:** archive coordination

Catalog data, meta data, published data, and other information exchanged between archives to support data synchronization and satisfy user data requests.

**Logical Architecture Data Flow(s):**  
toa-archive\_coordination\_data

**Physical Architecture Flow Name:** archive requests

A request to a data source for information on available data (i.e. "catalog") or a request that defines the data to be archived. The request can be a general subscription intended to initiate a continuous or regular data stream or a specific request intended to initiate a one-time response from the recipient.

**Logical Architecture Data Flow(s):**  
tods-other\_data\_source\_archive\_request

**Physical Architecture Flow Name:** archive status

Notification that data provided to an archive contains erroneous, missing, or suspicious data or verification that the data provided appears valid. If an error has been detected, the offending data and the nature of the potential problem are identified.

**Logical Architecture Data Flow(s):**  
tods-other\_data\_source\_archive\_status

### **Archived Data Management** => **Parking Management**

**Physical Architecture Flow Name:** archive requests

A request to a data source for information on available data (i.e. "catalog") or a request that defines the data to be archived. The request can be a general subscription intended to initiate a continuous or regular data stream or a specific request intended to initiate a one-time response from the recipient.

**Logical Architecture Data Flow(s):**  
parking\_archive\_request

**Physical Architecture Flow Name:** archive status

## Archived Data Management

Notification that data provided to an archive contains erroneous, missing, or suspicious data or verification that the data provided appears valid. If an error has been detected, the offending data and the nature of the potential problem are identified.

### Logical Architecture Data Flow(s):

parking\_archive\_status

## Archived Data Management

=> **Payment Administration**

**Physical Architecture Flow Name:** archive requests

A request to a data source for information on available data (i.e. "catalog") or a request that defines the data to be archived. The request can be a general subscription intended to initiate a continuous or regular data stream or a specific request intended to initiate a one-time response from the recipient.

### Logical Architecture Data Flow(s):

toll\_archive\_request

**Physical Architecture Flow Name:** archive status

Notification that data provided to an archive contains erroneous, missing, or suspicious data or verification that the data provided appears valid. If an error has been detected, the offending data and the nature of the potential problem are identified.

### Logical Architecture Data Flow(s):

toll\_archive\_status

## Archived Data Management

=> **Roadway**

**Physical Architecture Flow Name:** data collection and monitoring control

Information used to configure and control data collection and monitoring systems.

### Logical Architecture Data Flow(s):

roadside\_archive\_control  
data\_collection\_device\_control

## Archived Data Management

=> **Surface Transportation  
Weather Service**

**Physical Architecture Flow Name:** archive requests

A request to a data source for information on available data (i.e. "catalog") or a request that defines the data to be archived. The request can be a general subscription intended to initiate a continuous or regular data stream or a specific request intended to initiate a one-time response from the recipient.

### Logical Architecture Data Flow(s):

tstws-archive\_request

**Physical Architecture Flow Name:** archive status

Notification that data provided to an archive contains erroneous, missing, or suspicious data or verification that the data provided appears valid. If an error has been detected, the offending data and the nature of the potential problem are identified.

### Logical Architecture Data Flow(s):

tstws-trans\_weather\_archive\_status

## Archived Data Management

=> **Traffic Management**

**Physical Architecture Flow Name:** archive requests

A request to a data source for information on available data (i.e. "catalog") or a request that defines the data to be archived. The request can be a general subscription intended to initiate a

## Archived Data Management

continuous or regular data stream or a specific request intended to initiate a one-time response from the recipient.

### Logical Architecture Data Flow(s):

traffic\_management\_archive\_request

**Physical Architecture Flow Name:** archive status

Notification that data provided to an archive contains erroneous, missing, or suspicious data or verification that the data provided appears valid. If an error has been detected, the offending data and the nature of the potential problem are identified.

### Logical Architecture Data Flow(s):

traffic\_management\_archive\_status

**Physical Architecture Flow Name:** archived data products

Raw or processed data, meta data, data catalogs and other data products provided to a user system upon request. The response may also include any associated transaction information.

### Logical Architecture Data Flow(s):

traffic\_archive\_data\_product

**Archived Data Management** => **Transit Management**

**Physical Architecture Flow Name:** archive requests

A request to a data source for information on available data (i.e. "catalog") or a request that defines the data to be archived. The request can be a general subscription intended to initiate a continuous or regular data stream or a specific request intended to initiate a one-time response from the recipient.

### Logical Architecture Data Flow(s):

transit\_archive\_request

**Physical Architecture Flow Name:** archive status

Notification that data provided to an archive contains erroneous, missing, or suspicious data or verification that the data provided appears valid. If an error has been detected, the offending data and the nature of the potential problem are identified.

### Logical Architecture Data Flow(s):

transit\_archive\_status

**Physical Architecture Flow Name:** archived data products

Raw or processed data, meta data, data catalogs and other data products provided to a user system upon request. The response may also include any associated transaction information.

### Logical Architecture Data Flow(s):

transit\_archive\_data\_product

**Archived Data Management** => **Weather Service**

**Physical Architecture Flow Name:** archive requests

A request to a data source for information on available data (i.e. "catalog") or a request that defines the data to be archived. The request can be a general subscription intended to initiate a continuous or regular data stream or a specific request intended to initiate a one-time response from the recipient.

### Logical Architecture Data Flow(s):

tws-weather\_archive\_request

**Physical Architecture Flow Name:** archive status

Notification that data provided to an archive contains erroneous, missing, or suspicious data or verification that the data provided appears valid. If an error has been detected, the offending data and the nature of the potential problem are identified.

## Archived Data Management

### **Logical Architecture Data Flow(s):**

tws-weather\_archive\_status

**Physical Architecture Flow Name:** archive analysis requests

A user request that initiates data mining, analytical processing, aggregation or summarization, report formulation, or other advanced processing and analysis of archived data. The request also includes information that is used to identify and authenticate the user and support electronic payment requirements, if any.

### **Logical Architecture Data Flow(s):**

fadu-on\_demand\_archive\_request  
fadu-archive\_analysis\_request

**Physical Architecture Flow Name:** archived data product requests

A user-specified request for archived data products (i.e. data, meta data, or data catalogs). The request also includes information that is used to identify and authenticate the user and support electronic payment requirements, if any.

### **Logical Architecture Data Flow(s):**

fadu-archive\_data\_product\_request

**Asset Management** => **Archived Data Management**

**Physical Architecture Flow Name:** asset archive data

Information describing transportation assets including pavements, bridges, and all other infrastructure included in the transportation network. In addition, information can cover support assets (support equipment and systems, software, etc.). Content may include a catalog of available information, the actual information to be archived, and associated meta data that describes the archived information.

### **Logical Architecture Data Flow(s):**

fam-asset\_archive\_data

**Border Inspection Administration** => **Archived Data Management**

**Physical Architecture Flow Name:** border information archive data

Border inspection activities data. Content may include a catalog of available information, the actual information to be archived, and associated meta data that describes the archived

### **Logical Architecture Data Flow(s):**

fbia-border\_archive\_data

**Border Inspection Systems** => **Archived Data Management**

**Physical Architecture Flow Name:** border wait times archived data

Wait time data to be archived and used for planning and analysis activities.

### **Logical Architecture Data Flow(s):**

fbis-border\_wait\_times\_archive

**Commercial Vehicle Administration** => **Archived Data Management**

**Physical Architecture Flow Name:** commercial vehicle archive data

Information describing commercial vehicle travel and commodity flow characteristics. Content may include a catalog of available information, the actual information to be archived, and associated meta data that describes the archived information.

## Archived Data Management

### **Logical Architecture Data Flow(s):**

cv\_archive\_data

### **Emergency Management**

=> **Archived Data Management**

#### **Physical Architecture Flow Name:**

emergency archive data

Logged emergency information including information that characterizes identified incidents (routine highway incidents through disasters), corresponding incident response information, evacuation information, surveillance data, threat data, and resource information. Content may include a catalog of available information, the actual information to be archived, and associated meta data that describes the archived information.

### **Logical Architecture Data Flow(s):**

em\_archive\_data

### **Emissions Management**

=> **Archived Data Management**

#### **Physical Architecture Flow Name:**

emissions archive data

Air quality and vehicle emissions information that is collected by sensors or derived from models. Content may include a catalog of available information, the actual information to be archived, and associated meta data that describes the archived information.

### **Logical Architecture Data Flow(s):**

emissions\_archive\_data

### **Financial Institution**

=> **Archived Data Management**

#### **Physical Architecture Flow Name:**

transaction status

Response to transaction request. Normally dealing with a request for payment.

### **Logical Architecture Data Flow(s):**

ffi-archive\_payment\_confirm  
ffi-archive\_analysis\_payment\_confirm

### **Government Reporting Systems**

=> **Archived Data Management**

#### **Physical Architecture Flow Name:**

government reporting data receipt

The acknowledgement of satisfactory receipt of information used as input to government data systems or a report identifying problems or issues with the data submittal.

### **Logical Architecture Data Flow(s):**

fgrs-government\_data\_report\_request

### **Information Service Provider**

=> **Archived Data Management**

#### **Physical Architecture Flow Name:**

traveler archive data

Data associated with traveler information services including service requests, facility usage, rideshare, routing, and traveler payment transaction data. Content may include a catalog of available information, the actual information to be archived, and associated meta data that describes the archived information.

### **Logical Architecture Data Flow(s):**

traveler\_archive\_data

### **Intermodal Freight Depot**

=> **Archived Data Management**

#### **Physical Architecture Flow Name:**

intermodal freight archive data

Information describing demand at intermodal freight terminals including loading/unloading activities of trailers and containers. Content may include a catalog of available information, the actual information to be archived, and associated meta data that describes the archived

## Archived Data Management

**Logical Architecture Data Flow(s):**  
fifd-intermodal\_archive\_data

**Maintenance and Construction Management** => **Archived Data Management**

**Physical Architecture Flow Name:** maint and constr archive data

Information describing road construction and maintenance activities identifying the type of activity, the work performed, and work zone information including work zone configuration and safety (e.g., a record of intrusions and vehicle speeds) information. For construction activities, this information also includes a description of the completed infrastructure, including as-built plans as applicable. Content may include a catalog of available information, the actual information to be archived, and associated meta data that describes the archived information.

**Logical Architecture Data Flow(s):**  
m\_and\_c\_archive\_data

**Map Update Provider** => **Archived Data Management**

**Physical Architecture Flow Name:** map updates

Map update which could include a new underlying static or real-time map or map layer(s) update.

**Logical Architecture Data Flow(s):**  
fmup-map\_archive\_data

**Multimodal Transportation Service Provider** => **Archived Data Management**

**Physical Architecture Flow Name:** multimodal archive data

Operational information from alternate passenger transportation modes including air, rail transit, taxis, and ferries. Content may include a catalog of available information, the actual information to be archived, and associated meta data that describes the archived information.

**Logical Architecture Data Flow(s):**  
fmtsp-multimodal\_archive\_data

**Other Archives** => **Archived Data Management**

**Physical Architecture Flow Name:** archive coordination

Catalog data, meta data, published data, and other information exchanged between archives to support data synchronization and satisfy user data requests.

**Logical Architecture Data Flow(s):**  
foa-archive\_coordination\_data

**Other Data Sources** => **Archived Data Management**

**Physical Architecture Flow Name:** other data source archive data

Data extracted from other data sources. A wide range of ITS and non-ITS data and associated meta data may be provided.

**Logical Architecture Data Flow(s):**  
fods-other\_data\_source\_archive\_data

**Parking Management** => **Archived Data Management**

**Physical Architecture Flow Name:** parking archive data

Data used to analyze and monitor trends in parking demand, pricing, and operational actions. Content may include a catalog of available information, the actual information to be archived,

## Archived Data Management

and associated meta data that describes the archived information.

### **Logical Architecture Data Flow(s):**

parking\_archive\_data

**Payment Administration** => **Archived Data Management**

**Physical Architecture Flow Name:** toll archive data

Data indicating toll facility usage and pricing schedules. Content may include a catalog of available information, the actual information to be archived, and associated meta data that describes the archived information.

### **Logical Architecture Data Flow(s):**

toll\_archive\_data

**Roadway** => **Archived Data Management**

**Physical Architecture Flow Name:** probe archive data

Probe data that allows calculation of travel times, volumes, and other measures that support transportation planning. Optionally, this flow also includes origin and destination information for vehicles that opt to provide this information.

### **Logical Architecture Data Flow(s):**

traffic\_probe\_data\_from\_vehicles\_archive\_data

**Physical Architecture Flow Name:** roadside archive data

A broad set of data derived from roadside sensors that includes current traffic conditions, environmental conditions, and any other data that can be directly collected by roadside sensors. This data also indicates the status of the sensors and reports of any identified sensor faults.

### **Logical Architecture Data Flow(s):**

data\_collection\_device\_status  
roadside\_archive\_data

**Surface Transportation Weather Service** => **Archived Data Management**

**Physical Architecture Flow Name:** transportation weather information

Current and forecast road conditions and weather information (e.g., surface condition, flooding, wind advisories, visibility, etc.) associated with the transportation network. This information is of a resolution, timeliness, and accuracy to be useful in transportation decision making.

### **Logical Architecture Data Flow(s):**

fstws-trans\_weather\_archive\_data

**Traffic Management** => **Archived Data Management**

**Physical Architecture Flow Name:** archived data product requests

A user-specified request for archived data products (i.e. data, meta data, or data catalogs). The request also includes information that is used to identify and authenticate the user and support electronic payment requirements, if any.

### **Logical Architecture Data Flow(s):**

traffic\_archive\_data\_product\_request

**Physical Architecture Flow Name:** traffic archive data

Information describing the use and vehicle composition on transportation facilities and the traffic control strategies employed. Content may include a catalog of available information, the actual information to be archived, and associated meta data that describes the archived information.

## Archived Data Management

### **Logical Architecture Data Flow(s):**

traffic\_management\_archive\_data

### **Transit Management**

=>

### **Archived Data Management**

#### **Physical Architecture Flow Name:**

archived data product requests

A user-specified request for archived data products (i.e. data, meta data, or data catalogs). The request also includes information that is used to identify and authenticate the user and support electronic payment requirements, if any.

### **Logical Architecture Data Flow(s):**

transit\_archive\_data\_product\_request

#### **Physical Architecture Flow Name:**

transit archive data

Data used to describe and monitor transit demand, fares, operations, and system performance. Content may include a catalog of available information, the actual information to be archived, and associated meta data that describes the archived information.

### **Logical Architecture Data Flow(s):**

transit\_archive\_data

### **Weather Service**

=>

### **Archived Data Management**

#### **Physical Architecture Flow Name:**

weather archive data

Accumulated forecasted and current weather data (e.g., temperature, pressure, wind speed, wind direction, humidity, precipitation, visibility, light conditions, etc.) as well as qualified environmental sensor data. Content may include a catalog of available information, the actual information to be archived, and associated meta data that describes the archived information.

### **Logical Architecture Data Flow(s):**

fws-weather\_and\_env\_data\_for\_archive

### *2.3.3 Architecture Flow Diagrams for ADMS*



# Archived Data Management

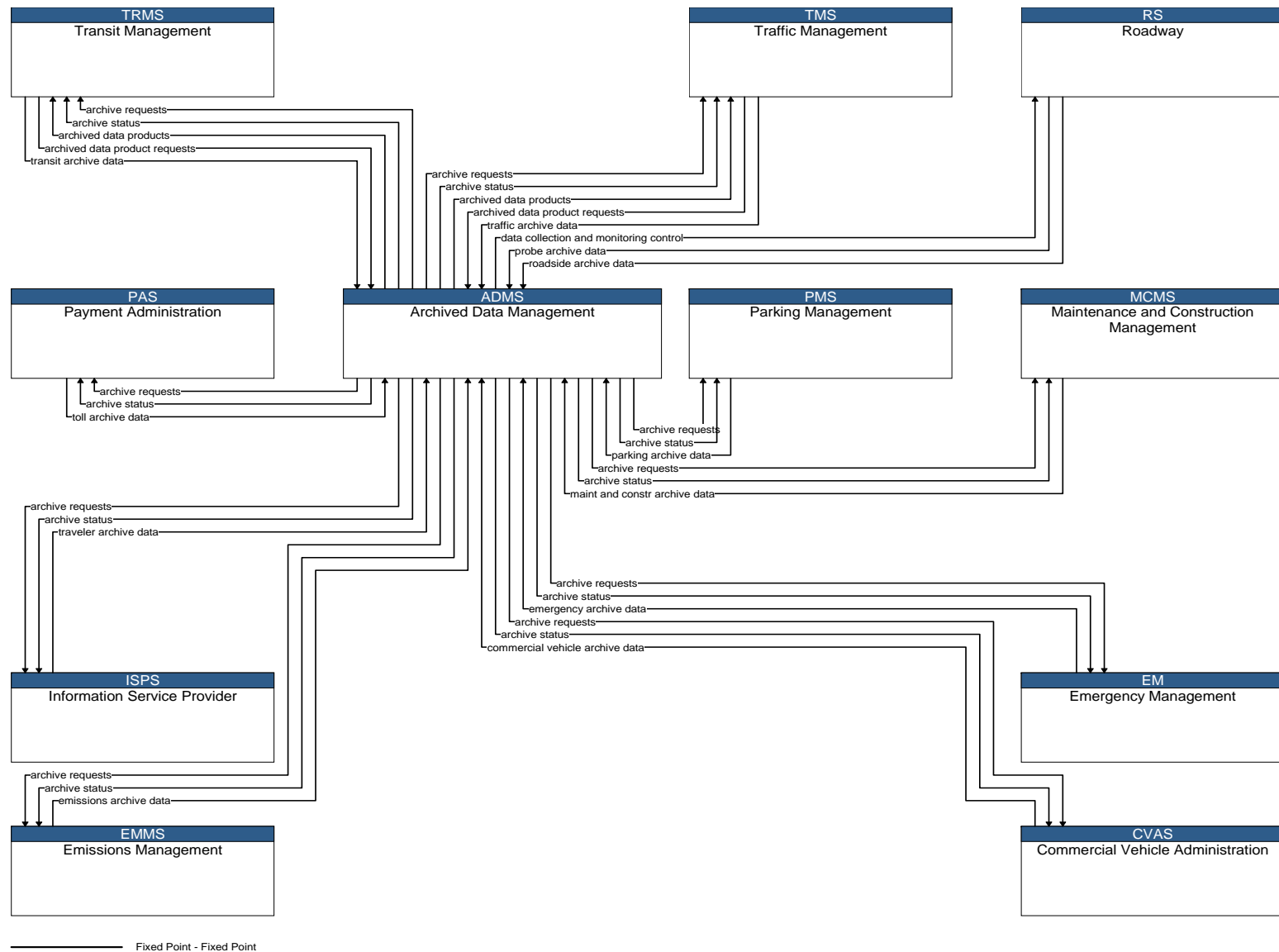


Figure 2: ADMS Subsystem Interfaces

# Archived Data Management

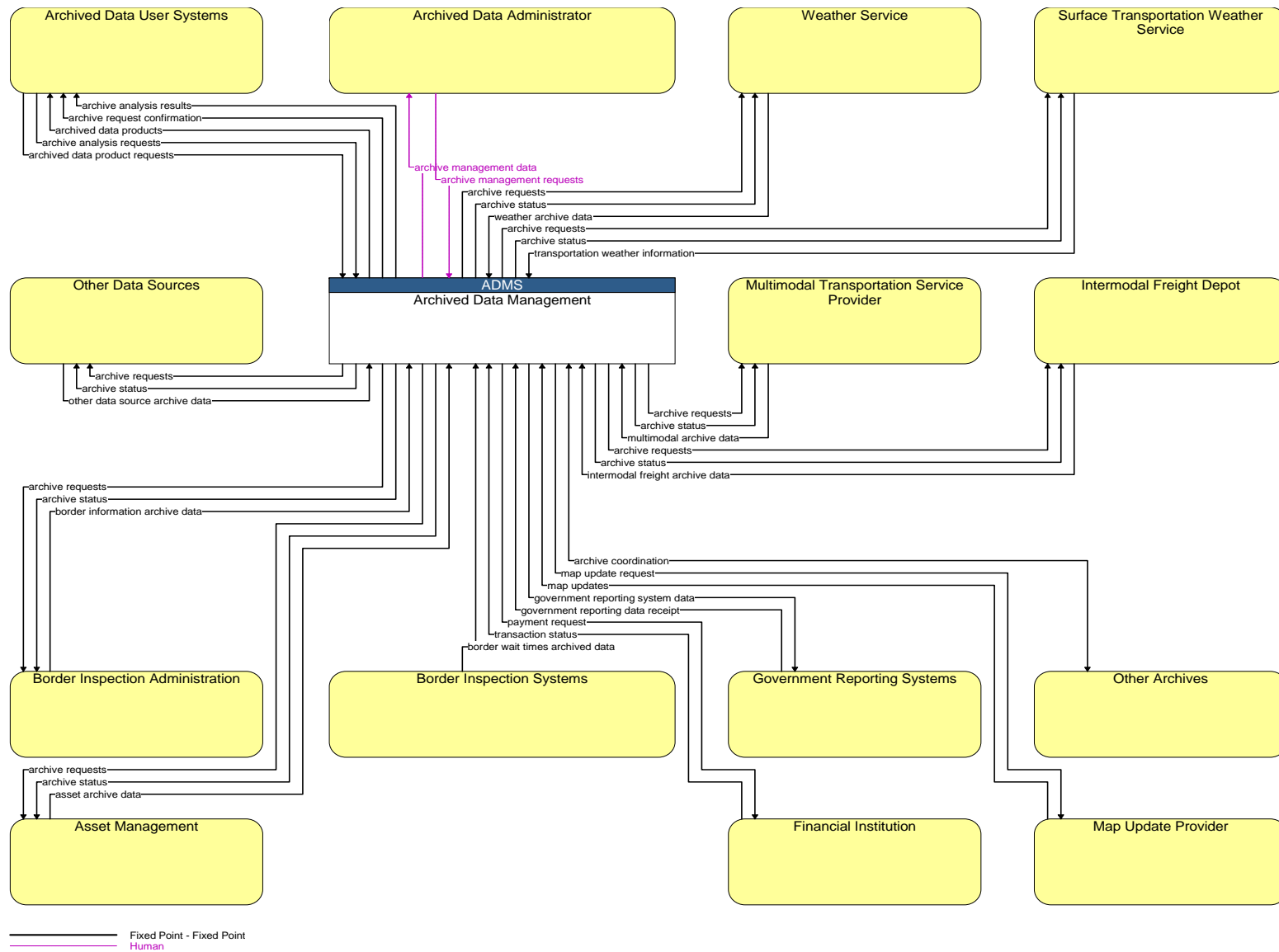


Figure 3: ADMS Terminator Interfaces

## 2.4 Commercial Vehicle

The Commercial Vehicle Subsystem (CVS) resides in a commercial vehicle and provides the sensory, processing, storage, and communications functions necessary to support safe and efficient commercial vehicle operations. The Commercial Vehicle Subsystem provides two-way communications between the commercial vehicle drivers, their fleet managers, attached freight equipment, and roadside officials, and provides HAZMAT response teams with timely and accurate cargo contents information after a vehicle incident. This subsystem provides the capability to collect and process vehicle, cargo information from the attached freight equipment, and driver safety data and status and alert the driver whenever there is a potential safety or security problem. Basic identification, security and safety status data are supplied to inspection facilities at mainline speeds. In addition, the subsystem will automatically collect and record mileage, fuel usage, and border crossings.

### 2.4.1 *Equipment Packages and Process Specifications for CVS*

#### **Equipment Package: On-board Cargo Monitoring**

This on-board equipment package monitors the location and status of the commercial vehicle and its cargo. It sends the collected data to appropriate centers and roadside facilities, including emergency management in the case of HAZMAT incidents. Depending on the nature of the cargo, this equipment package may include sensors that measure temperature, pressure, load leveling, acceleration, and other attributes of the cargo.

#### **Process Specifications**

- 2.4.2 Collect On-board Commercial Vehicle Sensor Data**
- 2.4.3 Analyze Commercial Vehicle On-board Data**
- 2.4.7 Manage CV On-board Data**

#### **Equipment Package: On-board CV Electronic Data**

This on-board equipment package exchanges information with roadside facilities, providing information such as driver, vehicle, and carrier identification to roadside facilities that can be used to support electronic screening. Pass/pull-in messages are received and presented to the commercial vehicle driver and screening events are recorded. Additional information, including trip records (e.g., border clearance information), safety inspection records, cargo information, and driver status information may also be collected, stored, and made available to the roadside facility by this equipment package.

#### **Process Specifications**

- 2.2.3 Provide CV Driver Electronic Credential and Tax Filing Interface**
- 2.3.7 Produce Commercial Vehicle Driver Message on Vehicle**
- 2.4.1 Communicate Commercial Vehicle On-board Data to Roadside**
- 2.4.6 Provide Commercial Vehicle On-board Data Store Interface**
- 2.6.2 Transmit Commercial Vehicle Tag Data**
- 2.6.3 Provide Commercial Driver Tag Data Interface**
- 2.6.4 Provide Lock Tag Data Interface**
- 2.6.5 Manage Commercial Vehicle Tag Data Store**

#### **Equipment Package: On-board CV Safety and Security**

This on-board equipment package collects and processes vehicle and driver safety and security information and provides safety and security information to the Fleet and Freight Management Subsystem. This equipment package also supplies this information to the roadside facilities both at mainline speeds and while stopped for inspections. Safety information may also be provided at predetermined trigger areas using wireless communications. The capability to alert the commercial vehicle driver whenever there is a critical safety or security problem or potential emergency is also provided. The package also supports on-board driver safety log maintenance and checking.

#### **Process Specifications**

- 2.3.7 Produce Commercial Vehicle Driver Message on Vehicle**
- 2.4.1 Communicate Commercial Vehicle On-board Data to Roadside**
- 2.4.2 Collect On-board Commercial Vehicle Sensor Data**

## Commercial Vehicle

- 2.4.3 **Analyze Commercial Vehicle On-board Data**
- 2.4.4 **Provide Commercial Vehicle Driver Interface**
- 2.4.5 **Communicate Commercial Vehicle On-board Data to Vehicle Manager**
- 2.4.6 **Provide Commercial Vehicle On-board Data Store Interface**
- 2.4.7 **Manage CV On-board Data**
- 2.6.2 **Transmit Commercial Vehicle Tag Data**

### **Equipment Package: On-board Driver Authentication**

This on-board equipment package monitors the identity of the commercial vehicle driver and compares it with the planned drivers for the commercial vehicle. Any change in driver is sent to the Fleet and Freight Management Subsystem. Notification of any unexpected drivers will also be sent to the Fleet and Freight Management Subsystem which, in turn, may send a disable vehicle command back to this equipment package to cause the vehicle to stop. On receipt of a disable vehicle message from the Fleet and Freight Management Subsystem or on detection of an unauthorized driver, the equipment package will safety disable the CV.

#### **Process Specifications**

- 2.4.1 **Communicate Commercial Vehicle On-board Data to Roadside**
- 2.4.3 **Analyze Commercial Vehicle On-board Data**
- 2.4.4 **Provide Commercial Vehicle Driver Interface**
- 2.4.7 **Manage CV On-board Data**
- 2.4.9 **Authenticate Commercial Vehicle Driver**

### **Equipment Package: On-board Trip Monitoring**

This equipment package provides the capabilities to support fleet management with automatic vehicle location and automated mileage and fuel reporting and auditing. In addition, this equipment is used to monitor the planned route and notify the Fleet and Freight Management Subsystem of any deviations.

#### **Process Specifications**

- 2.1.4 **Provide Commercial Vehicle Driver Routing Interface**
- 2.2.2 **Provide Vehicle Static Route**
- 2.2.4 **Provide Commercial Vehicle Driver Communications**
- 2.4.2 **Collect On-board Commercial Vehicle Sensor Data**
- 2.4.3 **Analyze Commercial Vehicle On-board Data**
- 2.4.4 **Provide Commercial Vehicle Driver Interface**
- 2.4.5 **Communicate Commercial Vehicle On-board Data to Vehicle Manager**
- 2.4.6 **Provide Commercial Vehicle On-board Data Store Interface**
- 2.4.7 **Manage CV On-board Data**
- 2.4.8 **Correlate Commercial Vehicle Route**

### *2.4.2 Interfaces for CVS*

**Basic Commercial Vehicle** ==> **Commercial Vehicle**

**Physical Architecture Flow Name:** commercial vehicle measures

Commercial vehicle and driver status measured by on-board ITS equipment.

**Logical Architecture Data Flow(s):**

- fbcv-brake\_condition
- fbcv-distance\_traveled
- fbcv-vehicle\_identity
- fbcv-vehicle\_security\_status
- fbcv-vehicle\_safety\_status

## Commercial Vehicle

fbcv-driver\_status  
fbcv-weight  
fbcv-driver\_safety\_status

### **Border Inspection Systems** => **Commercial Vehicle**

**Physical Architecture Flow Name:** border pass/pull-in  
Command to commercial vehicle to pull into or bypass border inspection station

**Logical Architecture Data Flow(s):**  
fbis-border\_vehicle\_pass\_pull\_in

**Physical Architecture Flow Name:** clearance notification  
Notification that cargo has been cleared through customs.

**Logical Architecture Data Flow(s):**  
fbis-border\_vehicle\_clearance\_notice

### **Commercial Vehicle** => **Basic Commercial Vehicle**

**Physical Architecture Flow Name:** safe vehicle disable  
Control signal disabling or enabling commercial vehicle.

**Logical Architecture Data Flow(s):**  
tbcv-disable\_vehicle

### **Commercial Vehicle** => **Border Inspection Systems**

**Physical Architecture Flow Name:** tag data  
Unique tag ID and related vehicle information.

**Logical Architecture Data Flow(s):**  
tbis-border\_vehicle\_onboard\_clearance\_data

### **Commercial Vehicle** => **Commercial Vehicle Administration**

**Physical Architecture Flow Name:** driver log  
A daily log showing hours in service for the current driver. The query flow is not explicitly shown.

**Logical Architecture Data Flow(s):**  
cvo\_onboard\_driver\_log\_for\_admin

**Physical Architecture Flow Name:** on-board safety data  
Safety data measured by on-board sensors. Includes information about the vehicle, vehicle components, cargo, and driver. The query flow is not explicitly shown.

**Logical Architecture Data Flow(s):**  
cvo\_onboard\_safety\_data\_for\_admin

### **Commercial Vehicle** => **Commercial Vehicle Check**

**Physical Architecture Flow Name:** border clearance data  
Trip specific data regarding the movement of goods across international borders. Includes trip identification number. May also include results from recent border crossing screening events.

**Logical Architecture Data Flow(s):**

## Commercial Vehicle

cvo\_border\_clearance\_data

**Physical Architecture Flow Name:** commercial vehicle breach

Information about a breach or tamper event on a Commercial Vehicle or its attached freight equipment which includes identity, type of breach, location, and time.

**Logical Architecture Data Flow(s):**

cv\_security\_alarm  
freight\_breach\_for\_rs

**Physical Architecture Flow Name:** commercial vehicle disable status

This flow provides the status of the disable flag in the commercial vehicle.

**Logical Architecture Data Flow(s):**

cv\_disable\_info

**Physical Architecture Flow Name:** driver log

A daily log showing hours in service for the current driver. The query flow is not explicitly shown.

**Logical Architecture Data Flow(s):**

cvo\_driver\_log

**Physical Architecture Flow Name:** electronic lock data

Notification to roadside (via transponder) of the presence and status of electronic cargo locks.

**Logical Architecture Data Flow(s):**

cv\_electronic\_clearance\_data

**Physical Architecture Flow Name:** expected driver identity characteristics

Driver identification information e.g. encrypted PIN codes issued to drivers, encrypted driver biometric parameters.

**Logical Architecture Data Flow(s):**

stored\_driver\_identity\_characteristics

**Physical Architecture Flow Name:** freight equipment information

Container, trailer, or chassis information regarding identity, type, location, brake wear data, mileage, seal #, seal type, door open/close status, chassis bare/covered status, tethered / untethered status, Bill of Lading, and sensor status.

**Logical Architecture Data Flow(s):**

freight\_equipment\_info  
freight\_info\_for\_inspection

**Physical Architecture Flow Name:** on-board safety data

Safety data measured by on-board sensors. Includes information about the vehicle, vehicle components, cargo, and driver. The query flow is not explicitly shown.

**Logical Architecture Data Flow(s):**

cvo\_onboard\_safety\_data  
cv\_on\_board\_data

**Physical Architecture Flow Name:** safety inspection record

Record containing results of commercial vehicle safety inspection.

**Logical Architecture Data Flow(s):**

cvo\_safety\_inspection

**Physical Architecture Flow Name:** screening event record

Results of CVO electronic screening activity.

## Commercial Vehicle

### Logical Architecture Data Flow(s):

cv\_electronic\_screening\_data

### Physical Architecture Flow Name: tag data

Unique tag ID and related vehicle information.

### Logical Architecture Data Flow(s):

cvo\_tag\_data

## Commercial Vehicle => Commercial Vehicle Driver

### Physical Architecture Flow Name: alerts

This flow represents the visual or auditory interface with ITS equipment containing specific alerts and messages related to commercial vehicles (e.g. trucks not advised, trucks over 10 tons not allowed on bridge, route details). This also includes detected route deviations and warning indications detected by on-board sensors (e.g., safety) and freight equipment sensors (e.g., breach, cargo).

### Logical Architecture Data Flow(s):

tcvd-critical\_security\_problem  
tcvd-critical\_safety\_problem  
tcvd-route\_data  
tcvd-routing\_instructions  
tcvd-data\_request

### Physical Architecture Flow Name: CVO pass/pull-in message

This flow represents the visual or auditory interface with ITS equipment containing a message sent to commercial vehicle driver indicating whether to bypass or requesting pull in to inspection/verification stop along with inspection results (e. g., LED indicator on transponder or variable message sign).

### Logical Architecture Data Flow(s):

tcvd-on\_board\_pull\_in\_output

### Physical Architecture Flow Name: trip log information

This flow represents the tactile or auditory interface with ITS equipment containing the information entered into the trip log, or request for update.

### Logical Architecture Data Flow(s):

tcvd-type\_input\_request  
tcvd-output\_tag\_data  
tcvd-other\_data\_request  
tcvd-enrollment\_confirmation  
tcvd-output\_data  
tcvd-data\_input\_request  
tcvd-confirm\_data\_stored  
tcvd-enrollment\_payment\_confirmation

## Commercial Vehicle => Emergency Management

### Physical Architecture Flow Name: hazmat spill notification

Information provided to emergency response organizations when cargo sensors detect a release of hazardous material. This information will include sensor information, vehicle location and identification, and carrier identification.

### Logical Architecture Data Flow(s):

cvo\_hazmat\_spill\_data

## Commercial Vehicle => Fleet and Freight Management

### Physical Architecture Flow Name: commercial vehicle breach

## Commercial Vehicle

Information about a breach or tamper event on a Commercial Vehicle or its attached freight equipment which includes identity, type of breach, location, and time.

**Logical Architecture Data Flow(s):**

cvo\_security\_alarm  
cv\_freight\_breach

**Physical Architecture Flow Name:** driver alert response

Commercial Vehicle Driver response to a breach alert for a Freight Equipment breach or tamper event.

**Logical Architecture Data Flow(s):**

cv\_driver\_response

**Physical Architecture Flow Name:** driver log

A daily log showing hours in service for the current driver. The query flow is not explicitly shown.

**Logical Architecture Data Flow(s):**

cf\_on\_board\_driver\_log

**Physical Architecture Flow Name:** driver to fleet request

Requests from the driver and vehicle for routing, payment, and enrollment information.

**Logical Architecture Data Flow(s):**

cv\_driver\_enrollment\_payment\_request  
cv\_static\_route\_data  
cv\_driver\_storage\_request  
cv\_driver\_route\_request  
cf\_driver\_route\_instructions\_request  
cv\_driver\_enrollment\_request

**Physical Architecture Flow Name:** freight equipment information

Container, trailer, or chassis information regarding identity, type, location, brake wear data, mileage, seal #, seal type, door open/close status, chassis bare/covered status, tethered / untethered status, Bill of Lading, and sensor status.

**Logical Architecture Data Flow(s):**

cv\_freight\_integrity  
cv\_freight\_operations  
cv\_cargo\_information  
cv\_freight\_maintenance  
cv\_freight\_location

**Physical Architecture Flow Name:** identities

Identification information for the Commercial Vehicle (e.g., license plate number or USDOT number), Freight Equipment (e.g., container, chassis, or trailer identification), and Driver.

**Logical Architecture Data Flow(s):**

cv\_identities

**Physical Architecture Flow Name:** on-board safety data

Safety data measured by on-board sensors. Includes information about the vehicle, vehicle components, cargo, and driver. The query flow is not explicitly shown.

**Logical Architecture Data Flow(s):**

cvo\_on\_board\_safety\_data  
cvo\_tag\_safety\_data

**Physical Architecture Flow Name:** on-board vehicle data

Information about the commercial vehicle stored on-board (for maintenance purposes, gate access, cargo status, lock status, etc.).

**Logical Architecture Data Flow(s):**



## Commercial Vehicle

cf\_on\_board\_vehicle\_data  
cf\_tag\_data\_store\_output

**Physical Architecture Flow Name:** route deviation alert

An alert that indicates a deviation from a planned route has been detected. The alert will contain the current Commercial Vehicle location and identity.

**Logical Architecture Data Flow(s):**

cv\_route\_warning

**Physical Architecture Flow Name:** trip log

Driver's daily log, vehicle location, mileage, and trip activity (includes screening, inspection and border clearance event data as well as fare payments).

**Logical Architecture Data Flow(s):**

cvo\_trip\_log\_data

**Commercial Vehicle** => **Vehicle**

**Physical Architecture Flow Name:** commercial vehicle data

Information about the commercial vehicles cargo, credentials, and payments.

**Logical Architecture Data Flow(s):**

processed\_cargo\_data  
cv\_driver\_enrollment\_cost

**Commercial Vehicle Administration** => **Commercial Vehicle**

**Physical Architecture Flow Name:** safety inspection record

Record containing results of commercial vehicle safety inspection.

**Logical Architecture Data Flow(s):**

cv\_admin\_inspection\_data

**Commercial Vehicle Check** => **Commercial Vehicle**

**Physical Architecture Flow Name:** border clearance data request

Request for trip specific data regarding the movement of goods across international borders. Includes trip identification number. May also include results from recent border crossing screening events.

**Logical Architecture Data Flow(s):**

cvo\_border\_clearance\_request

**Physical Architecture Flow Name:** border clearance event

Reports clearance event data regarding action taken at border, including acceptance or override of system decision, and date/time stamp

**Logical Architecture Data Flow(s):**

cv\_on\_board\_border\_record

**Physical Architecture Flow Name:** electronic lock data request

Request from roadside for data regarding presence and status of electronic cargo locks.

**Logical Architecture Data Flow(s):**

cv\_request\_electronic\_clearance\_data

**Physical Architecture Flow Name:** electronic screening request

Request for identification data to support electronic screening.

## Commercial Vehicle

**Logical Architecture Data Flow(s):**

cv\_request\_electronic\_screening\_data

**Physical Architecture Flow Name:** pass/pull-in

Command to commercial vehicle to pull into or bypass inspection station.

**Logical Architecture Data Flow(s):**

cv\_on\_board\_pull\_in\_output

**Physical Architecture Flow Name:** request tag data

Request for tag information including credit identity, stored value card cash, etc.

**Logical Architecture Data Flow(s):**

cvo\_request\_tag\_data

**Physical Architecture Flow Name:** safety inspection record

Record containing results of commercial vehicle safety inspection.

**Logical Architecture Data Flow(s):**

cv\_inspection\_data\_output

**Physical Architecture Flow Name:** safety inspection request

Request for safety inspection record.

**Logical Architecture Data Flow(s):**

cvo\_safety\_inspection\_request

**Physical Architecture Flow Name:** screening event record

Results of CVO electronic screening activity.

**Logical Architecture Data Flow(s):**

cv\_on\_board\_screening\_record

**Physical Architecture Flow Name:** trigger area notification

Notification to activate wireless roadside inspection safety data message collection.

**Logical Architecture Data Flow(s):**

cv\_trigger\_area\_notification

**Commercial Vehicle Driver** => **Commercial Vehicle**

**Physical Architecture Flow Name:** alert response

This flow represents the tactile or auditory interface with ITS equipment containing the response by a Commercial Vehicle Driver or Fleet-Freight Manager that confirms or cancels an alert.

**Logical Architecture Data Flow(s):**

fcvd-driver\_response

**Physical Architecture Flow Name:** CVO driver initialization

This flow represents the tactile or auditory interface with ITS equipment containing the commercial vehicle driver and vehicle information. This flow contains inquiries to the commercial vehicle managing system, interaction with on-board equipment including setup, configuration, and initiation of self tests, and entry of carrier, driver, vehicle, and route

**Logical Architecture Data Flow(s):**

fcvd-driver\_input\_type  
fcvd-activity\_request  
fcvd-carrier\_number  
fcvd-driver\_general\_message  
fcvd-driver\_number

## Commercial Vehicle

fcvd-enrollment\_payment\_request  
fcvd-enrollment\_request  
fcvd-other\_data\_input  
fcvd-request\_routing\_instructions  
fcvd-request\_tag\_data\_output  
fcvd-route\_data  
fcvd-route\_request  
fcvd-vehicle\_number  
fcvd-driver\_data\_input

**Physical Architecture Flow Name:** driver identity characteristics

The physical or visible characteristics of a commercial vehicle driver that can be measured to uniquely identify a driver. Could be an Identification Card with a Personal Identification Number, biometrics, or visual verification by an operator.

**Logical Architecture Data Flow(s):**

fcvd-driver\_characteristics

**Physical Architecture Flow Name:** trip identification number input

Commercial vehicle driver input containing the unique trip load number for a specific cross-border shipment.

**Logical Architecture Data Flow(s):**

fcvd-trip\_identification\_number

**Driver Identification Card** => **Commercial Vehicle**

**Physical Architecture Flow Name:** cv driver credential

Driver information (e.g., identity, biometrics, address, date of birth, endorsements, restrictions) stored on a driver's license or other official identification card used to identify a driver of commercial vehicles.

**Logical Architecture Data Flow(s):**

fdic-driver\_cred\_info

**Fleet and Freight Management** => **Commercial Vehicle**

**Physical Architecture Flow Name:** commercial vehicle disable

This flow safely disables a specific commercial vehicle.

**Logical Architecture Data Flow(s):**

cv\_disable

**Physical Architecture Flow Name:** driver log

A daily log showing hours in service for the current driver. The query flow is not explicitly shown.

**Logical Architecture Data Flow(s):**

cf\_driver\_log\_update

**Physical Architecture Flow Name:** expected driver identity characteristics

Driver identification information e.g. encrypted PIN codes issued to drivers, encrypted driver biometric parameters.

**Logical Architecture Data Flow(s):**

cv\_driver\_assignment

**Physical Architecture Flow Name:** fleet to driver update

Updated instructions to the driver including dispatch, routing, and special instructions.

**Logical Architecture Data Flow(s):**

cv\_driver\_enrollment\_payment\_confirmation

## Commercial Vehicle

cvo\_general\_message  
cvo\_vehicle\_route  
cf\_manager\_route\_monitoring\_parameters  
cf\_driver\_route\_instructions  
cf\_tag\_data\_store\_request  
cv\_driver\_enrollment\_information  
cv\_driver\_route\_data  
cv\_static\_route\_request  
cf\_tag\_data\_store\_write

**Physical Architecture Flow Name:** on-board vehicle request

Request for on-board vehicle data.

**Logical Architecture Data Flow(s):**

cvo\_on\_board\_vehicle\_data\_request  
cvo\_tag\_data\_store\_request

**Physical Architecture Flow Name:** safety inspection record

Record containing results of commercial vehicle safety inspection.

**Logical Architecture Data Flow(s):**

cf\_inspection\_data

**Physical Architecture Flow Name:** trigger area

A geographic area a commercial motor vehicle crosses into, which initiates a request to compile and transmit a safety data message. May be associated with a time period.

**Logical Architecture Data Flow(s):**

cf\_trigger\_area

**Physical Architecture Flow Name:** trigger area notification

Notification to activate wireless roadside inspection safety data message collection.

**Logical Architecture Data Flow(s):**

cf\_trigger\_area\_notification

**Physical Architecture Flow Name:** trip identification number

The unique trip load number for a specific cross-border shipment.

**Logical Architecture Data Flow(s):**

cvo\_trip\_identification\_number

**Physical Architecture Flow Name:** trip log request

Request for trip log.

**Logical Architecture Data Flow(s):**

cvo\_trip\_log\_data\_request

**Freight Equipment** => **Commercial Vehicle**

**Physical Architecture Flow Name:** freight breach

Information about a breach or tamper event on Freight Equipment which includes identity, type of breach, location, and time.

**Logical Architecture Data Flow(s):**

ffe-breach\_warning\_for\_cv

**Physical Architecture Flow Name:** freight equipment information

Container, trailer, or chassis information regarding identity, type, location, brake wear data, mileage, seal #, seal type, door open/close status, chassis bare/covered status, tethered /

## Commercial Vehicle

untethered status, Bill of Lading, and sensor status.

### Logical Architecture Data Flow(s):

ffe-operational\_data\_for\_cv  
ffe-lock\_tag\_data\_for\_cv  
ffe-location\_data\_for\_cv  
ffe-maintenance\_data\_for\_cv  
ffe-integrity\_data\_for\_cv  
ffe-cargo\_info\_for\_cv

**Intermodal Freight Shipper** => **Commercial Vehicle**

**Physical Architecture Flow Name:** trip identification number

The unique trip load number for a specific cross-border shipment.

### Logical Architecture Data Flow(s):

fifs-trip\_identification\_number

**Location Data Source** => **Commercial Vehicle**

**Physical Architecture Flow Name:** position fix

Information which provides a traveler's or vehicle's geographical position.

### Logical Architecture Data Flow(s):

From\_Location\_Data\_Source

**Vehicle** => **Commercial Vehicle**

**Physical Architecture Flow Name:** commercial vehicle data request

Requests from the vehicle for information about the commercial vehicle's cargo, credentials, and payments.

### Logical Architecture Data Flow(s):

cargo\_data\_request  
cv\_driver\_credit\_identity

### 2.4.3 Architecture Flow Diagrams for CVS

# Commercial Vehicle

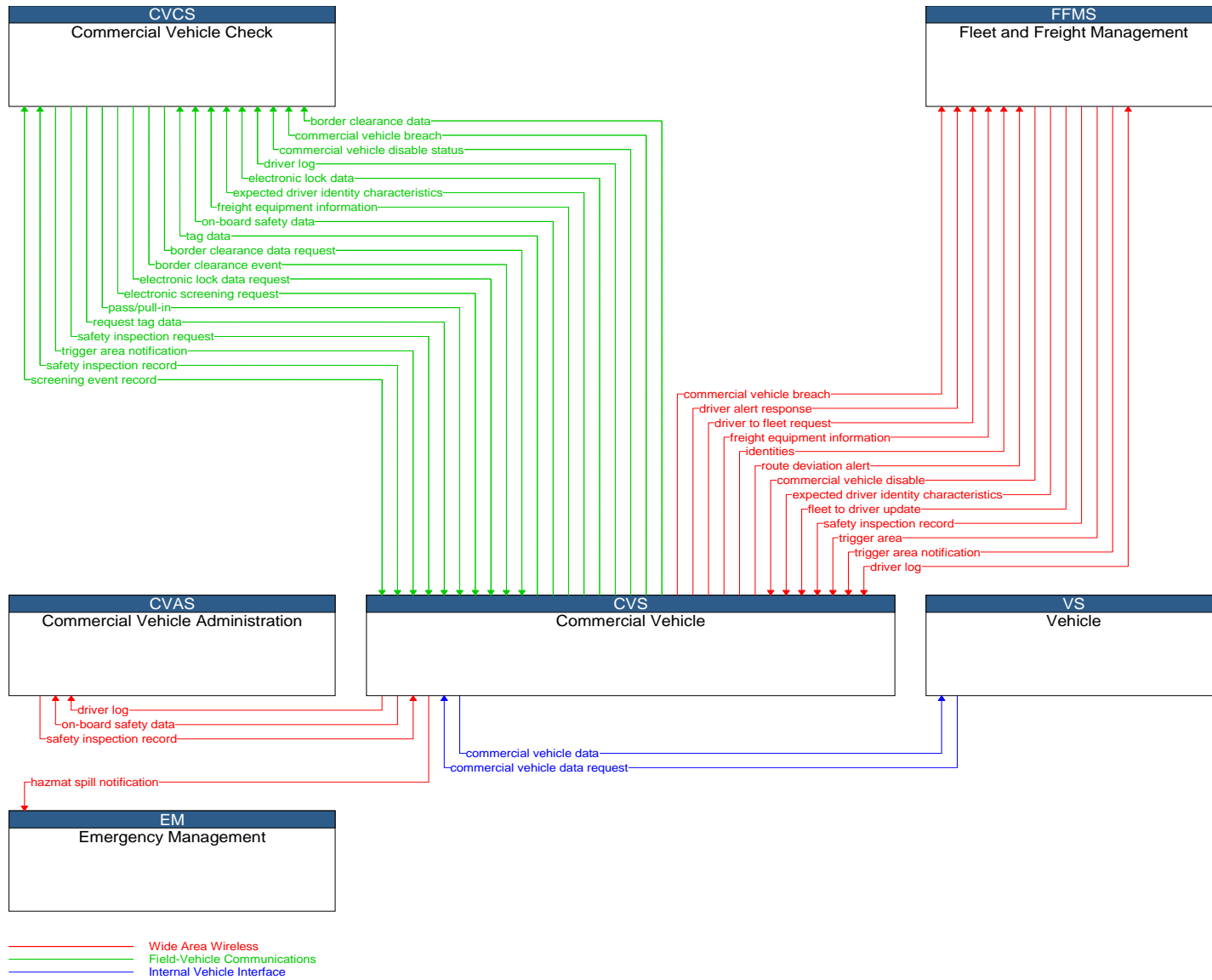
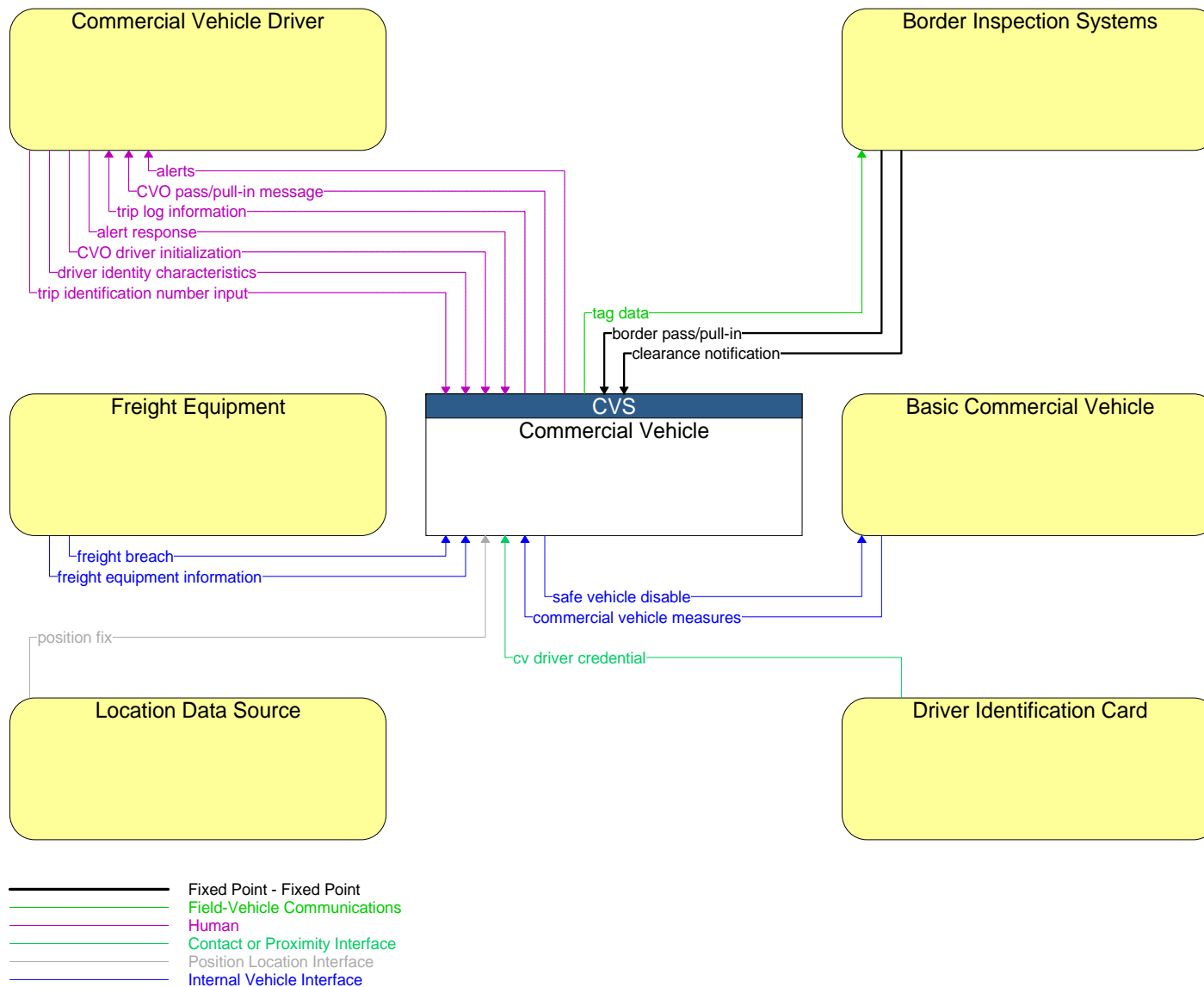


Figure 4: CVS Subsystem Interfaces

# Commercial Vehicle



**Figure 5: CVS Terminator Interfaces**

## 2.5 Commercial Vehicle Administration

The Commercial Vehicle Administration Subsystem (CVAS) will operate at one or more fixed locations within a region. This subsystem performs administrative functions supporting credentials, tax, and safety regulations. It issues credentials, collects fees and taxes, and supports enforcement of credential requirements. This subsystem communicates with the Fleet Management Subsystems associated with the motor carriers to process credentials applications and collect fuel taxes, weight/distance taxes, and other taxes and fees associated with commercial vehicle operations. The subsystem also receives applications for, and issues special Oversize/Overweight and HAZMAT permits in coordination with other cognizant authorities. The subsystem coordinates with other Commercial Vehicle Administration Subsystems (in other states/regions) to support nationwide access to credentials and safety information for administration and enforcement functions. This subsystem supports communications with Commercial Vehicle Check Subsystems operating at the roadside to enable credential checking and safety information collection. The collected safety information is processed, stored, and made available to qualified stakeholders to identify carriers and drivers that operate unsafely.

### 2.5.1 *Equipment Packages and Process Specifications for CVAS*

#### **Equipment Package: Credentials and Taxes Administration**

This equipment package issues credentials, collects fees and taxes, and supports enforcement of credential requirements. It manages driver licensing and enrolls carriers in additional CVO programs such as wireless roadside inspection programs. It communicates with the Fleet and Freight Management Subsystems associated with the motor carriers to process applications and collect fuel taxes, weight/distance taxes, and other taxes and fees associated with commercial vehicle operations. The subsystem also receives applications for, and issues special Oversize/Overweight and HAZMAT permits in coordination with other cognizant authorities. It supports user account management and receives and processes requests for review of carrier and driver status. This equipment package communicates with similar packages in other jurisdictions to exchange credentials database information. This equipment package also exchanges hazmat route restrictions information, and provides a clearinghouse for this information that can be shared with Map Update Providers, Fleet and Freight Management subsystems and Information Service Providers.

#### **Process Specifications**

- 2.5.1 **Manage Commercial Vehicle Trips and Clearances**
- 2.5.2 **Obtain Electronic Credential and Tax Filing Payment**
- 2.5.4 **Communicate with Other Commercial Vehicle Administration System**
- 2.5.5 **Manage Commercial Vehicle and Driver Credentials and Enrollment**
- 2.5.8 **Process Data Received from Roadside Facilities**
- 5.4.6 **Process CV Violations**
- 7.4.1.1 **Process Commercial Vehicle Payments**

#### **Equipment Package: CV Data Collection**

This equipment package collects and stores commercial vehicle information that is collected in the course of Commercial Vehicle Administration Subsystem operations. This data can be used directly by operations personnel or it can be made available to other data users and archives in the region.

#### **Process Specifications**

- 2.5.9 **Manage Commercial Vehicle Archive Data**

#### **Equipment Package: CV Information Exchange**

This equipment package supports the exchange of safety, credentials, permit data, and other data concerning the operation of commercial vehicles among jurisdictions. The package also supports the exchange of safety, credentials, permit, and operations data between systems (for example, an administrative center and the roadside check facilities) within a single jurisdiction. Data are collected from multiple authoritative sources and packaged into snapshots (top-level summary and critical status information) and profiles (detailed and historical data). Data is made available to fleet operators and other information requestors on request or based on subscriptions established by the requestor.

#### **Process Specifications**



## Commercial Vehicle Administration

- 2.5.1      Manage Commercial Vehicle Trips and Clearances**
- 2.5.3.1    Communicate with Border Inspection**
- 2.5.3.2    Analyze Border Clearance Data**
- 2.5.4      Communicate with Other Commercial Vehicle Administration System**
- 2.5.5      Manage Commercial Vehicle and Driver Credentials and Enrollment**
- 2.5.6      Output Commercial Vehicle Enrollment Data to Roadside Facilities**
- 2.5.8      Process Data Received from Roadside Facilities**
- 5.4.6      Process CV Violations**

### **Equipment Package: CV Safety and Security Administration**

This equipment package provides commercial vehicle safety and security criteria to roadside check facilities, collects and reviews safety and security data from the field and distributes safety and security information to other centers, carriers, and enforcement agencies. This equipment package also supports wireless roadside inspections, including carrier enrollment, managing and distributing information about trigger areas where wireless inspections may occur, and monitoring the condition of the commercial vehicle and driver using wireless communications at identified trigger areas. It supports the collection and review of carrier and driver safety and security data and supports determination of the carrier and driver safety and security ratings. It clears the out-of-service status when the responsible carrier or driver reports that deficiencies flagged during inspections have been corrected.

#### **Process Specifications**

- 2.5.4      Communicate with Other Commercial Vehicle Administration System**
- 2.5.5      Manage Commercial Vehicle and Driver Credentials and Enrollment**
- 2.5.6      Output Commercial Vehicle Enrollment Data to Roadside Facilities**
- 2.5.7      Process Commercial Vehicle Violations**
- 2.5.8      Process Data Received from Roadside Facilities**
- 5.4.6      Process CV Violations**

### **Equipment Package: International CV Administration**

This equipment package generates and processes the entry documentation necessary to obtain release of vehicle, cargo, and driver across an international border, report the results of the crossing event, and handle duty fee processing. It interfaces with the systems used by customs and border protection, immigration, carriers, and service providers (e.g., brokers) to generate, process, and store entry documentation.

#### **Process Specifications**

- 2.5.3.1    Communicate with Border Inspection**
- 2.5.3.2    Analyze Border Clearance Data**
- 2.5.4      Communicate with Other Commercial Vehicle Administration System**
- 2.5.6      Output Commercial Vehicle Enrollment Data to Roadside Facilities**
- 2.5.8      Process Data Received from Roadside Facilities**

## *2.5.2 Interfaces for CVAS*

**Alerting and Advisory Systems**                   =>      **Commercial Vehicle Administration**

**Physical Architecture Flow Name:**           alerts and advisories

Assessments (general incident and vulnerability awareness information), advisories (identification of threats or recommendations to increase preparedness levels), and alerts (information on imminent or in-progress emergencies). This flow also provides supporting descriptive detail on incidents, threats, and vulnerabilities to increase preparedness and support effective response to threats against the surface transportation system.

**Logical Architecture Data Flow(s):**

faas-alerts\_and\_advisories\_for\_cvas

## Commercial Vehicle Administration

### Archived Data Management => Commercial Vehicle Administration

**Physical Architecture Flow Name:** archive requests

A request to a data source for information on available data (i.e. "catalog") or a request that defines the data to be archived. The request can be a general subscription intended to initiate a continuous or regular data stream or a specific request intended to initiate a one-time response from the recipient.

**Logical Architecture Data Flow(s):**  
cv\_archive\_request

**Physical Architecture Flow Name:** archive status

Notification that data provided to an archive contains erroneous, missing, or suspicious data or verification that the data provided appears valid. If an error has been detected, the offending data and the nature of the potential problem are identified.

**Logical Architecture Data Flow(s):**  
cv\_archive\_status

### Border Inspection Administration => Commercial Vehicle Administration

**Physical Architecture Flow Name:** client verification request

Request for information such as commercial drivers license information and carrier safety status.

**Logical Architecture Data Flow(s):**  
fbia-border\_client\_request

**Physical Architecture Flow Name:** pre-arrival notification

Identification of a vehicle or driver that is approaching a border crossing.

**Logical Architecture Data Flow(s):**  
fbia-border\_prearrival\_notice

### Border Inspection Systems => Commercial Vehicle Administration

**Physical Architecture Flow Name:** arrival notification

Notification of arrival (and departure) of a motor vehicle at the inspection station.

**Logical Architecture Data Flow(s):**  
fbis-border\_arrival\_notice

### Commercial Vehicle => Commercial Vehicle Administration

**Physical Architecture Flow Name:** driver log

A daily log showing hours in service for the current driver. The query flow is not explicitly shown.

**Logical Architecture Data Flow(s):**  
cvo\_onboard\_driver\_log\_for\_admin

**Physical Architecture Flow Name:** on-board safety data

Safety data measured by on-board sensors. Includes information about the vehicle, vehicle components, cargo, and driver. The query flow is not explicitly shown.

**Logical Architecture Data Flow(s):**  
cvo\_onboard\_safety\_data\_for\_admin

## Commercial Vehicle Administration

### **Commercial Vehicle Administration** => **Archived Data Management**

**Physical Architecture Flow Name:** commercial vehicle archive data

Information describing commercial vehicle travel and commodity flow characteristics. Content may include a catalog of available information, the actual information to be archived, and associated meta data that describes the archived information.

**Logical Architecture Data Flow(s):**  
cv\_archive\_data

### **Commercial Vehicle Administration** => **Border Inspection Administration**

**Physical Architecture Flow Name:** border clearance status

Notification regarding the crossing status of commercial freight shipment scheduled to enter the U.S. Includes portions of border agency and transportation agency clearance results, as they become available.

**Logical Architecture Data Flow(s):**  
tbia-border\_clearance\_status

**Physical Architecture Flow Name:** client verification information

Information about carriers who have made border credential applications such as commercial drivers license information and carrier safety status.

**Logical Architecture Data Flow(s):**  
tbia-border\_client\_information

**Physical Architecture Flow Name:** screening results

Results of commercial vehicle screening event at a border crossing - reports clearance event data regarding action taken at border, including acceptance or override of system decision, and date/time stamp.

**Logical Architecture Data Flow(s):**  
tbia-border\_screening\_results

### **Commercial Vehicle Administration** => **Commercial Vehicle**

**Physical Architecture Flow Name:** safety inspection record

Record containing results of commercial vehicle safety inspection.

**Logical Architecture Data Flow(s):**  
cv\_admin\_inspection\_data

### **Commercial Vehicle Administration** => **Commercial Vehicle Check**

**Physical Architecture Flow Name:** accident report

Report of commercial vehicle safety accident. The information may be provided as a response to a real-time query or proactively by the source. The query flow is not explicitly

**Logical Architecture Data Flow(s):**  
cvo\_accident\_report

**Physical Architecture Flow Name:** border agency clearance results

Notification regarding the granting of permission for commercial freight shipment to enter the U.S.

**Logical Architecture Data Flow(s):**

## Commercial Vehicle Administration

cvo\_border\_agency\_clearance\_results

**Physical Architecture Flow Name:** carrier participation report

Report that summarizes motor carrier participation in CVO programs. Used to identify the level of active participation and to report which enrolled carriers are not participating as expected.

**Logical Architecture Data Flow(s):**

cv\_carrier\_participation\_report\_to\_roadside

**Physical Architecture Flow Name:** citation

Report of commercial vehicle citation. The citation includes references to the statute(s) that was (were) violated. It includes information on the violator and the officer issuing the citation. A citation differs from a violation because it is adjudicated by the courts. The information may be provided as a response to a real-time query or proactively by the source. The query flow is not explicitly shown.

**Logical Architecture Data Flow(s):**

cvo\_citation\_info

**Physical Architecture Flow Name:** credentials information

Response containing full vehicle fuel tax and registration credentials information. "Response" may be provided in reaction to a real-time query or a standing request for updated information. The query flow is not explicitly shown.

**Logical Architecture Data Flow(s):**

cv\_credentials\_information\_response  
cvo\_credentials\_info

**Physical Architecture Flow Name:** credentials status information

Credentials information such as registration, licensing, insurance, check flags, and electronic screening enrollment data. A unique identifier is included. Corresponds to the credentials portion of CVISN "snapshots." The status information may be provided as a response to a real-time query or as a result of a standing request for updated information (subscription). This may also include information about non-U.S. fleets for use by U.S. authorities, and information regarding U.S. fleets made available to Mexican and Canadian authorities. The query flow is not explicitly shown.

**Logical Architecture Data Flow(s):**

cvo\_credentials\_status  
cv\_credentials\_database\_update

**Physical Architecture Flow Name:** cv driver record

Information typically maintained by a state driver licensing agency about a driver of a commercial vehicle including driver identification data, license data, permit data, and driving history details. The query flow is not explicitly shown.

**Logical Architecture Data Flow(s):**

cvo\_driver\_record\_to\_roadside

**Physical Architecture Flow Name:** safety inspection report

Report containing results of commercial vehicle safety inspection. The information may be provided as a response to a real-time query or proactively by the source. The query flow is not explicitly shown.

**Logical Architecture Data Flow(s):**

cv\_safety\_information\_response

**Physical Architecture Flow Name:** safety status information

Safety information such as safety ratings, security ratings or flags, inspection summaries, and violation summaries. A unique identifier is included. Corresponds to the safety and security portion of CVISN "snapshots." The status information may be provided as a response to a real-time query or as a result of a standing request for updated information (subscription). This

## Commercial Vehicle Administration

may also include information about non-U.S. fleets for use by U.S. authorities, and information regarding U.S. fleets made available to Mexican and Canadian authorities. The query flow is not explicitly shown.

**Logical Architecture Data Flow(s):**

cv\_safety\_database\_update

**Physical Architecture Flow Name:** targeted list

List of carriers, drivers, and/or vehicles of interest for enforcement purposes.

**Logical Architecture Data Flow(s):**

cv\_roadside\_inspection\_configuration

**Physical Architecture Flow Name:** transportation border clearance assessment

Includes directions for commercial driver to proceed to nearest vehicle weigh and inspection station for further review if required.

**Logical Architecture Data Flow(s):**

cvo\_transportation\_border\_clearance

**Physical Architecture Flow Name:** trigger control

Controls to enable or disable a particular trigger.

**Logical Architecture Data Flow(s):**

cv\_roadside\_inspection\_control

**Physical Architecture Flow Name:** trip declaration identifiers

Specific identifiers extracted from notification containing information regarding pending commercial freight shipment into the U.S. Includes carrier, vehicle, and driver identification data.

**Logical Architecture Data Flow(s):**

cv\_border\_database\_update

**Commercial Vehicle Administration** => **CVO Information Requestor**

**Physical Architecture Flow Name:** carrier participation report

Report that summarizes motor carrier participation in CVO programs. Used to identify the level of active participation and to report which enrolled carriers are not participating as expected.

**Logical Architecture Data Flow(s):**

tcvoir-cv\_carrier\_participation\_report

**Physical Architecture Flow Name:** credentials information

Response containing full vehicle fuel tax and registration credentials information. "Response" may be provided in reaction to a real-time query or a standing request for updated information. The query flow is not explicitly shown.

**Logical Architecture Data Flow(s):**

tcvoir-credentials

**Physical Architecture Flow Name:** credentials status information

Credentials information such as registration, licensing, insurance, check flags, and electronic screening enrollment data. A unique identifier is included. Corresponds to the credentials portion of CVISN "snapshots." The status information may be provided as a response to a real-time query or as a result of a standing request for updated information (subscription). This may also include information about non-U.S. fleets for use by U.S. authorities, and information regarding U.S. fleets made available to Mexican and Canadian authorities. The

**Logical Architecture Data Flow(s):**

## Commercial Vehicle Administration

tcvoir-credential\_status

**Physical Architecture Flow Name:** cv driver record

Information typically maintained by a state driver licensing agency about a driver of a commercial vehicle including driver identification data, license data, permit data, and driving history details. The query flow is not explicitly shown.

**Logical Architecture Data Flow(s):**

tcvoir-driver\_record

**Physical Architecture Flow Name:** safety status information

Safety information such as safety ratings, security ratings or flags, inspection summaries, and violation summaries. A unique identifier is included. Corresponds to the safety and security portion of CVISN "snapshots." The status information may be provided as a response to a real-time query or as a result of a standing request for updated information (subscription). This may also include information about non-U.S. fleets for use by U.S. authorities, and information regarding U.S. fleets made available to Mexican and Canadian authorities. The query flow is not explicitly shown.

**Logical Architecture Data Flow(s):**

tcvoir-safety\_status

**Commercial Vehicle Administration** => **Enforcement Agency**

**Physical Architecture Flow Name:** accident report

Report of commercial vehicle safety accident. The information may be provided as a response to a real-time query or proactively by the source. The query flow is not explicitly shown.

**Logical Architecture Data Flow(s):**

tea-accident\_data

**Physical Architecture Flow Name:** carrier participation report

Report that summarizes motor carrier participation in CVO programs. Used to identify the level of active participation and to report which enrolled carriers are not participating as expected.

**Logical Architecture Data Flow(s):**

tea-cv\_carrier\_participation\_report

**Physical Architecture Flow Name:** citation

Report of commercial vehicle citation. The citation includes references to the statute(s) that was (were) violated. It includes information on the violator and the officer issuing the citation. A citation differs from a violation because it is adjudicated by the courts. The information may be provided as a response to a real-time query or proactively by the source. The query flow is not explicitly shown.

**Logical Architecture Data Flow(s):**

tea-cv\_citation\_data

**Physical Architecture Flow Name:** safety inspection report

Report containing results of commercial vehicle safety inspection. The information may be provided as a response to a real-time query or proactively by the source. The query flow is not explicitly shown.

**Logical Architecture Data Flow(s):**

tea-cv\_safety\_inspection

**Physical Architecture Flow Name:** violation notification

Notification to enforcement agency of a violation. The violation notification flow describes the statute or regulation that was violated and how it was violated (e. g., overweight on specific axle by xxx pounds or which brake was out of adjustment and how far out of adjustment it was). A violation differs from a citation because it is not adjudicated by the courts.

## Commercial Vehicle Administration

### Logical Architecture Data Flow(s):

tea-cv\_violation\_data

**Commercial Vehicle  
Administration**

=> **Financial Institution**

**Physical Architecture Flow Name:** payment request

Request for payment from financial institution.

### Logical Architecture Data Flow(s):

tfi-cv\_payment\_request

**Commercial Vehicle  
Administration**

=> **Fleet and Freight  
Management**

**Physical Architecture Flow Name:** accident report

Report of commercial vehicle safety accident. The information may be provided as a response to a real-time query or proactively by the source. The query flow is not explicitly shown.

### Logical Architecture Data Flow(s):

cvo\_accident\_data\_for\_fleet

**Physical Architecture Flow Name:** border clearance status

Notification regarding the crossing status of commercial freight shipment scheduled to enter the U.S. Includes portions of border agency and transportation agency clearance results, as they become available.

### Logical Architecture Data Flow(s):

cvo\_border\_clearance\_for\_fleet

**Physical Architecture Flow Name:** citation

Report of commercial vehicle citation. The citation includes references to the statute(s) that was (were) violated. It includes information on the violator and the officer issuing the citation. A citation differs from a violation because it is adjudicated by the courts. The information may be provided as a response to a real-time query or proactively by the source. The query flow is not explicitly shown.

### Logical Architecture Data Flow(s):

cvo\_citation

**Physical Architecture Flow Name:** commercial vehicle permit

Permit for oversize, overweight, or hazmat shipments.

### Logical Architecture Data Flow(s):

commercial\_vehicle\_permit\_information

**Physical Architecture Flow Name:** compliance review report

Report containing results of carrier compliance review, including concomitant out-of-service notifications, carrier warnings/notifications. The information may be provided as a response to a real-time query or proactively by the source. The query flow is not explicitly shown.

### Logical Architecture Data Flow(s):

cf\_roadside\_activity\_report

**Physical Architecture Flow Name:** credentials information

Response containing full vehicle fuel tax and registration credentials information. "Response" may be provided in reaction to a real-time query or a standing request for updated information. The query flow is not explicitly shown.

### Logical Architecture Data Flow(s):

cf\_enrollment\_information

## Commercial Vehicle Administration

cf\_enrollment\_payment\_confirmation  
cv\_enrollment\_information  
cv\_enrollment\_payment\_confirmation

**Physical Architecture Flow Name:** credentials status information

Credentials information such as registration, licensing, insurance, check flags, and electronic screening enrollment data. A unique identifier is included. Corresponds to the credentials portion of CVISN "snapshots." The status information may be provided as a response to a real-time query or as a result of a standing request for updated information (subscription). This may also include information about non-U.S. fleets for use by U.S. authorities, and information regarding U.S. fleets made available to Mexican and Canadian authorities. The query flow is not explicitly shown.

**Logical Architecture Data Flow(s):**

cvo\_credential\_status  
cvo\_credentials\_status\_for\_fms

**Physical Architecture Flow Name:** cv driver record

Information typically maintained by a state driver licensing agency about a driver of a commercial vehicle including driver identification data, license data, permit data, and driving history details. The query flow is not explicitly shown.

**Logical Architecture Data Flow(s):**

cvo\_driver\_record\_info

**Physical Architecture Flow Name:** route restrictions

Information about routes, road segments, and areas that do not allow the transport of security sensitive hazmat cargoes or include other restrictions (such as height or weight limits).

**Logical Architecture Data Flow(s):**

cv\_route\_restrictions

**Physical Architecture Flow Name:** safety inspection report

Report containing results of commercial vehicle safety inspection. The information may be provided as a response to a real-time query or proactively by the source. The query flow is not explicitly shown.

**Logical Architecture Data Flow(s):**

cf\_periodic\_activity\_report

**Physical Architecture Flow Name:** safety status information

Safety information such as safety ratings, security ratings or flags, inspection summaries, and violation summaries. A unique identifier is included. Corresponds to the safety and security portion of CVISN "snapshots." The status information may be provided as a response to a real-time query or as a result of a standing request for updated information (subscription). This may also include information about non-U.S. fleets for use by U.S. authorities, and information regarding U.S. fleets made available to Mexican and Canadian authorities. The query flow is not explicitly shown.

**Logical Architecture Data Flow(s):**

cvo\_safety\_status

**Physical Architecture Flow Name:** trigger area

A geographic area a commercial motor vehicle crosses into, which initiates a request to compile and transmit a safety data message. May be associated with a time period.

**Logical Architecture Data Flow(s):**

cf\_enforcement\_trigger\_areas

**Physical Architecture Flow Name:** trigger area notification

Notification to activate wireless roadside inspection safety data message collection.



## Commercial Vehicle Administration

### Logical Architecture Data Flow(s):

cf\_enforcement\_trigger\_notification

**Commercial Vehicle Administration** => **Information Service Provider**

**Physical Architecture Flow Name:** route restrictions

Information about routes, road segments, and areas that do not allow the transport of security sensitive hazmat cargoes or include other restrictions (such as height or weight limits).

### Logical Architecture Data Flow(s):

route\_restrictions\_for\_isp

**Commercial Vehicle Administration** => **Intermodal Freight Shipper**

**Physical Architecture Flow Name:** border clearance status

Notification regarding the crossing status of commercial freight shipment scheduled to enter the U.S. Includes portions of border agency and transportation agency clearance results, as they become available.

### Logical Architecture Data Flow(s):

tifs-border\_clearance\_status

**Commercial Vehicle Administration** => **Map Update Provider**

**Physical Architecture Flow Name:** route restrictions

Information about routes, road segments, and areas that do not allow the transport of security sensitive hazmat cargoes or include other restrictions (such as height or weight limits).

### Logical Architecture Data Flow(s):

tmup-route\_restrictions

**Commercial Vehicle Administration** => **Other CVAS**

**Physical Architecture Flow Name:** accident report

Report of commercial vehicle safety accident. The information may be provided as a response to a real-time query or proactively by the source. The query flow is not explicitly shown.

### Logical Architecture Data Flow(s):

tocvas-accident\_report

**Physical Architecture Flow Name:** border clearance status

Notification regarding the crossing status of commercial freight shipment scheduled to enter the U.S. Includes portions of border agency and transportation agency clearance results, as they become available.

### Logical Architecture Data Flow(s):

tocvas-border\_clearance

**Physical Architecture Flow Name:** citation

Report of commercial vehicle citation. The citation includes references to the statute(s) that was (were) violated. It includes information on the violator and the officer issuing the citation. A citation differs from a violation because it is adjudicated by the courts. The information may be provided as a response to a real-time query or proactively by the source. The query flow is not explicitly shown.

### Logical Architecture Data Flow(s):

tocvas-citation\_info

## Commercial Vehicle Administration

**Physical Architecture Flow Name:** commercial vehicle permit coordination

Information for the coordination of commercial vehicle permits for oversize, overweight, or for dangerous goods.

**Logical Architecture Data Flow(s):**

tocvas-permit\_coordination

**Physical Architecture Flow Name:** credential fee coordination

Jurisdiction's rates for various credentials (IRP, IFTA, etc.) that are exchanged between agencies.

**Logical Architecture Data Flow(s):**

tocvas-data\_table

**Physical Architecture Flow Name:** credentials information

Response containing full vehicle fuel tax and registration credentials information. "Response" may be provided in reaction to a real-time query or a standing request for updated information. The query flow is not explicitly shown.

**Logical Architecture Data Flow(s):**

tocvas-credentials

**Physical Architecture Flow Name:** credentials status information

Credentials information such as registration, licensing, insurance, check flags, and electronic screening enrollment data. A unique identifier is included. Corresponds to the credentials portion of CVISN "snapshots." The status information may be provided as a response to a real-time query or as a result of a standing request for updated information (subscription). This may also include information about non-U.S. fleets for use by U.S. authorities, and information regarding U.S. fleets made available to Mexican and Canadian authorities. The query flow is not explicitly shown.

**Logical Architecture Data Flow(s):**

tocvas-credentials\_status

**Physical Architecture Flow Name:** cv driver record

Information typically maintained by a state driver licensing agency about a driver of a commercial vehicle including driver identification data, license data, permit data, and driving history details. The query flow is not explicitly shown.

**Logical Architecture Data Flow(s):**

tocvas-cv\_driver\_record

**Physical Architecture Flow Name:** route restrictions

Information about routes, road segments, and areas that do not allow the transport of security sensitive hazmat cargoes or include other restrictions (such as height or weight limits).

**Logical Architecture Data Flow(s):**

tocvas-route\_restrictions

**Physical Architecture Flow Name:** safety inspection report

Report containing results of commercial vehicle safety inspection. The information may be provided as a response to a real-time query or proactively by the source. The query flow is not explicitly shown.

**Logical Architecture Data Flow(s):**

tocvas-safety\_inspection

**Physical Architecture Flow Name:** safety status information

Safety information such as safety ratings, security ratings or flags, inspection summaries, and violation summaries. A unique identifier is included. Corresponds to the safety and security portion of CVISN "snapshots." The status information may be provided as a response to a real-time query or as a result of a standing request for updated information (subscription). This may also include information about non-U.S. fleets for use by U.S. authorities, and

## Commercial Vehicle Administration

information regarding U.S. fleets made available to Mexican and Canadian authorities. The query flow is not explicitly shown.

### Logical Architecture Data Flow(s):

tocvas-safety\_status

## Commercial Vehicle Check

=>

## Commercial Vehicle Administration

**Physical Architecture Flow Name:** accident report

Report of commercial vehicle safety accident. The information may be provided as a response to a real-time query or proactively by the source. The query flow is not explicitly shown.

### Logical Architecture Data Flow(s):

cvo\_accident\_data

**Physical Architecture Flow Name:** border clearance event

Reports clearance event data regarding action taken at border, including acceptance or override of system decision, and date/time stamp

### Logical Architecture Data Flow(s):

cvo\_border\_clearance

**Physical Architecture Flow Name:** citation

Report of commercial vehicle citation. The citation includes references to the statute(s) that was (were) violated. It includes information on the violator and the officer issuing the citation. A citation differs from a violation because it is adjudicated by the courts. The information may be provided as a response to a real-time query or proactively by the source. The query flow is not explicitly shown.

### Logical Architecture Data Flow(s):

cvo\_citation\_data

**Physical Architecture Flow Name:** daily site activity data

Record of daily activities at commercial vehicle check stations including summaries of screening events and inspections.

### Logical Architecture Data Flow(s):

cv\_roadside\_daily\_log

**Physical Architecture Flow Name:** driver log

A daily log showing hours in service for the current driver. The query flow is not explicitly shown.

### Logical Architecture Data Flow(s):

cv\_roadside\_driver\_logs\_for\_admin

**Physical Architecture Flow Name:** on-board safety data

Safety data measured by on-board sensors. Includes information about the vehicle, vehicle components, cargo, and driver. The query flow is not explicitly shown.

### Logical Architecture Data Flow(s):

cv\_roadside\_safety\_data\_for\_admin

**Physical Architecture Flow Name:** roadside data message

Data set collected by roadside sensors to identify and characterize a vehicle, carrier, and (potentially) driver.

### Logical Architecture Data Flow(s):

cv\_roadside\_data\_collected

**Physical Architecture Flow Name:** safety inspection report

Report containing results of commercial vehicle safety inspection. The information may be

## Commercial Vehicle Administration

provided as a response to a real-time query or proactively by the source. The query flow is not explicitly shown.

**Logical Architecture Data Flow(s):**

cvo\_safety\_inspection\_data

**Physical Architecture Flow Name:** violation notification

Notification to enforcement agency of a violation. The violation notification flow describes the statute or regulation that was violated and how it was violated (e. g., overweight on specific axle by xxx pounds or which brake was out of adjustment and how far out of adjustment it was). A violation differs from a citation because it is not adjudicated by the courts.

**Logical Architecture Data Flow(s):**

cvo\_violation

**CVO Information Requestor** => **Commercial Vehicle Administration**

**Physical Architecture Flow Name:** request for data review

Request that data reported about a motor carrier or driver be reviewed for potential mis-assignment or other error.

**Logical Architecture Data Flow(s):**

fcvoir-record\_review\_request

**DMV** => **Commercial Vehicle Administration**

**Physical Architecture Flow Name:** registration

Registered owner of vehicle and associated vehicle information.

**Logical Architecture Data Flow(s):**

fdmv-cv\_violation\_vehicle\_registration

**Enforcement Agency** => **Commercial Vehicle Administration**

**Physical Architecture Flow Name:** information on violators

Information on violators provided by a law enforcement agency. May include information about commercial vehicle violations or other kinds of violations associated with the particular entity. The information may be provided as a response to a real-time query or proactively by the source. The query flow is not explicitly shown.

**Logical Architecture Data Flow(s):**

fea-cv\_enforcement\_agency\_response

**Physical Architecture Flow Name:** targeted list

List of carriers, drivers, and/or vehicles of interest for enforcement purposes.

**Logical Architecture Data Flow(s):**

fea-cv\_enforcement\_targets

**Physical Architecture Flow Name:** trigger area definition

Information that defines the desired trigger area for wireless roadside inspection safety data message submission.

**Logical Architecture Data Flow(s):**

fea-cv\_enforcement\_configuration

## Commercial Vehicle Administration

**Physical Architecture Flow Name:** trigger control

Controls to enable or disable a particular trigger.

**Logical Architecture Data Flow(s):**

fea-cv\_enforcement\_control

**Financial Institution** => **Commercial Vehicle Administration**

**Physical Architecture Flow Name:** transaction status

Response to transaction request. Normally dealing with a request for payment.

**Logical Architecture Data Flow(s):**

ffi-cv\_payment\_confirm

**Fleet and Freight Management** => **Commercial Vehicle Administration**

**Physical Architecture Flow Name:** audit data

Information to support a tax audit.

**Logical Architecture Data Flow(s):**

cvo\_audit\_data

**Physical Architecture Flow Name:** credential application

Application for commercial vehicle credentials. Authorization for payment is included.

**Logical Architecture Data Flow(s):**

cv\_enrollment\_request

cf\_enrollment\_request

**Physical Architecture Flow Name:** cv repair status

Information about the completion of a repair to a commercial vehicle.

**Logical Architecture Data Flow(s):**

cvo\_repair\_information

**Physical Architecture Flow Name:** driver log

A daily log showing hours in service for the current driver. The query flow is not explicitly shown.

**Logical Architecture Data Flow(s):**

cf\_driver\_logs\_for\_admin

**Physical Architecture Flow Name:** on-board safety data

Safety data measured by on-board sensors. Includes information about the vehicle, vehicle components, cargo, and driver. The query flow is not explicitly shown.

**Logical Architecture Data Flow(s):**

cf\_safety\_data

**Physical Architecture Flow Name:** request for permit

Request by fleet management for oversize, overweight, or hazmat permit.

**Logical Architecture Data Flow(s):**

vehicle\_permit\_request

**Physical Architecture Flow Name:** tax filing

## Commercial Vehicle Administration

Commercial vehicle tax filing data. Authorization for payment is included.

### Logical Architecture Data Flow(s):

cf\_tax\_data

### Maintenance and Construction Management

=>

### Commercial Vehicle Administration

**Physical Architecture Flow Name:** current asset restrictions

Restrictions levied on transportation asset usage based on infrastructure design, surveys, tests, or analyses. This includes standard facility design height, width, and weight restrictions, special restrictions such as spring weight restrictions, and temporary facility restrictions that are imposed during maintenance and construction.

### Logical Architecture Data Flow(s):

asset\_restrictions\_for\_com\_veh

### Other CVAS

=>

### Commercial Vehicle Administration

**Physical Architecture Flow Name:** accident report

Report of commercial vehicle safety accident. The information may be provided as a response to a real-time query or proactively by the source. The query flow is not explicitly shown.

### Logical Architecture Data Flow(s):

focvas-accident\_report

**Physical Architecture Flow Name:** border clearance status

Notification regarding the crossing status of commercial freight shipment scheduled to enter the U.S. Includes portions of border agency and transportation agency clearance results, as they become available.

### Logical Architecture Data Flow(s):

focvas-border\_clearance

**Physical Architecture Flow Name:** citation

Report of commercial vehicle citation. The citation includes references to the statute(s) that was (were) violated. It includes information on the violator and the officer issuing the citation. A citation differs from a violation because it is adjudicated by the courts. The information may be provided as a response to a real-time query or proactively by the source. The query flow is not explicitly shown.

### Logical Architecture Data Flow(s):

focvas-citation\_info

**Physical Architecture Flow Name:** commercial vehicle permit coordination

Information for the coordination of commercial vehicle permits for oversize, overweight, or for dangerous goods.

### Logical Architecture Data Flow(s):

focvas-permit\_coordination

**Physical Architecture Flow Name:** credential fee coordination

Jurisdiction's rates for various credentials (IRP, IFTA, etc.) that are exchanged between agencies.

### Logical Architecture Data Flow(s):

focvas-data\_table

**Physical Architecture Flow Name:** credentials information

Response containing full vehicle fuel tax and registration credentials information. "Response" may be provided in reaction to a real-time query or a standing request for updated information.

## Commercial Vehicle Administration

The query flow is not explicitly shown.

### **Logical Architecture Data Flow(s):**

focvas-credentials

**Physical Architecture Flow Name:** credentials status information

Credentials information such as registration, licensing, insurance, check flags, and electronic screening enrollment data. A unique identifier is included. Corresponds to the credentials portion of CVISN "snapshots." The status information may be provided as a response to a real-time query or as a result of a standing request for updated information (subscription). This may also include information about non-U.S. fleets for use by U.S. authorities, and information regarding U.S. fleets made available to Mexican and Canadian authorities. The query flow is not explicitly shown.

### **Logical Architecture Data Flow(s):**

focvas-credentials\_status

**Physical Architecture Flow Name:** cv driver record

Information typically maintained by a state driver licensing agency about a driver of a commercial vehicle including driver identification data, license data, permit data, and driving history details. The query flow is not explicitly shown.

### **Logical Architecture Data Flow(s):**

focvas-cv\_driver\_record

**Physical Architecture Flow Name:** route restrictions

Information about routes, road segments, and areas that do not allow the transport of security sensitive hazmat cargoes or include other restrictions (such as height or weight limits).

### **Logical Architecture Data Flow(s):**

focvas-route\_restrictions

**Physical Architecture Flow Name:** safety inspection report

Report containing results of commercial vehicle safety inspection. The information may be provided as a response to a real-time query or proactively by the source. The query flow is not explicitly shown.

### **Logical Architecture Data Flow(s):**

focvas-safety\_inspection

**Physical Architecture Flow Name:** safety status information

Safety information such as safety ratings, security ratings or flags, inspection summaries, and violation summaries. A unique identifier is included. Corresponds to the safety and security portion of CVISN "snapshots." The status information may be provided as a response to a real-time query or as a result of a standing request for updated information (subscription). This may also include information about non-U.S. fleets for use by U.S. authorities, and information regarding U.S. fleets made available to Mexican and Canadian authorities. The query flow is not explicitly shown.

### **Logical Architecture Data Flow(s):**

focvas-safety\_status

## 2.5.3 *Architecture Flow Diagrams for CVAS*

# Commercial Vehicle Administration

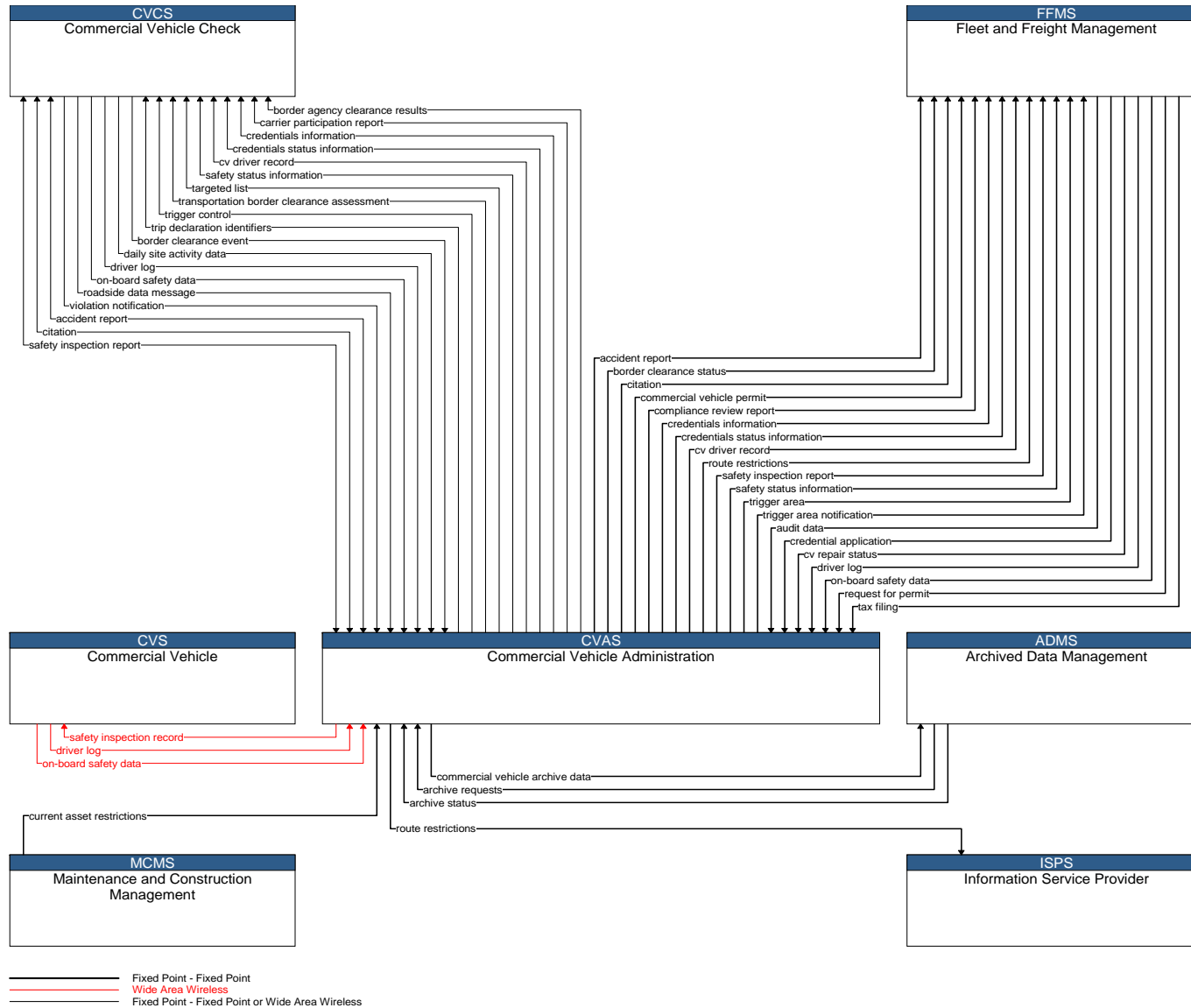
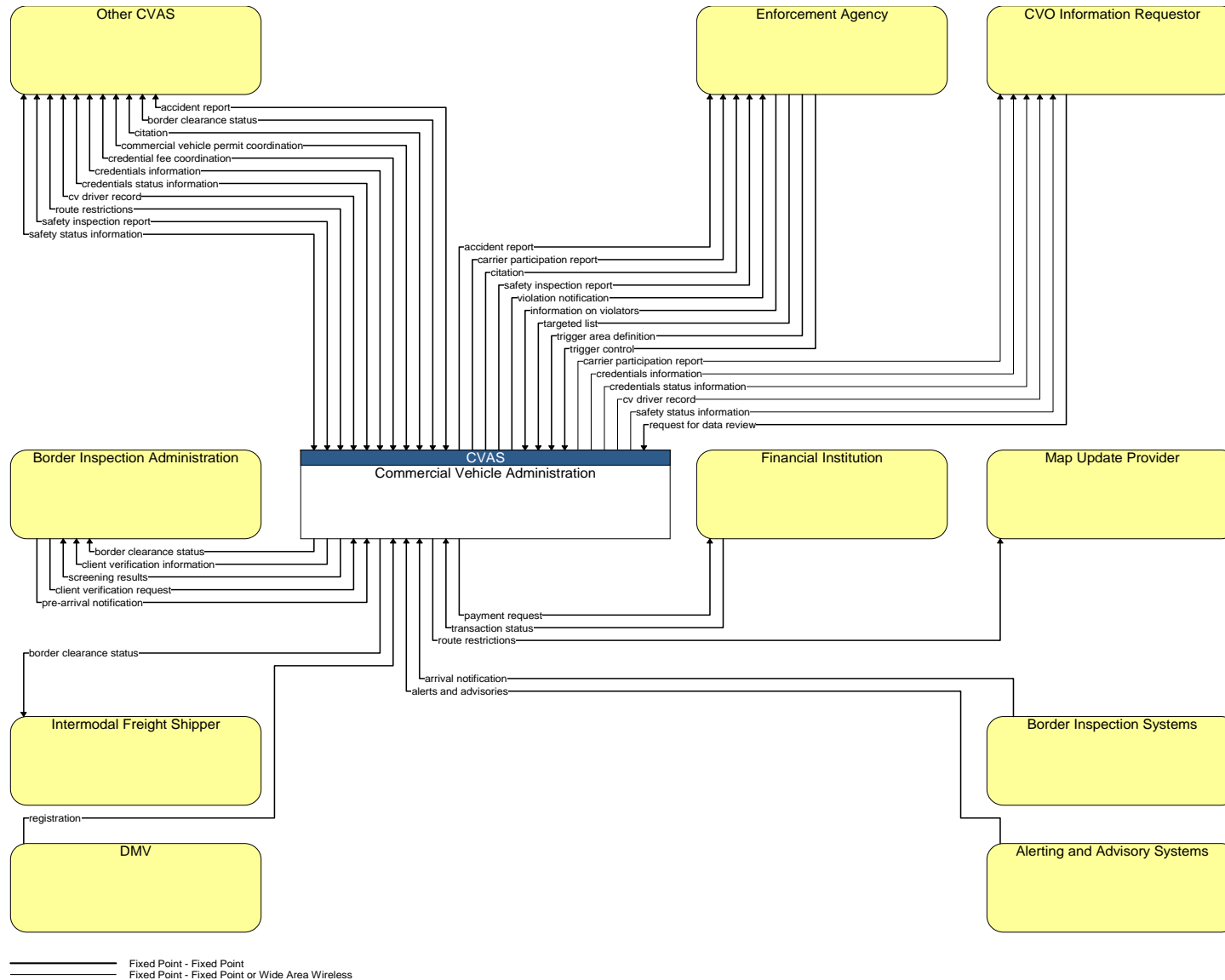


Figure 6: CVAS Subsystem Interfaces



# Commercial Vehicle Administration



**Figure 7: CVAS Terminator Interfaces**

## 2.6 Commercial Vehicle Check

The Commercial Vehicle Check Subsystem (CVCS) supports automated vehicle identification at mainline speeds for credential checking, roadside safety inspections, and weigh-in-motion using two-way data exchange. These capabilities include providing warnings to the commercial vehicle drivers, their fleet managers, and proper authorities of any safety problems that have been identified, accessing and examining historical safety data, and automatically deciding whether to allow the vehicle to pass or require it to stop with operator manual override. The Commercial Vehicle Check Subsystem also provides supplemental inspection services to current capabilities by supporting expedited brake inspections, the use of operator hand-held devices, mobile screening sites, on-board safety database access, and the enrollment of vehicles and carriers in the electronic clearance program.

### 2.6.1 *Equipment Packages and Process Specifications for CVCS*

#### **Equipment Package: Citation and Accident Electronic Recording**

The equipment package documents accidents, citations, and violations identified during roadside safety inspections and forwards the information to the Commercial Vehicle Administration Subsystem for processing. It collects data from the vehicle to help characterize the circumstances surrounding the accident.

##### **Process Specifications**

- 2.3.3.1 Provide Commercial Vehicle Checkstation Communications**
- 2.3.3.3 Administer Commercial Vehicle Roadside Safety Database**
- 2.3.3.5 Carry-out Commercial Vehicle Roadside Inspection**
- 2.3.4 Detect and Classify Commercial Vehicles and Freight Equipment**
- 2.3.6 Provide Commercial Vehicle Reports**

#### **Equipment Package: International Border Crossing**

This equipment package checks compliance with import/export and immigration regulations to manage release of commercial vehicle, cargo, and driver across an international border. It includes interfaces to the equipment at international border crossings operated by government agencies such as Customs and Border Protection.

##### **Process Specifications**

- 2.3.4 Detect and Classify Commercial Vehicles and Freight Equipment**
- 2.3.6 Provide Commercial Vehicle Reports**
- 2.3.8 Provide Commercial Vehicle Border Screening**

#### **Equipment Package: Roadside Electronic Screening**

This equipment package provides two-way communication with approaching properly equipped commercial vehicles at mainline speeds, reading tags for automated vehicle identification and credential checking. This equipment package processes the data from the commercial vehicles along with accessed database information to determine whether a pull-in message is needed or to generate random pull-in messages with provisions for facility operators and enforcement officials to have manual override capabilities.

##### **Process Specifications**

- 2.3.1 Produce Commercial Vehicle Driver Message at Roadside**
- 2.3.2.1 Administer Commercial Vehicle Roadside Credentials Database**
- 2.3.2.2 Process Screening Transactions**
- 2.3.3.1 Provide Commercial Vehicle Checkstation Communications**
- 2.3.3.3 Administer Commercial Vehicle Roadside Safety Database**
- 2.3.4 Detect and Classify Commercial Vehicles and Freight Equipment**
- 2.3.5 Provide Commercial Vehicle Roadside Operator Interface**
- 2.3.6 Provide Commercial Vehicle Reports**

#### **Equipment Package: Roadside HAZMAT Detection**

This equipment package detects and identifies commercial vehicles carrying security sensitive hazardous

## Commercial Vehicle Check

materials. It assesses the likelihood of the presence of security sensitive HAZMAT materials based on remote sensed data as well as other physical information acquired about the commercial vehicle. It then determines if any detected HAZMAT is authorized. If unauthorized HAZMAT material is detected, a pull-in message is generated. The equipment package may also issue a message to the Emergency Management (Police Dispatch) function that includes: location of the incident, current location of the commercial vehicle, timestamp, Vehicle ID, Carrier ID, Driver ID, CV Credentials information, HAZMAT material or category detected, and cargo manifest (if known).

### **Process Specifications**

- 2.3.1 Produce Commercial Vehicle Driver Message at Roadside**
- 2.3.2.1 Administer Commercial Vehicle Roadside Credentials Database**
- 2.3.2.2 Process Screening Transactions**
- 2.3.4 Detect and Classify Commercial Vehicles and Freight Equipment**

### **Equipment Package: Roadside Safety and Security Inspection**

This equipment package supports the roadside safety inspection process, including wireless roadside inspections that are conducted remotely. It reads on-board safety data at mainline speeds to rapidly check the vehicle and driver and accesses historical safety data after identifying vehicles at mainline speeds or while stopped at the roadside. The capabilities to process safety data and issue pull-in messages or provide warnings to the driver, carrier, and enforcement agencies are also provided. It includes hand held or automatic devices to rapidly inspect the vehicle and driver. Results of screening and summary safety inspection data are stored and maintained.

Since a vehicle may cross jurisdictional boundaries during a trip, this equipment package supports the concept of a last clearance event record carried on the vehicle tag. The last clearance event record reflects the results of the roadside verification action. For example, if the vehicle is pulled over in State A and undergoes credential, weight, and safety checks, the results of the clearance process are written to the vehicle's tag. If the vehicle continues the trip and passes a roadside station in State B, the State B station has access to the results of the previous pull-in because it can read the last clearance event record written by the State A roadside station. This equipment package associates high-risk cargo with the container/chassis, manifest, carrier, vehicle and driver transporting it.

### **Process Specifications**

- 2.3.1 Produce Commercial Vehicle Driver Message at Roadside**
- 2.3.3.1 Provide Commercial Vehicle Checkstation Communications**
- 2.3.3.2 Provide Commercial Vehicle Inspector Handheld Terminal Interface**
- 2.3.3.3 Administer Commercial Vehicle Roadside Safety Database**
- 2.3.3.4 Carry-out Commercial Vehicle Roadside Safety Screening**
- 2.3.3.5 Carry-out Commercial Vehicle Roadside Inspection**
- 2.3.4 Detect and Classify Commercial Vehicles and Freight Equipment**
- 2.3.5 Provide Commercial Vehicle Roadside Operator Interface**
- 2.3.6 Provide Commercial Vehicle Reports**

### **Equipment Package: Roadside WIM**

This equipment package measures commercial vehicle weight at high speeds. It includes both portable and permanent installations and can be used to augment electronic credentials checking or it can be a stand alone package with display.

### **Process Specifications**

- 2.3.1 Produce Commercial Vehicle Driver Message at Roadside**
- 2.3.2.2 Process Screening Transactions**
- 2.3.4 Detect and Classify Commercial Vehicles and Freight Equipment**

## Commercial Vehicle Check

### 2.6.2 Interfaces for CVCS

#### Alerting and Advisory Systems => Commercial Vehicle Check

**Physical Architecture Flow Name:** alerts and advisories

Assessments (general incident and vulnerability awareness information), advisories (identification of threats or recommendations to increase preparedness levels), and alerts (information on imminent or in-progress emergencies). This flow also provides supporting descriptive detail on incidents, threats, and vulnerabilities to increase preparedness and support effective response to threats against the surface transportation system.

**Logical Architecture Data Flow(s):**  
faas-alerts\_and\_advisories\_for\_screening  
faas-alerts\_and\_advisories\_for\_inspection

#### Basic Commercial Vehicle => Commercial Vehicle Check

**Physical Architecture Flow Name:** CVO weight and presence

Physical attribute of commercial vehicle that can be measured (for example, weight, number of axels, axel spacing, etc.).

**Logical Architecture Data Flow(s):**  
fbcv-vehicle\_characteristics

**Physical Architecture Flow Name:** identification information

The physical characteristics of a commercial vehicle that can be used to determine a vehicle's identity, such as a license plate number, USDOT number, ICC number, bar code, etc.

**Logical Architecture Data Flow(s):**  
fbcv-vehicle\_identification

#### Border Inspection Systems => Commercial Vehicle Check

**Physical Architecture Flow Name:** inspection results

Report of results of border inspection on a particular load.

**Logical Architecture Data Flow(s):**  
fbis-border\_crossing\_inspection\_results

#### Commercial Vehicle => Commercial Vehicle Check

**Physical Architecture Flow Name:** border clearance data

Trip specific data regarding the movement of goods across international borders. Includes trip identification number. May also include results from recent border crossing screening events.

**Logical Architecture Data Flow(s):**  
cvo\_border\_clearance\_data

**Physical Architecture Flow Name:** commercial vehicle breach

Information about a breach or tamper event on a Commercial Vehicle or its attached freight equipment which includes identity, type of breach, location, and time.

**Logical Architecture Data Flow(s):**  
freight\_breach\_for\_rs  
cv\_security\_alarm

**Physical Architecture Flow Name:** commercial vehicle disable status

This flow provides the status of the disable flag in the commercial vehicle.

**Logical Architecture Data Flow(s):**

## Commercial Vehicle Check

cv\_disable\_info

**Physical Architecture Flow Name:** driver log

A daily log showing hours in service for the current driver. The query flow is not explicitly shown.

**Logical Architecture Data Flow(s):**

cvo\_driver\_log

**Physical Architecture Flow Name:** electronic lock data

Notification to roadside (via transponder) of the presence and status of electronic cargo locks.

**Logical Architecture Data Flow(s):**

cv\_electronic\_clearance\_data

**Physical Architecture Flow Name:** expected driver identity characteristics

Driver identification information e.g. encrypted PIN codes issued to drivers, encrypted driver biometric parameters.

**Logical Architecture Data Flow(s):**

stored\_driver\_identity\_characteristics

**Physical Architecture Flow Name:** freight equipment information

Container, trailer, or chassis information regarding identity, type, location, brake wear data, mileage, seal #, seal type, door open/close status, chassis bare/covered status, tethered / untethered status, Bill of Lading, and sensor status.

**Logical Architecture Data Flow(s):**

freight\_equipment\_info

freight\_info\_for\_inspection

**Physical Architecture Flow Name:** on-board safety data

Safety data measured by on-board sensors. Includes information about the vehicle, vehicle components, cargo, and driver. The query flow is not explicitly shown.

**Logical Architecture Data Flow(s):**

cv\_on\_board\_data

cvo\_onboard\_safety\_data

**Physical Architecture Flow Name:** safety inspection record

Record containing results of commercial vehicle safety inspection.

**Logical Architecture Data Flow(s):**

cvo\_safety\_inspection

**Physical Architecture Flow Name:** screening event record

Results of CVO electronic screening activity.

**Logical Architecture Data Flow(s):**

cv\_electronic\_screening\_data

**Physical Architecture Flow Name:** tag data

Unique tag ID and related vehicle information.

**Logical Architecture Data Flow(s):**

cvo\_tag\_data

**Commercial Vehicle  
Administration**

=> **Commercial Vehicle Check**

**Physical Architecture Flow Name:** accident report

Report of commercial vehicle safety accident. The information may be provided as a

## Commercial Vehicle Check

response to a real-time query or proactively by the source. The query flow is not explicitly shown.

**Logical Architecture Data Flow(s):**

cvo\_accident\_report

**Physical Architecture Flow Name:** border agency clearance results

Notification regarding the granting of permission for commercial freight shipment to enter the U.S.

**Logical Architecture Data Flow(s):**

cvo\_border\_agency\_clearance\_results

**Physical Architecture Flow Name:** carrier participation report

Report that summarizes motor carrier participation in CVO programs. Used to identify the level of active participation and to report which enrolled carriers are not participating as expected.

**Logical Architecture Data Flow(s):**

cv\_carrier\_participation\_report\_to\_roadside

**Physical Architecture Flow Name:** citation

Report of commercial vehicle citation. The citation includes references to the statute(s) that was (were) violated. It includes information on the violator and the officer issuing the citation. A citation differs from a violation because it is adjudicated by the courts. The information may be provided as a response to a real-time query or proactively by the source. The query flow is not explicitly shown.

**Logical Architecture Data Flow(s):**

cvo\_citation\_info

**Physical Architecture Flow Name:** credentials information

Response containing full vehicle fuel tax and registration credentials information. "Response" may be provided in reaction to a real-time query or a standing request for updated information. The query flow is not explicitly shown.

**Logical Architecture Data Flow(s):**

cv\_credentials\_information\_response  
cvo\_credentials\_info

**Physical Architecture Flow Name:** credentials status information

Credentials information such as registration, licensing, insurance, check flags, and electronic screening enrollment data. A unique identifier is included. Corresponds to the credentials portion of CVISN "snapshots." The status information may be provided as a response to a real-time query or as a result of a standing request for updated information (subscription). This may also include information about non-U.S. fleets for use by U.S. authorities, and information regarding U.S. fleets made available to Mexican and Canadian authorities. The query flow is not explicitly shown.

**Logical Architecture Data Flow(s):**

cvo\_credentials\_status  
cv\_credentials\_database\_update

**Physical Architecture Flow Name:** cv driver record

Information typically maintained by a state driver licensing agency about a driver of a commercial vehicle including driver identification data, license data, permit data, and driving history details. The query flow is not explicitly shown.

**Logical Architecture Data Flow(s):**

cvo\_driver\_record\_to\_roadside

**Physical Architecture Flow Name:** safety inspection report

Report containing results of commercial vehicle safety inspection. The information may be provided as a response to a real-time query or proactively by the source. The query flow is not explicitly shown.

## Commercial Vehicle Check

### Logical Architecture Data Flow(s):

cv\_safety\_information\_response

**Physical Architecture Flow Name:** safety status information

Safety information such as safety ratings, security ratings or flags, inspection summaries, and violation summaries. A unique identifier is included. Corresponds to the safety and security portion of CVISN "snapshots." The status information may be provided as a response to a real-time query or as a result of a standing request for updated information (subscription). This may also include information about non-U.S. fleets for use by U.S. authorities, and information regarding U.S. fleets made available to Mexican and Canadian authorities. The query flow is not explicitly shown.

### Logical Architecture Data Flow(s):

cv\_safety\_database\_update

**Physical Architecture Flow Name:** targeted list

List of carriers, drivers, and/or vehicles of interest for enforcement purposes.

### Logical Architecture Data Flow(s):

cv\_roadside\_inspection\_configuration

**Physical Architecture Flow Name:** transportation border clearance assessment

Includes directions for commercial driver to proceed to nearest vehicle weigh and inspection station for further review if required.

### Logical Architecture Data Flow(s):

cvo\_transportation\_border\_clearance

**Physical Architecture Flow Name:** trigger control

Controls to enable or disable a particular trigger.

### Logical Architecture Data Flow(s):

cv\_roadside\_inspection\_control

**Physical Architecture Flow Name:** trip declaration identifiers

Specific identifiers extracted from notification containing information regarding pending commercial freight shipment into the U.S. Includes carrier, vehicle, and driver identification data.

### Logical Architecture Data Flow(s):

cv\_border\_database\_update

**Commercial Vehicle Check** => **Commercial Vehicle**

**Physical Architecture Flow Name:** border clearance data request

Request for trip specific data regarding the movement of goods across international borders. Includes trip identification number. May also include results from recent border crossing screening events.

### Logical Architecture Data Flow(s):

cvo\_border\_clearance\_request

**Physical Architecture Flow Name:** border clearance event

Reports clearance event data regarding action taken at border, including acceptance or override of system decision, and date/time stamp

### Logical Architecture Data Flow(s):

cv\_on\_board\_border\_record

**Physical Architecture Flow Name:** electronic lock data request

Request from roadside for data regarding presence and status of electronic cargo locks.

## Commercial Vehicle Check

**Logical Architecture Data Flow(s):**

cv\_request\_electronic\_clearance\_data

**Physical Architecture Flow Name:** electronic screening request

Request for identification data to support electronic screening.

**Logical Architecture Data Flow(s):**

cv\_request\_electronic\_screening\_data

**Physical Architecture Flow Name:** pass/pull-in

Command to commercial vehicle to pull into or bypass inspection station.

**Logical Architecture Data Flow(s):**

cv\_on\_board\_pull\_in\_output

**Physical Architecture Flow Name:** request tag data

Request for tag information including credit identity, stored value card cash, etc.

**Logical Architecture Data Flow(s):**

cvo\_request\_tag\_data

**Physical Architecture Flow Name:** safety inspection record

Record containing results of commercial vehicle safety inspection.

**Logical Architecture Data Flow(s):**

cv\_inspection\_data\_output

**Physical Architecture Flow Name:** safety inspection request

Request for safety inspection record.

**Logical Architecture Data Flow(s):**

cvo\_safety\_inspection\_request

**Physical Architecture Flow Name:** screening event record

Results of CVO electronic screening activity.

**Logical Architecture Data Flow(s):**

cv\_on\_board\_screening\_record

**Physical Architecture Flow Name:** trigger area notification

Notification to activate wireless roadside inspection safety data message collection.

**Logical Architecture Data Flow(s):**

cv\_trigger\_area\_notification

## Commercial Vehicle Check

=>

## Commercial Vehicle Administration

**Physical Architecture Flow Name:** accident report

Report of commercial vehicle safety accident. The information may be provided as a response to a real-time query or proactively by the source. The query flow is not explicitly shown.

**Logical Architecture Data Flow(s):**

cvo\_accident\_data

**Physical Architecture Flow Name:** border clearance event

Reports clearance event data regarding action taken at border, including acceptance or override of system decision, and date/time stamp

**Logical Architecture Data Flow(s):**



## Commercial Vehicle Check

cvo\_border\_clearance

**Physical Architecture Flow Name:** citation

Report of commercial vehicle citation. The citation includes references to the statute(s) that was (were) violated. It includes information on the violator and the officer issuing the citation. A citation differs from a violation because it is adjudicated by the courts. The information may be provided as a response to a real-time query or proactively by the source. The query flow is not explicitly shown.

**Logical Architecture Data Flow(s):**

cvo\_citation\_data

**Physical Architecture Flow Name:** daily site activity data

Record of daily activities at commercial vehicle check stations including summaries of screening events and inspections.

**Logical Architecture Data Flow(s):**

cv\_roadside\_daily\_log

**Physical Architecture Flow Name:** driver log

A daily log showing hours in service for the current driver. The query flow is not explicitly shown.

**Logical Architecture Data Flow(s):**

cv\_roadside\_driver\_logs\_for\_admin

**Physical Architecture Flow Name:** on-board safety data

Safety data measured by on-board sensors. Includes information about the vehicle, vehicle components, cargo, and driver. The query flow is not explicitly shown.

**Logical Architecture Data Flow(s):**

cv\_roadside\_safety\_data\_for\_admin

**Physical Architecture Flow Name:** roadside data message

Data set collected by roadside sensors to identify and characterize a vehicle, carrier, and (potentially) driver.

**Logical Architecture Data Flow(s):**

cv\_roadside\_data\_collected

**Physical Architecture Flow Name:** safety inspection report

Report containing results of commercial vehicle safety inspection. The information may be provided as a response to a real-time query or proactively by the source. The query flow is not explicitly shown.

**Logical Architecture Data Flow(s):**

cvo\_safety\_inspection\_data

**Physical Architecture Flow Name:** violation notification

Notification to enforcement agency of a violation. The violation notification flow describes the statute or regulation that was violated and how it was violated (e. g., overweight on specific axle by xxx pounds or which brake was out of adjustment and how far out of adjustment it was). A violation differs from a citation because it is not adjudicated by the courts.

**Logical Architecture Data Flow(s):**

cvo\_violation

**Commercial Vehicle Check** => **Commercial Vehicle Driver**

**Physical Architecture Flow Name:** CVO pass/pull-in message

This flow represents the visual or auditory interface with ITS equipment containing a message sent to commercial vehicle driver indicating whether to bypass or requesting pull in to inspection/verification stop along with inspection results (e. g., LED indicator on transponder or variable message sign).

## Commercial Vehicle Check

### Logical Architecture Data Flow(s):

tcvd-safety\_pull\_in\_output  
tcvd-inspection\_results  
tcvd-general\_pull\_in\_output  
tcvd-clearance\_pull\_in\_output  
tcvd-border\_pull\_in\_output

**Commercial Vehicle Check** => **CVO Inspector**

**Physical Architecture Flow Name:** CVO inspector information

This flow represents the visual or auditory interface with ITS equipment containing credential, safety, and preclearance information and instructions to the commercial vehicle inspector.

### Logical Architecture Data Flow(s):

tci-pull-in\_information  
tci-output\_log\_report  
tci-credentials\_data\_output  
tci-inspection\_report  
tci-safety\_data\_output

**Commercial Vehicle Check** => **Emergency Management**

**Physical Architecture Flow Name:** alarm

Information about a Commercial Vehicle or Freight Equipment breach, non-permitted security sensitive hazmat detected at the roadside, route deviation, or Commercial Vehicle Driver / Commercial Vehicle / Freight Equipment assignment mismatches which includes the location of the Commercial Vehicle and appropriate identities.

### Logical Architecture Data Flow(s):

cv\_hazmat\_alarm

**Commercial Vehicle Check** => **Enforcement Agency**

**Physical Architecture Flow Name:** violation notification

Notification to enforcement agency of a violation. The violation notification flow describes the statute or regulation that was violated and how it was violated (e. g., overweight on specific axle by xxx pounds or which brake was out of adjustment and how far out of adjustment it was). A violation differs from a citation because it is not adjudicated by the courts.

### Logical Architecture Data Flow(s):

tea-cvo\_violation

**CVO Inspector** => **Commercial Vehicle Check**

**Physical Architecture Flow Name:** CVC override mode

This flow represents the tactile or auditory interface with ITS equipment containing the manual override of automated pass/pull-in decisions generated by the Commercial Vehicle Check station.

### Logical Architecture Data Flow(s):

fci-pull-in\_action

**Physical Architecture Flow Name:** CVO inspector input

This flow represents the tactile or auditory interface with ITS equipment containing requests from the commercial vehicle inspector to operate the commercial vehicle inspection station.

### Logical Architecture Data Flow(s):

fci-credentials\_data\_request  
fci-inspection\_data\_input  
fci-request\_log\_report  
fci-safety\_data\_request  
fci-start\_inspection

## Commercial Vehicle Check

### **Driver Identification Card** => **Commercial Vehicle Check**

**Physical Architecture Flow Name:** cv driver credential

Driver information (e.g., identity, biometrics, address, date of birth, endorsements, restrictions) stored on a driver's license or other official identification card used to identify a driver of commercial vehicles.

**Logical Architecture Data Flow(s):**  
fdic-driver\_information

### **Enforcement Agency** => **Commercial Vehicle Check**

**Physical Architecture Flow Name:** information on violators

Information on violators provided by a law enforcement agency. May include information about commercial vehicle violations or other kinds of violations associated with the particular entity. The information may be provided as a response to a real-time query or proactively by the source. The query flow is not explicitly shown.

**Logical Architecture Data Flow(s):**  
fea-violator\_information

### **Freight Equipment** => **Commercial Vehicle Check**

**Physical Architecture Flow Name:** freight breach

Information about a breach or tamper event on Freight Equipment which includes identity, type of breach, location, and time.

**Logical Architecture Data Flow(s):**  
ffe-freight\_breach

**Physical Architecture Flow Name:** freight equipment information

Container, trailer, or chassis information regarding identity, type, location, brake wear data, mileage, seal #, seal type, door open/close status, chassis bare/covered status, tethered / untethered status, Bill of Lading, and sensor status.

**Logical Architecture Data Flow(s):**  
ffe-freight\_equipment\_info

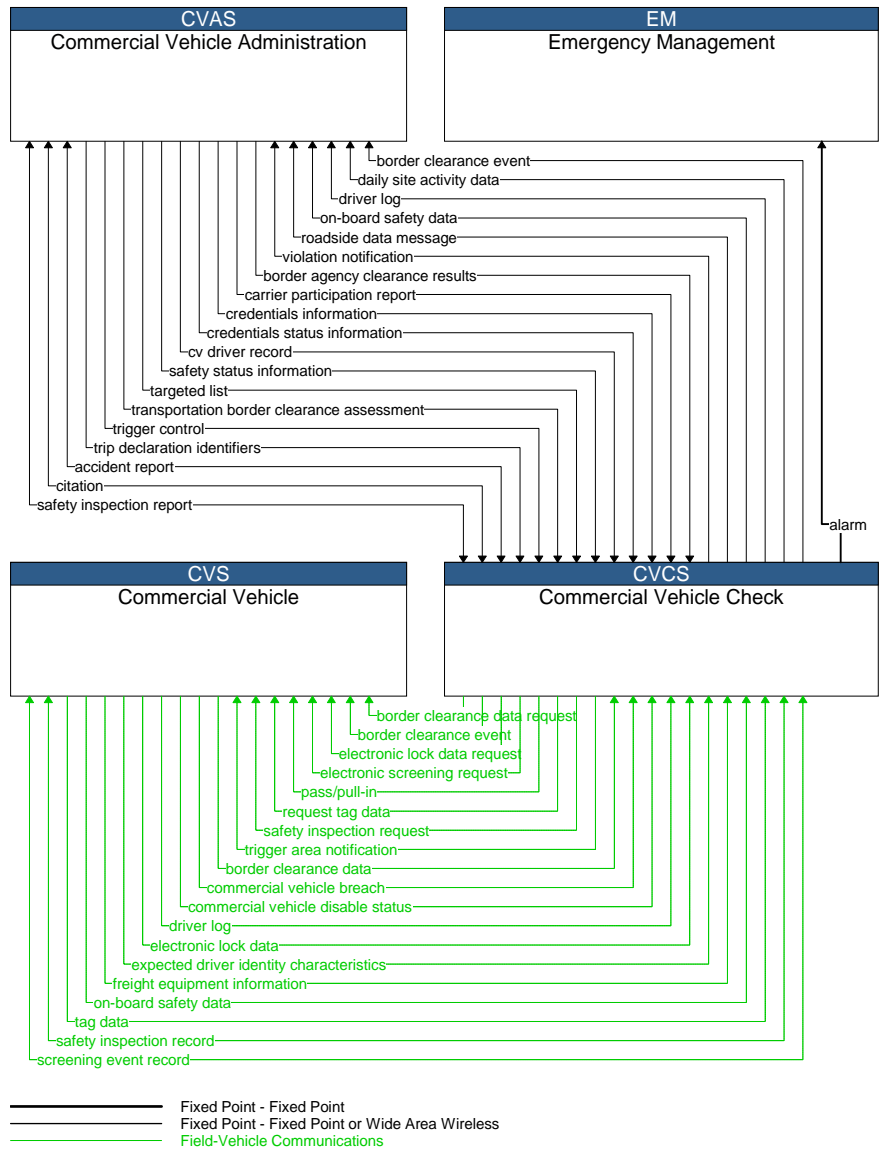
**Physical Architecture Flow Name:** hazmat environmental factors

Sensed characteristics of a vehicle that are analyzed to indicate if the vehicle is carrying a security sensitive substance, e.g. detection of radiation or ammonia compounds.

**Logical Architecture Data Flow(s):**  
ffe-sensed\_hazmat

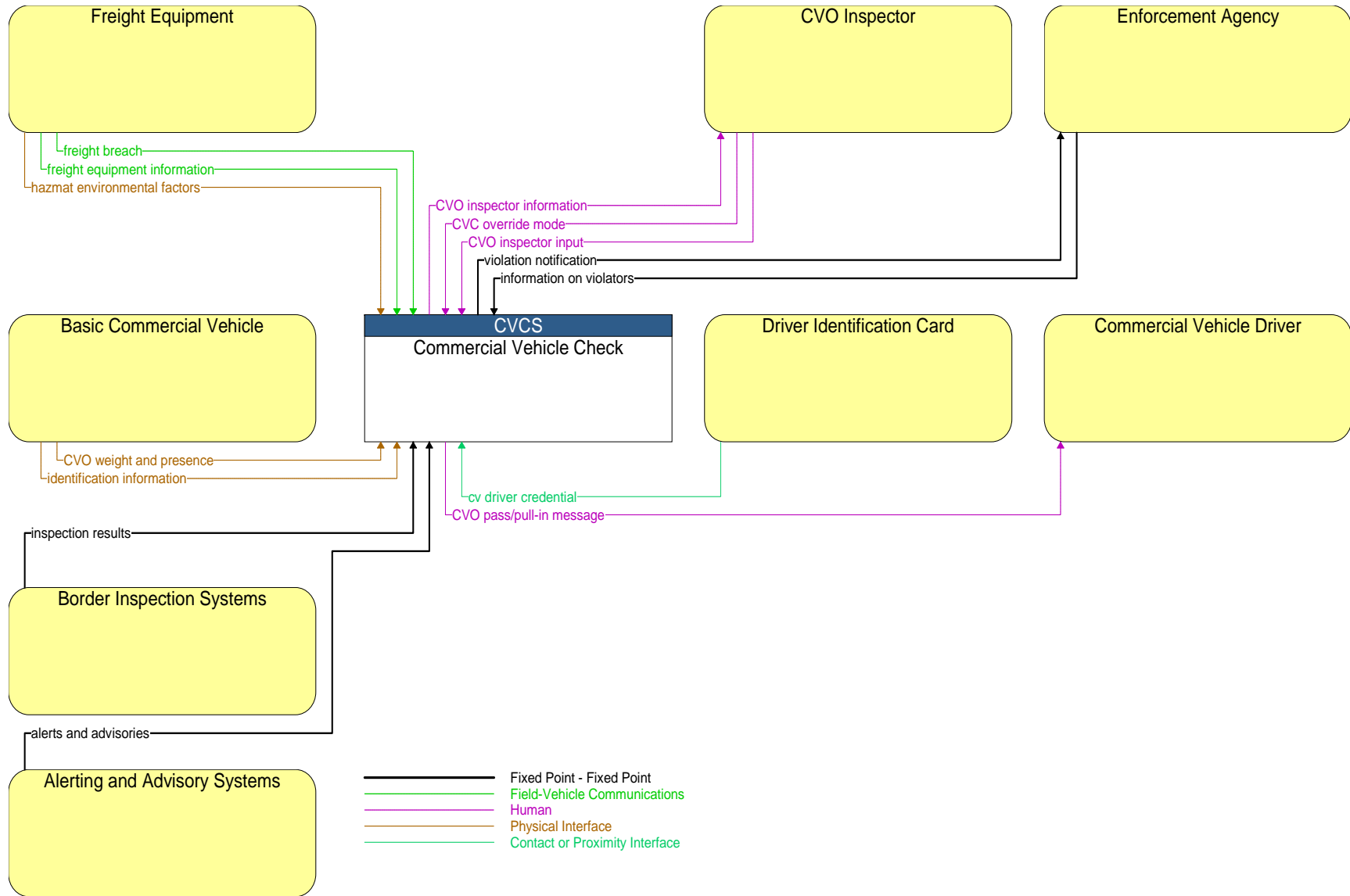
### 2.6.3 *Architecture Flow Diagrams for CVCS*

# Commercial Vehicle Check



**Figure 8: CVCS Subsystem Interfaces**

# Commercial Vehicle Check



**Figure 9: CVCS Terminator Interfaces**

## 2.7 Emergency Management

The Emergency Management (EM) Subsystem represents public safety, emergency management, and other allied agency systems that support incident management, disaster response and evacuation, security monitoring, and other security and public safety-oriented ITS applications. The subsystem includes the functions associated with fixed and mobile public safety communications centers including public safety call taker and dispatch centers operated by police (including transit police), fire, and emergency medical services. It includes the functions associated with Emergency Operations Centers that are activated at local, regional, state, and federal levels for emergencies and the portable and transportable systems that support Incident Command System operations at an incident. This subsystem also represents other allied systems including centers associated with towing and recovery, freeway service patrols, HAZMAT response teams, and mayday service providers.

The subsystem manages sensor and surveillance equipment used to enhance transportation security of the roadway infrastructure (including bridges, tunnels, interchanges, and other key roadway segments) and the public transportation system (including transit vehicles, public areas such as transit stops and stations, facilities such as transit yards, and transit infrastructure such as rail, bridges, tunnels, or bus guideways). The subsystem provides security/surveillance services to improve traveler security in public areas not a part of the public transportation system.

This subsystem monitors alerts, advisories, and other threat information and prepares for and responds to identified emergencies. It interfaces with other Emergency Management Subsystems to support coordinated emergency response involving multiple agencies. The subsystem stores, coordinates, and utilizes emergency response and evacuation plans to facilitate this coordinated response. As the response progresses, situation information including damage assessments, response status, evacuation information, and resource information are shared to keep all allied agencies apprised of the response. Interface with the Transit Management Subsystem allows coordinated use of transit vehicles to facilitate response to major emergencies and to support evacuation efforts. The Emergency Management Subsystem also provides a focal point for coordination of the emergency and evacuation information that is provided to the traveling public, including wide-area alerts when immediate public notification is warranted.

The subsystem tracks and manages emergency vehicle fleets using real-time road network status and routing information from the other center subsystems to aide in selecting the emergency vehicle(s) and routes that will provide the most timely response. Interface with the Traffic Management Subsystem allows strategic coordination in tailoring traffic control to support emergency vehicle ingress and egress, implementation of special traffic restrictions and closures, evacuation traffic control plans, and other special strategies that adapt the transportation system to better meet the unique demands of an emergency.

### 2.7.1 *Equipment Packages and Process Specifications for EM*

#### **Equipment Package: Center Secure Area Alarm Support**

This equipment package receives traveler or transit vehicle operator alarm messages, notifies the system operator, and provides acknowledgement of alarm receipt back to the originator of the alarm. The alarms received can be generated by silent or audible alarm systems and may originate from public areas (e.g. transit stops, park and ride lots, transit stations, rest areas) or transit vehicles. The nature of the emergency may be determined based on the information in the alarm message as well as other inputs.

#### **Process Specifications**

##### **5.1.1.4.6 Provide Operator Interface for Security**

##### **5.1.7.4 Manage Alarms**

#### **Equipment Package: Center Secure Area Sensor Management**

This equipment package manages sensors that monitor secure areas in the transportation system, processes the collected data, performs threat analysis in which data is correlated with other sensor, surveillance, and advisory inputs, and then disseminates resultant threat information to emergency personnel and other agencies. In response to identified threats, the operator may request activation of barrier and safeguard systems to preclude an incident, control access during and after an incident or mitigate impact of an incident. The sensors may be in secure areas frequented by travelers (i.e., transit stops, transit stations, rest areas, park and ride lots, modal interchange facilities, on-board a transit vehicle, etc.) or around transportation infrastructure such as bridges, tunnels and transit railways or guideways. The types of sensors include

## Emergency Management

acoustic, threat (e.g. chemical agent, toxic industrial chemical, biological, explosives, and radiological sensors), infrastructure condition and integrity, motion and object sensors.

### **Process Specifications**

- 5.1.1.4.1     Manage Secure Area Sensors**
- 5.1.1.4.3     Analyze Threats**
- 5.1.1.4.4     Disseminate Threat Info**
- 5.1.1.4.6     Provide Operator Interface for Security**
- 5.1.4           Manage Emergency Response**
- 5.2             Provide Operator Interface for Emergency Data**

### **Equipment Package: Center Secure Area Surveillance**

This equipment package monitors surveillance inputs from secure areas in the transportation system. The surveillance may be of secure areas frequented by travelers (i.e., transit stops, transit stations, rest areas, park and ride lots, modal interchange facilities, on-board a transit vehicle, etc.) or around transportation infrastructure such as bridges, tunnels and transit railways or guideways. It provides both video and audio surveillance information to emergency personnel and automatically alerts emergency personnel of potential

### **Process Specifications**

- 5.1.1.4.2     Manage Secure Area Surveillance**
- 5.1.1.4.5     Analyze Traveler Image**
- 5.1.1.4.6     Provide Operator Interface for Security**
- 5.1.2           Determine Coordinated Response Plan**
- 5.2             Provide Operator Interface for Emergency Data**

### **Equipment Package: Emergency Call-Taking**

This equipment package supports the emergency call-taker, collecting available information about the caller and the reported emergency, and forwarding this information to other equipment packages that formulate and manage the emergency response. This equipment package receives 9-1-1, 7-digit local access, and motorist call-box calls and interfaces to other agencies to assist in the verification and assessment of the emergency and to forward the emergency information to the appropriate response agency.

### **Process Specifications**

- 5.1.1.1        Coordinate Emergency Inputs**
- 5.1.1.3        Collect Incident And Event Data**
- 5.1.2           Determine Coordinated Response Plan**
- 5.1.3           Communicate Emergency Status**
- 5.1.4           Manage Emergency Response**
- 5.2             Provide Operator Interface for Emergency Data**
- 5.5             Update Emergency Display Map Data**

### **Equipment Package: Emergency Commercial Vehicle Response**

This equipment package identifies and initiates a response to commercial vehicle and freight equipment related emergencies. These emergencies may include incidents involving hazardous materials as well as the detection of non-permitted transport of security sensitive hazmat. The equipment package identifies the location of the vehicle, the nature of the incident, the route information, and information concerning the freight itself. The information supports the determination of the response and identifies the responding agencies to notify. As part of the response, this equipment package can request Fleet and Freight Management to disable a specific vehicle in their fleet.

### **Process Specifications**

- 5.1.1.1        Coordinate Emergency Inputs**
- 5.1.1.2        Identify Commercial Vehicle Emergencies**
- 5.1.2           Determine Coordinated Response Plan**

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- 5.1.4 **Manage Emergency Response**
- 5.2 **Provide Operator Interface for Emergency Data**

### **Equipment Package: Emergency Data Collection**

This equipment package collects and stores emergency information that is collected in the course of operations by the Emergency Management Subsystem. This data can be used directly by operations personnel or it can be made available to other data users and archives in the region.

#### **Process Specifications**

- 5.6 **Manage Emergency Services Data**

### **Equipment Package: Emergency Dispatch**

This equipment package tracks the location and status of emergency vehicles and dispatches these vehicles to incidents. Pertinent incident information is gathered from the public and other public safety agencies (see the Emergency Call-Taking equipment package) and relayed to the responding units. Incident status and the status of the responding units is tracked so that additional units can be dispatched and/or unit status can be returned to available when the incident is cleared and closed.

#### **Process Specifications**

- 5.1.2 **Determine Coordinated Response Plan**
- 5.1.4 **Manage Emergency Response**
- 5.2 **Provide Operator Interface for Emergency Data**
- 5.3.2 **Dispatch Vehicle**
- 5.3.6 **Maintain Vehicle Status**
- 5.5 **Update Emergency Display Map Data**

### **Equipment Package: Emergency Early Warning System**

This equipment package monitors alerting and advisory systems, information collected by ITS surveillance and sensors, and reports from other agencies and uses this information to identify potential, imminent, or in-progress major incidents or disasters. Notification is provided to other equipment packages that provide the emergency response, including public notification using ITS traveler information systems, where appropriate.

#### **Process Specifications**

- 5.1.1.3 **Collect Incident And Event Data**
- 5.1.2 **Determine Coordinated Response Plan**
- 5.1.3 **Communicate Emergency Status**
- 5.1.8 **Manage Wide Area Alerts and Advisories**

### **Equipment Package: Emergency Environmental Monitoring**

This equipment package collects current and forecast road conditions and surface weather information from a variety of sources. The collected environmental information is monitored and presented to the operator and used to more effectively manage incidents.

#### **Process Specifications**

- 5.1.4 **Manage Emergency Response**

### **Equipment Package: Emergency Evacuation Support**

This equipment package coordinates evacuation plans among allied agencies and manages evacuation and reentry of a population in the vicinity of a disaster or other emergency that poses a risk to public safety. Where appropriate, the affected population is evacuated in shifts, using more than one evacuation route, and including several evacuation destinations to spread demand and thereby expedite the evacuation. All affected jurisdictions (e.g., states and counties) at the evacuation origin, evacuation destination, and along the evacuation route are informed of the plan. The public is provided with real-time evacuation guidance including basic information to assist potential evacuees in determining whether evacuation is necessary. Resource requirements are forecast based on the evacuation plans, and the necessary resources are located, shared between agencies if necessary, and deployed at the right locations at the appropriate times. The evacuation and reentry status are monitored and used to refine the plan and resource allocations during the evacuation and subsequent reentry. This equipment package communicates with public health systems to develop evacuation plans and recommended strategies for disasters and evacuation scenarios involving



## Emergency Management

biological or other medical hazards.

### **Process Specifications**

- 5.1.3 Communicate Emergency Status**
- 5.1.4 Manage Emergency Response**
- 5.2 Provide Operator Interface for Emergency Data**
- 5.7.4 Provide Evacuation Coordination**
- 5.7.5 Manage Evacuation**

### **Equipment Package: Emergency Response Management**

This equipment package provides the strategic emergency response capabilities and broad inter-agency interfaces that are implemented for extraordinary incidents and disasters that require response from outside the local community. It provides the functional capabilities and interfaces commonly associated with Emergency Operations Centers. This equipment package develops and stores emergency response plans and manages overall coordinated response to emergencies. It monitors real-time information on the state of the regional transportation system including current traffic and road conditions, weather conditions, special event and incident information. It tracks the availability of resources and assists in the appropriate allocation of these resources for a particular emergency response. This equipment package provides coordination between multiple allied agencies before and during emergencies to implement emergency response plans and track progress through the incident. It also coordinates with the public through the Emergency Telecommunication Systems (e.g., Reverse 911). This equipment package coordinates with public health systems to provide the most appropriate response for emergencies involving biological or other medical hazards.

### **Process Specifications**

- 5.1.1.3 Collect Incident And Event Data**
- 5.1.2 Determine Coordinated Response Plan**
- 5.1.3 Communicate Emergency Status**
- 5.1.4 Manage Emergency Response**
- 5.1.5 Manage Emergency Service Allocation Store**
- 5.2 Provide Operator Interface for Emergency Data**
- 5.3.1 Select Response Mode**
- 5.5 Update Emergency Display Map Data**
- 5.7.1 Assess System Status For Disasters**
- 5.7.2 Provide Disaster Response Coordination**
- 5.7.3 Assess System Status For Evacuation**

### **Equipment Package: Emergency Routing**

This equipment package supports routing of emergency vehicles and enlists support from the Traffic Management Subsystem to facilitate travel along these routes. Routes may be determined by this equipment package based on real-time traffic information and road conditions or routes may be provided by the Traffic Management Subsystem on request. Vehicles are tracked and routes are based on current vehicle location. This equipment package may coordinate with the Traffic Management Subsystem to provide preemption or otherwise adapt the traffic control strategy along the selected route.

### **Process Specifications**

- 5.2 Provide Operator Interface for Emergency Data**
- 5.3.6 Maintain Vehicle Status**
- 5.3.7 Provide Emergency Vehicle Route**

### **Equipment Package: Emergency Transportation Operations Data Collection**

This equipment package collects real-time information on the state of the regional transportation system for operational use by the center. It includes communication and data processing capabilities that provide real-time access to regional transportation information that is stored in a regional repository. This equipment package establishes communications with the repository, requests or subscribes to information relevant to

## Emergency Management

the center, receives and processes the information, and then distributes the information to other equipment packages and the system operator for use. Although request and subscription flows are not explicitly included in the National ITS Architecture, interactive data services are supported by this equipment package.

### Process Specifications

- 5.1.4 **Manage Emergency Response**
- 5.2 **Provide Operator Interface for Emergency Data**
- 5.3.7 **Provide Emergency Vehicle Route**
- 5.7.1 **Assess System Status For Disasters**
- 5.7.3 **Assess System Status For Evacuation**

### Equipment Package: Incident Command

The equipment package provides tactical decision support, resource coordination, and communications integration for Incident Commands that are established by first responders at or near the incident scene to support local management of an incident. The equipment package supports communications with public safety, emergency management, transportation, and other allied response agency centers, tracks and maintains resource information, action plans, and the incident command organization itself. Information is shared with agency centers including resource deployment status, hazardous material information, traffic, road, and weather conditions, evacuation advice, and other information that enables emergency or maintenance personnel in the field to implement an effective, safe incident response. This equipment package supports the functions and interfaces commonly supported by a mobile command center.

### Process Specifications

- 5.1.1.3 **Collect Incident And Event Data**
- 5.1.3 **Communicate Emergency Status**
- 5.1.4 **Manage Emergency Response**
- 5.3.4 **Assess Response Status**

### Equipment Package: Mayday Support

This equipment package receives Mayday messages from vehicles or personal handheld devices, determines an appropriate response, and either uses internal resources or contacts a local agency to provide that response. The nature of the emergency is determined based on the information in the mayday message as well as other inputs. This package effectively serves as an interface between automated mobile mayday systems and the local public safety answering point for messages which require a public safety response.

### Process Specifications

- 5.1.2 **Determine Coordinated Response Plan**
- 5.1.3 **Communicate Emergency Status**
- 5.1.6 **Process Mayday Messages**
- 5.2 **Provide Operator Interface for Emergency Data**

### Equipment Package: Service Patrol Management

This equipment package supports dispatch and communication with roadway service patrol vehicles that monitor roads to aid motorists, offering rapid response to minor incidents.

### Process Specifications

- 5.1.3 **Communicate Emergency Status**
- 5.2 **Provide Operator Interface for Emergency Data**
- 5.3.2 **Dispatch Vehicle**
- 5.3.4 **Assess Response Status**
- 5.3.6 **Maintain Vehicle Status**

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### 2.7.2 Interfaces for EM

#### Alerting and Advisory Systems => Emergency Management

**Physical Architecture Flow Name:** alerts and advisories

Assessments (general incident and vulnerability awareness information), advisories (identification of threats or recommendations to increase preparedness levels), and alerts (information on imminent or in-progress emergencies). This flow also provides supporting descriptive detail on incidents, threats, and vulnerabilities to increase preparedness and support effective response to threats against the surface transportation system.

**Logical Architecture Data Flow(s):**

faas-wide\_area\_alert\_notifications\_and\_advisories  
faas-alerts\_and\_advisories\_for\_threat\_analysis

**Physical Architecture Flow Name:** threat support data

Information provided to help receiving agency identify possible threats, including biometric image processing support data.

**Logical Architecture Data Flow(s):**

faas-threat\_support\_data  
faas-image\_search\_data  
faas-confirm\_image\_match

#### Archived Data Management => Emergency Management

**Physical Architecture Flow Name:** archive requests

A request to a data source for information on available data (i.e. "catalog") or a request that defines the data to be archived. The request can be a general subscription intended to initiate a continuous or regular data stream or a specific request intended to initiate a one-time response from the recipient.

**Logical Architecture Data Flow(s):**

em\_archive\_request

**Physical Architecture Flow Name:** archive status

Notification that data provided to an archive contains erroneous, missing, or suspicious data or verification that the data provided appears valid. If an error has been detected, the offending data and the nature of the potential problem are identified.

**Logical Architecture Data Flow(s):**

em\_archive\_status

#### Border Inspection Systems => Emergency Management

**Physical Architecture Flow Name:** border incident information

Notification of existence of incident in the vicinity of the border. Information would include expected severity, location, time and nature of incident. As additional information is gathered and the incident evolves, updated incident information is provided.

**Logical Architecture Data Flow(s):**

fbis-border\_incident\_information

**Physical Architecture Flow Name:** care facility status

Information regarding facility type and capabilities, facility status, and its ability to admit new patients.

**Logical Architecture Data Flow(s):**

fcf-care\_facility\_status\_response

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fcf-care\_facility\_status\_response\_for\_disaster

**Commercial Vehicle** => **Emergency Management**

**Physical Architecture Flow Name:** hazmat spill notification

Information provided to emergency response organizations when cargo sensors detect a release of hazardous material. This information will include sensor information, vehicle location and identification, and carrier identification.

**Logical Architecture Data Flow(s):**  
cvo\_hazmat\_spill\_data

**Commercial Vehicle Check** => **Emergency Management**

**Physical Architecture Flow Name:** alarm

Information about a Commercial Vehicle or Freight Equipment breach, non-permitted security sensitive hazmat detected at the roadside, route deviation, or Commercial Vehicle Driver / Commercial Vehicle / Freight Equipment assignment mismatches which includes the location of the Commercial Vehicle and appropriate identities.

**Logical Architecture Data Flow(s):**  
cv\_hazmat\_alarm

**Emergency Management** => **Alerting and Advisory Systems**

**Physical Architecture Flow Name:** threat data for analysis

Data from surveillance or sensor equipment in secure areas provided for further analysis.

**Logical Architecture Data Flow(s):**  
taas-traveler\_image  
taas-traveler\_image\_matching\_details  
taas-threat\_data\_for\_analysis

**Physical Architecture Flow Name:** threat information

Threats regarding transportation infrastructure, facilities, or systems detected by a variety of methods (sensors, surveillance, threat analysis of advisories from outside agencies, etc.

**Logical Architecture Data Flow(s):**  
taas-threat\_info

**Emergency Management** => **Archived Data Management**

**Physical Architecture Flow Name:** emergency archive data

Logged emergency information including information that characterizes identified incidents (routine highway incidents through disasters), corresponding incident response information, evacuation information, surveillance data, threat data, and resource information. Content may include a catalog of available information, the actual information to be archived, and associated meta data that describes the archived information.

**Logical Architecture Data Flow(s):**  
em\_archive\_data

**Emergency Management** => **Border Inspection Systems**

**Physical Architecture Flow Name:** border incident response status

Status of the current incident response at a border crossing, including a summary of incident status and its impact on the transportation system, traffic management strategies implemented at the site (e.g., closures, diversions, traffic signal control overrides), and current and planned response activities.

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**Logical Architecture Data Flow(s):**  
tbis-border\_incident\_information

**Emergency Management** => **Care Facility**

**Physical Architecture Flow Name:** care facility status request  
Request for information regarding care facility availability and status.

**Logical Architecture Data Flow(s):**  
tcf-care\_facility\_status\_request  
tcf-care\_facility\_disaster\_data  
tcf-care\_facility\_status\_request\_for\_disaster

**Emergency Management** => **Emergency Personnel**

**Physical Architecture Flow Name:** incident command information presentation  
Presentation of information to emergency personnel in the field that supports local tactical decision-making within an incident command system structure.

**Logical Architecture Data Flow(s):**  
tep-incident\_command\_information\_presentation

**Emergency Management** => **Emergency System Operator**

**Physical Architecture Flow Name:** emergency operations status  
Presentation of information to the operator including emergency operations data, supporting a range of emergency operating positions including call taker, dispatch, emergency operations, security monitoring, and various other operations and communications center operator positions.

**Logical Architecture Data Flow(s):**  
teso-secure\_area\_sensor\_surveillance\_information  
teso-emergency\_vehicle\_dispatch\_failure  
teso-alerts\_and\_advisories  
teso-emergency\_request  
teso-emergency\_routing\_information  
teso-wide\_area\_alert\_status  
teso-emergency\_data\_output  
teso-emergency\_action\_log\_output  
teso-image\_match  
teso-archive\_status

**Emergency Management** => **Emergency Telecommunications System**

**Physical Architecture Flow Name:** incident information for public  
Report of current desensitized incident information prepared for public dissemination through the telecommunications system.

**Logical Architecture Data Flow(s):**  
tets-incident\_information\_dissemination

**Physical Architecture Flow Name:** incident notification response  
Interactive acknowledgement and verification of the incident information received, requests for additional information, and general information on incident response status.

**Logical Architecture Data Flow(s):**  
tets-incident\_acknowledge

**Emergency Management** => **Emergency Vehicle**

## Emergency Management

**Physical Architecture Flow Name:** decision support information

Information provided to support effective and safe incident response, including local traffic, road, and weather conditions, hazardous material information, and the current status of resources that have been allocated to an incident.

**Logical Architecture Data Flow(s):**

local\_decision\_support

**Physical Architecture Flow Name:** emergency dispatch requests

Emergency vehicle dispatch instructions including incident location and available information concerning the incident.

**Logical Architecture Data Flow(s):**

emergency\_vehicle\_dispatch\_request

**Physical Architecture Flow Name:** suggested route

Suggested route for a dispatched emergency or maintenance vehicle that may reflect current network conditions and the additional routing options available to en route emergency or maintenance vehicles that are not available to the general public.

**Logical Architecture Data Flow(s):**

emergency\_vehicle\_suggested\_route

**Emergency Management** => **Event Promoters**

**Physical Architecture Flow Name:** event confirmation

Confirmation that special event details have been received and processed.

**Logical Architecture Data Flow(s):**

tevp-planned\_event\_confirmation

**Emergency Management** => **Fleet and Freight Management**

**Physical Architecture Flow Name:** disable commercial vehicle

A request that a specific commercial vehicle should be safely disabled.

**Logical Architecture Data Flow(s):**

disable\_commercial\_vehicle

**Physical Architecture Flow Name:** hazmat information request

Request for information about a particular hazmat load.

**Logical Architecture Data Flow(s):**

cf\_hazmat\_request

**Emergency Management** => **Information Service Provider**

**Physical Architecture Flow Name:** alert notification

Notification of a major emergency such as a natural or man-made disaster, civil emergency, or child abduction for distribution to the public. The flow identifies the alert originator, the nature of the emergency, the geographic area affected by the emergency, the effective time period, and information and instructions necessary for the public to respond to the alert. This flow may also identify specific information that should not be released to the public.

**Logical Architecture Data Flow(s):**

wide\_area\_alert\_notification\_for\_travelers  
deactivate\_traveler\_information\_restrictions\_for\_travelers  
traveler\_information\_restrictions\_for\_travelers

## Emergency Management

**Physical Architecture Flow Name:** evacuation information

Evacuation instructions and information including evacuation zones, evacuation times, and reentry times.

**Logical Architecture Data Flow(s):**

evacuation\_data\_for\_isp

**Physical Architecture Flow Name:** incident information

Notification of existence of incident and expected severity, location, time and nature of incident. As additional information is gathered and the incident evolves, updated incident information is provided. Incidents include any event that impacts transportation system operation ranging from routine incidents (e.g., disabled vehicle at the side of the road) through large-scale natural or human-caused disasters that involve loss of life, injuries, extensive property damage, and multi-jurisdictional response. This also includes special events, closures, and other planned events that may impact the transportation system.

**Logical Architecture Data Flow(s):**

incident\_information

**Physical Architecture Flow Name:** transportation system status

Current status and condition of transportation infrastructure (e.g., tunnels, bridges, interchanges, TMC offices, maintenance facilities). In case of disaster or major incident, this flow provides an assessment of damage sustained by the surface transportation system including location and extent of the damage, estimate of remaining capacity and necessary restrictions, and time frame for repair and recovery.

**Logical Architecture Data Flow(s):**

disaster\_transportation\_system\_status\_for\_isp  
evacuation\_transportation\_system\_status\_for\_isp

## Emergency Management

=>

## Maintenance and Construction Management

**Physical Architecture Flow Name:** alert notification

Notification of a major emergency such as a natural or man-made disaster, civil emergency, or child abduction for distribution to the public. The flow identifies the alert originator, the nature of the emergency, the geographic area affected by the emergency, the effective time period, and information and instructions necessary for the public to respond to the alert. This flow may also identify specific information that should not be released to the public.

**Logical Architecture Data Flow(s):**

wide\_area\_alert\_notification\_for\_maint

**Physical Architecture Flow Name:** emergency plan coordination

Information that supports coordination of emergency management plans, continuity of operations plans, emergency response and recovery plans, evacuation plans, and other emergency plans between agencies. This includes general plans that are coordinated prior to an incident and shorter duration tactical plans that are prepared during an incident.

**Logical Architecture Data Flow(s):**

disaster\_response\_plan\_coordination\_to\_m\_and\_c  
evacuation\_plan\_coordination\_to\_m\_and\_c

**Physical Architecture Flow Name:** evacuation information

Evacuation instructions and information including evacuation zones, evacuation times, and reentry times.

**Logical Architecture Data Flow(s):**

evacuation\_information\_for\_m\_and\_c

**Physical Architecture Flow Name:** incident information

Notification of existence of incident and expected severity, location, time and nature of

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incident. As additional information is gathered and the incident evolves, updated incident information is provided. Incidents include any event that impacts transportation system operation ranging from routine incidents (e.g., disabled vehicle at the side of the road) through large-scale natural or human-caused disasters that involve loss of life, injuries, extensive property damage, and multi-jurisdictional response. This also includes special events, closures, and other planned events that may impact the transportation system.

**Logical Architecture Data Flow(s):**

incident\_info\_from\_emerg

**Physical Architecture Flow Name:** incident response status

Status of the current incident response including a summary of incident status and its impact on the transportation system, traffic management strategies implemented at the site (e.g., closures, diversions, traffic signal control overrides), and current and planned response activities.

**Logical Architecture Data Flow(s):**

incident\_response\_status\_from\_emerg

**Physical Architecture Flow Name:** maint and constr resource request

Request for road maintenance and construction resources that can be used in the diversion of traffic (cones, portable signs), clearance of a road hazard, repair of ancillary damage, or any other incident response. The request may poll for resource availability or request pre-staging, staging, or immediate dispatch of resources.

**Logical Architecture Data Flow(s):**

m\_and\_c\_resource\_request\_from\_emerg  
m\_and\_c\_evacuation\_resource\_request  
roadway\_maint\_action\_req\_from\_emerg

**Physical Architecture Flow Name:** security field equipment status

Identification of security sensors and surveillance equipment requiring repair and known information about the associated faults.

**Logical Architecture Data Flow(s):**

security\_surveillance equip\_status\_for\_m\_and\_c  
security\_sensor equip\_status\_for\_m\_and\_c

**Physical Architecture Flow Name:** threat information

Threats regarding transportation infrastructure, facilities, or systems detected by a variety of methods (sensors, surveillance, threat analysis of advisories from outside agencies, etc).

**Logical Architecture Data Flow(s):**

threat\_info\_for\_maint

**Physical Architecture Flow Name:** transportation system status

Current status and condition of transportation infrastructure (e.g., tunnels, bridges, interchanges, TMC offices, maintenance facilities). In case of disaster or major incident, this flow provides an assessment of damage sustained by the surface transportation system including location and extent of the damage, estimate of remaining capacity and necessary restrictions, and time frame for repair and recovery.

**Logical Architecture Data Flow(s):**

m\_and\_c\_transportation\_system\_status\_for\_disaster  
m\_and\_c\_transportation\_system\_status\_for\_evacuation  
infrastructure\_integrity\_status\_for\_maint

**Physical Architecture Flow Name:** work plan feedback

Comments and suggested changes to proposed construction and maintenance work schedules and activities. This information influences work plan schedules so that they minimize impact to other system operations and the overall transportation system.

**Logical Architecture Data Flow(s):**

m\_and\_c\_plan\_feedback\_from\_emerg



## Emergency Management

### Emergency Management => Map Update Provider

**Physical Architecture Flow Name:** map update request

Request for a map update which could include a new underlying map or map layer updates.

**Logical Architecture Data Flow(s):**

tmup-emergency\_route\_map\_request  
tmup-request\_emergency\_display\_update

### Emergency Management => Media

**Physical Architecture Flow Name:** incident information for media

Report of current desensitized incident information prepared for public dissemination through the media.

**Logical Architecture Data Flow(s):**

tm-emergency\_information

### Emergency Management => Other Emergency Management

**Physical Architecture Flow Name:** alert notification coordination

Coordination of emergency alerts to be distributed to the public. This includes notification of a major emergency such as a natural or man-made disaster, civil emergency, or child abduction for distribution to the public and status of the public notification.

**Logical Architecture Data Flow(s):**

toem-alert\_notification\_status  
toem-wide\_area\_alert\_notification

**Physical Architecture Flow Name:** emergency plan coordination

Information that supports coordination of emergency management plans, continuity of operations plans, emergency response and recovery plans, evacuation plans, and other emergency plans between agencies. This includes general plans that are coordinated prior to an incident and shorter duration tactical plans that are prepared during an incident.

**Logical Architecture Data Flow(s):**

toem-evacuation\_plan\_coordination  
toem-disaster\_response\_plan\_coordination

**Physical Architecture Flow Name:** evacuation coordination

Coordination of information regarding a pending or in-process evacuation. Includes evacuation zones, evacuation times, evacuation routes, forecast network conditions, and reentry times.

**Logical Architecture Data Flow(s):**

toem-evacuation\_status  
toem-evacuation\_information\_for\_other\_em

**Physical Architecture Flow Name:** incident command information coordination

Information that supports local management of an incident. It includes resource deployment status, hazardous material information, traffic, road, and weather conditions, evacuation advice, and other information that enables emergency or maintenance personnel in the field to implement an effective, safe incident response.

**Logical Architecture Data Flow(s):**

toem-incident\_command\_information\_coordination

**Physical Architecture Flow Name:** incident report

Report of an identified incident including incident location, type, severity and other information necessary to initiate an appropriate incident response.

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### Logical Architecture Data Flow(s):

toem-incident\_details  
toem-mayday\_emergency\_data

**Physical Architecture Flow Name:** incident response coordination

Incident response procedures and current incident response status that are shared between allied response agencies to support a coordinated response to incidents. This flow provides current situation information, including a summary of incident status and its impact on the transportation system and other infrastructure, and current and planned response activities. This flow also coordinates a positive hand off of responsibility for all or part of an incident response between agencies.

### Logical Architecture Data Flow(s):

toem-response\_for\_emergency\_support  
toem-incident\_response\_coordination  
toem-request\_for\_emergency\_support

**Physical Architecture Flow Name:** resource coordination

Coordination of resource inventory information, specific resource status information, resource prioritization and reallocation between jurisdictions, and specific requests for resources and responses that service those requests.

### Logical Architecture Data Flow(s):

toem-evacuation\_resource\_response  
toem-emergency\_resource\_request  
toem-emergency\_resource\_response  
toem-evacuation\_resource\_request

**Physical Architecture Flow Name:** threat information coordination

Sensor, surveillance, and threat data including raw and processed data that is collected by sensor and surveillance equipment located in secure areas.

### Logical Architecture Data Flow(s):

toem-verified\_image\_match  
toem-threat\_info  
toem-threat\_analysis\_results  
toem-secure\_area\_surveillance  
toem-secure\_area\_sensor\_data

**Physical Architecture Flow Name:** transportation system status

Current status and condition of transportation infrastructure (e.g., tunnels, bridges, interchanges, TMC offices, maintenance facilities). In case of disaster or major incident, this flow provides an assessment of damage sustained by the surface transportation system including location and extent of the damage, estimate of remaining capacity and necessary restrictions, and time frame for repair and recovery.

### Logical Architecture Data Flow(s):

toem-transportation\_system\_status\_for\_evacuation  
toem-transportation\_system\_status\_for\_disaster

## Emergency Management

=> **Payment Administration**

**Physical Architecture Flow Name:** alert notification

Notification of a major emergency such as a natural or man-made disaster, civil emergency, or child abduction for distribution to the public. The flow identifies the alert originator, the nature of the emergency, the geographic area affected by the emergency, the effective time period, and information and instructions necessary for the public to respond to the alert. This flow may also identify specific information that should not be released to the public.

### Logical Architecture Data Flow(s):

wide\_area\_alert\_notification\_for\_tolls

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**Physical Architecture Flow Name:** toll service change request

Request to change pricing, modify restrictions, or modify operations of a toll road facility

**Logical Architecture Data Flow(s):**  
evacuation\_toll\_change\_request

**Emergency Management** => **Personal Information Access**

**Physical Architecture Flow Name:** emergency acknowledge

Acknowledge request for emergency assistance and provide additional details regarding actions and verification requirements.

**Logical Architecture Data Flow(s):**  
emergency\_request\_personal\_traveler\_acknowledge

**Emergency Management** => **Public Health System**

**Physical Architecture Flow Name:** public health request

Request for specific information or recommended response concerning an emergency involving biological or other medically related emergency.

**Logical Architecture Data Flow(s):**  
tphs-public\_health\_evacuation\_request  
tphs-public\_health\_request

**Emergency Management** => **Rail Operations**

**Physical Architecture Flow Name:** emergency plan coordination

Information that supports coordination of emergency management plans, continuity of operations plans, emergency response and recovery plans, evacuation plans, and other emergency plans between agencies. This includes general plans that are coordinated prior to an incident and shorter duration tactical plans that are prepared during an incident.

**Logical Architecture Data Flow(s):**  
tro-evacuation\_plan\_coordination  
tro-disaster\_response\_plan\_coordination

**Physical Architecture Flow Name:** evacuation information

Evacuation instructions and information including evacuation zones, evacuation times, and reentry times.

**Logical Architecture Data Flow(s):**  
tro-evacuation\_information\_for\_rail

**Physical Architecture Flow Name:** incident information

Notification of existence of incident and expected severity, location, time and nature of incident. As additional information is gathered and the incident evolves, updated incident information is provided. Incidents include any event that impacts transportation system operation ranging from routine incidents (e.g., disabled vehicle at the side of the road) through large-scale natural or human-caused disasters that involve loss of life, injuries, extensive property damage, and multi-jurisdictional response. This also includes special events, closures, and other planned events that may impact the transportation system.

**Logical Architecture Data Flow(s):**  
tro-incident\_information

**Physical Architecture Flow Name:** incident response status

Status of the current incident response including a summary of incident status and its impact on the transportation system, traffic management strategies implemented at the site (e.g.,

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closures, diversions, traffic signal control overrides), and current and planned response activities.

### Logical Architecture Data Flow(s):

tro-incident\_response\_status

**Physical Architecture Flow Name:** threat information

Threats regarding transportation infrastructure, facilities, or systems detected by a variety of methods (sensors, surveillance, threat analysis of advisories from outside agencies, etc.

### Logical Architecture Data Flow(s):

tro-threat\_info

**Physical Architecture Flow Name:** transportation system status

Current status and condition of transportation infrastructure (e.g., tunnels, bridges, interchanges, TMC offices, maintenance facilities). In case of disaster or major incident, this flow provides an assessment of damage sustained by the surface transportation system including location and extent of the damage, estimate of remaining capacity and necessary restrictions, and time frame for repair and recovery.

### Logical Architecture Data Flow(s):

tro-transportation\_system\_status\_for\_disaster  
tro-transportation\_system\_status\_for\_evacuation

**Emergency Management** => **Remote Traveler Support**

**Physical Architecture Flow Name:** alarm acknowledge

Confirmation that alarm was received, instructions and additional information for the alarm initiator, and requests for additional information.

### Logical Architecture Data Flow(s):

traveler\_alarm\_acknowledge  
secure\_area\_traveler\_alarm\_response

**Physical Architecture Flow Name:** secure area sensor control

Information used to configure and control threat sensors (e.g., thermal, acoustic, radiological, chemical), object, motion and intrusion detection sensors. The provided information controls sensor data collection, aggregation, filtering, and other local processing.

### Logical Architecture Data Flow(s):

traveler\_threat\_sensor\_control  
traveler\_intrusion\_motion\_sensor\_control  
traveler\_object\_detection\_sensor\_control  
traveler\_sensor\_field\_proc\_parameters

**Physical Architecture Flow Name:** secure area surveillance control

Information used to configure and control audio and video surveillance systems used for transportation infrastructure security in secure areas. The provided information controls surveillance data collection, aggregation, filtering, and other local processing.

### Logical Architecture Data Flow(s):

traveler\_surveillance\_field\_proc\_parameters  
traveler\_secure\_area\_surveillance\_control

**Emergency Management** => **Security Monitoring**

**Physical Architecture Flow Name:** infrastructure monitoring sensor control

Data used to configure and control infrastructure monitoring sensors.

### Logical Architecture Data Flow(s):

infrastructure\_integrity\_sensor\_control

**Physical Architecture Flow Name:** secure area sensor control

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Information used to configure and control threat sensors (e.g., thermal, acoustic, radiological, chemical), object, motion and intrusion detection sensors. The provided information controls sensor data collection, aggregation, filtering, and other local processing.

### Logical Architecture Data Flow(s):

- object\_detection\_sensor\_control
- secure\_area\_sensor\_field\_proc\_parameters
- threat\_sensor\_control
- intrusion\_motion\_sensor\_control

**Physical Architecture Flow Name:** secure area surveillance control

Information used to configure and control audio and video surveillance systems used for transportation infrastructure security in secure areas. The provided information controls surveillance data collection, aggregation, filtering, and other local processing.

### Logical Architecture Data Flow(s):

- secure\_area\_surveillance\_field\_proc\_parameters
- secure\_area\_surveillance\_control

**Emergency Management** ==> **Shelter Providers**

**Physical Architecture Flow Name:** evacuation information

Evacuation instructions and information including evacuation zones, evacuation times, and reentry times.

### Logical Architecture Data Flow(s):

- tsp-shelter\_evacuation\_information
- tsp-shelter\_information\_request

**Emergency Management** ==> **Surface Transportation Weather Service**

**Physical Architecture Flow Name:** transportation weather information request

A request for transportation weather information that may specify the area of interest (a geographic region, particular routes within a region, specific road segments), the type of information that is required, the desired spatial resolution of the information, and time horizon.

### Logical Architecture Data Flow(s):

- tstws-trans\_weather\_info\_request

**Emergency Management** ==> **Traffic Management**

**Physical Architecture Flow Name:** alert notification

Notification of a major emergency such as a natural or man-made disaster, civil emergency, or child abduction for distribution to the public. The flow identifies the alert originator, the nature of the emergency, the geographic area affected by the emergency, the effective time period, and information and instructions necessary for the public to respond to the alert. This flow may also identify specific information that should not be released to the public.

### Logical Architecture Data Flow(s):

- wide\_area\_alert\_notification\_for\_traffic
- traveler\_information\_restrictions\_for\_traffic
- deactivate\_traveler\_information\_restrictions\_for\_traffic

**Physical Architecture Flow Name:** emergency plan coordination

Information that supports coordination of emergency management plans, continuity of operations plans, emergency response and recovery plans, evacuation plans, and other emergency plans between agencies. This includes general plans that are coordinated prior to an incident and shorter duration tactical plans that are prepared during an incident.

### Logical Architecture Data Flow(s):

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evacuation\_plan\_coordination\_to\_traffic  
disaster\_response\_plan\_coordination\_to\_traffic

**Physical Architecture Flow Name:** emergency route request

Request for access routes for emergency response vehicles and equipment. This may be a request for ingress or egress routes or other emergency routes.

**Logical Architecture Data Flow(s):**  
emergency\_route\_request

**Physical Architecture Flow Name:** emergency traffic control request

Special request to preempt the current traffic control strategy in effect at one or more signalized intersections or highway segments, activate traffic control and closure systems such as gates and barriers, activate safeguard systems, or use driver information systems. For example, this flow can request all signals to red-flash, request a progression of traffic control preemptions along an emergency vehicle route, request a specific evacuation traffic control plan, request activation of a road closure barrier system, or place a public safety or emergency-related message on a dynamic message sign.

**Logical Architecture Data Flow(s):**  
roadway\_information\_data\_to\_traffic  
barrier\_system\_activation\_request\_from\_emerg  
safeguard\_system\_activation\_request\_from\_emerg  
emergency\_traffic\_control\_request

**Physical Architecture Flow Name:** evacuation information

Evacuation instructions and information including evacuation zones, evacuation times, and reentry times.

**Logical Architecture Data Flow(s):**  
evacuation\_information\_for\_traffic\_management

**Physical Architecture Flow Name:** incident information

Notification of existence of incident and expected severity, location, time and nature of incident. As additional information is gathered and the incident evolves, updated incident information is provided. Incidents include any event that impacts transportation system operation ranging from routine incidents (e.g., disabled vehicle at the side of the road) through large-scale natural or human-caused disasters that involve loss of life, injuries, extensive property damage, and multi-jurisdictional response. This also includes special events, closures, and other planned events that may impact the transportation system.

**Logical Architecture Data Flow(s):**  
incident\_details

**Physical Architecture Flow Name:** incident response status

Status of the current incident response including a summary of incident status and its impact on the transportation system, traffic management strategies implemented at the site (e.g., closures, diversions, traffic signal control overrides), and current and planned response activities.

**Logical Architecture Data Flow(s):**  
incident\_response\_status

**Physical Architecture Flow Name:** remote surveillance control

The control commands used to remotely operate another center's sensors or surveillance equipment so that roadside surveillance assets can be shared by more than one agency.

**Logical Architecture Data Flow(s):**  
remote\_video\_image\_control

**Physical Architecture Flow Name:** resource deployment status

Status of resource deployment identifying the resources (vehicles, equipment, materials, and personnel) available and their current status. General resource inventory information and

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specific status of deployed resources may be included.

### **Logical Architecture Data Flow(s):**

em\_resource\_response\_to\_traffic

**Physical Architecture Flow Name:** resource request

A request for resources to implement special traffic control measures, assist in clean up, verify an incident, etc. The request may poll for resource availability or request pre-staging, staging, or immediate deployment of resources. Resources may be explicitly requested or a service may be requested and the specific resource deployment may be determined by the responding agency.

### **Logical Architecture Data Flow(s):**

traffic\_evacuation\_resource\_request  
resource\_request

**Physical Architecture Flow Name:** road closure notification

Notification that agency personnel have closed a road due to adverse weather, major incident, or other reason.

### **Logical Architecture Data Flow(s):**

roadway\_closure\_from\_emergency

**Physical Architecture Flow Name:** threat information

Threats regarding transportation infrastructure, facilities, or systems detected by a variety of methods (sensors, surveillance, threat analysis of advisories from outside agencies, etc.

### **Logical Architecture Data Flow(s):**

threat\_info\_for\_traffic

**Physical Architecture Flow Name:** transportation system status

Current status and condition of transportation infrastructure (e.g., tunnels, bridges, interchanges, TMC offices, maintenance facilities). In case of disaster or major incident, this flow provides an assessment of damage sustained by the surface transportation system including location and extent of the damage, estimate of remaining capacity and necessary restrictions, and time frame for repair and recovery.

### **Logical Architecture Data Flow(s):**

disaster\_transportation\_system\_status\_for\_traffic  
infrastructure\_integrity\_status\_for\_traffic  
evacuation\_transportation\_system\_status\_for\_traffic

**Emergency Management** => **Transit Management**

**Physical Architecture Flow Name:** alert notification

Notification of a major emergency such as a natural or man-made disaster, civil emergency, or child abduction for distribution to the public. The flow identifies the alert originator, the nature of the emergency, the geographic area affected by the emergency, the effective time period, and information and instructions necessary for the public to respond to the alert. This flow may also identify specific information that should not be released to the public.

### **Logical Architecture Data Flow(s):**

wide\_area\_alert\_notification\_for\_transit  
deactivate\_traveler\_information\_restrictions\_for\_transit  
traveler\_information\_restrictions\_for\_transit

**Physical Architecture Flow Name:** emergency plan coordination

Information that supports coordination of emergency management plans, continuity of operations plans, emergency response and recovery plans, evacuation plans, and other emergency plans between agencies. This includes general plans that are coordinated prior to an incident and shorter duration tactical plans that are prepared during an incident.

### **Logical Architecture Data Flow(s):**

evacuation\_plan\_coordination\_to\_transit

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disaster\_response\_plan\_coordination\_to\_transit

**Physical Architecture Flow Name:** emergency transit service request

Request to modify transit service and fare schedules to address emergencies, including requests for transit services to evacuate people from and/or deploy response agency personnel to an emergency scene. The request may poll for resource availability or request pre-staging, staging, or immediate dispatch of transit resources.

**Logical Architecture Data Flow(s):**

request\_for\_emergency\_transit\_support  
transit\_evacuation\_resource\_request

**Physical Architecture Flow Name:** evacuation information

Evacuation instructions and information including evacuation zones, evacuation times, and reentry times.

**Logical Architecture Data Flow(s):**

evacuation\_information\_for\_transit\_management

**Physical Architecture Flow Name:** incident information

Notification of existence of incident and expected severity, location, time and nature of incident. As additional information is gathered and the incident evolves, updated incident information is provided. Incidents include any event that impacts transportation system operation ranging from routine incidents (e.g., disabled vehicle at the side of the road) through large-scale natural or human-caused disasters that involve loss of life, injuries, extensive property damage, and multi-jurisdictional response. This also includes special events, closures, and other planned events that may impact the transportation system.

**Logical Architecture Data Flow(s):**

emergency\_data\_for\_transit

**Physical Architecture Flow Name:** incident response status

Status of the current incident response including a summary of incident status and its impact on the transportation system, traffic management strategies implemented at the site (e.g., closures, diversions, traffic signal control overrides), and current and planned response activities.

**Logical Architecture Data Flow(s):**

incident\_response\_status\_to\_transit  
transit\_incident\_coordination\_data

**Physical Architecture Flow Name:** threat information

Threats regarding transportation infrastructure, facilities, or systems detected by a variety of methods (sensors, surveillance, threat analysis of advisories from outside agencies, etc).

**Logical Architecture Data Flow(s):**

threat\_info\_for\_transit

**Physical Architecture Flow Name:** transportation system status

Current status and condition of transportation infrastructure (e.g., tunnels, bridges, interchanges, TMC offices, maintenance facilities). In case of disaster or major incident, this flow provides an assessment of damage sustained by the surface transportation system including location and extent of the damage, estimate of remaining capacity and necessary restrictions, and time frame for repair and recovery.

**Logical Architecture Data Flow(s):**

infrastructure\_integrity\_status\_for\_transit  
evacuation\_transportation\_system\_status\_for\_transit  
disaster\_transportation\_system\_status\_for\_transit

**Emergency Management** ==> **Transit Vehicle**

**Physical Architecture Flow Name:** alarm acknowledge



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Confirmation that alarm was received, instructions and additional information for the alarm initiator, and requests for additional information.

### Logical Architecture Data Flow(s):

on\_board\_traveler\_alarm\_response  
secure\_transit\_vehicle\_alarm\_acknowledge

**Physical Architecture Flow Name:** secure area sensor control

Information used to configure and control threat sensors (e.g., thermal, acoustic, radiological, chemical), object, motion and intrusion detection sensors. The provided information controls sensor data collection, aggregation, filtering, and other local processing.

### Logical Architecture Data Flow(s):

vehicle\_secure\_area\_sensor\_field\_proc\_parameters  
vehicle\_threat\_sensor\_control  
vehicle\_object\_detection\_sensor\_control

**Physical Architecture Flow Name:** secure area surveillance control

Information used to configure and control audio and video surveillance systems used for transportation infrastructure security in secure areas. The provided information controls surveillance data collection, aggregation, filtering, and other local processing.

### Logical Architecture Data Flow(s):

vehicle\_secure\_area\_surveillance\_control  
vehicle\_secure\_area\_surveillance\_field\_proc\_parameters

**Emergency Management** => **Vehicle**

**Physical Architecture Flow Name:** emergency acknowledge

Acknowledge request for emergency assistance and provide additional details regarding actions and verification requirements.

### Logical Architecture Data Flow(s):

emergency\_request\_vehicle\_acknowledge  
emergency\_request\_driver\_acknowledge

**Physical Architecture Flow Name:** emergency data request

A request for additional information or a control command issued by the emergency response agency in response to an emergency request for assistance from a traveler.

### Logical Architecture Data Flow(s):

emergency\_data\_request  
vehicle\_security\_system\_commands

**Emergency Personnel** => **Emergency Management**

**Physical Architecture Flow Name:** incident command inputs

User input from emergency personnel including incident command status, incident information and resource coordination.

### Logical Architecture Data Flow(s):

fep-incident\_command\_inputs

**Emergency System Operator** => **Emergency Management**

**Physical Architecture Flow Name:** emergency operations inputs

Emergency operator inputs supporting call taking, dispatch, emergency operations, security monitoring, and other operations and communications center operator functions.

### Logical Architecture Data Flow(s):

feso-image\_processing\_parameters  
feso-alerts\_and\_advisories

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feso-emergency\_display\_update\_request  
feso-emergency\_action\_log\_request  
feso-emergency\_response  
feso-secure\_area\_sensor\_surveillance\_control  
feso-emergency\_data\_input  
feso-emergency\_allocation\_override  
feso-emergency\_data\_output\_request  
feso-archive\_commands  
feso-emergency\_routing\_input

### **Emergency Telecommunications System** => **Emergency Management**

**Physical Architecture Flow Name:** incident notification

The notification of an incident including its nature, severity, and location.

**Logical Architecture Data Flow(s):**

fets-caller\_information  
fets-incident\_information

### **Emergency Vehicle** => **Emergency Management**

**Physical Architecture Flow Name:** emergency dispatch response

Request for additional emergency dispatch information and provision of en route status.

**Logical Architecture Data Flow(s):**

emergency\_vehicle\_dispatch\_response

**Physical Architecture Flow Name:** emergency vehicle tracking data

The current location and operating status of the emergency vehicle.

**Logical Architecture Data Flow(s):**

emergency\_vehicle\_tracking\_data

**Physical Architecture Flow Name:** incident status

Information gathered at the incident site that more completely characterizes the incident and provides current incident response status.

**Logical Architecture Data Flow(s):**

incident\_status\_update

### **Event Promoters** => **Emergency Management**

**Physical Architecture Flow Name:** event plans

Plans for major events possibly impacting traffic.

**Logical Architecture Data Flow(s):**

fevp-planned\_event\_data

### **Fleet and Freight Management** => **Emergency Management**

**Physical Architecture Flow Name:** alarm

Information about a Commercial Vehicle or Freight Equipment breach, non-permitted security sensitive hazmat detected at the roadside, route deviation, or Commercial Vehicle Driver / Commercial Vehicle / Freight Equipment assignment mismatches which includes the location of the Commercial Vehicle and appropriate identities.

**Logical Architecture Data Flow(s):**

freight\_alarm  
cvo\_alarm

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**Physical Architecture Flow Name:** hazmat information

Information about a particular hazmat load including nature of the load and unloading instructions. May also include hazmat vehicle route and route update information.

**Logical Architecture Data Flow(s):**

cf\_hazmat\_route\_information  
cf\_hazmat\_vehicle\_information

**Information Service Provider** => **Emergency Management**

**Physical Architecture Flow Name:** alert status

Information indicating the current status of the emergency alert including identification of the traveler and driver information systems that are being used to provide the alert.

**Logical Architecture Data Flow(s):**

alert\_notification\_status\_from\_travelers

**Physical Architecture Flow Name:** transportation information for operations

Information on the state of transportation system operations including traffic and road conditions, advisories, incidents, transit service information, weather information, parking information, and other related data.

**Logical Architecture Data Flow(s):**

transportation\_information\_for\_evac\_operations  
transportation\_information\_for\_emerg\_operations  
transportation\_information\_for\_emerg\_routing  
transportation\_information\_for\_disaster\_operations

**Maintenance and Construction Management** => **Emergency Management**

**Physical Architecture Flow Name:** alert status

Information indicating the current status of the emergency alert including identification of the traveler and driver information systems that are being used to provide the alert.

**Logical Architecture Data Flow(s):**

alert\_notification\_status\_from\_maint

**Physical Architecture Flow Name:** current asset restrictions

Restrictions levied on transportation asset usage based on infrastructure design, surveys, tests, or analyses. This includes standard facility design height, width, and weight restrictions, special restrictions such as spring weight restrictions, and temporary facility restrictions that are imposed during maintenance and construction.

**Logical Architecture Data Flow(s):**

asset\_restrictions\_for\_emerg  
asset\_restrictions\_for\_em\_response

**Physical Architecture Flow Name:** emergency plan coordination

Information that supports coordination of emergency management plans, continuity of operations plans, emergency response and recovery plans, evacuation plans, and other emergency plans between agencies. This includes general plans that are coordinated prior to an incident and shorter duration tactical plans that are prepared during an incident.

**Logical Architecture Data Flow(s):**

evacuation\_plan\_coordination\_from\_m\_and\_c  
disaster\_response\_plan\_coordination\_from\_m\_and\_c

**Physical Architecture Flow Name:** incident information

Notification of existence of incident and expected severity, location, time and nature of incident. As additional information is gathered and the incident evolves, updated incident

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information is provided. Incidents include any event that impacts transportation system operation ranging from routine incidents (e.g., disabled vehicle at the side of the road) through large-scale natural or human-caused disasters that involve loss of life, injuries, extensive property damage, and multi-jurisdictional response. This also includes special events, closures, and other planned events that may impact the transportation system.

### **Logical Architecture Data Flow(s):**

incident\_info\_for\_emerg

**Physical Architecture Flow Name:** maint and constr resource response

Current status of maintenance and construction resources including availability and deployment status. General resource inventory information covering vehicles, equipment, materials, and people and specific resource deployment status may be included.

### **Logical Architecture Data Flow(s):**

m\_and\_c\_evacuation\_resource\_response

m\_and\_c\_resource\_response\_to\_emerg

**Physical Architecture Flow Name:** maint and constr work plans

Future construction and maintenance work schedules and activities including anticipated closures with anticipated impact to the roadway, alternate routes, anticipated delays, closure times, and durations.

### **Logical Architecture Data Flow(s):**

m\_and\_c\_work\_plans\_for\_emerg

**Physical Architecture Flow Name:** road network status assessment

Assessment of damage sustained by the road network including location and extent of the damage, estimate of remaining capacity, required closures, alternate routes, necessary restrictions, and time frame for repair and recovery.

### **Logical Architecture Data Flow(s):**

m\_and\_c\_status\_assessment\_for\_evacuation

m\_and\_c\_status\_assessment\_for\_disaster

**Physical Architecture Flow Name:** road weather information

Road conditions and weather information that are made available by road maintenance operations to other transportation system operators.

### **Logical Architecture Data Flow(s):**

road\_weather\_info\_for\_emergency

**Physical Architecture Flow Name:** roadway maintenance status

Summary of maintenance fleet operations affecting the road network. This includes the status of winter maintenance (snow plow schedule and current status).

### **Logical Architecture Data Flow(s):**

roadway\_maint\_status\_for\_emerg

**Physical Architecture Flow Name:** security equipment maintenance status

Current status of security surveillance and sensor field equipment maintenance actions.

### **Logical Architecture Data Flow(s):**

security\_sensor equip\_maint\_status

security\_surveillance equip\_maint\_status

**Physical Architecture Flow Name:** work zone information

Summary of maintenance and construction work zone activities affecting the road network including the nature of the maintenance or construction activity, location, impact to the roadway, expected time(s) and duration of impact, anticipated delays, alternate routes, and suggested speed limits. This information may be augmented with images that provide a visual indication of current work zone status and traffic impacts.

## Emergency Management

### **Logical Architecture Data Flow(s):**

work\_zone\_info\_for\_emergency

**Map Update Provider** => **Emergency Management**

**Physical Architecture Flow Name:** map updates

Map update which could include a new underlying static or real-time map or map layer(s) update.

### **Logical Architecture Data Flow(s):**

fmup-emergency\_route\_map\_update

fmup-emergency\_display\_update

**Other Emergency Management** => **Emergency Management**

**Physical Architecture Flow Name:** alert notification coordination

Coordination of emergency alerts to be distributed to the public. This includes notification of a major emergency such as a natural or man-made disaster, civil emergency, or child abduction for distribution to the public and status of the public notification.

### **Logical Architecture Data Flow(s):**

foem-alert\_notification\_status

foem-wide\_area\_alert\_notification

**Physical Architecture Flow Name:** emergency plan coordination

Information that supports coordination of emergency management plans, continuity of operations plans, emergency response and recovery plans, evacuation plans, and other emergency plans between agencies. This includes general plans that are coordinated prior to an incident and shorter duration tactical plans that are prepared during an incident.

### **Logical Architecture Data Flow(s):**

foem-evacuation\_plan\_coordination

foem-disaster\_response\_plan\_coordination

**Physical Architecture Flow Name:** evacuation coordination

Coordination of information regarding a pending or in-process evacuation. Includes evacuation zones, evacuation times, evacuation routes, forecast network conditions, and reentry times.

### **Logical Architecture Data Flow(s):**

foem-evacuation\_information\_from\_other\_em

foem-evacuation\_status

**Physical Architecture Flow Name:** incident command information coordination

Information that supports local management of an incident. It includes resource deployment status, hazardous material information, traffic, road, and weather conditions, evacuation advice, and other information that enables emergency or maintenance personnel in the field to implement an effective, safe incident response.

### **Logical Architecture Data Flow(s):**

foem-incident\_command\_information\_coordination

**Physical Architecture Flow Name:** incident report

Report of an identified incident including incident location, type, severity and other information necessary to initiate an appropriate incident response.

### **Logical Architecture Data Flow(s):**

foem-incident\_details

foem-mayday\_emergency\_data

**Physical Architecture Flow Name:** incident response coordination

Incident response procedures and current incident response status that are shared between allied response agencies to support a coordinated response to incidents. This flow provides

## Emergency Management

current situation information, including a summary of incident status and its impact on the transportation system and other infrastructure, and current and planned response activities. This flow also coordinates a positive hand off of responsibility for all or part of an incident response between agencies.

### **Logical Architecture Data Flow(s):**

- foem-incident\_response\_coordination
- foem-response\_for\_emergency\_support
- foem-request\_for\_emergency\_support

**Physical Architecture Flow Name:** resource coordination

Coordination of resource inventory information, specific resource status information, resource prioritization and reallocation between jurisdictions, and specific requests for resources and responses that service those requests.

### **Logical Architecture Data Flow(s):**

- foem-emergency\_resource\_response
- foem-emergency\_resource\_request
- foem-evacuation\_resource\_request
- foem-evacuation\_resource\_response

**Physical Architecture Flow Name:** threat information coordination

Sensor, surveillance, and threat data including raw and processed data that is collected by sensor and surveillance equipment located in secure areas.

### **Logical Architecture Data Flow(s):**

- foem-verified\_image\_match
- foem-threat\_info
- foem-threat\_analysis\_results
- foem-secure\_area\_sensor\_data
- foem-secure\_area\_surveillance

**Physical Architecture Flow Name:** transportation system status

Current status and condition of transportation infrastructure (e.g., tunnels, bridges, interchanges, TMC offices, maintenance facilities). In case of disaster or major incident, this flow provides an assessment of damage sustained by the surface transportation system including location and extent of the damage, estimate of remaining capacity and necessary restrictions, and time frame for repair and recovery.

### **Logical Architecture Data Flow(s):**

- foem-transportation\_system\_status\_for\_disaster
- foem-transportation\_system\_status\_for\_evacuation

**Physical Architecture Flow Name:** alert status

Information indicating the current status of the emergency alert including identification of the traveler and driver information systems that are being used to provide the alert.

### **Logical Architecture Data Flow(s):**

- alert\_notification\_status\_from\_tolls

**Physical Architecture Flow Name:** toll service change response

Response to toll service change requests indicating level of compliance with request.

### **Logical Architecture Data Flow(s):**

- evacuation\_toll\_change\_response

**Personal Information Access** => **Emergency Management**

**Physical Architecture Flow Name:** emergency notification

An emergency request for assistance automatically initiated by a vehicle or originated by a

## Emergency Management

traveler using an in-vehicle or personal device.

### **Logical Architecture Data Flow(s):**

emergency\_request\_personal\_traveler\_details

## **Public Health System**

=>

## **Emergency Management**

### **Physical Architecture Flow Name:**

public health response

Specific information or recommendation on how to treat or respond to an emergency involving biological or other medically related emergency.

### **Logical Architecture Data Flow(s):**

fphs-public\_health\_evacuation

fphs-public\_health\_response

## **Rail Operations**

=>

## **Emergency Management**

### **Physical Architecture Flow Name:**

emergency plan coordination

Information that supports coordination of emergency management plans, continuity of operations plans, emergency response and recovery plans, evacuation plans, and other emergency plans between agencies. This includes general plans that are coordinated prior to an incident and shorter duration tactical plans that are prepared during an incident.

### **Logical Architecture Data Flow(s):**

fro-evacuation\_plan\_coordination

fro-disaster\_response\_plan\_coordination

### **Physical Architecture Flow Name:**

incident information

Notification of existence of incident and expected severity, location, time and nature of incident. As additional information is gathered and the incident evolves, updated incident information is provided. Incidents include any event that impacts transportation system operation ranging from routine incidents (e.g., disabled vehicle at the side of the road) through large-scale natural or human-caused disasters that involve loss of life, injuries, extensive property damage, and multi-jurisdictional response. This also includes special events, closures, and other planned events that may impact the transportation system.

### **Logical Architecture Data Flow(s):**

fro-rail\_incident\_information

### **Physical Architecture Flow Name:**

rail incident response status

Status of the rail system's response to current incidents.

### **Logical Architecture Data Flow(s):**

fro-rail\_incident\_response\_status

### **Physical Architecture Flow Name:**

rail system status assessment

Assessment of damage sustained by rail lines and associated railroad infrastructure including location and extent of the damage, impact on current operations and necessary restrictions, and time frame for repair and recovery.

### **Logical Architecture Data Flow(s):**

fro-rail\_system\_status\_for\_evacuation

fro-rail\_system\_status\_for\_disaster

### **Physical Architecture Flow Name:**

railroad schedules

Train schedules, maintenance schedules, and other information from the railroad that supports forecast of HRI closures.

### **Logical Architecture Data Flow(s):**

fro-railroad\_schedules\_for\_emergency

### Remote Traveler Support => Emergency Management

**Physical Architecture Flow Name:** alarm notification

Notification of activation of an audible or silent alarm by a traveler in a public area or by a transit vehicle operator using an on-board device.

**Logical Architecture Data Flow(s):**

traveler\_alarm\_request

**Physical Architecture Flow Name:** secure area sensor data

Data provided by threat sensors (e.g., thermal, acoustic, radiological, chemical), and intrusion, motion, and object detection sensors in secure areas indicating the sensor's operational status, raw and processed sensor data, and alarm indicators when a threat has been detected.

**Logical Architecture Data Flow(s):**

traveler\_threat\_sensor\_status  
traveler\_secure\_area\_sensor\_threat\_data  
field\_processed\_traveler\_object\_detection\_sensor\_data  
traveler\_threat\_sensor\_data  
field\_processed\_traveler\_threat\_sensor\_data  
traveler\_intrusion\_motion\_sensor\_data  
traveler\_intrusion\_motion\_sensor\_status  
traveler\_object\_detection\_sensor\_data  
traveler\_object\_detection\_sensor\_status  
field\_processed\_traveler\_intrusion\_motion\_sensor\_data

**Physical Architecture Flow Name:** secure area surveillance data

Data collected from surveillance systems used to monitor secure areas. Includes video, audio, processed surveillance data, equipment operational status, and alarm indicators when a threat has been detected.

**Logical Architecture Data Flow(s):**

traveler\_secure\_area\_images  
traveler\_secure\_area\_surveillance\_status  
field\_processed\_traveler\_secure\_area\_audio  
traveler\_secure\_area\_surveillance\_threat\_data  
field\_processed\_traveler\_secure\_area\_images  
traveler\_secure\_area\_audio

### Security Monitoring => Emergency Management

**Physical Architecture Flow Name:** infrastructure monitoring sensor data

Data read from infrastructure-based sensors that monitor the condition or integrity of transportation infrastructure including bridges, tunnels, interchanges, pavement, culverts, signs, transit rail or guideway, and other roadway infrastructure. Includes sensor data and the operational status of the sensors.

**Logical Architecture Data Flow(s):**

infrastructure\_integrity\_sensor\_status  
field\_processed\_infrastructure\_integrity\_sensor\_data

**Physical Architecture Flow Name:** secure area sensor data

Data provided by threat sensors (e.g., thermal, acoustic, radiological, chemical), and intrusion, motion, and object detection sensors in secure areas indicating the sensor's operational status, raw and processed sensor data, and alarm indicators when a threat has been detected.

**Logical Architecture Data Flow(s):**

object\_detection\_sensor\_status  
object\_detection\_sensor\_data  
intrusion\_motion\_sensor\_data  
threat\_sensor\_data  
field\_processed\_object\_detection\_sensor\_data



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secure\_area\_sensor\_threat\_data  
intrusion\_motion\_sensor\_status  
field\_processed\_threat\_sensor\_data  
infrastructure\_integrity\_sensor\_data  
threat\_sensor\_status  
field\_processed\_intrusion\_motion\_sensor\_data

**Physical Architecture Flow Name:** secure area surveillance data

Data collected from surveillance systems used to monitor secure areas. Includes video, audio, processed surveillance data, equipment operational status, and alarm indicators when a threat has been detected.

**Logical Architecture Data Flow(s):**

secure\_area\_images  
field\_processed\_secure\_area\_images  
field\_processed\_secure\_area\_audio  
secure\_area\_audio  
secure\_area\_surveillance\_threat\_data  
secure\_area\_surveillance\_status

**Shelter Providers** => **Emergency Management**

**Physical Architecture Flow Name:** shelter information

Evacuation shelter information including location, hours of operation, special accommodations, and current vacancy/availability information.

**Logical Architecture Data Flow(s):**

fsp-shelter\_information

**Surface Transportation Weather Service** => **Emergency Management**

**Physical Architecture Flow Name:** transportation weather information

Current and forecast road conditions and weather information (e.g., surface condition, flooding, wind advisories, visibility, etc.) associated with the transportation network. This information is of a resolution, timeliness, and accuracy to be useful in transportation decision making.

**Logical Architecture Data Flow(s):**

fstws-surface\_trans\_weather\_observations  
fstws-surface\_trans\_weather\_forecasts

**Traffic Management** => **Emergency Management**

**Physical Architecture Flow Name:** alert status

Information indicating the current status of the emergency alert including identification of the traveler and driver information systems that are being used to provide the alert.

**Logical Architecture Data Flow(s):**

alert\_notification\_status\_from\_traffic

**Physical Architecture Flow Name:** emergency plan coordination

Information that supports coordination of emergency management plans, continuity of operations plans, emergency response and recovery plans, evacuation plans, and other emergency plans between agencies. This includes general plans that are coordinated prior to an incident and shorter duration tactical plans that are prepared during an incident.

**Logical Architecture Data Flow(s):**

disaster\_response\_plan\_coordination\_from\_traffic  
evacuation\_plan\_coordination\_from\_traffic

**Physical Architecture Flow Name:** emergency routes

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Suggested ingress and egress routes for access to and between the scene and staging areas or other specialized emergency access routes.

**Logical Architecture Data Flow(s):**

emergency\_route\_response

**Physical Architecture Flow Name:** emergency traffic control information

Status of a special traffic control strategy or system activation implemented in response to an emergency traffic control request, a request for emergency access routes, a request for evacuation, a request to activate closure systems, a request to employ driver information systems to support public safety objectives, or other special requests. Identifies the selected traffic control strategy and system control status.

**Logical Architecture Data Flow(s):**

roadway\_information\_status\_from\_traffic  
traffic\_evacuation\_status  
emergency\_traffic\_control\_response  
barrier\_system\_status\_to\_emerg  
safeguard\_system\_status\_to\_emerg

**Physical Architecture Flow Name:** incident information

Notification of existence of incident and expected severity, location, time and nature of incident. As additional information is gathered and the incident evolves, updated incident information is provided. Incidents include any event that impacts transportation system operation ranging from routine incidents (e.g., disabled vehicle at the side of the road) through large-scale natural or human-caused disasters that involve loss of life, injuries, extensive property damage, and multi-jurisdictional response. This also includes special events, closures, and other planned events that may impact the transportation system.

**Logical Architecture Data Flow(s):**

incident\_response\_clear  
wrong\_way\_vehicle\_detection  
planned\_events\_for\_em\_response  
incident\_alert\_details

**Physical Architecture Flow Name:** incident response status

Status of the current incident response including a summary of incident status and its impact on the transportation system, traffic management strategies implemented at the site (e.g., closures, diversions, traffic signal control overrides), and current and planned response

**Logical Architecture Data Flow(s):**

current\_traffic\_incident\_response

**Physical Architecture Flow Name:** resource deployment status

Status of resource deployment identifying the resources (vehicles, equipment, materials, and personnel) available and their current status. General resource inventory information and specific status of deployed resources may be included.

**Logical Architecture Data Flow(s):**

resource\_deployment\_status

**Physical Architecture Flow Name:** resource request

A request for resources to implement special traffic control measures, assist in clean up, verify an incident, etc. The request may poll for resource availability or request pre-staging, staging, or immediate deployment of resources. Resources may be explicitly requested or a service may be requested and the specific resource deployment may be determined by the

**Logical Architecture Data Flow(s):**

em\_resource\_request\_from\_traffic

**Physical Architecture Flow Name:** road network conditions

Current and forecasted traffic information, road and weather conditions, and other road network status. Either raw data, processed data, or some combination of both may be provided by

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this architecture flow. Information on diversions and alternate routes, closures, and special traffic restrictions (lane/shoulder use, weight restrictions, width restrictions, HOV requirements) in effect is included along with a definition of the links, nodes, and routes that make up the road network.

**Logical Architecture Data Flow(s):**

roadway\_detours\_and\_closures\_for\_em  
traffic\_data\_for\_emergency\_services  
traffic\_data\_for\_em\_response  
roadway\_detours\_and\_closures\_for\_em\_response

**Physical Architecture Flow Name:** road network status assessment

Assessment of damage sustained by the road network including location and extent of the damage, estimate of remaining capacity, required closures, alternate routes, necessary restrictions, and time frame for repair and recovery.

**Logical Architecture Data Flow(s):**

network\_status\_from\_traffic\_for\_evacuation  
network\_status\_from\_traffic\_for\_disaster

**Physical Architecture Flow Name:** traffic images

High fidelity, real-time traffic images suitable for surveillance monitoring by the operator or for use in machine vision applications.

**Logical Architecture Data Flow(s):**

incident\_video\_for\_emergency\_services

**Transit Management** => **Emergency Management**

**Physical Architecture Flow Name:** alert status

Information indicating the current status of the emergency alert including identification of the traveler and driver information systems that are being used to provide the alert.

**Logical Architecture Data Flow(s):**

alert\_notification\_status\_from\_transit

**Physical Architecture Flow Name:** emergency plan coordination

Information that supports coordination of emergency management plans, continuity of operations plans, emergency response and recovery plans, evacuation plans, and other emergency plans between agencies. This includes general plans that are coordinated prior to an incident and shorter duration tactical plans that are prepared during an incident.

**Logical Architecture Data Flow(s):**

evacuation\_plan\_coordination\_from\_transit  
disaster\_response\_plan\_coordination\_from\_transit

**Physical Architecture Flow Name:** emergency transit schedule information

Information on transit schedule and service changes that adapt the service to better meet needs of responders and the general public in an emergency situation, including special service schedules supporting evacuation.

**Logical Architecture Data Flow(s):**

transit\_schedule\_information\_during\_evacuation  
transit\_schedule\_information\_during\_emergencies

**Physical Architecture Flow Name:** emergency transit service response

Response indicating changes to transit service, fares, and/or restrictions that will be made and status of transit resources to be deployed to support emergency response and/or evacuation.

**Logical Architecture Data Flow(s):**

transit\_evacuation\_status  
response\_for\_emergency\_transit\_support

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**Physical Architecture Flow Name:** transit emergency data

Initial notification of transit emergency at a transit stop or on transit vehicles and further coordination as additional details become available and the response is coordinated.

**Logical Architecture Data Flow(s):**

transit\_incident\_details  
transit\_emergency\_data  
transit\_coordination\_data

**Physical Architecture Flow Name:** transit system status assessment

Assessment of damage sustained by the public transportation system including location and extent of the damage, current operational status including an estimate of remaining capacity and necessary restrictions, and time frame for repair and recovery.

**Logical Architecture Data Flow(s):**

transit\_system\_status

**Transit Vehicle** => **Emergency Management**

**Physical Architecture Flow Name:** alarm notification

Notification of activation of an audible or silent alarm by a traveler in a public area or by a transit vehicle operator using an on-board device.

**Logical Architecture Data Flow(s):**

secure\_transit\_vehicle\_alarm\_request  
transit\_vehicle\_location\_for\_alarms

**Physical Architecture Flow Name:** secure area sensor data

Data provided by threat sensors (e.g., thermal, acoustic, radiological, chemical), and intrusion, motion, and object detection sensors in secure areas indicating the sensor's operational status, raw and processed sensor data, and alarm indicators when a threat has been detected.

**Logical Architecture Data Flow(s):**

vehicle\_threat\_sensor\_data  
field\_processed\_vehicle\_threat\_sensor\_data  
transit\_vehicle\_location\_for\_sensors  
vehicle\_object\_detection\_sensor\_status  
vehicle\_threat\_sensor\_status  
field\_processed\_vehicle\_object\_detection\_sensor\_data  
vehicle\_secure\_area\_sensor\_threat\_data  
vehicle\_object\_detection\_sensor\_data

**Physical Architecture Flow Name:** secure area surveillance data

Data collected from surveillance systems used to monitor secure areas. Includes video, audio, processed surveillance data, equipment operational status, and alarm indicators when a threat has been detected.

**Logical Architecture Data Flow(s):**

vehicle\_secure\_area\_surveillance\_status  
vehicle\_secure\_area\_audio  
vehicle\_secure\_area\_surveillance\_threat\_data  
field\_processed\_vehicle\_secure\_area\_images  
field\_processed\_vehicle\_secure\_area\_audio  
vehicle\_secure\_area\_images

**Physical Architecture Flow Name:** transit vehicle location data

Current transit vehicle location and related operational conditions data provided by a transit vehicle.

**Logical Architecture Data Flow(s):**

transit\_vehicle\_location\_for\_surveillance\_and\_security

## Emergency Management

**Vehicle** => **Emergency Management**

**Physical Architecture Flow Name:** emergency notification

An emergency request for assistance automatically initiated by a vehicle or originated by a traveler using an in-vehicle or personal device.

**Logical Architecture Data Flow(s):**

- emergency\_request\_driver\_details
- vehicle\_security\_system\_commands\_request
- driver\_status\_update
- vehicle\_status\_update
- emergency\_request\_vehicle\_details

**Weather Service** => **Emergency Management**

**Physical Architecture Flow Name:** weather information

Accumulated forecasted and current weather data (e.g., temperature, pressure, wind speed, wind direction, humidity, precipitation, visibility, light conditions, etc.).

**Logical Architecture Data Flow(s):**

- fws-current\_weather\_observations
- fws-weather\_forecasts

### 2.7.3 *Architecture Flow Diagrams for EM*

# Emergency Management

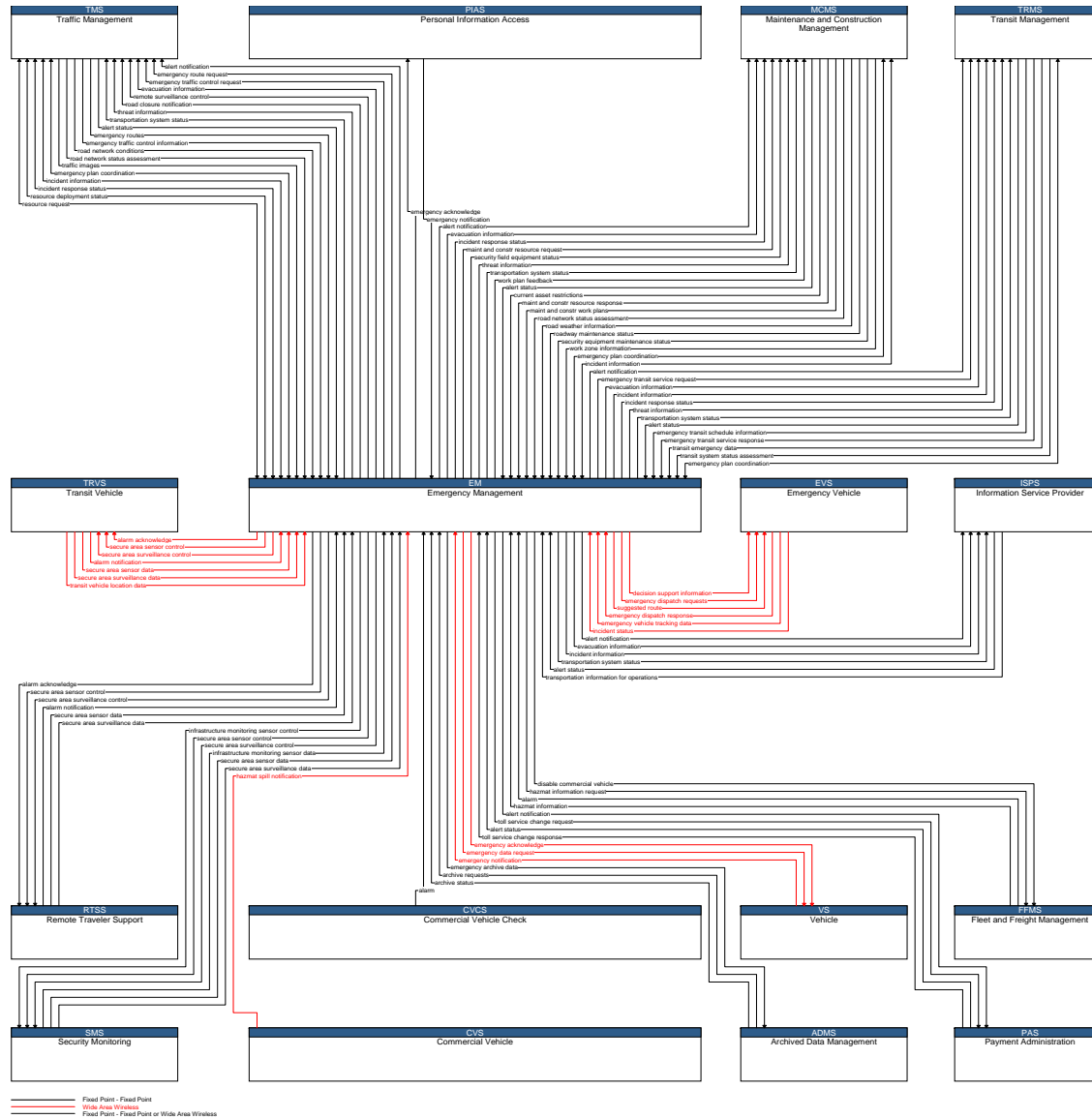
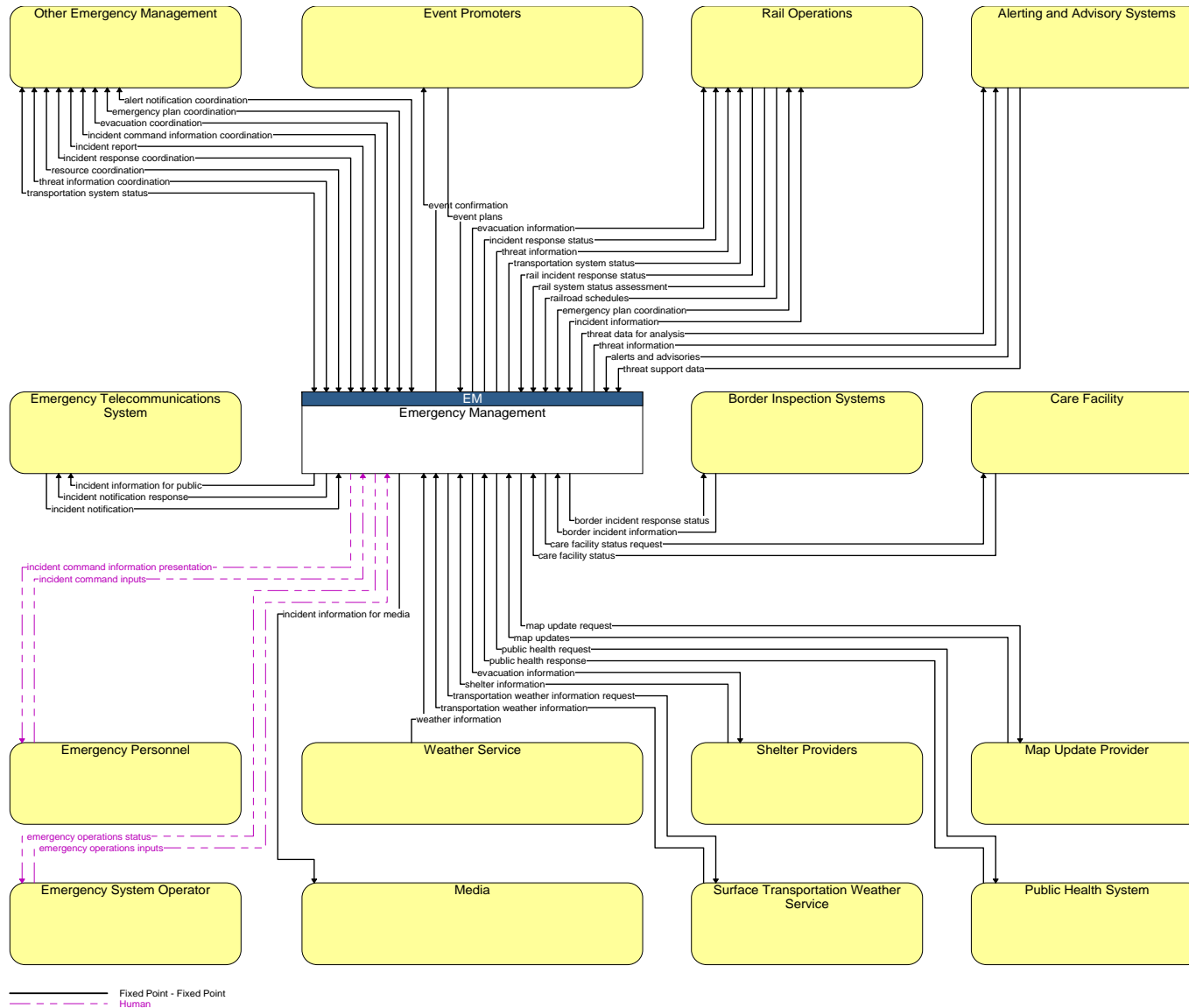


Figure 10: EM Subsystem Interfaces

# Emergency Management



**Figure 11: EM Terminator Interfaces**

## 2.8 Emergency Vehicle

The Emergency Vehicle Subsystem (EVS) resides in an emergency vehicle and provides the sensory, processing, storage, and communications functions necessary to support safe and efficient incident response. The subsystem represents a range of vehicles including those operated by police, fire, and emergency medical services. In addition, this subsystem represents other incident response vehicles including towing and recovery vehicles and freeway service patrols. The Emergency Vehicle Subsystem includes two-way communications to support coordinated response to emergencies in accordance with an associated Emergency Management Subsystem. Emergency vehicles are equipped with automated vehicle location capability for monitoring by vehicle tracking and fleet management functions in the Emergency Management Subsystem. Using these capabilities, the appropriate emergency vehicle to respond to each emergency is determined. Route guidance capabilities within the vehicle enable safe and efficient routing to the emergency. In addition, the emergency vehicle may be equipped to support signal preemption through communications with the Roadway Subsystem.

### 2.8.1 Equipment Packages and Process Specifications for EVS

#### **Equipment Package: On-Board EV Barrier System Control**

This on-board equipment package provides local control of automatic or remotely controlled gates and other barrier systems from an emergency vehicle. Using this equipment package, emergency personnel can open and close barriers without leaving the vehicle, using Field-Vehicle Communications to control the barriers.

#### **Process Specifications**

##### **5.3.5 Provide Emergency Personnel Interface**

##### **5.3.8 Control Barrier Systems From Emergency Vehicle**

#### **Equipment Package: On-board EV En Route Support**

This on-board equipment package supports dispatch, routing, and tracking of an emergency vehicle. Dispatch and routing information are received and presented to the driver and vehicle location and status are tracked and provided back to the dispatcher. This equipment package supports traffic signal preemption via short range communication directly with signal control equipment and sends alert messages to surrounding vehicles. It also supports communications with care facilities, sharing patient status and care facility status between the en route emergency vehicle and the care facility.

#### **Process Specifications**

##### **5.3.3 Provide Emergency Vehicle Location**

##### **5.3.5 Provide Emergency Personnel Interface**

#### **Equipment Package: On-board EV Incident Management Communication**

This on-board equipment package provides communications support to first responders. Information about the incident, information on dispatched resources, and ancillary information such as road and weather conditions are provided to emergency personnel. Emergency personnel transmit information about the incident such as identification of vehicles and people involved, the extent of injuries, hazardous material, resources on site, site management strategies in effect, and current clearance status. Emergency personnel may also send in-vehicle signing messages to approaching traffic using short range communications.

#### **Process Specifications**

##### **5.3.5 Provide Emergency Personnel Interface**

### 2.8.2 Interfaces for EVS

**Care Facility** => **Emergency Vehicle**

**Physical Architecture Flow Name:** care facility status

Information regarding facility type and capabilities, facility status, and its ability to admit new patients.

**Logical Architecture Data Flow(s):**

fcf-care\_facility\_vehicle\_status\_response

**Emergency Management** => **Emergency Vehicle**



## Emergency Vehicle

**Physical Architecture Flow Name:** decision support information

Information provided to support effective and safe incident response, including local traffic, road, and weather conditions, hazardous material information, and the current status of resources that have been allocated to an incident.

**Logical Architecture Data Flow(s):**

local\_decision\_support

**Physical Architecture Flow Name:** emergency dispatch requests

Emergency vehicle dispatch instructions including incident location and available information concerning the incident.

**Logical Architecture Data Flow(s):**

emergency\_vehicle\_dispatch\_request

**Physical Architecture Flow Name:** suggested route

Suggested route for a dispatched emergency or maintenance vehicle that may reflect current network conditions and the additional routing options available to en route emergency or maintenance vehicles that are not available to the general public.

**Logical Architecture Data Flow(s):**

emergency\_vehicle\_suggested\_route

**Emergency Personnel** ==> **Emergency Vehicle**

**Physical Architecture Flow Name:** emergency personnel inputs

User input from emergency personnel in the field including dispatch coordination, incident status information, and remote device control requests.

**Logical Architecture Data Flow(s):**

fep-incident\_status

fep-barrier\_system\_control

fep-emergency\_dispatch\_acknowledge

**Emergency Vehicle** ==> **Care Facility**

**Physical Architecture Flow Name:** care facility status request

Request for information regarding care facility availability and status.

**Logical Architecture Data Flow(s):**

tcf-care\_facility\_vehicle\_status\_request

**Physical Architecture Flow Name:** patient status

Information that supports assessment of the patient's condition. Information could include general categorization of patient status, patient vital signs, pertinent medical history, and emergency care information.

**Logical Architecture Data Flow(s):**

tcf-emergency\_vehicle\_patient\_status\_update

**Emergency Vehicle** ==> **Emergency Management**

**Physical Architecture Flow Name:** emergency dispatch response

Request for additional emergency dispatch information and provision of en route status.

**Logical Architecture Data Flow(s):**

emergency\_vehicle\_dispatch\_response

**Physical Architecture Flow Name:** emergency vehicle tracking data

The current location and operating status of the emergency vehicle.

## Emergency Vehicle

**Logical Architecture Data Flow(s):**  
emergency\_vehicle\_tracking\_data

**Physical Architecture Flow Name:** incident status

Information gathered at the incident site that more completely characterizes the incident and provides current incident response status.

**Logical Architecture Data Flow(s):**  
incident\_status\_update

**Emergency Vehicle** => **Emergency Personnel**

**Physical Architecture Flow Name:** emergency personnel information presentation

Presentation of information to emergency personnel in the field including dispatch information, incident information, current road network conditions, device status, and other supporting information.

**Logical Architecture Data Flow(s):**  
tep-decision\_support  
tep-barrier\_system\_status  
tep-emergency\_dispatch\_order

**Emergency Vehicle** => **Roadway**

**Physical Architecture Flow Name:** barrier system control

Information used to configure and control barrier systems that are represented by gates, barriers and other automated or remotely controlled systems used to manage entry to roadways.

**Logical Architecture Data Flow(s):**  
barrier\_system\_control\_from\_emerg\_veh

**Physical Architecture Flow Name:** local signal preemption request

Direct control signal or message to a signalized intersection that results in preemption of the current control plan and grants right-of-way to the requesting vehicle.

**Logical Architecture Data Flow(s):**  
emergency\_vehicle\_preemptions

**Emergency Vehicle** => **Vehicle**

**Physical Architecture Flow Name:** emergency vehicle alert

Notification to vehicles in the area that an emergency vehicle is in the vicinity. The number of responding vehicles, their status, location, speed, and direction are provided.

**Logical Architecture Data Flow(s):**  
emergency\_vehicle\_proximity

**Physical Architecture Flow Name:** vehicle signage data

In-vehicle signing data that augments regulatory, warning, and informational road signs and signals. The information provided would include static sign information (e.g., stop, curve warning, guide signs, service signs, and directional signs) and dynamic information (e.g., current signal states, grade crossing information, local traffic and road conditions, advisories, and detours).

**Logical Architecture Data Flow(s):**  
em\_to\_vehicle\_incident\_scene\_information

**Location Data Source** => **Emergency Vehicle**

**Physical Architecture Flow Name:** position fix

Information which provides a traveler's or vehicle's geographical position.

## Emergency Vehicle

### **Logical Architecture Data Flow(s):**

From\_Location\_Data\_Source

**Roadway**

=>

**Emergency Vehicle**

### **Physical Architecture Flow Name:**

barrier system status

Current operating status of barrier systems. Barrier systems represent gates, barriers and other automated or remotely controlled systems used to manage entry to roadways. Status of the systems includes operating condition and current operational state.

### **Logical Architecture Data Flow(s):**

barrier\_system\_status\_to\_emerg\_veh

### 2.8.3 *Architecture Flow Diagrams for EVS*

# Emergency Vehicle

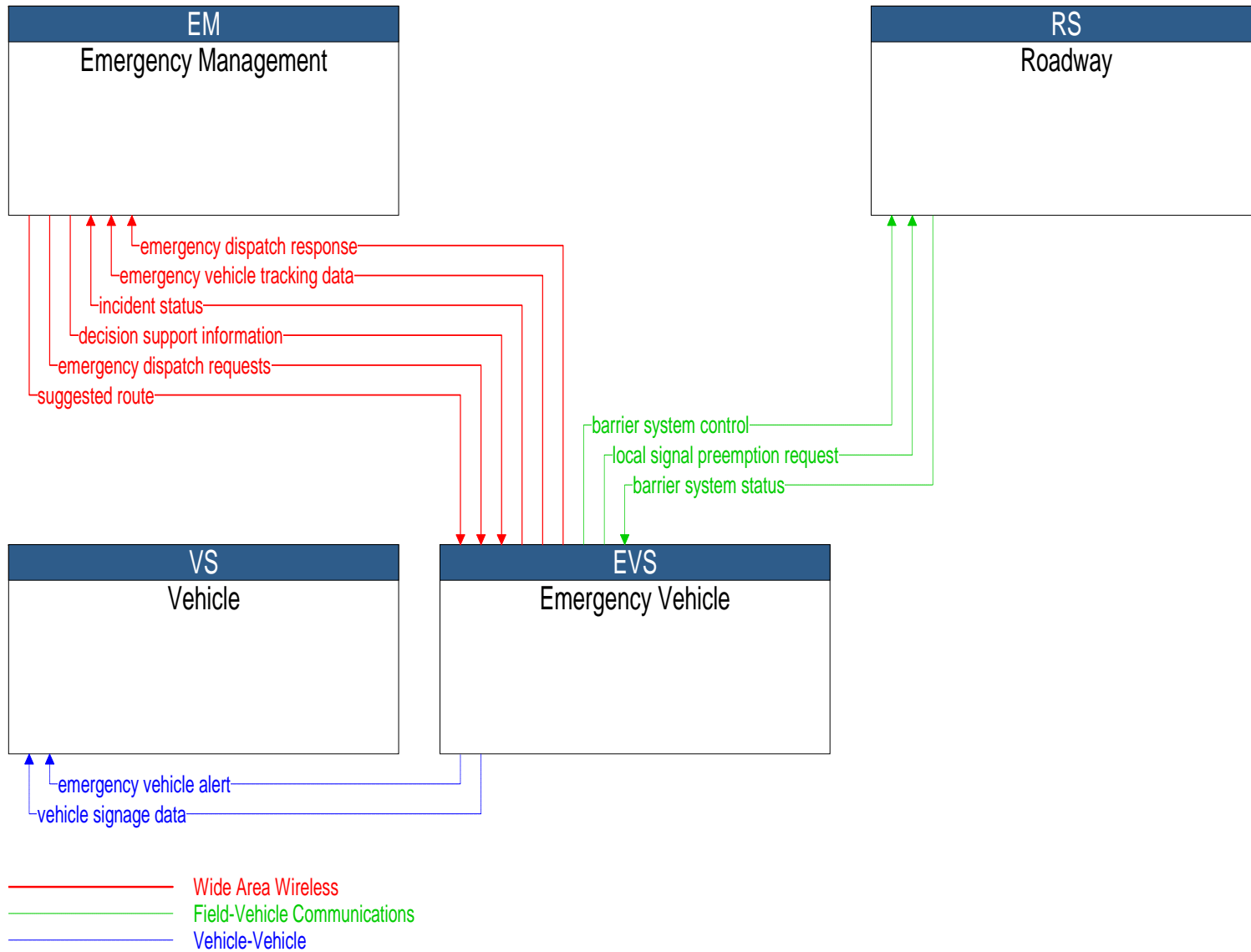


Figure 12: EVS Subsystem Interfaces

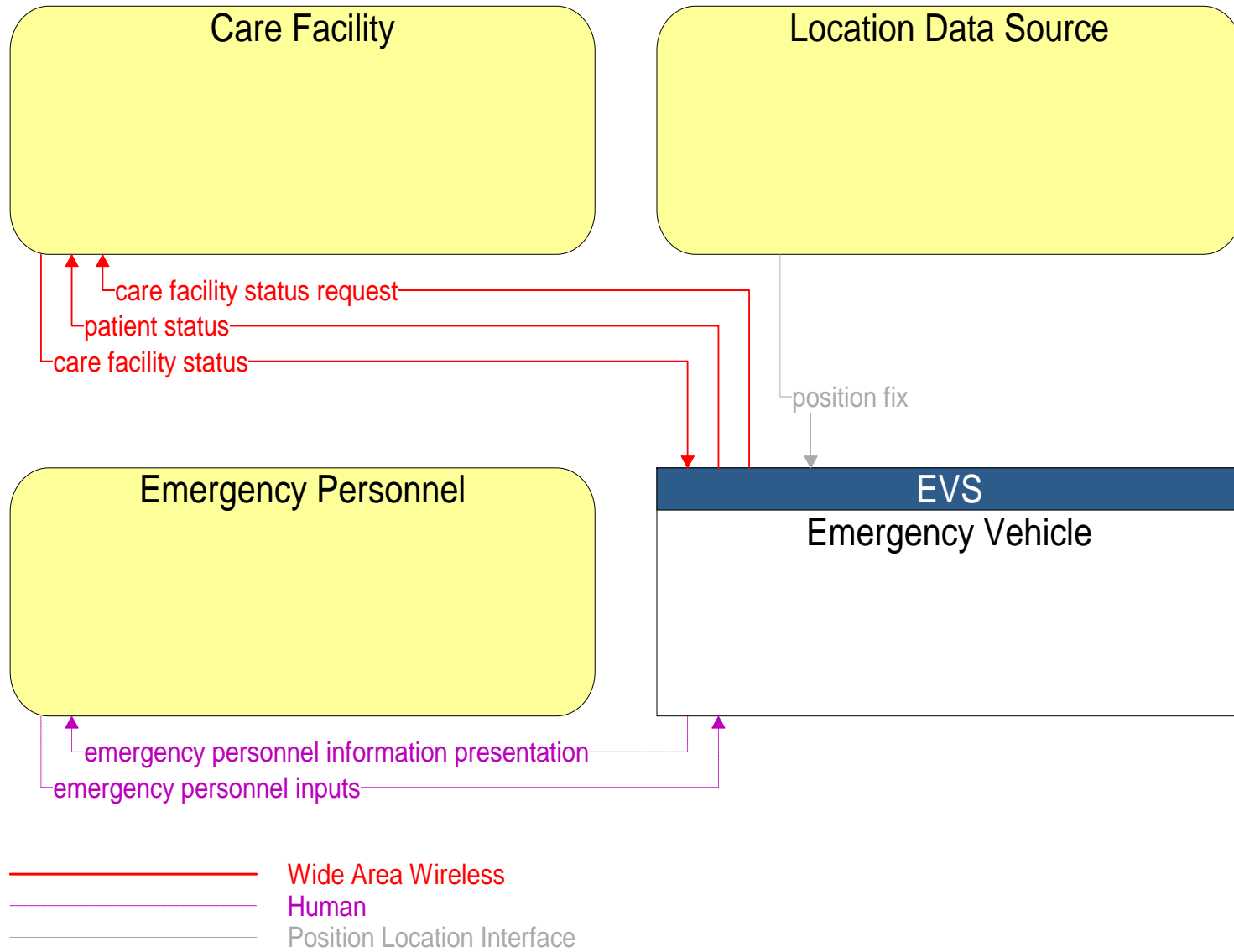


Figure 13: EVS Terminator Interfaces

## 2.9 Emissions Management

This Emissions Management Subsystem (EMMS) operates at a fixed location and may co-reside with the Traffic Management Subsystem or may operate in its own distinct location depending on regional preferences and priorities. This subsystem provides the capabilities for air quality managers to monitor and manage air quality. These capabilities include collecting emissions data from distributed emissions sensors within the roadway subsystem. These sensors monitor general air quality within each sector of the area and also monitor the emissions of individual vehicles on the roadway. The sector emissions measures are collected, processed, and used to identify sectors exceeding safe pollution levels. This information is provided to traffic management to implement strategies intended to reduce emissions in and around the problem areas. Emissions data associated with individual vehicles, supplied by the Roadway Subsystem, is also processed and monitored to identify vehicles that exceed standards. This subsystem provides any functions necessary to inform the violators and otherwise ensure timely compliance with emissions standards.

### 2.9.1 *Equipment Packages and Process Specifications for EMMS*

#### **Equipment Package: Emissions Data Collection**

This equipment package collects and stores air quality and emissions management information that is collected in the course of Emissions Management Subsystem operations. This data can be used directly by operations personnel or it can be made available to other data users and archives in the region.

#### **Process Specifications**

##### **1.5.9 Manage Emissions Archive Data**

#### **Equipment Package: Emissions Data Management**

This equipment package collects and stores air quality and vehicle emissions information by remotely monitoring and controlling area wide and point sensors. General air quality measures are distributed as general traveler information and also may be used for in demand management programs. Collected roadside emissions are analyzed and used to detect, identify, and notify concerned parties regarding vehicles that exceed emissions standards.

#### **Process Specifications**

##### **1.5.1 Provide Emissions Operations Personnel Interface**

##### **1.5.10 Manage Emissions State Data Store**

##### **1.5.2 Process Pollution Data**

##### **1.5.3 Update Pollution Display Map Data**

##### **1.5.4 Manage Pollution State Data Store**

##### **1.5.7 Process Vehicle Emissions Data**

##### **1.5.8 Manage Emissions and Pollution Reference Data Stores**

##### **5.4.8 Process Emissions Violations**

### 2.9.2 *Interfaces for EMMS*

#### **Archived Data Management**

#### **=> Emissions Management**

**Physical Architecture Flow Name:** archive requests

A request to a data source for information on available data (i.e. "catalog") or a request that defines the data to be archived. The request can be a general subscription intended to initiate a continuous or regular data stream or a specific request intended to initiate a one-time response from the recipient.

#### **Logical Architecture Data Flow(s):**

emissions\_archive\_request

**Physical Architecture Flow Name:** archive status

Notification that data provided to an archive contains erroneous, missing, or suspicious data or verification that the data provided appears valid. If an error has been detected, the offending

## Emissions Management

data and the nature of the potential problem are identified.

**Logical Architecture Data Flow(s):**  
emissions\_archive\_status

**DMV** => **Emissions Management**

**Physical Architecture Flow Name:** registration  
Registered owner of vehicle and associated vehicle information.

**Logical Architecture Data Flow(s):**  
fdmv-emissions\_violation\_state\_identity  
fdmv-emissions\_violation\_vehicle\_registration

**Emissions Management** => **Archived Data Management**

**Physical Architecture Flow Name:** emissions archive data  
Air quality and vehicle emissions information that is collected by sensors or derived from models. Content may include a catalog of available information, the actual information to be archived, and associated meta data that describes the archived information.

**Logical Architecture Data Flow(s):**  
emissions\_archive\_data

**Emissions Management** => **DMV**

**Physical Architecture Flow Name:** license request  
Request supporting registration data based on license plate read during violation.

**Logical Architecture Data Flow(s):**  
tdmv-emissions\_violation\_vehicle\_license  
tdmv-emissions\_violation\_identity\_code

**Emissions Management** => **Emissions Management Operator**

**Physical Architecture Flow Name:** pollution data display  
Presentation of information to the operator supporting both area-wide air quality monitoring and vehicle emissions monitoring. Includes both reference and current pollution status details for a given geographic area.

**Logical Architecture Data Flow(s):**  
temo-pollution\_data\_display  
temo-vehicle\_emissions\_data

**Emissions Management** => **Enforcement Agency**

**Physical Architecture Flow Name:** emissions violation notification  
Notification to enforcement agency of a detected vehicle emissions violation.

**Logical Architecture Data Flow(s):**  
tea-emissions\_violation\_data

**Emissions Management** => **Information Service Provider**

**Physical Architecture Flow Name:** air quality information  
Aggregated region-wide measured air quality data and possible pollution incident information.

## Emissions Management

**Logical Architecture Data Flow(s):**  
current\_traffic\_pollution\_data

**Emissions Management** => **Map Update Provider**

**Physical Architecture Flow Name:** map update request  
Request for a map update which could include a new underlying map or map layer updates.

**Logical Architecture Data Flow(s):**  
tmup-request\_pollution\_display\_update

**Emissions Management** => **Media**

**Physical Architecture Flow Name:** air quality information  
Aggregated region-wide measured air quality data and possible pollution incident information.

**Logical Architecture Data Flow(s):**  
tm-pollution\_data

**Emissions Management** => **Roadway**

**Physical Architecture Flow Name:** emissions sensor control  
Data used to configure and control vehicle emissions sensors.

**Logical Architecture Data Flow(s):**  
vehicle\_emissions\_sensor\_control

**Physical Architecture Flow Name:** pollution sensor control  
Data used to configure and control area pollution and air quality sensors.

**Logical Architecture Data Flow(s):**  
pollution\_sensor\_control

**Emissions Management** => **Traffic Management**

**Physical Architecture Flow Name:** widearea statistical pollution information  
Aggregated region-wide measured emissions data and possible pollution incident information.

**Logical Architecture Data Flow(s):**  
pollution\_incident  
pollution\_state\_data  
wide\_area\_pollution\_data

**Emissions Management Operator** => **Emissions Management**

**Physical Architecture Flow Name:** pollution data parameters  
User input from the system operator including nominal pollution data compliance (reference) levels for each sector of an urban area.

**Logical Architecture Data Flow(s):**  
femo-emissions\_and\_pollution\_parameter\_updates  
femo-emissions\_and\_pollution\_data\_information\_request

**Map Update Provider** => **Emissions Management**

**Physical Architecture Flow Name:** map updates  
Map update which could include a new underlying static or real-time map or map layer(s)



## Emissions Management

update.

**Logical Architecture Data Flow(s):**  
fmup-pollution\_display\_update

**Roadway** => **Emissions Management**

**Physical Architecture Flow Name:** area pollution data

Measured air quality data, including measured levels of atmospheric pollutants including ozone, particulate matter, carbon monoxide, and nitrogen oxides, and operational status of the sensors.

**Logical Architecture Data Flow(s):**  
pollution\_sensor\_data  
pollution\_sensor\_status

**Physical Architecture Flow Name:** vehicle emissions data

Measured emissions of specific vehicles comprised of exhaust pollutants including hydrocarbons, carbon monoxide, and nitrogen oxides.

**Logical Architecture Data Flow(s):**  
vehicle\_emissions\_sensor\_data  
vehicle\_emissions\_sensor\_status  
vehicle\_emissions\_alert

**Traffic Management** => **Emissions Management**

**Physical Architecture Flow Name:** pollution state data request

Aggregated emissions data information request.

**Logical Architecture Data Flow(s):**  
pollution\_state\_data\_request

**Weather Service** => **Emissions Management**

**Physical Architecture Flow Name:** weather information

Accumulated forecasted and current weather data (e.g., temperature, pressure, wind speed, wind direction, humidity, precipitation, visibility, light conditions, etc.).

**Logical Architecture Data Flow(s):**  
fws-current\_weather\_observations  
fws-weather\_forecasts

### 2.9.3 Architecture Flow Diagrams for EMMS

# Emissions Management

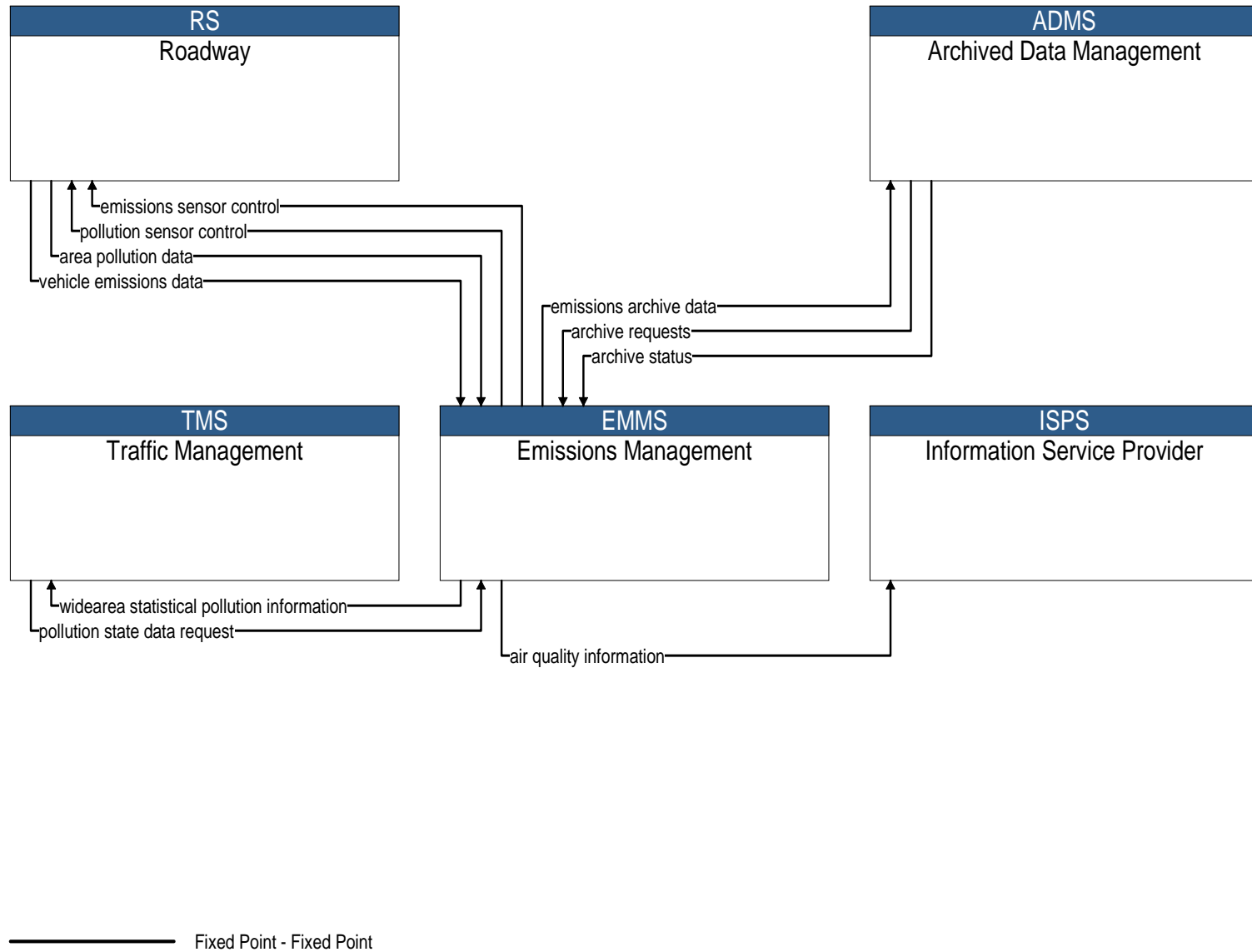


Figure 14: EMMS Subsystem Interfaces

# Emissions Management

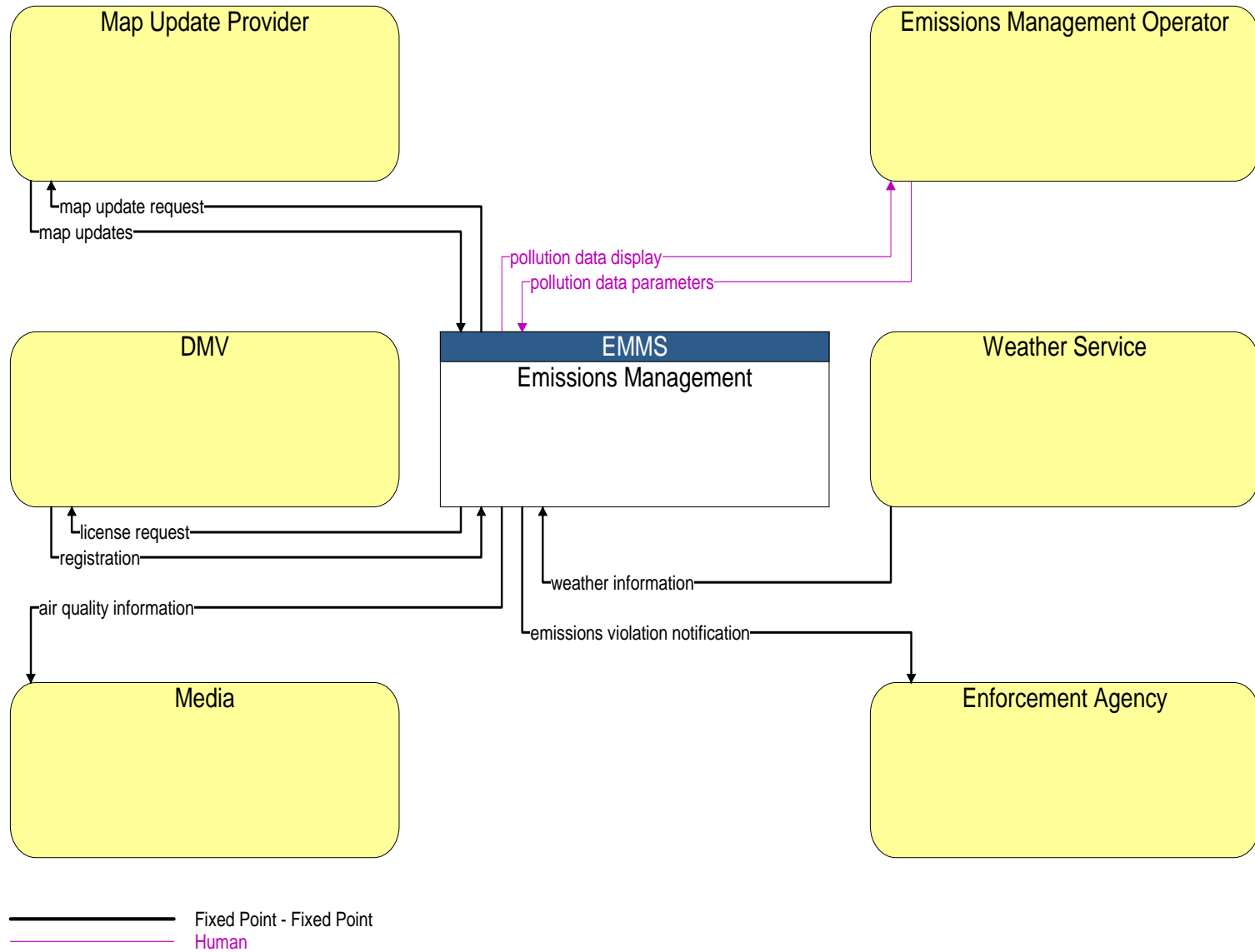


Figure 15: EMMS Terminator Interfaces

## 2.10 Fleet and Freight Management

The Fleet and Freight Management Subsystem (FFMS) provides the capability for commercial drivers and fleet or freight managers to receive real-time routing information and access databases containing vehicle and/or freight equipment locations as well as carrier, vehicle, freight equipment and driver information. In addition, the capability to purchase credentials electronically shall also be provided, with automated and efficient connections to financial institutions and regulatory agencies, along with post-trip automated mileage and fuel usage reporting. The Fleet and Freight Management Subsystem also provides the capability for fleet managers to monitor the safety and security of their commercial vehicle drivers and fleet. The subsystem also supports application for hazmat credentials and makes information about hazmat cargo available to agencies as required. Within this subsystem lies all the functionality associated with subsystems and components necessary to enroll and participate in international goods movement programs aimed at enhancing trade and transportation safety and security.

### 2.10.1 *Equipment Packages and Process Specifications for FFMS*

#### **Equipment Package: Commercial Vehicle and Freight Security**

This equipment package provides for the security of the commercial vehicle and the freight that it carries by detecting breaches such as seals or locks being broken into by unauthorized personnel and/or any other unauthorized tampering. In addition, this equipment package monitors the commercial vehicle driver and compares it with the planned driver for the vehicle. In a similar manner, the driver and vehicle that have been assigned to move freight are monitored and compared with the planned assignment for that freight. In all cases, any deviations to the planned assignments and any breach or tamper events are reported to the Emergency Management Subsystem.

#### **Process Specifications**

- 2.1.1.7 Monitor Assignment Identities**
- 2.1.6 Manage Commercial Vehicle Incidents**
- 2.7.1 Manage Freight Incidents**
- 2.7.5 Process Freight Integrity Data**
- 2.7.6 Provide Freight Manager Interface**

#### **Equipment Package: Fleet Administration**

This equipment package provides vehicle tracking, dispatch, and reporting capabilities to fleet management center personnel. It gathers current road conditions and traffic information, prepares vehicle routes, and provides a fleet interface for toll collection. It also provides route plan information for network performance evaluation. As part of the tracking function, this equipment package monitors commercial vehicle location, compares it against the known route and notifies the Emergency Management Subsystem and Fleet-Freight Manager of any deviations, including HAZMAT route restriction violations. It supports carrier participation in wireless roadside inspection programs, monitoring geographic trigger areas and providing current safety data on behalf of the commercial vehicles it manages. This equipment package supports pre-hiring checks for potential drivers and monitors the performance of each driver who is hired. It also supports ongoing monitoring of the company's safety performance.

#### **Process Specifications**

- 2.1.1.1 Manage Commercial Fleet Electronic Credentials and Tax Filing**
- 2.1.1.2 Manage Commercial Vehicle Routes**
- 2.1.1.3 Provide Commercial Fleet Static Route**
- 2.1.1.5 Manage Commercial Vehicle Fleet Map Data**
- 2.1.1.6 Monitor Commercial Vehicle Route**
- 2.1.2 Provide Commercial Vehicle Fleet Manager Interface**
- 2.1.3 Provide Fleet Manager Commercial Vehicle Communications**
- 2.1.5 Manage Driver Instruction Store**
- 2.1.6 Manage Commercial Vehicle Incidents**
- 2.6.1 Provide Commercial Vehicle Manager Tag Data Interface**

### **Equipment Package: Fleet Credentials and Taxes Management and Reporting**

This equipment package provides the capability to purchase credentials, file taxes and trip reports electronically, apply for permits, and perform electronic enrollment in expedited border crossing programs. It tracks and manages credentials and provides electronic interfaces to appropriate state and federal commercial vehicle administration centers.

#### **Process Specifications**

- 2.1.1.1 Manage Commercial Fleet Electronic Credentials and Tax Filing**
- 2.1.2 Provide Commercial Vehicle Fleet Manager Interface**
- 2.2.1 Manage CV Electronic Credential and Tax Filing Interface**

### **Equipment Package: Fleet HAZMAT Management**

This equipment package manages hazardous materials shipments. In the event of an incident, it notifies the Emergency Management Subsystem, providing information on the nature of the cargo and the vehicle equipment.

#### **Process Specifications**

- 2.1.1.4 Provide HAZMAT Incident Support**

### **Equipment Package: Fleet Maintenance Management**

This equipment package tracks and monitors diagnostic results, vehicle mileage, inspection records, driver logs, and repair and service records collected from a commercial vehicle fleet equipped with on-board monitoring equipment. The data is used to develop preventative maintenance and repair schedules and repair and service records are maintained.

#### **Process Specifications**

- 2.1.1.6 Monitor Commercial Vehicle Route**
- 2.1.2 Provide Commercial Vehicle Fleet Manager Interface**
- 2.1.3 Provide Fleet Manager Commercial Vehicle Communications**
- 2.1.7 Schedule Commercial Vehicle Servicing**

### **Equipment Package: Freight Administration and Management**

This equipment package manages the movement of freight from source to destination via links to the freight equipment, intermodal freight shippers, and depots. It interfaces to intermodal freight shippers to setup and schedule transportation and coordinates with intermodal freight depots to coordinate the shipment. It coordinates with the appropriate government agencies to expedite the movement of trucks, their drivers, and their cargo across international borders. The equipment package monitors the status of the freight and freight equipment (container, trailer, or chassis) and monitors freight location and compares it against the planned route.

#### **Process Specifications**

- 2.6.1 Provide Commercial Vehicle Manager Tag Data Interface**
- 2.7.2 Monitor Freight Equipment Route**
- 2.7.3 Manage Freight Equipment Fleet**
- 2.7.4 Manage Freight Equipment Maintenance**
- 2.7.6 Provide Freight Manager Interface**
- 2.7.7 Provide Shipper Booking Interface**

### **Equipment Package: Manage CV Driver Identification**

This equipment package collects and stores driver identification records including driver issued PINS and/or individual driver biometric measurements. The equipment package can also manage the storage of driver PINS, data from a driver identification card, and/or biometric measurements for authorized drivers on individual commercial vehicles.

Based on information reported by the commercial vehicle, the equipment package will determine if the driver is authorized, and notify the Commercial Vehicle Manager when an unauthorized driver is detected. The Commercial Vehicle Manager may override the disable vehicle action. When an unauthorized driver is detected and the system is not overridden, then the equipment package will issue a message to the commercial vehicle to safely disable the vehicle. If an unauthorized driver is detected, then the equipment package will

## Fleet and Freight Management

send to the Emergency Management Subsystem an alert that includes: incident location, current location of the CV, Vehicle ID, Carrier ID, Driver ID, CV Credentials information, and cargo manifest (if known).

### Process Specifications

2.1.1.7 Monitor Assignment Identities

2.1.5 Manage Driver Instruction Store

2.1.6 Manage Commercial Vehicle Incidents

### 2.10.2 Interfaces for FFMS

**Alerting and Advisory Systems** => **Fleet and Freight Management**

**Physical Architecture Flow Name:** alerts and advisories

Assessments (general incident and vulnerability awareness information), advisories (identification of threats or recommendations to increase preparedness levels), and alerts (information on imminent or in-progress emergencies). This flow also provides supporting descriptive detail on incidents, threats, and vulnerabilities to increase preparedness and support effective response to threats against the surface transportation system.

**Logical Architecture Data Flow(s):**

faas-alerts\_and\_advisories\_for\_cvo  
faas-alerts\_and\_advisories\_for\_freight

**Border Inspection Administration** => **Fleet and Freight Management**

**Physical Architecture Flow Name:** clearance notification

Notification that cargo has been cleared through customs.

**Logical Architecture Data Flow(s):**

fbia-fleet\_border\_clearance\_status

**Physical Architecture Flow Name:** client id

A common identification number that can be used by all BIFA agencies and organizations to reference the carrier.

**Logical Architecture Data Flow(s):**

fbia-fleet\_client\_identification

**Physical Architecture Flow Name:** expedited clearance information

Includes carrier ID, importer ID, broker ID, conveyance ID, driver ID, service options, and associated information that is used to support expedited border clearance.

**Logical Architecture Data Flow(s):**

fbia-fleet\_expedited\_clearance\_response

**Physical Architecture Flow Name:** expedited clearance status

Status of expedited clearance registration.

**Logical Architecture Data Flow(s):**

fbia-fleet\_expedited\_clearance\_status

**Physical Architecture Flow Name:** manifest receipt confirmation

Confirmation that a shippers manifest has been received.

**Logical Architecture Data Flow(s):**

fbia-fleet\_manifest\_receipt

**Commercial Vehicle** => **Fleet and Freight Management**

**Physical Architecture Flow Name:** commercial vehicle breach

Information about a breach or tamper event on a Commercial Vehicle or its attached freight equipment which includes identity, type of breach, location, and time.

**Logical Architecture Data Flow(s):**

cv\_freight\_breach  
cvo\_security\_alarm

**Physical Architecture Flow Name:** driver alert response

Commercial Vehicle Driver response to a breach alert for a Freight Equipment breach or tamper event.

**Logical Architecture Data Flow(s):**

cv\_driver\_response

**Physical Architecture Flow Name:** driver log

A daily log showing hours in service for the current driver. The query flow is not explicitly shown.

**Logical Architecture Data Flow(s):**

cf\_on\_board\_driver\_log

**Physical Architecture Flow Name:** driver to fleet request

Requests from the driver and vehicle for routing, payment, and enrollment information.

**Logical Architecture Data Flow(s):**

cf\_driver\_route\_instructions\_request  
cv\_driver\_route\_request  
cv\_static\_route\_data  
cv\_driver\_storage\_request  
cv\_driver\_enrollment\_payment\_request  
cv\_driver\_enrollment\_request

**Physical Architecture Flow Name:** freight equipment information

Container, trailer, or chassis information regarding identity, type, location, brake wear data, mileage, seal #, seal type, door open/close status, chassis bare/covered status, tethered / untethered status, Bill of Lading, and sensor status.

**Logical Architecture Data Flow(s):**

cv\_freight\_location  
cv\_freight\_integrity  
cv\_freight\_maintenance  
cv\_cargo\_information  
cv\_freight\_operations

**Physical Architecture Flow Name:** identities

Identification information for the Commercial Vehicle (e.g., license plate number or USDOT number), Freight Equipment (e.g., container, chassis, or trailer identification), and Driver.

**Logical Architecture Data Flow(s):**

cv\_identities

**Physical Architecture Flow Name:** on-board safety data

Safety data measured by on-board sensors. Includes information about the vehicle, vehicle components, cargo, and driver. The query flow is not explicitly shown.

**Logical Architecture Data Flow(s):**

cvo\_tag\_safety\_data  
cvo\_on\_board\_safety\_data

## Fleet and Freight Management

**Physical Architecture Flow Name:** on-board vehicle data

Information about the commercial vehicle stored on-board (for maintenance purposes, gate access, cargo status, lock status, etc.).

**Logical Architecture Data Flow(s):**

cf\_on\_board\_vehicle\_data  
cf\_tag\_data\_store\_output

**Physical Architecture Flow Name:** route deviation alert

An alert that indicates a deviation from a planned route has been detected. The alert will contain the current Commercial Vehicle location and identity.

**Logical Architecture Data Flow(s):**

cv\_route\_warning

**Physical Architecture Flow Name:** trip log

Driver's daily log, vehicle location, mileage, and trip activity (includes screening, inspection and border clearance event data as well as fare payments).

**Logical Architecture Data Flow(s):**

cvo\_trip\_log\_data

**Commercial Vehicle  
Administration**

=>

**Fleet and Freight  
Management**

**Physical Architecture Flow Name:** accident report

Report of commercial vehicle safety accident. The information may be provided as a response to a real-time query or proactively by the source. The query flow is not explicitly shown.

**Logical Architecture Data Flow(s):**

cvo\_accident\_data\_for\_fleet

**Physical Architecture Flow Name:** border clearance status

Notification regarding the crossing status of commercial freight shipment scheduled to enter the U.S. Includes portions of border agency and transportation agency clearance results, as they become available.

**Logical Architecture Data Flow(s):**

cvo\_border\_clearance\_for\_fleet

**Physical Architecture Flow Name:** citation

Report of commercial vehicle citation. The citation includes references to the statute(s) that was (were) violated. It includes information on the violator and the officer issuing the citation. A citation differs from a violation because it is adjudicated by the courts. The information may be provided as a response to a real-time query or proactively by the source. The query flow is not explicitly shown.

**Logical Architecture Data Flow(s):**

cvo\_citation

**Physical Architecture Flow Name:** commercial vehicle permit

Permit for oversize, overweight, or hazmat shipments.

**Logical Architecture Data Flow(s):**

commercial\_vehicle\_permit\_information

**Physical Architecture Flow Name:** compliance review report

Report containing results of carrier compliance review, including concomitant out-of-service notifications, carrier warnings/notifications. The information may be provided as a response to a real-time query or proactively by the source. The query flow is not explicitly shown.

**Logical Architecture Data Flow(s):**



## Fleet and Freight Management

cf\_roadside\_activity\_report

**Physical Architecture Flow Name:** credentials information

Response containing full vehicle fuel tax and registration credentials information. "Response" may be provided in reaction to a real-time query or a standing request for updated information. The query flow is not explicitly shown.

**Logical Architecture Data Flow(s):**

cv\_enrollment\_information  
cf\_enrollment\_payment\_confirmation  
cf\_enrollment\_information  
cv\_enrollment\_payment\_confirmation

**Physical Architecture Flow Name:** credentials status information

Credentials information such as registration, licensing, insurance, check flags, and electronic screening enrollment data. A unique identifier is included. Corresponds to the credentials portion of CVISN "snapshots." The status information may be provided as a response to a real-time query or as a result of a standing request for updated information (subscription). This may also include information about non-U.S. fleets for use by U.S. authorities, and information regarding U.S. fleets made available to Mexican and Canadian authorities. The query flow is not explicitly shown.

**Logical Architecture Data Flow(s):**

cvo\_credential\_status  
cvo\_credentials\_status\_for\_fms

**Physical Architecture Flow Name:** cv driver record

Information typically maintained by a state driver licensing agency about a driver of a commercial vehicle including driver identification data, license data, permit data, and driving history details. The query flow is not explicitly shown.

**Logical Architecture Data Flow(s):**

cvo\_driver\_record\_info

**Physical Architecture Flow Name:** route restrictions

Information about routes, road segments, and areas that do not allow the transport of security sensitive hazmat cargoes or include other restrictions (such as height or weight limits).

**Logical Architecture Data Flow(s):**

cv\_route\_restrictions

**Physical Architecture Flow Name:** safety inspection report

Report containing results of commercial vehicle safety inspection. The information may be provided as a response to a real-time query or proactively by the source. The query flow is not explicitly shown.

**Logical Architecture Data Flow(s):**

cf\_periodic\_activity\_report

**Physical Architecture Flow Name:** safety status information

Safety information such as safety ratings, security ratings or flags, inspection summaries, and violation summaries. A unique identifier is included. Corresponds to the safety and security portion of CVISN "snapshots." The status information may be provided as a response to a real-time query or as a result of a standing request for updated information (subscription). This may also include information about non-U.S. fleets for use by U.S. authorities, and information regarding U.S. fleets made available to Mexican and Canadian authorities. The query flow is not explicitly shown.

**Logical Architecture Data Flow(s):**

cvo\_safety\_status

**Physical Architecture Flow Name:** trigger area

## Fleet and Freight Management

A geographic area a commercial motor vehicle crosses into, which initiates a request to compile and transmit a safety data message. May be associated with a time period.

**Logical Architecture Data Flow(s):**

cf\_enforcement\_trigger\_areas

**Physical Architecture Flow Name:** trigger area notification

Notification to activate wireless roadside inspection safety data message collection.

**Logical Architecture Data Flow(s):**

cf\_enforcement\_trigger\_notification

**Driver Identification Card** => **Fleet and Freight Management**

**Physical Architecture Flow Name:** cv driver credential

Driver information (e.g., identity, biometrics, address, date of birth, endorsements, restrictions) stored on a driver's license or other official identification card used to identify a driver of commercial vehicles.

**Logical Architecture Data Flow(s):**

fdic-driver\_info

**Emergency Management** => **Fleet and Freight Management**

**Physical Architecture Flow Name:** disable commercial vehicle

A request that a specific commercial vehicle should be safely disabled.

**Logical Architecture Data Flow(s):**

disable\_commercial\_vehicle

**Physical Architecture Flow Name:** hazmat information request

Request for information about a particular hazmat load.

**Logical Architecture Data Flow(s):**

cf\_hazmat\_request

**Fleet and Freight Management** => **Alerting and Advisory Systems**

**Physical Architecture Flow Name:** fleet and freight threat information

Information about threats detected by commercial vehicle fleet and freight operators. The threats include incidents involving commercial vehicles (i.e. hijacking), unusual activities observed by commercial vehicle operators (i.e. truck parked under a bridge), and incidents involving freight equipment (i.e. freight equipment tampering).

**Logical Architecture Data Flow(s):**

taas-threat\_info\_from\_freight  
taas-threat\_info\_from\_cvo

**Fleet and Freight Management** => **Border Inspection Administration**

**Physical Architecture Flow Name:** expedited clearance registration

Registration of the importer, carrier, conveyance, and driver, as applicable, for border clearance programs such as FAST, Customs Self Assessment (Canada), C-TPAT (US), PIP (Canada), ACI (Canada), and ACE (US). Includes electronic filing of forms and associated

## Fleet and Freight Management

**Logical Architecture Data Flow(s):**  
tbia-fleet\_expedited\_clearance\_request

**Physical Architecture Flow Name:** manifest data  
Identifies Port of Entry, date, and information on carrier and goods, origin, etc.

**Logical Architecture Data Flow(s):**  
tbia-fleet\_manifest\_data

## Fleet and Freight Management => Commercial Vehicle

**Physical Architecture Flow Name:** commercial vehicle disable  
This flow safely disables a specific commercial vehicle.

**Logical Architecture Data Flow(s):**  
cv\_disable

**Physical Architecture Flow Name:** driver log  
A daily log showing hours in service for the current driver. The query flow is not explicitly shown.

**Logical Architecture Data Flow(s):**  
cf\_driver\_log\_update

**Physical Architecture Flow Name:** expected driver identity characteristics  
Driver identification information e.g. encrypted PIN codes issued to drivers, encrypted driver biometric parameters.

**Logical Architecture Data Flow(s):**  
cv\_driver\_assignment

**Physical Architecture Flow Name:** fleet to driver update  
Updated instructions to the driver including dispatch, routing, and special instructions.

**Logical Architecture Data Flow(s):**  
cf\_driver\_route\_instructions  
cf\_tag\_data\_store\_request  
cf\_tag\_data\_store\_write  
cvo\_general\_message  
cv\_driver\_enrollment\_information  
cvo\_vehicle\_route  
cv\_driver\_enrollment\_payment\_confirmation  
cv\_driver\_route\_data  
cv\_static\_route\_request  
cf\_manager\_route\_monitoring\_parameters

**Physical Architecture Flow Name:** on-board vehicle request  
Request for on-board vehicle data.

**Logical Architecture Data Flow(s):**  
cvo\_on\_board\_vehicle\_data\_request  
cvo\_tag\_data\_store\_request

**Physical Architecture Flow Name:** safety inspection record  
Record containing results of commercial vehicle safety inspection.

**Logical Architecture Data Flow(s):**  
cf\_inspection\_data

**Physical Architecture Flow Name:** trigger area

## Fleet and Freight Management

A geographic area a commercial motor vehicle crosses into, which initiates a request to compile and transmit a safety data message. May be associated with a time period.

**Logical Architecture Data Flow(s):**

cf\_trigger\_area

**Physical Architecture Flow Name:** trigger area notification

Notification to activate wireless roadside inspection safety data message collection.

**Logical Architecture Data Flow(s):**

cf\_trigger\_area\_notification

**Physical Architecture Flow Name:** trip identification number

The unique trip load number for a specific cross-border shipment.

**Logical Architecture Data Flow(s):**

cvo\_trip\_identification\_number

**Physical Architecture Flow Name:** trip log request

Request for trip log.

**Logical Architecture Data Flow(s):**

cvo\_trip\_log\_data\_request

**Fleet and Freight Management** => **Commercial Vehicle Administration**

**Physical Architecture Flow Name:** audit data

Information to support a tax audit.

**Logical Architecture Data Flow(s):**

cvo\_audit\_data

**Physical Architecture Flow Name:** credential application

Application for commercial vehicle credentials. Authorization for payment is included.

**Logical Architecture Data Flow(s):**

cv\_enrollment\_request

cf\_enrollment\_request

**Physical Architecture Flow Name:** cv repair status

Information about the completion of a repair to a commercial vehicle.

**Logical Architecture Data Flow(s):**

cvo\_repair\_information

**Physical Architecture Flow Name:** driver log

A daily log showing hours in service for the current driver. The query flow is not explicitly shown.

**Logical Architecture Data Flow(s):**

cf\_driver\_logs\_for\_admin

**Physical Architecture Flow Name:** on-board safety data

Safety data measured by on-board sensors. Includes information about the vehicle, vehicle components, cargo, and driver. The query flow is not explicitly shown.

**Logical Architecture Data Flow(s):**

cf\_safety\_data

**Physical Architecture Flow Name:** request for permit

## Fleet and Freight Management

Request by fleet management for oversize, overweight, or hazmat permit.

**Logical Architecture Data Flow(s):**

vehicle\_permit\_request

**Physical Architecture Flow Name:** tax filing

Commercial vehicle tax filing data. Authorization for payment is included.

**Logical Architecture Data Flow(s):**

cf\_tax\_data

## Fleet and Freight Management => Emergency Management

**Physical Architecture Flow Name:** alarm

Information about a Commercial Vehicle or Freight Equipment breach, non-permitted security sensitive hazmat detected at the roadside, route deviation, or Commercial Vehicle Driver / Commercial Vehicle / Freight Equipment assignment mismatches which includes the location of the Commercial Vehicle and appropriate identities.

**Logical Architecture Data Flow(s):**

cvo\_alarm  
freight\_alarm

**Physical Architecture Flow Name:** hazmat information

Information about a particular hazmat load including nature of the load and unloading instructions. May also include hazmat vehicle route and route update information.

**Logical Architecture Data Flow(s):**

cf\_hazmat\_vehicle\_information  
cf\_hazmat\_route\_information

## Fleet and Freight Management => Fleet-Freight Manager

**Physical Architecture Flow Name:** fleet and freight alerts

This flow represents the visual or auditory interface with ITS equipment containing security alert status information regarding commercial vehicle fleets and freight equipment.

**Logical Architecture Data Flow(s):**

tffm-freight\_route\_alert  
tffm-freight\_integrity\_alert  
tffm-incident\_alert  
tffm-assignment\_alert

**Physical Architecture Flow Name:** fleet status

This flow represents the visual or auditory interface with ITS equipment containing fleet status information including enrollment status, safety status including inspection summaries, detailed inspection reports, and safety ratings, routing information, current vehicle information, and emergency information.

**Logical Architecture Data Flow(s):**

tffm-preclearance\_results  
tffm-roadside\_activity\_report  
tffm-other\_data\_request  
tffm-confirm\_enrollment\_data\_stored  
tffm-route\_data  
tffm-output\_tag\_data  
tffm-enrollment\_payment\_confirmation  
tffm-data\_input\_request  
tffm-freight\_data\_input\_request  
tffm-enrollment\_confirmation  
tffm-driver\_route\_instructions

## Fleet and Freight Management

### **Fleet and Freight Management** => **Freight Equipment**

**Physical Architecture Flow Name:** freight monitoring parameters

Parameters to configure the Freight Equipment for event reporting and keep alive functions.

**Logical Architecture Data Flow(s):**  
tfe-operational\_monitoring\_parameters  
tfe-integrity\_monitoring\_parameters

### **Fleet and Freight Management** => **Information Service Provider**

**Physical Architecture Flow Name:** route request

Request for a tailored route based on given constraints.

**Logical Architecture Data Flow(s):**  
cv\_route\_request  
cf\_route\_request

**Physical Architecture Flow Name:** toll data request

Request made to obtain toll schedule information or pay a toll in advance. The request can be a subscription that initiates as-needed information updates as well as a one-time request for information.

**Logical Architecture Data Flow(s):**  
cvo\_advanced\_payments\_request

### **Fleet and Freight Management** => **Intermodal Freight Depot**

**Physical Architecture Flow Name:** booking status

Status of the freight transport booking that includes the identities of the Commercial Vehicle and driver who will pick-up the freight or a request for more information from the originator.

**Logical Architecture Data Flow(s):**  
tifd-booking\_information

**Physical Architecture Flow Name:** freight transportation status

A time-stamped status of a freight shipment as it passes through the supply chain from manufacturer through arrival at its final destination; including cargo movement logs, routing information, and cargo ID's.

**Logical Architecture Data Flow(s):**  
tifd-freight\_shipment\_status

### **Fleet and Freight Management** => **Intermodal Freight Shipper**

**Physical Architecture Flow Name:** booking status

Status of the freight transport booking that includes the identities of the Commercial Vehicle and driver who will pick-up the freight or a request for more information from the originator.

**Logical Architecture Data Flow(s):**  
tifs-booking\_response

**Physical Architecture Flow Name:** freight breach

Information about a breach or tamper event on Freight Equipment which includes identity, type of breach, location, and time.

**Logical Architecture Data Flow(s):**  
tifs-freight\_breach

**Physical Architecture Flow Name:** freight transportation status

## Fleet and Freight Management

A time-stamped status of a freight shipment as it passes through the supply chain from manufacturer through arrival at its final destination; including cargo movement logs, routing information, and cargo ID's.

### Logical Architecture Data Flow(s):

tifs-freight\_shipment\_status

## Fleet and Freight Management => Map Update Provider

**Physical Architecture Flow Name:** map update request

Request for a map update which could include a new underlying map or map layer updates.

### Logical Architecture Data Flow(s):

tmup-fleet\_map\_update\_request

## Fleet and Freight Management => Payment Administration

**Physical Architecture Flow Name:** toll data request

Request made to obtain toll schedule information or pay a toll in advance. The request can be a subscription that initiates as-needed information updates as well as a one-time request for information.

### Logical Architecture Data Flow(s):

cvo\_advanced\_toll\_request  
cvo\_toll\_price\_request

## Fleet-Freight Manager => Fleet and Freight Management

**Physical Architecture Flow Name:** alert response

This flow represents the tactile or auditory interface with ITS equipment containing the response by a Commercial Vehicle Driver or Fleet-Freight Manager that confirms or cancels an alert.

### Logical Architecture Data Flow(s):

fffm-freight\_incident\_response  
fffm-incident\_response

**Physical Architecture Flow Name:** fleet manager inquiry

This flow represents the tactile or auditory interface with ITS equipment containing an inquiry from fleet manager requesting data from commercial vehicle management system.

### Logical Architecture Data Flow(s):

fffm-vehicle\_number  
fffm-update\_driver\_route\_instructions  
fffm-trip\_identity  
fffm-route\_function\_request  
fffm-roadside\_activity\_report\_request  
fffm-freight\_data\_input  
fffm-driver\_number  
fffm-request\_tag\_data\_output  
fffm-request\_on\_board\_vehicle\_data  
fffm-request\_driver\_route\_instructions  
fffm-preclearance\_data  
fffm-other\_data\_input  
fffm-enrollment\_request  
fffm-enrollment\_payment\_request  
fffm-carrier\_number  
fffm-route\_data

## Freight Equipment => Fleet and Freight Management

## Fleet and Freight Management

**Physical Architecture Flow Name:** freight breach

Information about a breach or tamper event on Freight Equipment which includes identity, type of breach, location, and time.

**Logical Architecture Data Flow(s):**

ffe-breach\_warning

**Physical Architecture Flow Name:** freight equipment information

Container, trailer, or chassis information regarding identity, type, location, brake wear data, mileage, seal #, seal type, door open/close status, chassis bare/covered status, tethered / untethered status, Bill of Lading, and sensor status.

**Logical Architecture Data Flow(s):**

ffe-lock\_tag\_data  
ffe-cargo\_information  
ffe-operational\_data  
ffe-location\_data  
ffe-integrity\_data  
ffe-maintenance\_data

**Information Service Provider** => **Fleet and Freight Management**

**Physical Architecture Flow Name:** incident information

Notification of existence of incident and expected severity, location, time and nature of incident. As additional information is gathered and the incident evolves, updated incident information is provided. Incidents include any event that impacts transportation system operation ranging from routine incidents (e.g., disabled vehicle at the side of the road) through large-scale natural or human-caused disasters that involve loss of life, injuries, extensive property damage, and multi-jurisdictional response. This also includes special events, closures, and other planned events that may impact the transportation system.

**Logical Architecture Data Flow(s):**

incident\_data\_for\_cvo

**Physical Architecture Flow Name:** road network conditions

Current and forecasted traffic information, road and weather conditions, and other road network status. Either raw data, processed data, or some combination of both may be provided by this architecture flow. Information on diversions and alternate routes, closures, and special traffic restrictions (lane/shoulder use, weight restrictions, width restrictions, HOV requirements) in effect is included along with a definition of the links, nodes, and routes that make up the road network.

**Logical Architecture Data Flow(s):**

traffic\_data\_for\_cvo

**Physical Architecture Flow Name:** route plan

Tailored route provided by ISP in response to a specific request.

**Logical Architecture Data Flow(s):**

cv\_route  
cf\_route

**Physical Architecture Flow Name:** toll data

Current toll schedules for different types of vehicles as well as advanced toll payment information.

**Logical Architecture Data Flow(s):**

cvo\_advanced\_toll\_payment\_information  
toll\_price\_for\_cvo



**Intermodal Freight Depot** => **Fleet and Freight Management**

**Physical Architecture Flow Name:** freight transportation status

A time-stamped status of a freight shipment as it passes through the supply chain from manufacturer through arrival at its final destination; including cargo movement logs, routing information, and cargo ID's.

**Logical Architecture Data Flow(s):**  
fifd-freight\_depot\_status\_data

**Intermodal Freight Shipper** => **Fleet and Freight Management**

**Physical Architecture Flow Name:** breach response

This is an Intermodal Freight Shipper's response to a breach or tamper event of their freight equipment. There maybe instructions for handling of the shipment, possible re-routing or pickup.

**Logical Architecture Data Flow(s):**  
fifs-breach\_response

**Physical Architecture Flow Name:** freight transport booking

Booking information for the transport of freight that includes company, contact information, point of origin, pick-up location, drop-off location, and freight equipment identifier.

**Logical Architecture Data Flow(s):**  
fifs-book\_transportation  
fifs-trip\_id\_number

**Physical Architecture Flow Name:** freight transportation status

A time-stamped status of a freight shipment as it passes through the supply chain from manufacturer through arrival at its final destination; including cargo movement logs, routing information, and cargo ID's.

**Logical Architecture Data Flow(s):**  
fifs-freight\_shipper\_status\_data

**Map Update Provider** => **Fleet and Freight Management**

**Physical Architecture Flow Name:** map updates

Map update which could include a new underlying static or real-time map or map layer(s) update.

**Logical Architecture Data Flow(s):**  
fmup-fleet\_map\_update

**Payment Administration** => **Fleet and Freight Management**

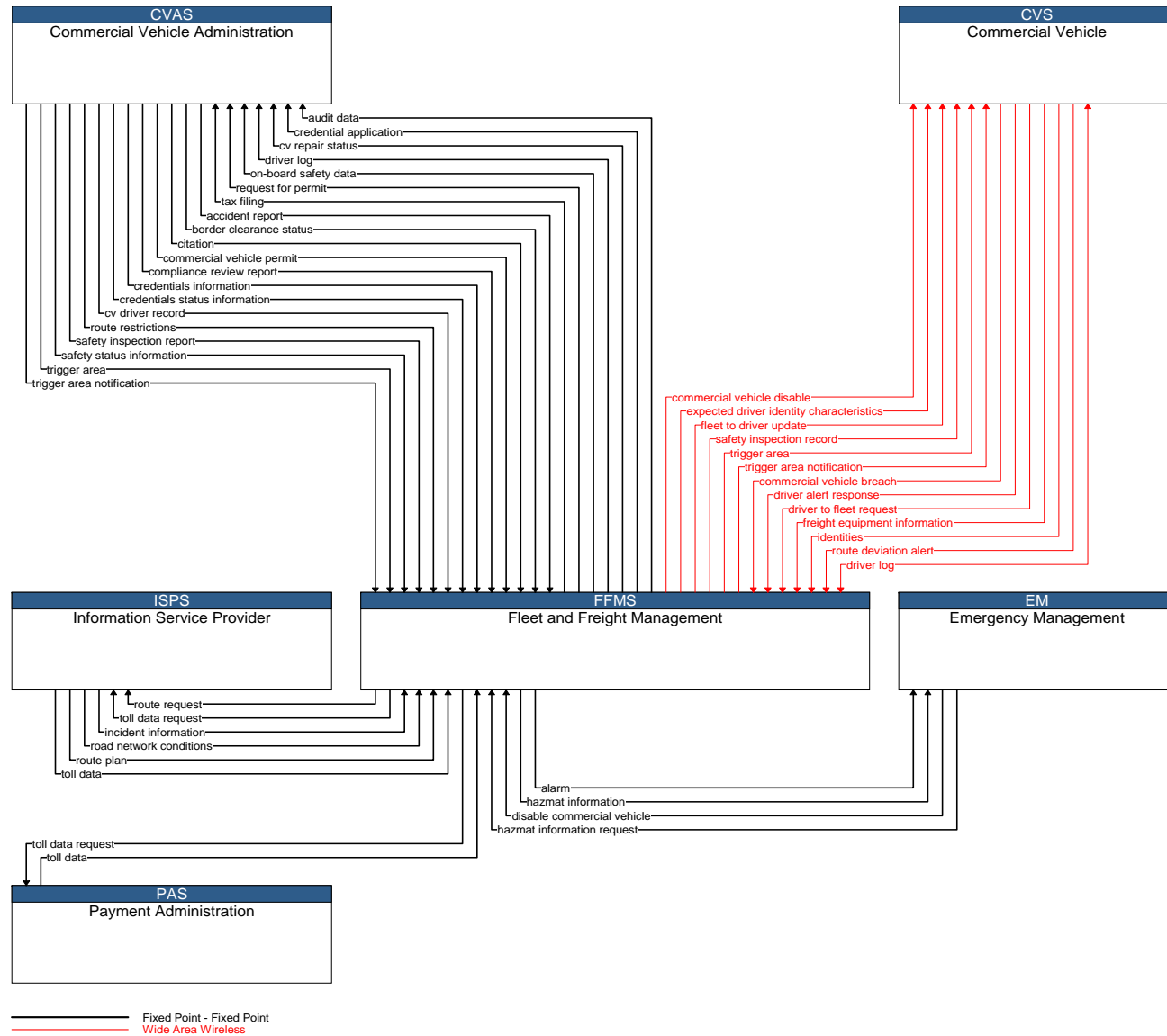
**Physical Architecture Flow Name:** toll data

Current toll schedules for different types of vehicles as well as advanced toll payment information.

**Logical Architecture Data Flow(s):**  
cvo\_advanced\_toll\_confirmation  
cvo\_toll\_price

*2.10.3 Architecture Flow Diagrams for FFMS*

# Fleet and Freight Management



**Figure 16: FFMS Subsystem Interfaces**

# Fleet and Freight Management

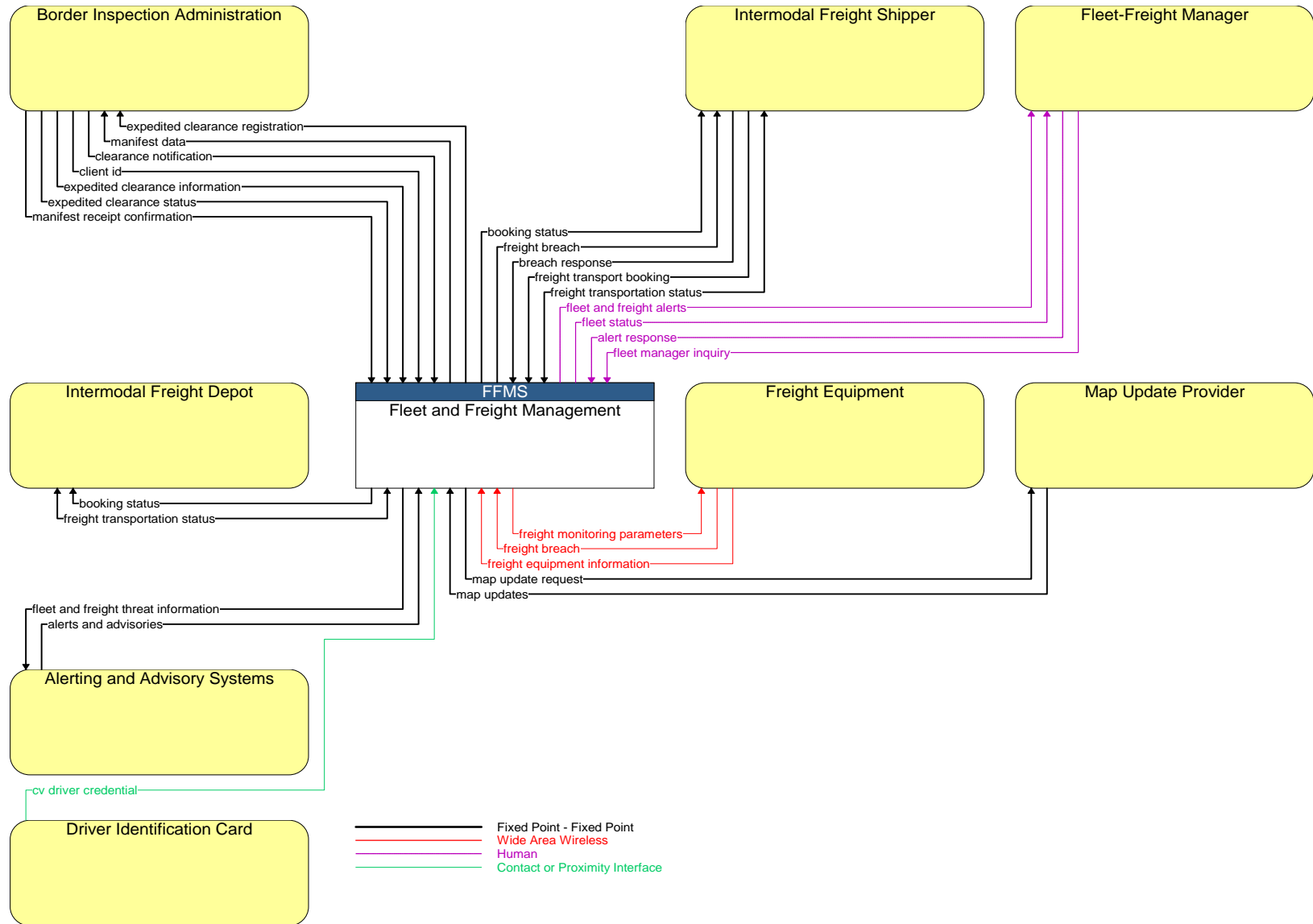


Figure 17: FFMS Terminator Interfaces

## 2.11 Information Service Provider

The Information Service Provider Subsystem (ISPS) collects, processes, stores, and disseminates transportation information to system operators and the traveling public. The subsystem can play several different roles in an integrated ITS. In one role, the ISP provides a data collection, fusing, and repackaging function, collecting information from transportation system operators and redistributing this information to other system operators in the region and other ISPs. In this information redistribution role, the ISP provides a bridge between the various transportation systems that produce the information and the other ISPs and their subscribers that use the information. The second role of an ISP is focused on delivery of traveler information to subscribers and the public at large. Information provided includes basic advisories, traffic and road conditions, transit schedule information, yellow pages information, ridematching information, and parking information. The subsystem also provides the capability to provide specific directions to travelers by receiving origin and destination requests from travelers, generating route plans, and returning the calculated plans to the users. In addition to general route planning for travelers, the ISP also supports specialized route planning for vehicle fleets. In this third role, the ISP function may be dedicated to, or even embedded within, the dispatch system. Reservation services are also provided in advanced implementations. The information is provided to the traveler through the Personal Information Access Subsystem, Remote Traveler Support Subsystem, and the Vehicle Subsystem through available communications links. Both basic one-way (broadcast) and personalized two-way information provision are supported. The ISP is most commonly implemented as an Internet web site, but it represents any traveler information distribution service including systems that broadcast digital transportation data (e.g., satellite radio networks) and systems that support distribution through Field-Vehicle Communications networks. The ISP accomplishes these roles using constantly evolving technologies like the Internet (World Wide Web pages), direct broadcast communications (email alerts, pagers, satellite radio network data broadcasts), communications through Field-Vehicle Communications networks, etc.

### 2.11.1 Equipment Packages and Process Specifications for ISPS

#### **Equipment Package: Basic Information Broadcast**

This equipment package disseminates traveler information including traffic and road conditions, incident information, maintenance and construction information, event information, transit information, parking information, and weather information. The same information is broadcast to all equipped traveler interface systems and vehicles.

#### **Process Specifications**

**6.5.1 Provide Broadcast Data Interface**

**6.5.7 Provide ISP Operator Traveler Information Parameters Interface**

#### **Equipment Package: Infrastructure Provided Dynamic Ridesharing**

This equipment package provides dynamic rideshare matches for eligible travelers, connecting riders and drivers for specific trips based on preferences. This ridesharing/ride matching capability also arranges connections to transit or other multimodal services for portions of a multi-segment trip that includes ridesharing. Reservations and advanced payment are also supported so that each segment of the trip may be confirmed.

#### **Process Specifications**

**6.1.1 Provide Trip Planning Information to Traveler**

**6.1.2 Confirm Traveler's Trip Plan**

**6.1.3 Provide ISP Operator Interface for Trip Planning Parameters**

**6.4.1 Screen Rider Requests**

**6.4.2 Match Rider and Provider**

**6.4.3 Report Ride Match Results to Requestor**

**6.4.4 Confirm Traveler Rideshare Request**

**7.4.1.7 Process Traveler Rideshare Payments**

#### **Equipment Package: Infrastructure Provided Trip Planning**

This equipment package provides pre-trip and en-route trip planning services for travelers. It receives origin, destination, constraints, and preferences and returns trip plan(s) that meet the supplied criteria. Trip

## Information Service Provider

plans may be based on current traffic and road conditions, transit schedule information, and other real-time traveler information. Candidate trip plans are multimodal and may include vehicle, transit, and alternate mode segments (e.g., rail, ferry, bicycle routes, and walkways) based on traveler preferences. This equipment package also confirms the trip plan for the traveler and supports reservations and advanced payment for portions of the trip. The trip plan includes specific routing information and instructions for each segment of the trip and may also include information and reservations for additional services (e.g., parking) along the route.

### **Process Specifications**

- 6.1.1 Provide Trip Planning Information to Traveler**
- 6.1.2 Confirm Traveler's Trip Plan**
- 6.1.3 Provide ISP Operator Interface for Trip Planning Parameters**
- 6.10 Manage Traveler Profiles**
- 6.6.1 Provide Multimodal Route Selection**
- 6.6.2.1 Calculate Vehicle Route**
- 6.6.2.2 Provide Vehicle Route Calculation Data**
- 6.6.3 Provide ISP Operator Route Parameters Interface**
- 6.6.4 Select Transit Route**
- 6.6.5 Select Other Routes**
- 7.1.6 Distribute Advanced Charges and Fares**
- 7.3.2 Distribute Advanced Tolls and Parking Lot Charges**
- 7.4.1.3 Process Driver Map Update Payments**
- 7.4.1.4 Process Traveler Map Update Payments**
- 7.4.1.6 Process Traveler Trip and Other Services Payments**
- 7.4.3 Route Traveler Advanced Payments**

### **Equipment Package: Interactive Infrastructure Information**

This equipment package disseminates personalized traveler information including traffic and road conditions, transit information, maintenance and construction information, multimodal information, event information, and weather information. Tailored information is provided based on the traveler's request in this interactive equipment package. The interactive service offered by this equipment package is available to the Vehicle, Remote Traveler Support, and Personal Information Access subsystems.

### **Process Specifications**

- 6.10 Manage Traveler Profiles**
- 6.5.2 Provide Interactive Data Interface**
- 6.5.7 Provide ISP Operator Traveler Information Parameters Interface**
- 7.2.6 Distribute Advanced Tolls and Fares**
- 7.4.1.4 Process Traveler Map Update Payments**

### **Equipment Package: ISP Data Collection**

This equipment package collects and stores traveler information that is collected in the course of operation of the ISP subsystem. This data can be used directly by operations personnel or it can be made available to other data users and archives in the region.

### **Process Specifications**

- 6.9 Manage Traveler Info Archive Data**

### **Equipment Package: ISP Emergency Traveler Information**

This equipment package provides emergency information to the public, including wide-area alerts and evacuation information. It provides emergency alerts, information on evacuation zones and evacuation requirements, evacuation destinations and shelter information, available transportation modes, and traffic and road conditions at the origin, destination, and along the evacuation routes. In addition to general evacuation information, personalized information including tailored evacuation routes, service information,

## Information Service Provider

and estimated travel times is also provided based on traveler specified origin, destination, and route parameters. Updated information is provided throughout the evacuation and subsequent reentry as status changes and plans are adapted.

### **Process Specifications**

**6.2.6 Collect Emergency Traveler Data**

**6.5.5 Provide Emergency Traveler Information**

**6.5.7 Provide ISP Operator Traveler Information Parameters Interface**

### **Equipment Package: ISP Operational Data Repository**

This equipment package processes, stores, and distributes real-time information on the state of the regional transportation system. This equipment package facilitates sharing of real-time transportation information among transportation system operators. It includes a central repository, data processing, and communication capabilities that provide real-time access to the collected information. Many different implementations are possible including: 1) a web application that provides a web-based interface to system operators, and 2) a networked enterprise database that provides a network interface to remote system applications. Although request and subscription flows are not explicitly included, interactive data services are supported by this equipment package. The data may be broadcast or customized based on the receiving center's specified requests or subscriptions.

### **Process Specifications**

**6.5.7 Provide ISP Operator Traveler Information Parameters Interface**

**6.5.8 Provide Operational Data for Other Centers**

### **Equipment Package: ISP Probe Information Collection**

This equipment package aggregates and processes traffic probe data collected from equipped vehicles, toll operators, and transit centers. It also collects, aggregates, and processes environmental probe data from equipped vehicles. Probe data may be collected through direct wide area wireless communications with vehicles or through short range communications equipment at the roadside. Aggregated probe data and derived route travel times and environmental conditions information are distributed to other centers and other equipment packages that use the information to support transportation operations and traveler information services.

### **Process Specifications**

**6.2.5 Collect Probe Data From Vehicles**

**6.6.2.2 Provide Vehicle Route Calculation Data**

### **Equipment Package: ISP Short Range Communications Traveler Information Distribution**

In support of connected vehicle applications, this equipment package disseminates traveler information including traffic and road conditions, incident information, maintenance and construction information, event information, transit information, parking information, and weather information. Location-specific or situation-relevant traveler information is sent to short range communications transceivers at the roadside.

### **Process Specifications**

**6.5.1 Provide Broadcast Data Interface**

**6.5.5 Provide Emergency Traveler Information**

**6.5.7 Provide ISP Operator Traveler Information Parameters Interface**

### **Equipment Package: ISP Travel Services Information and Reservation**

This equipment package disseminates information about traveler services such as lodging, restaurants, and service stations. Tailored traveler service information is provided on request that meets the constraints and preferences specified by the traveler. The equipment package also supports reservations and advanced payment for traveler services.

### **Process Specifications**

**6.10 Manage Traveler Profiles**

**6.5.3 Register Travel Services Providers**

**6.5.4 Process Travel Services Provider Data**

**6.5.7 Provide ISP Operator Traveler Information Parameters Interface**



## Information Service Provider

from the recipient.

### **Logical Architecture Data Flow(s):**

traveler\_archive\_request

**Physical Architecture Flow Name:** archive status

Notification that data provided to an archive contains erroneous, missing, or suspicious data or verification that the data provided appears valid. If an error has been detected, the offending data and the nature of the potential problem are identified.

### **Logical Architecture Data Flow(s):**

traveler\_archive\_status

**Border Inspection Systems** => **Information Service Provider**

**Physical Architecture Flow Name:** border crossing status information

Port of entry status including current wait-times, lane configuration and status including closures and restrictions, and notification of incidents at the border

### **Logical Architecture Data Flow(s):**

fbis-predicted\_border\_wait\_time\_for\_info  
fbis-actual\_border\_wait\_time\_for\_info  
fbis-traveler\_border\_status  
fbis-current\_border\_wait\_time\_for\_info

**Care Facility** => **Information Service Provider**

**Physical Architecture Flow Name:** care facility status

Information regarding facility type and capabilities, facility status, and its ability to admit new patients.

### **Logical Architecture Data Flow(s):**

fcf-care\_facility\_status\_for\_isp

**Commercial Vehicle Administration** => **Information Service Provider**

**Physical Architecture Flow Name:** route restrictions

Information about routes, road segments, and areas that do not allow the transport of security sensitive hazmat cargoes or include other restrictions (such as height or weight limits).

### **Logical Architecture Data Flow(s):**

route\_restrictions\_for\_isp

**Physical Architecture Flow Name:** alert notification

Notification of a major emergency such as a natural or man-made disaster, civil emergency, or child abduction for distribution to the public. The flow identifies the alert originator, the nature of the emergency, the geographic area affected by the emergency, the effective time period, and information and instructions necessary for the public to respond to the alert. This flow may also identify specific information that should not be released to the public.

### **Logical Architecture Data Flow(s):**

traveler\_information\_restrictions\_for\_travelers  
wide\_area\_alert\_notification\_for\_travelers  
deactivate\_traveler\_information\_restrictions\_for\_travelers

**Physical Architecture Flow Name:** evacuation information

Evacuation instructions and information including evacuation zones, evacuation times, and reentry times.



**Logical Architecture Data Flow(s):**

evacuation\_data\_for\_isp

**Physical Architecture Flow Name:** incident information

Notification of existence of incident and expected severity, location, time and nature of incident. As additional information is gathered and the incident evolves, updated incident information is provided. Incidents include any event that impacts transportation system operation ranging from routine incidents (e.g., disabled vehicle at the side of the road) through large-scale natural or human-caused disasters that involve loss of life, injuries, extensive property damage, and multi-jurisdictional response. This also includes special events, closures, and other planned events that may impact the transportation system.

**Logical Architecture Data Flow(s):**

incident\_information

**Physical Architecture Flow Name:** transportation system status

Current status and condition of transportation infrastructure (e.g., tunnels, bridges, interchanges, TMC offices, maintenance facilities). In case of disaster or major incident, this flow provides an assessment of damage sustained by the surface transportation system including location and extent of the damage, estimate of remaining capacity and necessary restrictions, and time frame for repair and recovery.

**Logical Architecture Data Flow(s):**

evacuation\_transportation\_system\_status\_for\_isp  
disaster\_transportation\_system\_status\_for\_isp

**Emissions Management** => **Information Service Provider**

**Physical Architecture Flow Name:** air quality information

Aggregated region-wide measured air quality data and possible pollution incident information.

**Logical Architecture Data Flow(s):**

current\_traffic\_pollution\_data

**Physical Architecture Flow Name:** event information

Special event information for travelers. This would include a broader array of information than the similar "event plans" that conveys only information necessary to support traffic management for the event.

**Logical Architecture Data Flow(s):**

fevp-event\_information\_for\_travelers

**Financial Institution** => **Information Service Provider**

**Physical Architecture Flow Name:** transaction status

Response to transaction request. Normally dealing with a request for payment.

**Logical Architecture Data Flow(s):**

ffi-driver\_display\_payment\_confirm  
ffi-registration\_payment\_confirm  
ffi-traveler\_display\_payment\_confirm  
ffi-driver\_map\_payment\_confirm  
ffi-traveler\_rideshare\_payment\_confirm  
ffi-traveler\_map\_payment\_confirm  
ffi-traveler\_other\_services\_payments\_confirm

**Fleet and Freight Management** => **Information Service Provider**

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**Physical Architecture Flow Name:** route request

Request for a tailored route based on given constraints.

**Logical Architecture Data Flow(s):**

cv\_route\_request  
cf\_route\_request

**Physical Architecture Flow Name:** toll data request

Request made to obtain toll schedule information or pay a toll in advance. The request can be a subscription that initiates as-needed information updates as well as a one-time request for information.

**Logical Architecture Data Flow(s):**

cvo\_advanced\_payments\_request

**Information Service Provider** => **Archived Data Management**

**Physical Architecture Flow Name:** traveler archive data

Data associated with traveler information services including service requests, facility usage, rideshare, routing, and traveler payment transaction data. Content may include a catalog of available information, the actual information to be archived, and associated meta data that describes the archived information.

**Logical Architecture Data Flow(s):**

traveler\_archive\_data

**Information Service Provider** => **Emergency Management**

**Physical Architecture Flow Name:** alert status

Information indicating the current status of the emergency alert including identification of the traveler and driver information systems that are being used to provide the alert.

**Logical Architecture Data Flow(s):**

alert\_notification\_status\_from\_travelers

**Physical Architecture Flow Name:** transportation information for operations

Information on the state of transportation system operations including traffic and road conditions, advisories, incidents, transit service information, weather information, parking information, and other related data.

**Logical Architecture Data Flow(s):**

transportation\_information\_for\_evac\_operations  
transportation\_information\_for\_emerg\_routing  
transportation\_information\_for\_emerg\_operations  
transportation\_information\_for\_disaster\_operations

**Information Service Provider** => **Event Promoters**

**Physical Architecture Flow Name:** event information request

Request for special event information.

**Logical Architecture Data Flow(s):**

tevp-event\_information\_request

**Information Service Provider** => **Financial Institution**

**Physical Architecture Flow Name:** payment request

Request for payment from financial institution.

## Information Service Provider

### Logical Architecture Data Flow(s):

tfi-traveler\_display\_payment\_request  
tfi-driver\_display\_payment\_request  
tfi-traveler\_map\_payment\_request  
tfi-traveler\_rideshare\_payment\_request  
tfi-registration\_payment\_request  
tfi-traveler\_other\_services\_payments\_request  
tfi-driver\_map\_payment\_request

## Information Service Provider

=>

## Fleet and Freight Management

### Physical Architecture Flow Name: incident information

Notification of existence of incident and expected severity, location, time and nature of incident. As additional information is gathered and the incident evolves, updated incident information is provided. Incidents include any event that impacts transportation system operation ranging from routine incidents (e.g., disabled vehicle at the side of the road) through large-scale natural or human-caused disasters that involve loss of life, injuries, extensive property damage, and multi-jurisdictional response. This also includes special events, closures, and other planned events that may impact the transportation system.

### Logical Architecture Data Flow(s):

incident\_data\_for\_cvo

### Physical Architecture Flow Name: road network conditions

Current and forecasted traffic information, road and weather conditions, and other road network status. Either raw data, processed data, or some combination of both may be provided by this architecture flow. Information on diversions and alternate routes, closures, and special traffic restrictions (lane/shoulder use, weight restrictions, width restrictions, HOV requirements) in effect is included along with a definition of the links, nodes, and routes that make up the road network.

### Logical Architecture Data Flow(s):

traffic\_data\_for\_cvo

### Physical Architecture Flow Name: route plan

Tailored route provided by ISP in response to a specific request.

### Logical Architecture Data Flow(s):

cf\_route  
cv\_route

### Physical Architecture Flow Name: toll data

Current toll schedules for different types of vehicles as well as advanced toll payment information.

### Logical Architecture Data Flow(s):

cvo\_advanced\_toll\_payment\_information  
toll\_price\_for\_cvo

## Information Service Provider

=>

## ISP Operator

### Physical Architecture Flow Name: ISP operations information presentation

Presentation of information to the ISP Operator including current operational status, parameters for broadcast information settings, route selection controls, and travel optimization algorithms.

### Logical Architecture Data Flow(s):

tispo-trav\_info\_equip\_status  
tispo-trip\_planning\_data  
tispo-traveler\_services\_data  
tispo-trip\_planning\_parameters

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tispo-traveler\_information\_parameters  
tispo-traveler\_data\_collected  
tispo-travel\_services\_operator\_information  
tispo-data\_collection\_parameters  
tispo-archive\_status  
tispo-route\_selection\_parameters

### Information Service Provider => Maintenance and Construction Management

**Physical Architecture Flow Name:** field equipment status

Identification of field equipment requiring repair and known information about the associated faults.

**Logical Architecture Data Flow(s):**  
field\_equipment\_status\_from\_isp

**Physical Architecture Flow Name:** road network environmental probe data

Aggregated vehicle probe information that can be used to estimate current environmental conditions. Collected information would include measured air temperature, exterior light status, wiper status, sun sensor status, rain sensor status, traction control status, ALB status, and other collected vehicle system status and sensor information.

**Logical Architecture Data Flow(s):**  
env\_probe\_info\_from\_isp\_for\_maint

**Physical Architecture Flow Name:** transportation information for operations

Information on the state of transportation system operations including traffic and road conditions, advisories, incidents, transit service information, weather information, parking information, and other related data.

**Logical Architecture Data Flow(s):**  
transportation\_information\_for\_maint\_operations

### Information Service Provider => Map Update Provider

**Physical Architecture Flow Name:** map update request

Request for a map update which could include a new underlying map or map layer updates.

**Logical Architecture Data Flow(s):**  
tmup-request\_info\_provider\_map\_update

### Information Service Provider => Media

**Physical Architecture Flow Name:** traveler information for media

General traveler information regarding incidents, unusual traffic conditions, transit issues, or other advisory information that has been desensitized and provided to the media.

**Logical Architecture Data Flow(s):**  
tm-traveler\_information\_request  
tm-transit\_vehicle\_deviations  
tm-traffic\_information  
tm-incident\_information

### Information Service Provider => Multimodal Transportation Service Provider

**Physical Architecture Flow Name:** multimodal information request  
Information request for alternate mode transportation providers such as train, ferry, air and bus.

**Logical Architecture Data Flow(s):**

## Information Service Provider

tmtsp-rail\_services\_request  
tmtsp-non\_motorized\_services\_request  
tmtsp-ferry\_services\_request  
tmtsp-confirm\_multimodal\_service  
tmtsp-air\_services\_request

### Information Service Provider => Other ISP

**Physical Architecture Flow Name:** emergency traveler information

Public notification of an emergency such as a natural or man-made disaster, civil emergency, or child abduction. This flow also includes evacuation information including evacuation instructions, evacuation zones, recommended evacuation times, tailored evacuation routes and destinations, traffic and road conditions along the evacuation routes, traveler services and shelter information, and reentry times and instructions.

**Logical Architecture Data Flow(s):**

toisp-emergency\_data

**Physical Architecture Flow Name:** incident information

Notification of existence of incident and expected severity, location, time and nature of incident. As additional information is gathered and the incident evolves, updated incident information is provided. Incidents include any event that impacts transportation system operation ranging from routine incidents (e.g., disabled vehicle at the side of the road) through large-scale natural or human-caused disasters that involve loss of life, injuries, extensive property damage, and multi-jurisdictional response. This also includes special events, closures, and other planned events that may impact the transportation system.

**Logical Architecture Data Flow(s):**

toisp-incident\_data

**Physical Architecture Flow Name:** multimodal information

Schedule information for alternate mode transportation providers such as train, ferry, air and bus.

**Logical Architecture Data Flow(s):**

toisp-multimodal\_data

**Physical Architecture Flow Name:** parking information

General parking information and status, including current parking availability.

**Logical Architecture Data Flow(s):**

toisp-parking\_data

**Physical Architecture Flow Name:** road network conditions

Current and forecasted traffic information, road and weather conditions, and other road network status. Either raw data, processed data, or some combination of both may be provided by this architecture flow. Information on diversions and alternate routes, closures, and special traffic restrictions (lane/shoulder use, weight restrictions, width restrictions, HOV requirements) in effect is included along with a definition of the links, nodes, and routes that make up the road network.

**Logical Architecture Data Flow(s):** road network.

toisp-road\_network\_inventory

toisp-road\_weather\_data

toisp-traffic\_data

**Physical Architecture Flow Name:** traffic images

High fidelity, real-time traffic images suitable for surveillance monitoring by the operator or for use in machine vision applications.

**Logical Architecture Data Flow(s):**

toisp-traffic\_images

**Physical Architecture Flow Name:** transit service information

## Information Service Provider

Transit service information including routes, schedules, and fare information as well as dynamic transit schedule adherence and transit vehicle location information.

### Logical Architecture Data Flow(s):

toisp-transit\_fare\_data  
toisp-transit\_data

## Information Service Provider

=> **Parking Management**

**Physical Architecture Flow Name:** parking lot data request

Request for parking lot occupancy, fares, and availability. The request can be a subscription that initiates as-needed information updates as well as a one-time request for information.

### Logical Architecture Data Flow(s):

advanced\_other\_charges\_request  
parking\_lot\_static\_information\_request\_by\_isp  
parking\_lot\_data\_request  
parking\_lot\_price\_data\_request  
parking\_lot\_dynamic\_information\_request\_by\_isp  
advanced\_traveler\_charges\_request

**Physical Architecture Flow Name:** parking reservations request

Reservation request for parking lot.

### Logical Architecture Data Flow(s):

parking\_lot\_reservation\_request

## Information Service Provider

=> **Payment Administration**

**Physical Architecture Flow Name:** toll data request

Request made to obtain toll schedule information or pay a toll in advance. The request can be a subscription that initiates as-needed information updates as well as a one-time request for information.

### Logical Architecture Data Flow(s):

toll\_price\_data\_request  
advanced\_traveler\_tolls\_request  
advanced\_other\_tolls\_request

## Information Service Provider

=> **Personal Information Access**

**Physical Architecture Flow Name:** broadcast traveler information

General traveler information that contains traffic and road conditions, link travel times, incidents, advisories, restrictions, transit service information, weather information, parking information, and other related traveler information.

### Logical Architecture Data Flow(s):

traveler\_personal\_broadcast\_border\_data  
traveler\_personal\_broadcast\_event\_information  
traveler\_personal\_broadcast\_weather\_data  
traveler\_personal\_broadcast\_multimodal\_data  
traveler\_personal\_broadcast\_parking\_data  
traveler\_personal\_broadcast\_price\_data  
traveler\_personal\_broadcast\_traffic\_data  
traveler\_personal\_broadcast\_transit\_data  
traveler\_personal\_broadcast\_incident\_information

**Physical Architecture Flow Name:** emergency traveler information

Public notification of an emergency such as a natural or man-made disaster, civil emergency, or child abduction. This flow also includes evacuation information including evacuation instructions, evacuation zones, recommended evacuation times, tailored evacuation routes and

## Information Service Provider

destinations, traffic and road conditions along the evacuation routes, traveler services and shelter information, and reentry times and instructions.

### Logical Architecture Data Flow(s):

- traveler\_personal\_evacuation\_traveler\_information
- traveler\_personal\_wide\_area\_alert\_information
- traveler\_personal\_emergency\_traveler\_information
- traveler\_personal\_transportation\_system\_status

**Physical Architecture Flow Name:** interactive traveler information

Traveler information provided in response to a traveler request. The provided information includes traffic and road conditions, advisories, incidents, payment information, transit services, parking information, weather information, and other travel-related data updates and confirmations.

### Logical Architecture Data Flow(s):

- traveler\_personal\_display\_update\_payment\_response
- traveler\_personal\_interactive\_transit\_data
- traveler\_personal\_interactive\_event\_information
- traveler\_personal\_interactive\_traffic\_data
- traveler\_personal\_interactive\_price\_data
- traveler\_personal\_interactive\_parking\_data
- traveler\_personal\_interactive\_multimodal\_data
- traveler\_personal\_interactive\_incident\_information
- traveler\_map\_update\_payment\_response
- traveler\_personal\_interactive\_border\_data
- traveler\_personal\_interactive\_weather\_data

**Physical Architecture Flow Name:** travel services information

Travel service information and reservations for tourist attractions, lodging, dining, service stations, emergency services, and other services and businesses of interest to the traveler.

### Logical Architecture Data Flow(s):

- traveler\_personal\_transaction\_confirmation
- traveler\_personal\_travel\_services\_provider\_data

**Physical Architecture Flow Name:** traveler alerts

Traveler information alerts reporting congestion, incidents, adverse road or weather conditions, parking availability, transit service delays or interruptions, and other information that may impact the traveler. Relevant alerts are provided based on traveler-supplied profile information including trip characteristics and preferences.

### Logical Architecture Data Flow(s):

- traveler\_personal\_border\_alert
- traveler\_personal\_weather\_alert
- traveler\_personal\_transit\_alert
- traveler\_personal\_traffic\_alert
- traveler\_personal\_parking\_alert
- traveler\_personal\_multimodal\_alert
- traveler\_personal\_incident\_alert
- traveler\_personal\_event\_alert

**Physical Architecture Flow Name:** trip plan

A travel itinerary identifying a route and associated traveler information and instructions identifying recommended modes and transfer information, ride sharing options, and transit and parking reservation information.

### Logical Architecture Data Flow(s):

- traveler\_guidance\_route
- traveler\_personal\_payment\_confirmation
- traveler\_personal\_trip\_information

**Information Service Provider** => **Remote Traveler Support**

**Physical Architecture Flow Name:** broadcast traveler information

General traveler information that contains traffic and road conditions, link travel times, incidents, advisories, restrictions, transit service information, weather information, parking information, and other related traveler information.

**Logical Architecture Data Flow(s):**

- traveler\_broadcast\_parking\_data
- traveler\_broadcast\_weather\_data
- traveler\_broadcast\_price\_data
- traveler\_broadcast\_multimodal\_data
- traveler\_broadcast\_incident\_information
- traveler\_broadcast\_event\_information
- traveler\_broadcast\_border\_data
- traveler\_broadcast\_transit\_data
- traveler\_broadcast\_traffic\_data

**Physical Architecture Flow Name:** emergency traveler information

Public notification of an emergency such as a natural or man-made disaster, civil emergency, or child abduction. This flow also includes evacuation information including evacuation instructions, evacuation zones, recommended evacuation times, tailored evacuation routes and destinations, traffic and road conditions along the evacuation routes, traveler services and shelter information, and reentry times and instructions.

**Logical Architecture Data Flow(s):**

- traveler\_transportation\_system\_status
- traveler\_wide\_area\_alert\_information
- traveler\_evacuation\_traveler\_information
- traveler\_emergency\_traveler\_information

**Physical Architecture Flow Name:** interactive traveler information

Traveler information provided in response to a traveler request. The provided information includes traffic and road conditions, advisories, incidents, payment information, transit services, parking information, weather information, and other travel-related data updates and confirmations.

**Logical Architecture Data Flow(s):**

- traveler\_interactive\_parking\_data
- advanced\_tolls\_and\_charges\_roadside\_confirm
- traveler\_interactive\_weather\_data
- traveler\_interactive\_transit\_data
- traveler\_interactive\_price\_data
- traveler\_interactive\_border\_data
- traveler\_interactive\_multimodal\_data
- traveler\_interactive\_incident\_information
- traveler\_interactive\_event\_information
- traveler\_interactive\_traffic\_data

**Physical Architecture Flow Name:** travel services information

Travel service information and reservations for tourist attractions, lodging, dining, service stations, emergency services, and other services and businesses of interest to the traveler.

**Logical Architecture Data Flow(s):**

- traveler\_travel\_services\_provider\_data
- traveler\_transaction\_confirmation

**Physical Architecture Flow Name:** trip plan

A travel itinerary identifying a route and associated traveler information and instructions identifying recommended modes and transfer information, ride sharing options, and transit and parking reservation information.

**Logical Architecture Data Flow(s):**

- traveler\_payment\_confirmation



## Information Service Provider

traveler\_trip\_information

**Information Service Provider** => **Roadway**

**Physical Architecture Flow Name:** broadcast traveler information

General traveler information that contains traffic and road conditions, link travel times, incidents, advisories, restrictions, transit service information, weather information, parking information, and other related traveler information.

**Logical Architecture Data Flow(s):**

field\_broadcast\_traffic\_data  
field\_broadcast\_price\_data  
field\_broadcast\_weather\_data  
field\_broadcast\_parking\_data  
field\_broadcast\_multimodal\_data  
field\_broadcast\_incident\_information  
field\_broadcast\_event\_information  
field\_broadcast\_border\_data  
field\_broadcast\_transit\_data

**Physical Architecture Flow Name:** emergency traveler information

Public notification of an emergency such as a natural or man-made disaster, civil emergency, or child abduction. This flow also includes evacuation information including evacuation instructions, evacuation zones, recommended evacuation times, tailored evacuation routes and destinations, traffic and road conditions along the evacuation routes, traveler services and shelter information, and reentry times and instructions.

**Logical Architecture Data Flow(s):**

field\_emergency\_traveler\_information  
field\_evacuation\_traveler\_information  
field\_transportation\_system\_status  
field\_wide\_area\_alert\_information

**Information Service Provider** => **Shelter Providers**

**Physical Architecture Flow Name:** emergency traveler information

Public notification of an emergency such as a natural or man-made disaster, civil emergency, or child abduction. This flow also includes evacuation information including evacuation instructions, evacuation zones, recommended evacuation times, tailored evacuation routes and destinations, traffic and road conditions along the evacuation routes, traveler services and shelter information, and reentry times and instructions.

**Logical Architecture Data Flow(s):**

tsp-evacuation\_traveler\_information

**Information Service Provider** => **Surface Transportation Weather Service**

**Physical Architecture Flow Name:** road network environmental probe data

Aggregated vehicle probe information that can be used to estimate current environmental conditions. Collected information would include measured air temperature, exterior light status, wiper status, sun sensor status, rain sensor status, traction control status, ALB status, and other collected vehicle system status and sensor information.

**Logical Architecture Data Flow(s):**

tstws-env\_probe\_info\_from\_isp

**Physical Architecture Flow Name:** transportation weather information request

A request for transportation weather information that may specify the area of interest (a geographic region, particular routes within a region, specific road segments), the type of information that is required, the desired spatial resolution of the information, and time horizon.

**Logical Architecture Data Flow(s):**  
tstws-trans\_weather\_info\_request

**Information Service Provider** => **Telecommunications System for Traveler Information**

**Physical Architecture Flow Name:** voice-based alert notification

Information to be distributed to the traveling public via voice regarding a major emergency such as a natural or man-made disaster, civil emergency, severe weather or child abduction. The flow may identify the alert originator, the nature of the emergency, the geographic area affected by the emergency, the effective time period, and information and instructions necessary for the public to respond to the alert. The content of this architecture flow may be specially formatted for voice-based traveler information.

**Logical Architecture Data Flow(s):**  
traveler\_telecomm\_wide\_area\_alert\_information  
ttsti-telecomm\_alert\_notification

**Physical Architecture Flow Name:** voice-based traveler information

Traveler information sent to the telecommunications systems for traveler information terminator. This flow may represent the bulk transfer of traveler information, including traffic conditions, incident information, transit information and weather and road condition information. It may be specially formatted for voice-based traveler information.

**Logical Architecture Data Flow(s):**  
ttsti-telecomm\_caller\_traveler\_information  
ttsti-telecomm\_batch\_regional\_traveler\_information

**Information Service Provider** => **Traffic Management**

**Physical Architecture Flow Name:** fare and price information

Current transit, parking, and toll fee schedule information.

**Logical Architecture Data Flow(s):**  
parking\_lot\_charge\_details  
transit\_fare\_details  
toll\_price\_details

**Physical Architecture Flow Name:** logged vehicle routes

Anticipated route information for guided vehicles, special vehicles (e.g., oversize vehicles) or groups of vehicles (e.g., governor's motorcade) that may require changes in traffic control strategy.

**Logical Architecture Data Flow(s):**  
special\_vehicle\_priority\_routing  
logged\_special\_vehicle\_route  
current\_other\_routes\_use  
current\_transit\_routes\_use  
route\_segment\_use\_prediction

**Physical Architecture Flow Name:** road network traffic probe data

Aggregated route usage, travel times, and other aggregated data collected from probe vehicles that can be used to estimate current traffic conditions.

**Logical Architecture Data Flow(s):**  
current\_road\_network\_use  
traffic\_probe\_info\_from\_isp\_for\_traffic

**Physical Architecture Flow Name:** transportation information for operations

Information on the state of transportation system operations including traffic and road conditions, advisories, incidents, transit service information, weather information, parking

## Information Service Provider

information, and other related data.

### Logical Architecture Data Flow(s):

transportation\_information\_for\_traffic\_operations

## Information Service Provider => Transit Management

### Physical Architecture Flow Name: demand responsive transit request

Request for paratransit support.

### Logical Architecture Data Flow(s):

paratransit\_trip\_request

### Physical Architecture Flow Name: selected routes

Routes selected based on route request criteria.

### Logical Architecture Data Flow(s):

paratransit\_service\_confirmation  
transit\_trip\_confirmation  
advanced\_tolls\_and\_charges\_vehicle\_confirm

### Physical Architecture Flow Name: transit information request

Request for transit operations information including schedule and fare information. The request can be a subscription that initiates as-needed information updates as well as a one-time request for information.

### Logical Architecture Data Flow(s):

transit\_services\_guidance\_request  
transit\_fare\_data\_request  
advanced\_traveler\_fares\_request  
advanced\_other\_fares\_request

### Physical Architecture Flow Name: transit trip request

Request for a transit trip plan that is responsive to traveler requirements such as schedule, cost, or duration.

### Logical Architecture Data Flow(s):

transit\_trip\_request

### Physical Architecture Flow Name: transportation information for operations

Information on the state of transportation system operations including traffic and road conditions, advisories, incidents, transit service information, weather information, parking information, and other related data.

### Logical Architecture Data Flow(s):

transportation\_information\_for\_transit\_operations

## Information Service Provider => Travel Services Provider

### Physical Architecture Flow Name: travel service information request

Requests for travel service information. This flow supports initial registration of service providers and requests for additional traveler service information from registered providers.

### Logical Architecture Data Flow(s):

ttsp-travel\_services\_info\_request  
ttsp-provider\_update\_confirm

### Physical Architecture Flow Name: travel service reservation request

Reservation request for traveler services (e.g. for a hotel or restaurant) including billing information when applicable.

### Logical Architecture Data Flow(s):

ttsp-transaction\_request

**Information Service Provider** => **Vehicle**

**Physical Architecture Flow Name:** broadcast traveler information

General traveler information that contains traffic and road conditions, link travel times, incidents, advisories, restrictions, transit service information, weather information, parking information, and other related traveler information.

**Logical Architecture Data Flow(s):**

vehicle\_broadcast\_weather\_data  
 vehicle\_broadcast\_traffic\_data  
 link\_and\_queue\_data  
 vehicle\_broadcast\_transit\_data  
 vehicle\_broadcast\_price\_data  
 vehicle\_broadcast\_parking\_data  
 vehicle\_broadcast\_multimodal\_data  
 vehicle\_broadcast\_incident\_information  
 vehicle\_broadcast\_event\_information  
 vehicle\_broadcast\_border\_data

**Physical Architecture Flow Name:** emergency traveler information

Public notification of an emergency such as a natural or man-made disaster, civil emergency, or child abduction. This flow also includes evacuation information including evacuation instructions, evacuation zones, recommended evacuation times, tailored evacuation routes and destinations, traffic and road conditions along the evacuation routes, traveler services and shelter information, and reentry times and instructions.

**Logical Architecture Data Flow(s):**

vehicle\_transportation\_system\_status  
 vehicle\_wide\_area\_alert\_information  
 vehicle\_emergency\_traveler\_information  
 vehicle\_evacuation\_traveler\_information

**Physical Architecture Flow Name:** interactive traveler information

Traveler information provided in response to a traveler request. The provided information includes traffic and road conditions, advisories, incidents, payment information, transit services, parking information, weather information, and other travel-related data updates and confirmations.

**Logical Architecture Data Flow(s):**

vehicle\_interactive\_incident\_information  
 vehicle\_interactive\_transit\_data  
 advanced\_tolls\_and\_fares\_response  
 advanced\_fares\_and\_charges\_response  
 driver\_map\_update\_payment\_response  
 vehicle\_interactive\_weather\_data  
 vehicle\_interactive\_traffic\_data  
 vehicle\_interactive\_price\_data  
 vehicle\_interactive\_parking\_data  
 vehicle\_interactive\_border\_data  
 vehicle\_interactive\_event\_information  
 driver\_display\_update\_payment\_response  
 vehicle\_interactive\_multimodal\_data

**Physical Architecture Flow Name:** traffic probe reporting management

Data used to manage probe data reporting by vehicles. This flow indicates to the vehicle when to report probe data, the type of probe data to send, and thresholds for nominal conditions when sending data can be skipped.

**Logical Architecture Data Flow(s):**

traffic\_probe\_configuration

**Physical Architecture Flow Name:** travel services information

## Information Service Provider

Travel service information and reservations for tourist attractions, lodging, dining, service stations, emergency services, and other services and businesses of interest to the traveler.

### Logical Architecture Data Flow(s):

vehicle\_transaction\_confirmation  
vehicle\_travel\_services\_provider\_data

**Physical Architecture Flow Name:** traveler alerts

Traveler information alerts reporting congestion, incidents, adverse road or weather conditions, parking availability, transit service delays or interruptions, and other information that may impact the traveler. Relevant alerts are provided based on traveler-supplied profile information including trip characteristics and preferences.

### Logical Architecture Data Flow(s):

vehicle\_traffic\_alert  
vehicle\_border\_alert  
vehicle\_event\_alert  
vehicle\_incident\_alert  
vehicle\_weather\_alert  
vehicle\_parking\_alert  
vehicle\_multimodal\_alert  
vehicle\_transit\_alert

**Physical Architecture Flow Name:** trip plan

A travel itinerary identifying a route and associated traveler information and instructions identifying recommended modes and transfer information, ride sharing options, and transit and parking reservation information.

### Logical Architecture Data Flow(s):

vehicle\_payment\_confirmation  
vehicle\_trip\_information  
vehicle\_guidance\_route

**Information Service Provider** => **Weather Service**

**Physical Architecture Flow Name:** road network environmental probe data

Aggregated vehicle probe information that can be used to estimate current environmental conditions. Collected information would include measured air temperature, exterior light status, wiper status, sun sensor status, rain sensor status, traction control status, ALB status, and other collected vehicle system status and sensor information.

### Logical Architecture Data Flow(s):

tws-env\_probe\_info\_from\_isp

**ISP Operator** => **Information Service Provider**

**Physical Architecture Flow Name:** ISP operator inputs

User input from the ISP system operator including requests to monitor current system operation and inputs to affect system operation including tuning and performance enhancement parameters to ISP algorithms.

### Logical Architecture Data Flow(s):

fispo-route\_selection\_parameters\_update  
fispo-request\_other\_routes\_selection\_map\_data\_update  
fispo-route\_selection\_parameters\_request  
fispo-trav\_info\_equip\_status\_request  
fispo-trip\_planning\_parameters\_update  
fispo-trip\_planning\_parameters\_request  
fispo-request\_trip\_planning\_map\_update  
fispo-archive\_commands  
fispo-data\_collection\_parameters\_update  
fispo-data\_collection\_parameters\_request

## Information Service Provider

fispo-request\_route\_selection\_map\_data\_update  
fispo-request\_data\_collection\_map\_update  
fispo-request\_traveler\_service\_map\_update  
fispo-travel\_services\_operator\_inputs  
fispo-traveler\_information\_parameters\_update  
fispo-traveler\_information\_parameters\_request  
fispo-traveler\_data\_collection\_request

### **Maintenance and Construction Management** => **Information Service Provider**

**Physical Architecture Flow Name:** current asset restrictions

Restrictions levied on transportation asset usage based on infrastructure design, surveys, tests, or analyses. This includes standard facility design height, width, and weight restrictions, special restrictions such as spring weight restrictions, and temporary facility restrictions that are imposed during maintenance and construction.

**Logical Architecture Data Flow(s):**  
asset\_restrictions\_for\_info\_provider

**Physical Architecture Flow Name:** equipment maintenance status

Current status of field equipment maintenance actions.

**Logical Architecture Data Flow(s):**  
field\_equip\_maint\_status\_for\_isp

**Physical Architecture Flow Name:** maint and constr work plans

Future construction and maintenance work schedules and activities including anticipated closures with anticipated impact to the roadway, alternate routes, anticipated delays, closure times, and durations.

**Logical Architecture Data Flow(s):**  
m\_and\_c\_work\_plans\_for\_info\_provider

**Physical Architecture Flow Name:** road weather information

Road conditions and weather information that are made available by road maintenance operations to other transportation system operators.

**Logical Architecture Data Flow(s):**  
road\_weather\_info\_for\_isp

**Physical Architecture Flow Name:** roadway maintenance status

Summary of maintenance fleet operations affecting the road network. This includes the status of winter maintenance (snow plow schedule and current status).

**Logical Architecture Data Flow(s):**  
roadway\_maint\_status\_for\_info\_provider

**Physical Architecture Flow Name:** work zone information

Summary of maintenance and construction work zone activities affecting the road network including the nature of the maintenance or construction activity, location, impact to the roadway, expected time(s) and duration of impact, anticipated delays, alternate routes, and suggested speed limits. This information may be augmented with images that provide a visual indication of current work zone status and traffic impacts.

**Logical Architecture Data Flow(s):**  
work\_zone\_images\_for\_isp  
work\_zone\_info\_for\_isp

### **Map Update Provider** => **Information Service Provider**

**Physical Architecture Flow Name:** map updates

## Information Service Provider

Map update which could include a new underlying static or real-time map or map layer(s) update.

**Logical Architecture Data Flow(s):**  
fmup-info\_provider\_map\_data

**Media** => **Information Service Provider**

**Physical Architecture Flow Name:** external reports

Traffic and incident information that is collected by the media through a variety of mechanisms (e.g., radio station call-in programs, air surveillance).

**Logical Architecture Data Flow(s):**  
fm-incident\_details  
fm-traveler\_information

**Multimodal Transportation Service Provider** => **Information Service Provider**

**Physical Architecture Flow Name:** multimodal information

Schedule information for alternate mode transportation providers such as train, ferry, air and bus.

**Logical Architecture Data Flow(s):**  
fmtsp-transit\_transfer\_clusters  
fmtsp-non\_motorized\_services  
fmtsp-multimodal\_service\_confirmation  
fmtsp-rail\_services  
fmtsp-air\_services  
fmtsp-ferry\_services

**Other ISP** => **Information Service Provider**

**Physical Architecture Flow Name:** emergency traveler information

Public notification of an emergency such as a natural or man-made disaster, civil emergency, or child abduction. This flow also includes evacuation information including evacuation instructions, evacuation zones, recommended evacuation times, tailored evacuation routes and destinations, traffic and road conditions along the evacuation routes, traveler services and shelter information, and reentry times and instructions.

**Logical Architecture Data Flow(s):**  
foisp-emergency\_data

**Physical Architecture Flow Name:** incident information

Notification of existence of incident and expected severity, location, time and nature of incident. As additional information is gathered and the incident evolves, updated incident information is provided. Incidents include any event that impacts transportation system operation ranging from routine incidents (e.g., disabled vehicle at the side of the road) through large-scale natural or human-caused disasters that involve loss of life, injuries, extensive property damage, and multi-jurisdictional response. This also includes special events, closures, and other planned events that may impact the transportation system.

**Logical Architecture Data Flow(s):**  
foisp-incident\_data

**Physical Architecture Flow Name:** multimodal information

Schedule information for alternate mode transportation providers such as train, ferry, air and bus.

**Logical Architecture Data Flow(s):**  
foisp-multimodal\_data

**Physical Architecture Flow Name:** parking information

## Information Service Provider

General parking information and status, including current parking availability.

**Logical Architecture Data Flow(s):**

foisp-parking\_data

**Physical Architecture Flow Name:** road network conditions

Current and forecasted traffic information, road and weather conditions, and other road network status. Either raw data, processed data, or some combination of both may be provided by this architecture flow. Information on diversions and alternate routes, closures, and special traffic restrictions (lane/shoulder use, weight restrictions, width restrictions, HOV requirements) in effect is included along with a definition of the links, nodes, and routes that make up the road network.

**Logical Architecture Data Flow(s):**

foisp-traffic\_data  
foisp-road\_network\_inventory  
foisp-road\_weather\_data

**Physical Architecture Flow Name:** traffic images

High fidelity, real-time traffic images suitable for surveillance monitoring by the operator or for use in machine vision applications.

**Logical Architecture Data Flow(s):**

foisp-traffic\_images

**Physical Architecture Flow Name:** transit service information

Transit service information including routes, schedules, and fare information as well as dynamic transit schedule adherence and transit vehicle location information.

**Logical Architecture Data Flow(s):**

foisp-transit\_fare\_data  
foisp-transit\_data

**Parking Management** => **Information Service Provider**

**Physical Architecture Flow Name:** parking information

General parking information and status, including current parking availability.

**Logical Architecture Data Flow(s):**

parking\_lot\_price\_data  
parking\_lot\_availability  
static\_parking\_information\_for\_isp  
dynamic\_parking\_information\_for\_isp

**Physical Architecture Flow Name:** parking lot reservation confirmation

Confirmation for parking lot reservation.

**Logical Architecture Data Flow(s):**

advanced\_other\_charges\_confirm  
advanced\_traveler\_charges\_confirm  
parking\_lot\_reservation\_confirm

**Payment Administration** => **Information Service Provider**

**Physical Architecture Flow Name:** toll data

Current toll schedules for different types of vehicles as well as advanced toll payment information.

**Logical Architecture Data Flow(s):**

advanced\_other\_tolls\_confirm  
toll\_price\_data  
advanced\_traveler\_tolls\_confirm



## Information Service Provider

**Physical Architecture Flow Name:** toll probe data

Aggregate probe data derived from electronic toll collection operations. Data collected could include vehicle speeds and travel times for a given link or collection of links.

**Logical Architecture Data Flow(s):**

toll\_probe\_data\_for\_isp

**Physical Architecture Flow Name:** VMT data for ISP

Road use charge rate policies for distribution to travelers.

**Logical Architecture Data Flow(s):**

vmt\_price\_data

**Personal Information Access** => **Information Service Provider**

**Physical Architecture Flow Name:** emergency traveler information request

Request for alerts, evacuation information, and other emergency information provided to the traveling public.

**Logical Architecture Data Flow(s):**

traveler\_personal\_emergency\_information\_request

**Physical Architecture Flow Name:** travel services request

Request for travel service information including tourist attractions, lodging, restaurants, service stations, and emergency services. The request identifies the type of service, the area of interest, optional reservation request information, parameters that are used to prioritize or filter the returned information, and sorting preferences.

**Logical Architecture Data Flow(s):**

traveler\_personal\_transaction\_request  
traveler\_personal\_payment\_information\_for\_services  
traveler\_personal\_travel\_services\_data\_request

**Physical Architecture Flow Name:** traveler profile

Information about a traveler including equipment capabilities, personal preferences, and traveler alert subscriptions.

**Logical Architecture Data Flow(s):**

traveler\_personal\_profile  
traveler\_personal\_alert\_subscriptions

**Physical Architecture Flow Name:** traveler request

A request for traveler information including traffic, transit, toll, parking, road weather conditions, event, and passenger rail information. The request identifies the type of information, the area of interest, parameters that are used to prioritize or filter the returned information, and sorting preferences.

**Logical Architecture Data Flow(s):**

traveler\_map\_update\_payment\_request  
traveler\_personal\_information\_request  
traveler\_personal\_display\_update\_payment\_request

**Physical Architecture Flow Name:** trip confirmation

Acknowledgement by the driver/traveler of acceptance of a trip plan with associated personal and payment information required to confirm reservations.

**Logical Architecture Data Flow(s):**

traveler\_personal\_payment\_information  
traveler\_personal\_trip\_confirmation  
traveler\_route\_accepted

**Physical Architecture Flow Name:** trip request

## Information Service Provider

Request for trip planning services that identifies the trip origin, destination(s), timing, preferences, and constraints. The request may also include a request for transit and parking reservations and ridesharing options associated with the trip.

### Logical Architecture Data Flow(s):

traveler\_personal\_trip\_request  
traveler\_route\_request

## Remote Traveler Support

=> **Information Service Provider**

### Physical Architecture Flow Name: emergency traveler information request

Request for alerts, evacuation information, and other emergency information provided to the traveling public.

### Logical Architecture Data Flow(s):

traveler\_emergency\_information\_request

### Physical Architecture Flow Name: travel services request

Request for travel service information including tourist attractions, lodging, restaurants, service stations, and emergency services. The request identifies the type of service, the area of interest, optional reservation request information, parameters that are used to prioritize or filter the returned information, and sorting preferences.

### Logical Architecture Data Flow(s):

traveler\_payment\_information\_for\_services  
traveler\_travel\_services\_data\_request  
traveler\_transaction\_request

### Physical Architecture Flow Name: traveler request

A request for traveler information including traffic, transit, toll, parking, road weather conditions, event, and passenger rail information. The request identifies the type of information, the area of interest, parameters that are used to prioritize or filter the returned information, and sorting preferences.

### Logical Architecture Data Flow(s):

traveler\_information\_request  
advanced\_tolls\_and\_charges\_roadside\_request

### Physical Architecture Flow Name: trip confirmation

Acknowledgement by the driver/traveler of acceptance of a trip plan with associated personal and payment information required to confirm reservations.

### Logical Architecture Data Flow(s):

traveler\_payment\_information  
traveler\_trip\_confirmation

### Physical Architecture Flow Name: trip request

Request for trip planning services that identifies the trip origin, destination(s), timing, preferences, and constraints. The request may also include a request for transit and parking reservations and ridesharing options associated with the trip.

### Logical Architecture Data Flow(s):

traveler\_trip\_request

## Roadway

=> **Information Service Provider**

### Physical Architecture Flow Name: environmental probe data

Data from vehicle safety and convenience systems that can be used to estimate environmental conditions, including measured air temperature, exterior light status, wiper status, sun sensor status, rain sensor status, traction control status, anti-lock brake status, and other collected vehicle system status and sensor information. The collected data is reported along with the location, heading, and time that the data was collected. Both current data and

## Information Service Provider

snapshots of recent events (e.g., traction control or anti-lock brake system activations) may be reported.

### Logical Architecture Data Flow(s):

vehicle\_env\_probe\_data\_for\_isp  
vehicle\_env\_probe\_status\_for\_isp

**Physical Architecture Flow Name:** short range communications status

Status of the short range communications equipment including the current state or mode of operation and the current equipment status.

### Logical Architecture Data Flow(s):

trav\_info equip\_status\_for\_isp\_operator

**Physical Architecture Flow Name:** traffic probe data

Vehicle data that is used to determine traffic conditions. In a basic implementation, the data could be limited to time stamped unique identifiers that can be used to measure a vehicle's progress through the network. In more advanced implementations, the vehicle may report current position, speed, and heading and snapshots of recent events including route information, starts and stops, speed changes, and other information that can be used to estimate traffic conditions.

### Logical Architecture Data Flow(s):

vehicle\_traffic\_probe\_data\_for\_isp  
vehicle\_traffic\_probe\_status\_for\_isp

**Shelter Providers** => **Information Service Provider**

**Physical Architecture Flow Name:** shelter information

Evacuation shelter information including location, hours of operation, special accommodations, and current vacancy/availability information.

### Logical Architecture Data Flow(s):

fsp-shelter\_information\_to\_travelers

**Surface Transportation Weather Service** => **Information Service Provider**

**Physical Architecture Flow Name:** transportation weather information

Current and forecast road conditions and weather information (e.g., surface condition, flooding, wind advisories, visibility, etc.) associated with the transportation network. This information is of a resolution, timeliness, and accuracy to be useful in transportation decision making.

### Logical Architecture Data Flow(s):

fstws-surface\_trans\_weather\_forecasts  
fstws-surface\_trans\_weather\_observations

**Telecommunications System for Traveler Information** => **Information Service Provider**

**Physical Architecture Flow Name:** voice-based traveler request

The electronic traveler information request from the telecommunications systems for traveler information terminator. It may be specifically formatted for voice-based traveler requests. The request can be a general subscription intended to initiate a continuous or regular data stream or a specific request intended to initiate a one-time response from the recipient.

### Logical Architecture Data Flow(s):

ftsti-telecomm\_caller\_request  
ftsti-telecomm\_batch\_regional\_info\_request

**Traffic Management** => **Information Service Provider**

**Physical Architecture Flow Name:** incident information

Notification of existence of incident and expected severity, location, time and nature of incident. As additional information is gathered and the incident evolves, updated incident information is provided. Incidents include any event that impacts transportation system operation ranging from routine incidents (e.g., disabled vehicle at the side of the road) through large-scale natural or human-caused disasters that involve loss of life, injuries, extensive property damage, and multi-jurisdictional response. This also includes special events, closures, and other planned events that may impact the transportation system.

**Logical Architecture Data Flow(s):**

traffic\_incident\_data\_for\_isp  
planned\_events

**Physical Architecture Flow Name:** road network conditions

Current and forecasted traffic information, road and weather conditions, and other road network status. Either raw data, processed data, or some combination of both may be provided by this architecture flow. Information on diversions and alternate routes, closures, and special traffic restrictions (lane/shoulder use, weight restrictions, width restrictions, HOV requirements) in effect is included along with a definition of the links, nodes, and routes that make up the road network.

**Logical Architecture Data Flow(s):**

traffic\_data\_for\_isp  
reversible\_lane\_signal\_state\_for\_roads  
traffic\_road\_weather\_data\_for\_isp  
roadway\_detours\_and\_closures\_for\_isp  
current\_road\_network\_state  
current\_highway\_network\_state  
link\_data\_for\_guidance  
prediction\_data  
reversible\_lane\_signal\_state\_for\_freeways

**Physical Architecture Flow Name:** traffic images

High fidelity, real-time traffic images suitable for surveillance monitoring by the operator or for use in machine vision applications.

**Logical Architecture Data Flow(s):**

traffic\_video\_for\_isp

**Transit Management** => **Information Service Provider**

**Physical Architecture Flow Name:** demand responsive transit plan

Plan regarding overall demand responsive transit schedules and deployment.

**Logical Architecture Data Flow(s):**

paratransit\_personal\_schedule

**Physical Architecture Flow Name:** emergency transit schedule information

Information on transit schedule and service changes that adapt the service to better meet needs of responders and the general public in an emergency situation, including special service schedules supporting evacuation.

**Logical Architecture Data Flow(s):**

transit\_evacuation\_data\_for\_isp

**Physical Architecture Flow Name:** transit and fare schedules

Transit service information including routes, schedules, and fare information.

**Logical Architecture Data Flow(s):**

transit\_services\_for\_guidance  
transit\_fare\_data  
transit\_transfer\_point\_list

## Information Service Provider

transit\_services\_for\_isp  
transit\_fare\_data\_for\_isp

**Physical Architecture Flow Name:** transit incident information

Information on transit incidents that impact transit services for public dissemination.

**Logical Architecture Data Flow(s):**

transit\_incident\_data

**Physical Architecture Flow Name:** transit probe data

Aggregate probe data derived from tracking transit vehicles. Data collected could include transit vehicle speeds and travel times for a given link or collection of links.

**Logical Architecture Data Flow(s):**

transit\_probe\_data\_for\_isp

**Physical Architecture Flow Name:** transit request confirmation

Confirmation of a request for transit information or service.

**Logical Architecture Data Flow(s):**

advanced\_other\_fares\_confirm  
advanced\_tolls\_and\_charges\_vehicle\_request  
advanced\_traveler\_fares\_confirm

**Physical Architecture Flow Name:** transit schedule adherence information

Dynamic transit schedule adherence and transit vehicle location information.

**Logical Architecture Data Flow(s):**

transit\_vehicle\_deviations\_details

**Physical Architecture Flow Name:** transit trip plan

An origin-destination transit trip that may involve multiple modes and connections. (could use current trip plan that is PIAS to ISP, but since this is center to center a separate AF might be called for).

**Logical Architecture Data Flow(s):**

individual\_transit\_trip\_plan

**Travel Services Provider** => **Information Service Provider**

**Physical Architecture Flow Name:** travel service information

Information supplied by a service provider (e.g., a hotel or restaurant) that identifies the service provider and provides details of the service offering. This flow covers initial registration of a service provider and subsequent submittal of new information and status updates so that data currency is maintained.

**Logical Architecture Data Flow(s):**

ftsp-request\_provider\_registration  
ftsp-provider\_profile\_update  
ftsp-emergency\_travel\_service\_update  
ftsp-travel\_services\_data

**Physical Architecture Flow Name:** travel service reservations

Traveler service (e.g., for a hotel or restaurant) reservation information and status, including information on associated billing transactions, when applicable.

**Logical Architecture Data Flow(s):**

ftsp-transaction\_confirmation

**Vehicle** => **Information Service Provider**

**Physical Architecture Flow Name:** emergency traveler information request

Request for alerts, evacuation information, and other emergency information provided to the traveling public.

**Logical Architecture Data Flow(s):**  
vehicle\_emergency\_information\_request

**Physical Architecture Flow Name:** environmental probe data

Data from vehicle safety and convenience systems that can be used to estimate environmental conditions, including measured air temperature, exterior light status, wiper status, sun sensor status, rain sensor status, traction control status, anti-lock brake status, and other collected vehicle system status and sensor information. The collected data is reported along with the location, heading, and time that the data was collected. Both current data and snapshots of recent events (e.g., traction control or anti-lock brake system activations) may be reported.

**Logical Architecture Data Flow(s):**  
env\_probe\_data\_from\_vehicle

**Physical Architecture Flow Name:** traffic probe data

Vehicle data that is used to determine traffic conditions. In a basic implementation, the data could be limited to time stamped unique identifiers that can be used to measure a vehicle's progress through the network. In more advanced implementations, the vehicle may report current position, speed, and heading and snapshots of recent events including route information, starts and stops, speed changes, and other information that can be used to estimate traffic conditions.

**Logical Architecture Data Flow(s):**  
guidance\_probe\_data\_from\_vehicle  
traffic\_probe\_data\_from\_vehicle

**Physical Architecture Flow Name:** travel services request

Request for travel service information including tourist attractions, lodging, restaurants, service stations, and emergency services. The request identifies the type of service, the area of interest, optional reservation request information, parameters that are used to prioritize or filter the returned information, and sorting preferences.

**Logical Architecture Data Flow(s):**  
vehicle\_transaction\_request  
vehicle\_travel\_services\_data\_request

**Physical Architecture Flow Name:** traveler profile

Information about a traveler including equipment capabilities, personal preferences, and traveler alert subscriptions.

**Logical Architecture Data Flow(s):**  
vehicle\_profile  
vehicle\_alert\_subscriptions

**Physical Architecture Flow Name:** traveler request

A request for traveler information including traffic, transit, toll, parking, road weather conditions, event, and passenger rail information. The request identifies the type of information, the area of interest, parameters that are used to prioritize or filter the returned information, and sorting preferences.

**Logical Architecture Data Flow(s):**  
driver\_display\_update\_payment\_request  
vehicle\_information\_request  
advanced\_fares\_and\_charges\_request  
advanced\_tolls\_and\_fares\_request  
driver\_map\_update\_payment\_request

**Physical Architecture Flow Name:** trip confirmation

Acknowledgement by the driver/traveler of acceptance of a trip plan with associated personal and payment information required to confirm reservations.

**Logical Architecture Data Flow(s):**

vehicle\_payment\_information  
vehicle\_trip\_confirmation  
vehicle\_payment\_information\_for\_services  
vehicle\_guidance\_route\_accepted

**Physical Architecture Flow Name:** trip request

Request for trip planning services that identifies the trip origin, destination(s), timing, preferences, and constraints. The request may also include a request for transit and parking reservations and ridesharing options associated with the trip.

**Logical Architecture Data Flow(s):**

vehicle\_trip\_request  
vehicle\_route\_request

**Weather Service**

=>

**Information Service Provider**

**Physical Architecture Flow Name:** qualified environmental conditions data

Current road conditions (e.g., surface temperature, subsurface temperature, moisture, icing, treatment status) and surface weather conditions (e.g., air temperature, wind speed, precipitation, visibility) that has had quality checks performed on it and has been formatted and consolidated by the Clarus system. Attributes relating to the data collection (and aggregation) are also included.

**Logical Architecture Data Flow(s):**

fws-env\_sensor\_data\_for\_isp

**Physical Architecture Flow Name:** weather information

Accumulated forecasted and current weather data (e.g., temperature, pressure, wind speed, wind direction, humidity, precipitation, visibility, light conditions, etc.).

**Logical Architecture Data Flow(s):**

fws-current\_weather\_observations  
fws-weather\_forecasts

*2.11.3 Architecture Flow Diagrams for ISPS*

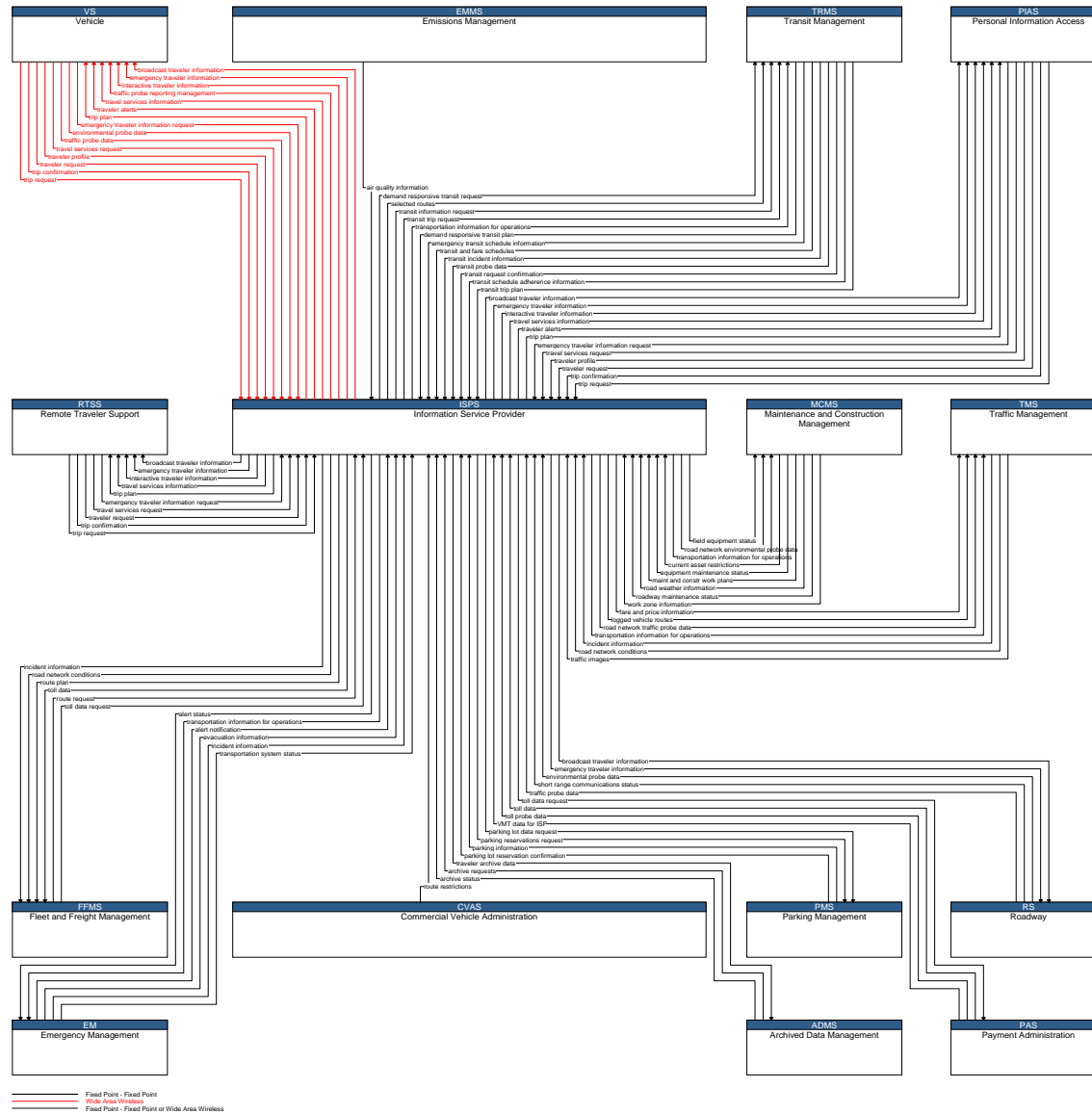
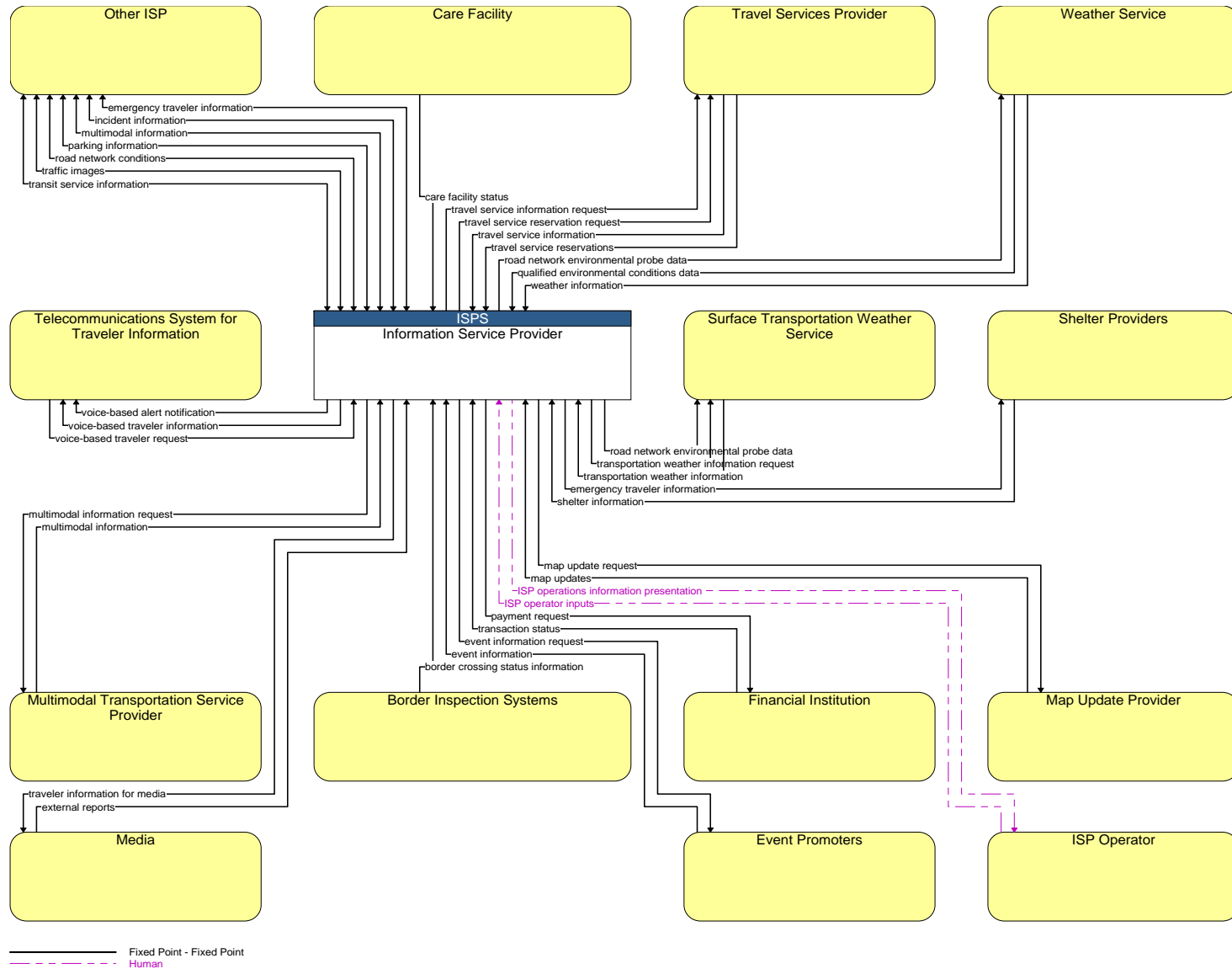


Figure 18: ISPS Subsystem Interfaces



# Information Service Provider



**Figure 19: ISPS Terminator Interfaces**

### 2.12 Maintenance and Construction Management

The Maintenance and Construction Management Subsystem (MCMS) monitors and manages roadway infrastructure construction and maintenance activities. Representing both public agencies and private contractors that provide these functions, this subsystem manages fleets of maintenance, construction, or special service vehicles (e.g., snow and ice control equipment). The subsystem receives a wide range of status information from these vehicles and performs vehicle dispatch, routing, and resource management for the vehicle fleets and associated equipment. The subsystem participates in incident response by deploying maintenance and construction resources to an incident scene, in coordination with other center subsystems. The subsystem manages equipment at the roadside, including environmental sensors and automated systems that monitor and mitigate adverse road and surface weather conditions. The subsystem manages the repair and maintenance of both non-ITS and ITS equipment including the traffic controllers, detectors, dynamic message signs, signals, and other equipment associated with the roadway infrastructure. Additional interfaces to weather information providers (the weather service and surface transportation weather service providers) provide current and forecast weather information that can be fused with other data sources and used to support advanced decision support systems that increase the efficiency and effectiveness of maintenance and construction operations.

The subsystem remotely monitors and manages ITS capabilities in work zones, gathering, storing, and disseminating work zone information to other systems. It manages traffic in the vicinity of the work zone and advises drivers of work zone status (either directly at the roadside or through an interface with the Information Service Provider or Traffic Management subsystems.) It schedules and manages the location and usage of maintenance assets (such as portable dynamic message signs).

Construction and maintenance activities are tracked and coordinated with other systems, improving the quality and accuracy of information available regarding closures and other roadway construction and maintenance activities.

#### 2.12.1 *Equipment Packages and Process Specifications for MCMS*

##### **Equipment Package: MCM Automated Treatment System Control**

This equipment package remotely monitors and controls automated road treatment systems that disperse anti-icing chemicals or otherwise treat a road segment. The automated treatment system may be remotely activated by this equipment package or it may include environmental sensors that activate the system automatically based on sensed environmental conditions. This equipment package monitors treatment system operation, sets operating parameters, and directly controls system activation if necessary.

##### **Process Specifications**

**9.2.5 Provide M&C Center Personnel Interface for Maint**

**9.2.6.1 Operate Roadway Automated Treatment System**

##### **Equipment Package: MCM Data Collection**

This equipment package collects and stores maintenance and construction information that is collected in the course of operations by the Maintenance and Construction Management Subsystem. This data can be used directly by operations personnel or it can be made available to other data users and archives in the region.

##### **Process Specifications**

**9.2.7 Manage M&C Archive Data**

##### **Equipment Package: MCM Environmental Information Collection**

This equipment package collects current road and weather conditions using data collected from environmental sensors deployed on and about the roadway. In addition to fixed sensor stations at the roadside, this equipment package also collects environmental information from sensor systems located on Maintenance and Construction Vehicles as well as the broader population of vehicle probes. It also collects current and forecast environmental conditions information that is made available by other systems. The equipment package aggregates the sensor system data and provides it, along with data attributes to meteorological systems.

##### **Process Specifications**

**9.4.2 Collect Environmental Data**

## Maintenance and Construction Management

### 9.4.5 Provide M&C Center Personnel Interface for Environment

#### **Equipment Package: MCM Environmental Information Processing**

This equipment package processes current and forecast weather data, road condition information, local environmental data, and uses internal models to develop specialized detailed forecasts of local weather and surface conditions. The processed environmental information products are presented to center personnel and disseminated to other centers.

#### **Process Specifications**

##### 9.2.2 Status Current M&C Activities and Transportation Infrastructure

##### 9.4.2 Collect Environmental Data

##### 9.4.3 Process Environmental Data

##### 9.4.4 Disseminate Environmental Information

##### 9.4.5 Provide M&C Center Personnel Interface for Environment

#### **Equipment Package: MCM Incident Management**

This equipment package supports maintenance and construction participation in coordinated incident response. Incident notifications are shared, incident response resources are managed, and the overall incident situation and incident response status is coordinated among allied response organizations.

#### **Process Specifications**

##### 9.1.4 Manage M&C Vehicle Fleet

##### 9.1.7 Process Road Network Information

##### 9.2.2 Status Current M&C Activities and Transportation Infrastructure

##### 9.2.3.4 Manage M&C Resource Needs

##### 9.2.5 Provide M&C Center Personnel Interface for Maint

#### **Equipment Package: MCM Infrastructure Monitoring**

This equipment package monitors the condition of pavement, bridges, tunnels, associated hardware, and other transportation-related infrastructure (e.g., culverts). This center equipment package monitors the infrastructure using both fixed and vehicle-based sensors. In addition to specialized infrastructure monitoring sensors, this equipment package also monitors the broader population of vehicle probes for vertical acceleration data and other probe data that may be used to determine current pavement condition.

#### **Process Specifications**

##### 9.2.3.2 Determine Roadway M&C Needs

##### 9.2.3.7 Process Environmental Probe Data for Maintenance

##### 9.2.6.3 Operate Infrastructure Monitoring Devices

#### **Equipment Package: MCM Maintenance Decision Support**

This equipment package recommends maintenance courses of action based on current and forecast environmental and road conditions and additional application specific information. Decisions are supported through understandable presentation of filtered and fused environmental and road condition information for specific time horizons as well as specific maintenance recommendations that are generated by the system based on this integrated information. The recommended courses of action are supported by information on the anticipated consequences of action or inaction, when available.

#### **Process Specifications**

##### 9.2.3.3 Provide Maintenance Decision Support

##### 9.2.5 Provide M&C Center Personnel Interface for Maint

#### **Equipment Package: MCM Roadway Maintenance and Construction**

This equipment package provides overall management and support for routine maintenance on a roadway system or right-of-way. Services managed include landscape maintenance, hazard removal (roadway debris, dead animals), routine maintenance activities (roadway cleaning, grass cutting), and repair and maintenance of both ITS and non-ITS equipment on the roadway (e.g., signs, traffic controllers, traffic detectors, dynamic message signs, traffic signals, etc.). Environmental conditions information is also received from various

## Maintenance and Construction Management

weather sources to aid in scheduling routine maintenance activities.

### Process Specifications

- 9.1.4      **Manage M&C Vehicle Fleet**
- 9.2.1      **Schedule M&C Activities**
- 9.2.2      **Status Current M&C Activities and Transportation Infrastructure**
- 9.2.3.2    **Determine Roadway M&C Needs**
- 9.2.3.4    **Manage M&C Resource Needs**
- 9.2.3.5    **Collect Roadside Equipment Status**
- 9.2.4      **Manage M&C Map Data**
- 9.2.5      **Provide M&C Center Personnel Interface for Maint**
- 9.2.6.3    **Operate Infrastructure Monitoring Devices**
- 9.2.8      **Manage M&C Materials**
- 9.4.2      **Collect Environmental Data**

### Equipment Package: MCM Speed Monitoring and Warning

This equipment package remotely monitors and controls devices that monitor vehicle speeds and provide safe speed advisories to the motorist. If excessive speeds are detected, this equipment package also includes the capability to notify an enforcement agency and request traffic enforcement in work zones or other areas where excessive speeds are identified.

### Process Specifications

- 9.2.5      **Provide M&C Center Personnel Interface for Maint**
- 9.3.3.2    **Monitor Vehicle Speed in Work Zone**

### Equipment Package: MCM Transportation Operations Data Collection

This equipment package collects real-time information on the state of the regional transportation system for operational use by the center. It includes communication and data processing capabilities that provide real-time access to regional transportation information that is stored in a regional repository. This equipment package establishes communications with the repository, requests or subscribes to information relevant to the center, receives and processes the information, and then distributes the information to other equipment packages and the system operator for use. Although request and subscription flows are not explicitly included in the National ITS Architecture, interactive data services are supported by this equipment package.

### Process Specifications

- 9.1.7      **Process Road Network Information**
- 9.2.5      **Provide M&C Center Personnel Interface for Maint**

### Equipment Package: MCM Vehicle and Equipment Maintenance Management

This equipment package monitors vehicle and equipment condition, tracks maintenance history, and schedules routine and corrective maintenance based on vehicle utilization and availability schedules.

### Process Specifications

- 9.1.5      **Schedule M&C Vehicle Maint**
- 9.2.5      **Provide M&C Center Personnel Interface for Maint**

### Equipment Package: MCM Vehicle Tracking

This equipment package tracks the location of maintenance and construction vehicles and other equipment. Vehicle location and associated information is presented to the operator.

### Process Specifications

- 9.1.3      **Track M&C Vehicles and Equipment**
- 9.2.4      **Manage M&C Map Data**
- 9.2.5      **Provide M&C Center Personnel Interface for Maint**

### Equipment Package: MCM Winter Maintenance Management

## Maintenance and Construction Management

This equipment package manages winter road maintenance, tracking and controlling snow plow operations, roadway treatment (e.g., salt spraying and other material applications), and other snow and ice control operations. It monitors environmental conditions and weather forecasts and uses the information to schedule winter maintenance activities, determine the appropriate snow and ice control response, and track and manage response operations.

### **Process Specifications**

- 9.1.4        Manage M&C Vehicle Fleet**
- 9.1.7        Process Road Network Information**
- 9.2.1        Schedule M&C Activities**
- 9.2.2        Status Current M&C Activities and Transportation Infrastructure**
- 9.2.3.1      Determine Winter Roadway Treatment Needs**
- 9.2.3.4      Manage M&C Resource Needs**
- 9.2.4        Manage M&C Map Data**
- 9.2.5        Provide M&C Center Personnel Interface for Maint**
- 9.2.8        Manage M&C Materials**
- 9.4.2        Collect Environmental Data**

### **Equipment Package: MCM Work Activity Coordination**

This equipment package disseminates work activity schedules and current asset restrictions to other agencies. Work schedules are coordinated with operating agencies, factoring in the needs and activities of other agencies and adjacent jurisdictions. Work schedules are also distributed to Information Service Providers for dissemination to the traveling public.

### **Process Specifications**

- 9.2.1        Schedule M&C Activities**
- 9.2.2        Status Current M&C Activities and Transportation Infrastructure**
- 9.2.3.4      Manage M&C Resource Needs**
- 9.2.5        Provide M&C Center Personnel Interface for Maint**

### **Equipment Package: MCM Work Zone Management**

This equipment package remotely monitors and supports work zone activities, controlling traffic through dynamic message signs (DMS), Highway Advisory Radio (HAR), gates and barriers, and informing other groups of activity (e.g., ISP, TM, other maintenance and construction centers) for better coordination management. Work zone speeds, and delays, and closures are provided to the motorist prior to the work zones. This equipment package provides control of field equipment in all maintenance areas, including fixed and portable field equipment supporting both stationary and mobile work zones.

### **Process Specifications**

- 9.1.7        Process Road Network Information**
- 9.2.1        Schedule M&C Activities**
- 9.2.5        Provide M&C Center Personnel Interface for Maint**
- 9.3.1.1      Operate Work Zone Devices**
- 9.3.2.2      Collect Work Zone Data**
- 9.3.2.3      Generate Work Zone Information for Distribution**

### **Equipment Package: MCM Work Zone Safety Management**

This equipment package remotely monitors work zone safety systems that detect vehicle intrusions in work zones and warns crew workers and drivers of imminent encroachment. Crew movements are also monitored so that the crew can be warned of movement beyond the designated safe zone.

### **Process Specifications**

- 9.2.5        Provide M&C Center Personnel Interface for Maint**
- 9.3.1.1      Operate Work Zone Devices**

## Maintenance and Construction Management

### 9.3.2.2 Collect Work Zone Data

#### 2.12.2 Interfaces for MCMS

#### Alerting and Advisory Systems => Maintenance and Construction Management

**Physical Architecture Flow Name:** alerts and advisories

Assessments (general incident and vulnerability awareness information), advisories (identification of threats or recommendations to increase preparedness levels), and alerts (information on imminent or in-progress emergencies). This flow also provides supporting descriptive detail on incidents, threats, and vulnerabilities to increase preparedness and support effective response to threats against the surface transportation system.

**Logical Architecture Data Flow(s):**  
faas-alerts\_and\_advisories\_for\_maint

#### Archived Data Management => Maintenance and Construction Management

**Physical Architecture Flow Name:** archive requests

A request to a data source for information on available data (i.e. "catalog") or a request that defines the data to be archived. The request can be a general subscription intended to initiate a continuous or regular data stream or a specific request intended to initiate a one-time response from the recipient.

**Logical Architecture Data Flow(s):**  
m\_and\_c\_archive\_request

**Physical Architecture Flow Name:** archive status

Notification that data provided to an archive contains erroneous, missing, or suspicious data or verification that the data provided appears valid. If an error has been detected, the offending data and the nature of the potential problem are identified.

**Logical Architecture Data Flow(s):**  
m\_and\_c\_archive\_status

#### Asset Management => Maintenance and Construction Management

**Physical Architecture Flow Name:** asset damage assessment

Information indicating the damage sustained by transportation assets, derived from aerial surveillance, field reports, inspections, tests, and analyses.

**Logical Architecture Data Flow(s):**  
fam-asset\_damage

**Physical Architecture Flow Name:** asset inventory

Information on pavement, bridges, signs and other assets. This includes asset location, installation information, materials information, vendor/contractor information, current maintenance status, and a variety of other information (e.g., video logs) that define the transportation infrastructure.

**Logical Architecture Data Flow(s):**  
fam-asset\_inventory

**Physical Architecture Flow Name:** asset restrictions

Restrictions levied on transportation asset usage based on infrastructure design, surveys, tests, or analyses. This includes standard height, width, and weight restrictions by facility as well as special restrictions such as spring weight restrictions and temporary bridge weight restrictions.

**Logical Architecture Data Flow(s):**

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fam-asset\_restrictions

**Physical Architecture Flow Name:** maintenance and repair needs

Recommended strategies and schedules for maintenance of the transportation infrastructure.

**Logical Architecture Data Flow(s):**  
fam-asset\_maint\_and\_repair\_needs

**Emergency Management** => **Maintenance and Construction Management**

**Physical Architecture Flow Name:** alert notification

Notification of a major emergency such as a natural or man-made disaster, civil emergency, or child abduction for distribution to the public. The flow identifies the alert originator, the nature of the emergency, the geographic area affected by the emergency, the effective time period, and information and instructions necessary for the public to respond to the alert. This flow may also identify specific information that should not be released to the public.

**Logical Architecture Data Flow(s):**  
wide\_area\_alert\_notification\_for\_maint

**Physical Architecture Flow Name:** emergency plan coordination

Information that supports coordination of emergency management plans, continuity of operations plans, emergency response and recovery plans, evacuation plans, and other emergency plans between agencies. This includes general plans that are coordinated prior to an incident and shorter duration tactical plans that are prepared during an incident.

**Logical Architecture Data Flow(s):**  
disaster\_response\_plan\_coordination\_to\_m\_and\_c  
evacuation\_plan\_coordination\_to\_m\_and\_c

**Physical Architecture Flow Name:** evacuation information

Evacuation instructions and information including evacuation zones, evacuation times, and reentry times.

**Logical Architecture Data Flow(s):**  
evacuation\_information\_for\_m\_and\_c

**Physical Architecture Flow Name:** incident information

Notification of existence of incident and expected severity, location, time and nature of incident. As additional information is gathered and the incident evolves, updated incident information is provided. Incidents include any event that impacts transportation system operation ranging from routine incidents (e.g., disabled vehicle at the side of the road) through large-scale natural or human-caused disasters that involve loss of life, injuries, extensive property damage, and multi-jurisdictional response. This also includes special events, closures, and other planned events that may impact the transportation system.

**Logical Architecture Data Flow(s):**  
incident\_info\_from\_emerg

**Physical Architecture Flow Name:** incident response status

Status of the current incident response including a summary of incident status and its impact on the transportation system, traffic management strategies implemented at the site (e.g., closures, diversions, traffic signal control overrides), and current and planned response

**Logical Architecture Data Flow(s):**  
incident\_response\_status\_from\_emerg

**Physical Architecture Flow Name:** maint and constr resource request

Request for road maintenance and construction resources that can be used in the diversion of traffic (cones, portable signs), clearance of a road hazard, repair of ancillary damage, or any other incident response. The request may poll for resource availability or request pre-staging.

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staging, or immediate dispatch of resources.

### Logical Architecture Data Flow(s):

m\_and\_c\_resource\_request\_from\_emerg  
m\_and\_c\_evacuation\_resource\_request  
roadway\_maint\_action\_req\_from\_emerg

**Physical Architecture Flow Name:** security field equipment status

Identification of security sensors and surveillance equipment requiring repair and known information about the associated faults.

### Logical Architecture Data Flow(s):

security\_surveillance equip\_status\_for\_m\_and\_c  
security\_sensor equip\_status\_for\_m\_and\_c

**Physical Architecture Flow Name:** threat information

Threats regarding transportation infrastructure, facilities, or systems detected by a variety of methods (sensors, surveillance, threat analysis of advisories from outside agencies, etc.

### Logical Architecture Data Flow(s):

threat\_info\_for\_maint

**Physical Architecture Flow Name:** transportation system status

Current status and condition of transportation infrastructure (e.g., tunnels, bridges, interchanges, TMC offices, maintenance facilities). In case of disaster or major incident, this flow provides an assessment of damage sustained by the surface transportation system including location and extent of the damage, estimate of remaining capacity and necessary restrictions, and time frame for repair and recovery.

### Logical Architecture Data Flow(s):

infrastructure\_integrity\_status\_for\_maint  
m\_and\_c\_transportation\_system\_status\_for\_disaster  
m\_and\_c\_transportation\_system\_status\_for\_evacuation

**Physical Architecture Flow Name:** work plan feedback

Comments and suggested changes to proposed construction and maintenance work schedules and activities. This information influences work plan schedules so that they minimize impact to other system operations and the overall transportation system.

### Logical Architecture Data Flow(s):

m\_and\_c\_plan\_feedback\_from\_emerg

**Equipment Repair Facility** => **Maintenance and Construction Management**

**Physical Architecture Flow Name:** maint and constr equipment repair status

Current maintenance and repair status of the maintenance and construction vehicle fleet and other support equipment. This information includes a record of all maintenance and repair activities performed.

### Logical Architecture Data Flow(s):

ferf-equipment\_status\_for\_tracking  
ferf-current\_fleet\_maintenance\_status  
ferf-equipment\_repair\_status  
ferf-fleet\_maintenance\_record

**Information Service Provider** => **Maintenance and Construction Management**

**Physical Architecture Flow Name:** field equipment status

Identification of field equipment requiring repair and known information about the associated



## Maintenance and Construction Management

faults.

### Logical Architecture Data Flow(s):

field\_equipment\_status\_from\_isp

**Physical Architecture Flow Name:** road network environmental probe data

Aggregated vehicle probe information that can be used to estimate current environmental conditions. Collected information would include measured air temperature, exterior light status, wiper status, sun sensor status, rain sensor status, traction control status, ALB status, and other collected vehicle system status and sensor information.

### Logical Architecture Data Flow(s):

env\_probe\_info\_from\_isp\_for\_maint

**Physical Architecture Flow Name:** transportation information for operations

Information on the state of transportation system operations including traffic and road conditions, advisories, incidents, transit service information, weather information, parking information, and other related data.

### Logical Architecture Data Flow(s):

transportation\_information\_for\_maint\_operations

**Maintenance and Construction  
Administrative Systems**

=>

**Maintenance and  
Construction Management**

**Physical Architecture Flow Name:** maint and constr administrative information

Administrative information that is provided to support maintenance and construction operations. This information includes: equipment and consumables resupply purchase request status, personnel qualifications including training and special certifications, environmental regulations and rules that may impact maintenance activities, and requests and project requirements from contract administration.

### Logical Architecture Data Flow(s):

fmcas-resupply\_response  
fmcas-m\_and\_c\_administrative\_information  
fmcas-m\_and\_c\_personnel\_information  
fmcas-m\_and\_c\_regulations

**Maintenance and Construction  
Center Personnel**

=>

**Maintenance and  
Construction Management**

**Physical Architecture Flow Name:** maint and constr center personnel inputs

User input from maintenance and construction center personnel including routing information, scheduling data, dispatch instructions, device configuration and control, resource allocations, alerts, incident and emergency response plan coordination.

### Logical Architecture Data Flow(s):

fmccp-vehicle\_speed\_sensor\_control  
fmccp-emergency\_plan\_response  
fmccp-archive\_commands  
fmccp-wz\_device\_control  
fmccp-alert\_and\_threats\_for\_field\_personnel  
fmccp-dispatch\_and\_routing\_info  
fmccp-wz\_collection\_and\_distribution\_parameters  
fmccp-vehicle\_systems\_control  
fmccp-request\_m\_and\_c\_tracking\_display\_update  
fmccp-infrastructure\_sensor\_control  
fmccp-mdss\_parameter\_input  
fmccp-request\_for\_schedule  
fmccp-env\_sensor\_control\_inputs  
fmccp-resource\_response  
fmccp-env\_info\_dissemination\_inputs

## Maintenance and Construction Management

fmccp-env\_data\_processing\_inputs  
fmccp-env\_data\_collection\_inputs

### **Maintenance and Construction Management** => **Archived Data Management**

**Physical Architecture Flow Name:** maint and constr archive data

Information describing road construction and maintenance activities identifying the type of activity, the work performed, and work zone information including work zone configuration and safety (e.g., a record of intrusions and vehicle speeds) information. For construction activities, this information also includes a description of the completed infrastructure, including as-built plans as applicable. Content may include a catalog of available information, the actual information to be archived, and associated meta data that describes the archived information.

**Logical Architecture Data Flow(s):**  
m\_and\_c\_archive\_data

### **Maintenance and Construction Management** => **Asset Management**

**Physical Architecture Flow Name:** asset status update

Changes to status of pavement, bridges, signs and other assets resulting from maintenance or construction activities or infrastructure monitoring. The updates may include changes in installation information, materials information, vendor/contractor information, condition, and current maintenance status. In addition to infrastructure asset updates, the information provided may also include status of the maintenance and construction support assets, including vehicle and equipment utilization and repair records.

**Logical Architecture Data Flow(s):**  
tam-asset\_status\_update\_for\_asset\_mgmt  
tam-infrastructure\_data\_for\_analysis

### **Maintenance and Construction Management** => **Commercial Vehicle Administration**

**Physical Architecture Flow Name:** current asset restrictions

Restrictions levied on transportation asset usage based on infrastructure design, surveys, tests, or analyses. This includes standard facility design height, width, and weight restrictions, special restrictions such as spring weight restrictions, and temporary facility restrictions that are imposed during maintenance and construction.

**Logical Architecture Data Flow(s):**  
asset\_restrictions\_for\_com\_veh

### **Maintenance and Construction Management** => **Emergency Management**

**Physical Architecture Flow Name:** alert status

Information indicating the current status of the emergency alert including identification of the traveler and driver information systems that are being used to provide the alert.

**Logical Architecture Data Flow(s):**  
alert\_notification\_status\_from\_maint

**Physical Architecture Flow Name:** current asset restrictions

Restrictions levied on transportation asset usage based on infrastructure design, surveys, tests, or analyses. This includes standard facility design height, width, and weight restrictions, special restrictions such as spring weight restrictions, and temporary facility restrictions that are imposed during maintenance and construction.

## Maintenance and Construction Management

### **Logical Architecture Data Flow(s):**

asset\_restrictions\_for\_emerg  
asset\_restrictions\_for\_em\_response

**Physical Architecture Flow Name:** emergency plan coordination

Information that supports coordination of emergency management plans, continuity of operations plans, emergency response and recovery plans, evacuation plans, and other emergency plans between agencies. This includes general plans that are coordinated prior to an incident and shorter duration tactical plans that are prepared during an incident.

### **Logical Architecture Data Flow(s):**

disaster\_response\_plan\_coordination\_from\_m\_and\_c  
evacuation\_plan\_coordination\_from\_m\_and\_c

**Physical Architecture Flow Name:** incident information

Notification of existence of incident and expected severity, location, time and nature of incident. As additional information is gathered and the incident evolves, updated incident information is provided. Incidents include any event that impacts transportation system operation ranging from routine incidents (e.g., disabled vehicle at the side of the road) through large-scale natural or human-caused disasters that involve loss of life, injuries, extensive property damage, and multi-jurisdictional response. This also includes special events, closures, and other planned events that may impact the transportation system.

### **Logical Architecture Data Flow(s):**

incident\_info\_for\_emerg

**Physical Architecture Flow Name:** maint and constr resource response

Current status of maintenance and construction resources including availability and deployment status. General resource inventory information covering vehicles, equipment, materials, and people and specific resource deployment status may be included.

### **Logical Architecture Data Flow(s):**

m\_and\_c\_evacuation\_resource\_response  
m\_and\_c\_resource\_response\_to\_emerg

**Physical Architecture Flow Name:** maint and constr work plans

Future construction and maintenance work schedules and activities including anticipated closures with anticipated impact to the roadway, alternate routes, anticipated delays, closure times, and durations.

### **Logical Architecture Data Flow(s):**

m\_and\_c\_work\_plans\_for\_emerg

**Physical Architecture Flow Name:** road network status assessment

Assessment of damage sustained by the road network including location and extent of the damage, estimate of remaining capacity, required closures, alternate routes, necessary restrictions, and time frame for repair and recovery.

### **Logical Architecture Data Flow(s):**

m\_and\_c\_status\_assessment\_for\_disaster  
m\_and\_c\_status\_assessment\_for\_evacuation

**Physical Architecture Flow Name:** road weather information

Road conditions and weather information that are made available by road maintenance operations to other transportation system operators.

### **Logical Architecture Data Flow(s):**

road\_weather\_info\_for\_emergency

**Physical Architecture Flow Name:** roadway maintenance status

Summary of maintenance fleet operations affecting the road network. This includes the status

## Maintenance and Construction Management

of winter maintenance (snow plow schedule and current status).

### Logical Architecture Data Flow(s):

roadway\_maint\_status\_for\_emerg

**Physical Architecture Flow Name:** security equipment maintenance status

Current status of security surveillance and sensor field equipment maintenance actions.

### Logical Architecture Data Flow(s):

security\_surveillance equip\_maint\_status

security\_sensor equip\_maint\_status

**Physical Architecture Flow Name:** work zone information

Summary of maintenance and construction work zone activities affecting the road network including the nature of the maintenance or construction activity, location, impact to the roadway, expected time(s) and duration of impact, anticipated delays, alternate routes, and suggested speed limits. This information may be augmented with images that provide a visual indication of current work zone status and traffic impacts.

### Logical Architecture Data Flow(s):

work\_zone\_info\_for\_emergency

**Maintenance and Construction Management** => **Enforcement Agency**

**Physical Architecture Flow Name:** request for enforcement

Request for traffic enforcement of speed limits, lane controls, etc. on a roadway including in a work zone or other special situations.

### Logical Architecture Data Flow(s):

tea-enforcement\_request\_from\_m\_and\_c

**Maintenance and Construction Management** => **Equipment Repair Facility**

**Physical Architecture Flow Name:** maint and constr fleet information

Information supporting maintenance of the maintenance and construction vehicle fleet and other support equipment. This information includes vehicle status and diagnostic information, vehicle utilization, and coordination of when vehicles will be available for preventative and corrective maintenance.

### Logical Architecture Data Flow(s):

terf-fleet\_maintenance\_availability

terf-mdss\_recommended\_actions

terf-vehicle\_utilization\_information

**Maintenance and Construction Management** => **Information Service Provider**

**Physical Architecture Flow Name:** current asset restrictions

Restrictions levied on transportation asset usage based on infrastructure design, surveys, tests, or analyses. This includes standard facility design height, width, and weight restrictions, special restrictions such as spring weight restrictions, and temporary facility restrictions that are imposed during maintenance and construction.

### Logical Architecture Data Flow(s):

asset\_restrictions\_for\_info\_provider

**Physical Architecture Flow Name:** equipment maintenance status

Current status of field equipment maintenance actions.

## Maintenance and Construction Management

### Logical Architecture Data Flow(s):

field\_equip\_maint\_status\_for\_isp

**Physical Architecture Flow Name:** maint and constr work plans

Future construction and maintenance work schedules and activities including anticipated closures with anticipated impact to the roadway, alternate routes, anticipated delays, closure times, and durations.

### Logical Architecture Data Flow(s):

m\_and\_c\_work\_plans\_for\_info\_provider

**Physical Architecture Flow Name:** road weather information

Road conditions and weather information that are made available by road maintenance operations to other transportation system operators.

### Logical Architecture Data Flow(s):

road\_weather\_info\_for\_isp

**Physical Architecture Flow Name:** roadway maintenance status

Summary of maintenance fleet operations affecting the road network. This includes the status of winter maintenance (snow plow schedule and current status).

### Logical Architecture Data Flow(s):

roadway\_maint\_status\_for\_info\_provider

**Physical Architecture Flow Name:** work zone information

Summary of maintenance and construction work zone activities affecting the road network including the nature of the maintenance or construction activity, location, impact to the roadway, expected time(s) and duration of impact, anticipated delays, alternate routes, and suggested speed limits. This information may be augmented with images that provide a visual indication of current work zone status and traffic impacts.

### Logical Architecture Data Flow(s):

work\_zone\_images\_for\_isp  
work\_zone\_info\_for\_isp

**Maintenance and Construction Management**

=>

**Maintenance and Construction Administrative Systems**

**Physical Architecture Flow Name:** maint and constr administrative request

Requests for maintenance and construction administrative information or services. Requests include: requests to purchasing for equipment and consumables resupply and requests to human resources that manage training and special certification for field crews and other personnel.

### Logical Architecture Data Flow(s):

tmcas-resupply\_request  
tmcas-m\_and\_c\_administrative\_request

**Physical Architecture Flow Name:** maint and constr work performance

Overall project status and work performance information provided to support contract administration.

### Logical Architecture Data Flow(s):

tmcas-m\_and\_c\_work\_performance  
tmcas-work\_zone\_info

**Maintenance and Construction Management**

=>

**Maintenance and Construction Center Personnel**

**Physical Architecture Flow Name:** maint and constr operations information

## Maintenance and Construction Management

### presentation

Presentation of maintenance and construction operations information to center personnel. This information includes maintenance resource status (vehicles, equipment, and personnel), work schedule information, work status, road and weather conditions, traffic information, incident information and associated resource requests, security alerts, emergency response plans and a range of other information that supports efficient maintenance and construction operations and planning.

#### Logical Architecture Data Flow(s):

- tmccp-alert\_and\_threats\_info
- tmccp-mdss\_recommended\_actions
- tmccp-scheduled\_work\_plan
- tmccp-env\_and\_weather\_data
- tmccp-resource\_request
- tmccp-barrier\_system\_status
- tmccp-m\_and\_c\_activity\_status
- tmccp-processed\_env\_info
- tmccp-vehicle\_fleet\_status
- tmccp-view\_of\_road\_network
- tmccp-emergency\_response\_plan
- tmccp-archive\_status
- tmccp-env\_info\_for\_dissemination
- tmccp-auto\_treat\_status
- tmccp-work\_zone\_info
- tmccp-work\_zone\_images\_for\_display
- tmccp-vehicle\_speed\_data

## Maintenance and Construction Management

=>

## Maintenance and Construction Vehicle

**Physical Architecture Flow Name:** environmental sensors control

Data used to configure and control environmental sensors.

#### Logical Architecture Data Flow(s):

- environmental\_sensor\_control\_for\_mcv

**Physical Architecture Flow Name:** maint and constr dispatch information

Information used to dispatch maintenance and construction vehicles, equipment, and crews and information used to keep work zone crews informed. This information includes routing information, traffic information, road restrictions, incident information, environmental information, decision support information, maintenance schedule data, dispatch instructions, personnel assignments, alert notifications, and corrective actions.

#### Logical Architecture Data Flow(s):

- dispatch\_orders\_to\_mcv
- status\_of\_other\_work\_zones
- mdss\_recommended\_actions\_for\_operator
- suggested\_route\_to\_mcv
- road\_network\_info\_to\_mcv
- winter\_dispatch\_orders\_to\_mcv

**Physical Architecture Flow Name:** maint and constr vehicle system control

Configure and control data that supports remote control of on-board maintenance and construction vehicle systems and field equipment that is remotely controlled by the vehicle. For example, the data can be used to adjust material application rates and spread patterns.

#### Logical Architecture Data Flow(s):

- center\_control\_of\_on\_board\_work\_zone\_devices
- mcv\_vehicle\_systems\_control\_by\_fleet\_manager
- mcv\_infrastructure\_sensor\_control

## Maintenance and Construction

=>

## Map Update Provider

## Maintenance and Construction Management

### Management

**Physical Architecture Flow Name:** map update request

Request for a map update which could include a new underlying map or map layer updates.

**Logical Architecture Data Flow(s):**

tmup-request\_m\_and\_c\_route\_map  
tmup-request\_m\_and\_c\_display\_update

**Maintenance and Construction Management** => **Media**

**Physical Architecture Flow Name:** maint and constr work plans

Future construction and maintenance work schedules and activities including anticipated closures with anticipated impact to the roadway, alternate routes, anticipated delays, closure times, and durations.

**Logical Architecture Data Flow(s):**

tm-m\_and\_c\_work\_plans\_for\_media

**Physical Architecture Flow Name:** road weather information

Road conditions and weather information that are made available by road maintenance operations to other transportation system operators.

**Logical Architecture Data Flow(s):**

tm-road\_weather\_info

**Physical Architecture Flow Name:** roadway maintenance status

Summary of maintenance fleet operations affecting the road network. This includes the status of winter maintenance (snow plow schedule and current status).

**Logical Architecture Data Flow(s):**

tm-roadway\_maint\_status\_for\_media

**Physical Architecture Flow Name:** work zone information

Summary of maintenance and construction work zone activities affecting the road network including the nature of the maintenance or construction activity, location, impact to the roadway, expected time(s) and duration of impact, anticipated delays, alternate routes, and suggested speed limits. This information may be augmented with images that provide a visual indication of current work zone status and traffic impacts.

**Logical Architecture Data Flow(s):**

tm-work\_zone\_info  
tm-work\_zone\_images

**Maintenance and Construction Management** => **Multimodal Transportation Service Provider**

**Physical Architecture Flow Name:** maint and constr work plans

Future construction and maintenance work schedules and activities including anticipated closures with anticipated impact to the roadway, alternate routes, anticipated delays, closure times, and durations.

**Logical Architecture Data Flow(s):**

tmtsp-m\_and\_c\_work\_plans\_for\_mtsp

**Maintenance and Construction Management** => **Other MCM**

**Physical Architecture Flow Name:** maint and constr resource coordination

## Maintenance and Construction Management

Request for road maintenance and construction resources that can be used in the diversion of traffic (cones, portable signs), clearance of a road hazard, repair of ancillary damage, or any other incident response.

**Logical Architecture Data Flow(s):**

tomcm-resource\_coordination\_data

**Physical Architecture Flow Name:** road weather information

Road conditions and weather information that are made available by road maintenance operations to other transportation system operators.

**Logical Architecture Data Flow(s):**

tomcm-road\_weather\_info

tomcm-env\_sensor\_data

**Physical Architecture Flow Name:** roadway maintenance status

Summary of maintenance fleet operations affecting the road network. This includes the status of winter maintenance (snow plow schedule and current status).

**Logical Architecture Data Flow(s):**

tomcm-roadway\_maint\_status

**Physical Architecture Flow Name:** work plan coordination

Coordination of work plan schedules and activities between maintenance and construction organizations or systems. This information includes the work plan schedules and comments and suggested changes that are exchanged as work plans are coordinated and finalized.

**Logical Architecture Data Flow(s):**

tomcm-m\_and\_c\_plan\_feedback

tomcm-m\_and\_c\_work\_plans

**Physical Architecture Flow Name:** work zone information

Summary of maintenance and construction work zone activities affecting the road network including the nature of the maintenance or construction activity, location, impact to the roadway, expected time(s) and duration of impact, anticipated delays, alternate routes, and suggested speed limits. This information may be augmented with images that provide a visual indication of current work zone status and traffic impacts.

**Logical Architecture Data Flow(s):**

tomcm-work\_zone\_images

tomcm-work\_zone\_info

## Maintenance and Construction Management

=>

## Rail Operations

**Physical Architecture Flow Name:** maint and constr work plans

Future construction and maintenance work schedules and activities including anticipated closures with anticipated impact to the roadway, alternate routes, anticipated delays, closure times, and durations.

**Logical Architecture Data Flow(s):**

tro-m\_and\_c\_work\_plans\_for\_rail

**Physical Architecture Flow Name:** road weather information

Road conditions and weather information that are made available by road maintenance operations to other transportation system operators.

**Logical Architecture Data Flow(s):**

tro-road\_weather\_info

**Physical Architecture Flow Name:** work plan feedback



## Maintenance and Construction Management

Comments and suggested changes to proposed construction and maintenance work schedules and activities. This information influences work plan schedules so that they minimize impact to other system operations and the overall transportation system.

**Logical Architecture Data Flow(s):**  
tro-railroad\_schedule\_feedback

**Maintenance and Construction Management** => **Roadway**

**Physical Architecture Flow Name:** barrier system control

Information used to configure and control barrier systems that are represented by gates, barriers and other automated or remotely controlled systems used to manage entry to roadways.

**Logical Architecture Data Flow(s):**  
barrier\_system\_control\_from\_m\_and\_c

**Physical Architecture Flow Name:** environmental sensors control

Data used to configure and control environmental sensors.

**Logical Architecture Data Flow(s):**  
environmental\_sensor\_control\_for\_roadway\_sensors

**Physical Architecture Flow Name:** infrastructure monitoring sensor control

Data used to configure and control infrastructure monitoring sensors.

**Logical Architecture Data Flow(s):**  
infrastructure\_sensor\_control\_from\_m\_and\_c

**Physical Architecture Flow Name:** roadway information system data

Information used to initialize, configure, and control roadside systems that provide driver information (e.g., dynamic message signs, highway advisory radio, beacon systems). This flow can provide message content and delivery attributes, local message store maintenance requests, control mode commands, status queries, and all other commands and associated parameters that support remote management of these systems.

**Logical Architecture Data Flow(s):**  
har\_data\_from\_m\_and\_c  
work\_zone\_info\_for\_display  
dms\_data\_from\_m\_and\_c  
dms\_auto\_treat\_data\_from\_maint

**Physical Architecture Flow Name:** roadway treatment system control

Control data for remotely located, automated devices, that affect the roadway surface (e.g. de-icing applications).

**Logical Architecture Data Flow(s):**  
roadway\_treatment\_system\_control

**Physical Architecture Flow Name:** speed monitoring control

Information used to configure and control automated speed monitoring, speed warning, and speed enforcement systems.

**Logical Architecture Data Flow(s):**  
speed\_sensor\_control\_from\_m\_and\_c

**Physical Architecture Flow Name:** video surveillance control

Information used to configure and control video surveillance systems.

**Logical Architecture Data Flow(s):**  
video\_control\_from\_m\_and\_c

## Maintenance and Construction Management

**Physical Architecture Flow Name:** work zone warning device control

Data used to configure and control work zone safety monitoring and warning devices.

**Logical Architecture Data Flow(s):**

intrusion\_alert\_device\_control  
intrusion\_detection\_device\_control

**Maintenance and Construction Management** ==> **Storage Facility**

**Physical Architecture Flow Name:** storage facility request

Request for information about the equipment and/or materials available at a maintenance storage facility.

**Logical Architecture Data Flow(s):**

tsf-materials\_status\_request  
tsf-equipment\_availability\_request

**Maintenance and Construction Management** ==> **Surface Transportation Weather Service**

**Physical Architecture Flow Name:** environmental conditions data

Current road conditions (e.g., surface temperature, subsurface temperature, moisture, icing, treatment status) and surface weather conditions (e.g., air temperature, wind speed, precipitation, visibility) as measured and reported by fixed and/or mobile environmental sensors and aggregated by the data collector. Attributes relating to the data collection (and aggregation) are also included.

**Logical Architecture Data Flow(s):**

tstws-env\_sensor\_data

**Physical Architecture Flow Name:** road data

Basic road facility and treatment information that supports road conditions forecasts.

**Logical Architecture Data Flow(s):**

tstws-asset\_treatment\_info

**Physical Architecture Flow Name:** road weather information

Road conditions and weather information that are made available by road maintenance operations to other transportation system operators.

**Logical Architecture Data Flow(s):**

tstws-env\_info

**Physical Architecture Flow Name:** transportation weather information request

A request for transportation weather information that may specify the area of interest (a geographic region, particular routes within a region, specific road segments), the type of information that is required, the desired spatial resolution of the information, and time horizon.

**Logical Architecture Data Flow(s):**

tstws-trans\_weather\_info\_request

**Maintenance and Construction Management** ==> **Traffic Management**

**Physical Architecture Flow Name:** current asset restrictions

Restrictions levied on transportation asset usage based on infrastructure design, surveys, tests, or analyses. This includes standard facility design height, width, and weight restrictions, special restrictions such as spring weight restrictions, and temporary facility restrictions that are imposed during maintenance and construction.

## Maintenance and Construction Management

### **Logical Architecture Data Flow(s):**

asset\_restrictions\_for\_traffic

**Physical Architecture Flow Name:** environmental conditions data

Current road conditions (e.g., surface temperature, subsurface temperature, moisture, icing, treatment status) and surface weather conditions (e.g., air temperature, wind speed, precipitation, visibility) as measured and reported by fixed and/or mobile environmental sensors and aggregated by the data collector. Attributes relating to the data collection (and aggregation) are also included.

### **Logical Architecture Data Flow(s):**

environment\_sensor\_data\_for\_traffic

**Physical Architecture Flow Name:** equipment maintenance status

Current status of field equipment maintenance actions.

### **Logical Architecture Data Flow(s):**

field equip\_maint\_status

**Physical Architecture Flow Name:** incident information

Notification of existence of incident and expected severity, location, time and nature of incident. As additional information is gathered and the incident evolves, updated incident information is provided. Incidents include any event that impacts transportation system operation ranging from routine incidents (e.g., disabled vehicle at the side of the road) through large-scale natural or human-caused disasters that involve loss of life, injuries, extensive property damage, and multi-jurisdictional response. This also includes special events, closures, and other planned events that may impact the transportation system.

### **Logical Architecture Data Flow(s):**

incident\_info\_for\_traffic

**Physical Architecture Flow Name:** maint and constr resource response

Current status of maintenance and construction resources including availability and deployment status. General resource inventory information covering vehicles, equipment, materials, and people and specific resource deployment status may be included.

### **Logical Architecture Data Flow(s):**

m\_and\_c\_resource\_response\_to\_traffic

**Physical Architecture Flow Name:** maint and constr work plans

Future construction and maintenance work schedules and activities including anticipated closures with anticipated impact to the roadway, alternate routes, anticipated delays, closure times, and durations.

### **Logical Architecture Data Flow(s):**

m\_and\_c\_work\_plans\_for\_traffic

**Physical Architecture Flow Name:** road network status assessment

Assessment of damage sustained by the road network including location and extent of the damage, estimate of remaining capacity, required closures, alternate routes, necessary restrictions, and time frame for repair and recovery.

### **Logical Architecture Data Flow(s):**

m\_and\_c\_status\_assessment\_for\_traffic

**Physical Architecture Flow Name:** road weather information

Road conditions and weather information that are made available by road maintenance operations to other transportation system operators.

### **Logical Architecture Data Flow(s):**

road\_weather\_info\_for\_traffic

**Physical Architecture Flow Name:** roadway maintenance status

## Maintenance and Construction Management

Summary of maintenance fleet operations affecting the road network. This includes the status of winter maintenance (snow plow schedule and current status).

**Logical Architecture Data Flow(s):**

roadway\_maint\_status\_for\_traffic

**Physical Architecture Flow Name:** work zone information

Summary of maintenance and construction work zone activities affecting the road network including the nature of the maintenance or construction activity, location, impact to the roadway, expected time(s) and duration of impact, anticipated delays, alternate routes, and suggested speed limits. This information may be augmented with images that provide a visual indication of current work zone status and traffic impacts.

**Logical Architecture Data Flow(s):**

work\_zone\_images\_for\_traffic

work\_zone\_info\_for\_traffic

## Maintenance and Construction Management

=> **Transit Management**

**Physical Architecture Flow Name:** current asset restrictions

Restrictions levied on transportation asset usage based on infrastructure design, surveys, tests, or analyses. This includes standard facility design height, width, and weight restrictions, special restrictions such as spring weight restrictions, and temporary facility restrictions that are imposed during maintenance and construction.

**Logical Architecture Data Flow(s):**

asset\_restrictions\_for\_transit

**Physical Architecture Flow Name:** maint and constr work plans

Future construction and maintenance work schedules and activities including anticipated closures with anticipated impact to the roadway, alternate routes, anticipated delays, closure times, and durations.

**Logical Architecture Data Flow(s):**

m\_and\_c\_work\_plans\_for\_transit

**Physical Architecture Flow Name:** road weather information

Road conditions and weather information that are made available by road maintenance operations to other transportation system operators.

**Logical Architecture Data Flow(s):**

road\_weather\_info\_for\_transit

**Physical Architecture Flow Name:** roadway maintenance status

Summary of maintenance fleet operations affecting the road network. This includes the status of winter maintenance (snow plow schedule and current status).

**Logical Architecture Data Flow(s):**

roadway\_maint\_status\_for\_transit

**Physical Architecture Flow Name:** work zone information

Summary of maintenance and construction work zone activities affecting the road network including the nature of the maintenance or construction activity, location, impact to the roadway, expected time(s) and duration of impact, anticipated delays, alternate routes, and suggested speed limits. This information may be augmented with images that provide a visual indication of current work zone status and traffic impacts.

**Logical Architecture Data Flow(s):**

work\_zone\_info\_for\_transit

## Maintenance and Construction

=> **Weather Service**

## Maintenance and Construction Management

### Management

**Physical Architecture Flow Name:** environmental conditions data

Current road conditions (e.g., surface temperature, subsurface temperature, moisture, icing, treatment status) and surface weather conditions (e.g., air temperature, wind speed, precipitation, visibility) as measured and reported by fixed and/or mobile environmental sensors and aggregated by the data collector. Attributes relating to the data collection (and aggregation) are also included.

**Logical Architecture Data Flow(s):**

tws-env\_sensor\_data

**Physical Architecture Flow Name:** road weather information

Road conditions and weather information that are made available by road maintenance operations to other transportation system operators.

**Logical Architecture Data Flow(s):**

tws-env\_info

**Maintenance and Construction Vehicle**

=>

**Maintenance and Construction Management**

**Physical Architecture Flow Name:** environmental sensor data

Current road conditions (e.g., surface temperature, subsurface temperature, moisture, icing, treatment status) and surface weather conditions (e.g., air temperature, wind speed, precipitation, visibility) as measured and reported by fixed and/or mobile environmental sensors. Operational status of the sensors is also included.

**Logical Architecture Data Flow(s):**

environmental\_sensor\_status\_from\_mcv  
environmental\_sensor\_data\_from\_mcv

**Physical Architecture Flow Name:** infrastructure conditions data

Current condition of pavement, bridges, culverts, signs, and other roadway infrastructure as measured by on-board sensors or read from infrastructure-based sensors. The data may include raw data or images (e.g., photo logs) that indicate the current status of the infrastructure.

**Logical Architecture Data Flow(s):**

mcv\_infrastructure\_sensor\_data  
mcv\_infrastructure\_sensor\_status

**Physical Architecture Flow Name:** maint and constr dispatch status

Current maintenance and construction status including work data, operator status, crew status, and equipment status.

**Logical Architecture Data Flow(s):**

m\_and\_c\_status\_from\_mcv\_operator  
field equip\_status\_from\_mcv\_operator  
dispatch\_response\_from\_mcv

**Physical Architecture Flow Name:** maint and constr vehicle conditions

Vehicle diagnostics information that is collected, filtered, and selectively reported by a maintenance and construction vehicle. The information includes engine temperature, mileage, tire wear, brake wear, belt wear, and any warnings or alarms concerning the operational condition of the vehicle and ancillary equipment.

**Logical Architecture Data Flow(s):**

basic\_mcv\_measures\_for\_maint\_sched  
safety\_data\_for\_fleet\_mgmt

**Physical Architecture Flow Name:** maint and constr vehicle location data

The current location and related status (e.g., direction and speed) of the maintenance/construction vehicle.

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### Logical Architecture Data Flow(s):

vehicle\_location\_for\_mcv\_tracking

**Physical Architecture Flow Name:** maint and constr vehicle operational data

Data that describes the maintenance and construction activity performed by the vehicle. Operational data includes materials usage (amount stored and current application rate), operational state of the maintenance equipment (e.g., blade up/down, spreader pattern), vehicle safety status, and other measures associated with the operation of a maintenance, construction, or other special purpose vehicle. Operational data may include basic operational status of the vehicle equipment or a more precise record of the work performed (e.g., application of crack sealant with precise locations and application characteristics).

### Logical Architecture Data Flow(s):

mcv\_operational\_data  
on\_board\_work\_zone\_device\_status  
mcv\_materials\_status

**Physical Architecture Flow Name:** work zone status

Current work zone status including current location (and future locations for moving work zones), impact to the roadway, required lane shifts, expected time(s) and duration of impact, anticipated delays, alternate routes, and suggested speed limits.

### Logical Architecture Data Flow(s):

work\_zone\_status\_from\_mcv

**Physical Architecture Flow Name:** work zone warning status

Status of a work zone safety monitoring and warning devices. This flow documents system activations and includes additional supporting information (e.g., an image) that allows verification of the alarm.

### Logical Architecture Data Flow(s):

work\_zone\_intrusion\_warning\_notification

**Map Update Provider** => **Maintenance and Construction Management**

**Physical Architecture Flow Name:** map updates

Map update which could include a new underlying static or real-time map or map layer(s) update.

### Logical Architecture Data Flow(s):

fmup-m\_and\_c\_route\_map\_update  
fmup-m\_and\_c\_display\_update

**Other MCM** => **Maintenance and Construction Management**

**Physical Architecture Flow Name:** maint and constr resource coordination

Request for road maintenance and construction resources that can be used in the diversion of traffic (cones, portable signs), clearance of a road hazard, repair of ancillary damage, or any other incident response.

### Logical Architecture Data Flow(s):

fomcm-resource\_coordination\_data

**Physical Architecture Flow Name:** road weather information

Road conditions and weather information that are made available by road maintenance operations to other transportation system operators.

### Logical Architecture Data Flow(s):

fomcm-env\_sensor\_data  
fomcm-road\_weather\_info

## Maintenance and Construction Management

**Physical Architecture Flow Name:** roadway maintenance status

Summary of maintenance fleet operations affecting the road network. This includes the status of winter maintenance (snow plow schedule and current status).

**Logical Architecture Data Flow(s):**  
fomcm-roadway\_maint\_status

**Physical Architecture Flow Name:** work plan coordination

Coordination of work plan schedules and activities between maintenance and construction organizations or systems. This information includes the work plan schedules and comments and suggested changes that are exchanged as work plans are coordinated and finalized.

**Logical Architecture Data Flow(s):**  
fomcm-m\_and\_c\_work\_plans  
fomcm-m\_and\_c\_plan\_feedback

**Physical Architecture Flow Name:** work zone information

Summary of maintenance and construction work zone activities affecting the road network including the nature of the maintenance or construction activity, location, impact to the roadway, expected time(s) and duration of impact, anticipated delays, alternate routes, and suggested speed limits. This information may be augmented with images that provide a visual indication of current work zone status and traffic impacts.

**Logical Architecture Data Flow(s):**  
fomcm-work\_zone\_images  
fomcm-work\_zone\_info

**Rail Operations** => **Maintenance and Construction Management**

**Physical Architecture Flow Name:** railroad schedules

Train schedules, maintenance schedules, and other information from the railroad that supports forecast of HRI closures.

**Logical Architecture Data Flow(s):**  
fro-railroad\_schedules

**Physical Architecture Flow Name:** work plan feedback

Comments and suggested changes to proposed construction and maintenance work schedules and activities. This information influences work plan schedules so that they minimize impact to other system operations and the overall transportation system.

**Logical Architecture Data Flow(s):**  
fro-m\_and\_c\_plan\_feedback\_from\_rail

**Roadway** => **Maintenance and Construction Management**

**Physical Architecture Flow Name:** barrier system status

Current operating status of barrier systems. Barrier systems represent gates, barriers and other automated or remotely controlled systems used to manage entry to roadways. Status of the systems includes operating condition and current operational state.

**Logical Architecture Data Flow(s):**  
barrier\_system\_status\_to\_m\_and\_c

**Physical Architecture Flow Name:** environmental probe data

Data from vehicle safety and convenience systems that can be used to estimate environmental conditions, including measured air temperature, exterior light status, wiper status, sun sensor status, rain sensor status, traction control status, anti-lock brake status, and other collected vehicle system status and sensor information. The collected data is reported along

## Maintenance and Construction Management

with the location, heading, and time that the data was collected. Both current data and snapshots of recent events (e.g., traction control or anti-lock brake system activations) may be reported.

**Logical Architecture Data Flow(s):**

vehicle\_env\_probe\_status\_for\_maint  
vehicle\_env\_probe\_data\_for\_infrastructure\_maint  
vehicle\_env\_probe\_data\_for\_maint

**Physical Architecture Flow Name:** environmental sensor data

Current road conditions (e.g., surface temperature, subsurface temperature, moisture, icing, treatment status) and surface weather conditions (e.g., air temperature, wind speed, precipitation, visibility) as measured and reported by fixed and/or mobile environmental sensors. Operational status of the sensors is also included.

**Logical Architecture Data Flow(s):**

environmental\_sensor\_data\_from\_roadway\_sensors  
environmental\_sensor\_status\_from\_roadway\_sensors

**Physical Architecture Flow Name:** field device status

Reports from field equipment (sensors, signals, signs, controllers, etc.) which indicate current operational status.

**Logical Architecture Data Flow(s):**

field equip\_status\_for\_m\_and\_c

**Physical Architecture Flow Name:** infrastructure monitoring sensor data

Data read from infrastructure-based sensors that monitor the condition or integrity of transportation infrastructure including bridges, tunnels, interchanges, pavement, culverts, signs, transit rail or guideway, and other roadway infrastructure. Includes sensor data and the operational status of the sensors.

**Logical Architecture Data Flow(s):**

infrastructure\_sensor\_status\_for\_m\_and\_c  
infrastructure\_sensor\_data\_for\_m\_and\_c

**Physical Architecture Flow Name:** roadway information system status

Current operating status of dynamic message signs, highway advisory radios, beacon systems, or other configurable field equipment that provides dynamic information to the driver.

**Logical Architecture Data Flow(s):**

dms\_auto\_treat\_status\_to\_maint  
dms\_status\_for\_m\_and\_c  
har\_status\_for\_m\_and\_c

**Physical Architecture Flow Name:** roadway treatment system status

Current operational status of automated roadway treatment devices (e.g., anti-icing systems).

**Logical Architecture Data Flow(s):**

roadway\_treatment\_system\_status

**Physical Architecture Flow Name:** speed monitoring information

System status including current operational state and logged information including measured speeds, warning messages displayed, and violation records.

**Logical Architecture Data Flow(s):**

speed\_violation\_notification\_for\_m\_and\_c  
speed\_data\_for\_m\_and\_c\_speed\_monitoring  
speed\_sensor\_log\_for\_m\_and\_c  
speed\_sensor\_status\_for\_m\_and\_c

**Physical Architecture Flow Name:** traffic images

High fidelity, real-time traffic images suitable for surveillance monitoring by the operator or for use in machine vision applications.



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### Logical Architecture Data Flow(s):

video\_device\_status\_for\_m\_and\_c  
work\_zone\_images

**Physical Architecture Flow Name:** work zone warning status

Status of a work zone safety monitoring and warning devices. This flow documents system activations and includes additional supporting information (e.g., an image) that allows verification of the alarm.

### Logical Architecture Data Flow(s):

intrusion\_detection\_device\_status  
roadside\_crew\_warning\_given  
work\_zone\_intrusion\_alert  
work\_zone\_intrusion\_detected  
work\_zone\_intrusion\_video\_image  
intrusion\_alert\_device\_status

**Storage Facility** => **Maintenance and Construction Management**

**Physical Architecture Flow Name:** equipment availability

An inventory of the maintenance and construction equipment available at the storage facility. This flow includes the type of equipment, enough descriptive information to indicate its suitability for use, and its current status. This flow may contain information for a specific type of equipment or include all equipment available at the facility.

### Logical Architecture Data Flow(s):

fsf-equipment\_availability\_for\_fleet\_manager  
fsf-equipment\_availability  
fsf-equipment\_status\_for\_tracking

**Physical Architecture Flow Name:** maintenance materials storage status

The amount and availability of maintenance materials in storage facilities.

### Logical Architecture Data Flow(s):

fsf-materials\_status

**Surface Transportation Weather Service** => **Maintenance and Construction Management**

**Physical Architecture Flow Name:** environmental conditions data

Current road conditions (e.g., surface temperature, subsurface temperature, moisture, icing, treatment status) and surface weather conditions (e.g., air temperature, wind speed, precipitation, visibility) as measured and reported by fixed and/or mobile environmental sensors and aggregated by the data collector. Attributes relating to the data collection (and aggregation) are also included.

### Logical Architecture Data Flow(s):

fstws-env\_sensor\_data\_for\_maint

**Physical Architecture Flow Name:** transportation weather information

Current and forecast road conditions and weather information (e.g., surface condition, flooding, wind advisories, visibility, etc.) associated with the transportation network. This information is of a resolution, timeliness, and accuracy to be useful in transportation decision making.

### Logical Architecture Data Flow(s):

fstws-surface\_trans\_weather\_forecasts  
fstws-surface\_trans\_weather\_observations

**Traffic Management** => **Maintenance and Construction Management**

## Maintenance and Construction Management

**Physical Architecture Flow Name:** environmental conditions data

Current road conditions (e.g., surface temperature, subsurface temperature, moisture, icing, treatment status) and surface weather conditions (e.g., air temperature, wind speed, precipitation, visibility) as measured and reported by fixed and/or mobile environmental sensors and aggregated by the data collector. Attributes relating to the data collection (and aggregation) are also included.

**Logical Architecture Data Flow(s):**  
environment\_sensor\_data\_for\_maint

**Physical Architecture Flow Name:** field equipment status

Identification of field equipment requiring repair and known information about the associated faults.

**Logical Architecture Data Flow(s):**  
field\_equipment\_status\_from\_traffic

**Physical Architecture Flow Name:** incident information

Notification of existence of incident and expected severity, location, time and nature of incident. As additional information is gathered and the incident evolves, updated incident information is provided. Incidents include any event that impacts transportation system operation ranging from routine incidents (e.g., disabled vehicle at the side of the road) through large-scale natural or human-caused disasters that involve loss of life, injuries, extensive property damage, and multi-jurisdictional response. This also includes special events, closures, and other planned events that may impact the transportation system.

**Logical Architecture Data Flow(s):**  
planned\_events\_for\_maint  
incident\_info\_from\_traffic

**Physical Architecture Flow Name:** maint and constr resource request

Request for road maintenance and construction resources that can be used in the diversion of traffic (cones, portable signs), clearance of a road hazard, repair of ancillary damage, or any other incident response. The request may poll for resource availability or request pre-staging, staging, or immediate dispatch of resources.

**Logical Architecture Data Flow(s):**  
winter\_maint\_action\_req\_from\_traffic  
roadway\_maint\_action\_req\_from\_traffic  
m\_and\_c\_resource\_request\_from\_traffic

**Physical Architecture Flow Name:** road network conditions

Current and forecasted traffic information, road and weather conditions, and other road network status. Either raw data, processed data, or some combination of both may be provided by this architecture flow. Information on diversions and alternate routes, closures, and special traffic restrictions (lane/shoulder use, weight restrictions, width restrictions, HOV requirements) in effect is included along with a definition of the links, nodes, and routes that make up the road network.

**Logical Architecture Data Flow(s):**  
roadway\_detours\_and\_closures\_for\_m\_and\_c  
road\_network\_info\_from\_traffic  
environmental\_sensor\_data\_from\_traffic\_management

**Physical Architecture Flow Name:** road network status assessment

Assessment of damage sustained by the road network including location and extent of the damage, estimate of remaining capacity, required closures, alternate routes, necessary restrictions, and time frame for repair and recovery.

**Logical Architecture Data Flow(s):**  
disaster\_network\_status\_from\_traffic\_to\_m\_and\_c

**Physical Architecture Flow Name:** traffic images

High fidelity, real-time traffic images suitable for surveillance monitoring by the operator or for use in machine vision applications.

## Maintenance and Construction Management

### Logical Architecture Data Flow(s):

traffic\_video\_for\_mcm

**Physical Architecture Flow Name:** work plan feedback

Comments and suggested changes to proposed construction and maintenance work schedules and activities. This information influences work plan schedules so that they minimize impact to other system operations and the overall transportation system.

### Logical Architecture Data Flow(s):

m\_and\_c\_plan\_feedback\_from\_traffic

## Transit Management

=>

## Maintenance and Construction Management

**Physical Architecture Flow Name:** work plan feedback

Comments and suggested changes to proposed construction and maintenance work schedules and activities. This information influences work plan schedules so that they minimize impact to other system operations and the overall transportation system.

### Logical Architecture Data Flow(s):

m\_and\_c\_plan\_feedback\_from\_transit

## Weather Service

=>

## Maintenance and Construction Management

**Physical Architecture Flow Name:** environmental conditions data status

Status of the data quality of environmental conditions data provided by a data contributor. Includes not only status by sensor, but statistical data regarding the quality checking of data provided.

### Logical Architecture Data Flow(s):

fws-maintenance\_environment\_sensor\_data\_status

**Physical Architecture Flow Name:** qualified environmental conditions data

Current road conditions (e.g., surface temperature, subsurface temperature, moisture, icing, treatment status) and surface weather conditions (e.g., air temperature, wind speed, precipitation, visibility) that has had quality checks performed on it and has been formatted and consolidated by the Clarus system. Attributes relating to the data collection (and aggregation) are also included.

### Logical Architecture Data Flow(s):

fws-env\_sensor\_data\_for\_maint

**Physical Architecture Flow Name:** weather information

Accumulated forecasted and current weather data (e.g., temperature, pressure, wind speed, wind direction, humidity, precipitation, visibility, light conditions, etc.).

### Logical Architecture Data Flow(s):

fws-weather\_forecasts

fws-current\_weather\_observations

### 2.12.3 Architecture Flow Diagrams for MCMS

# Maintenance and Construction Management

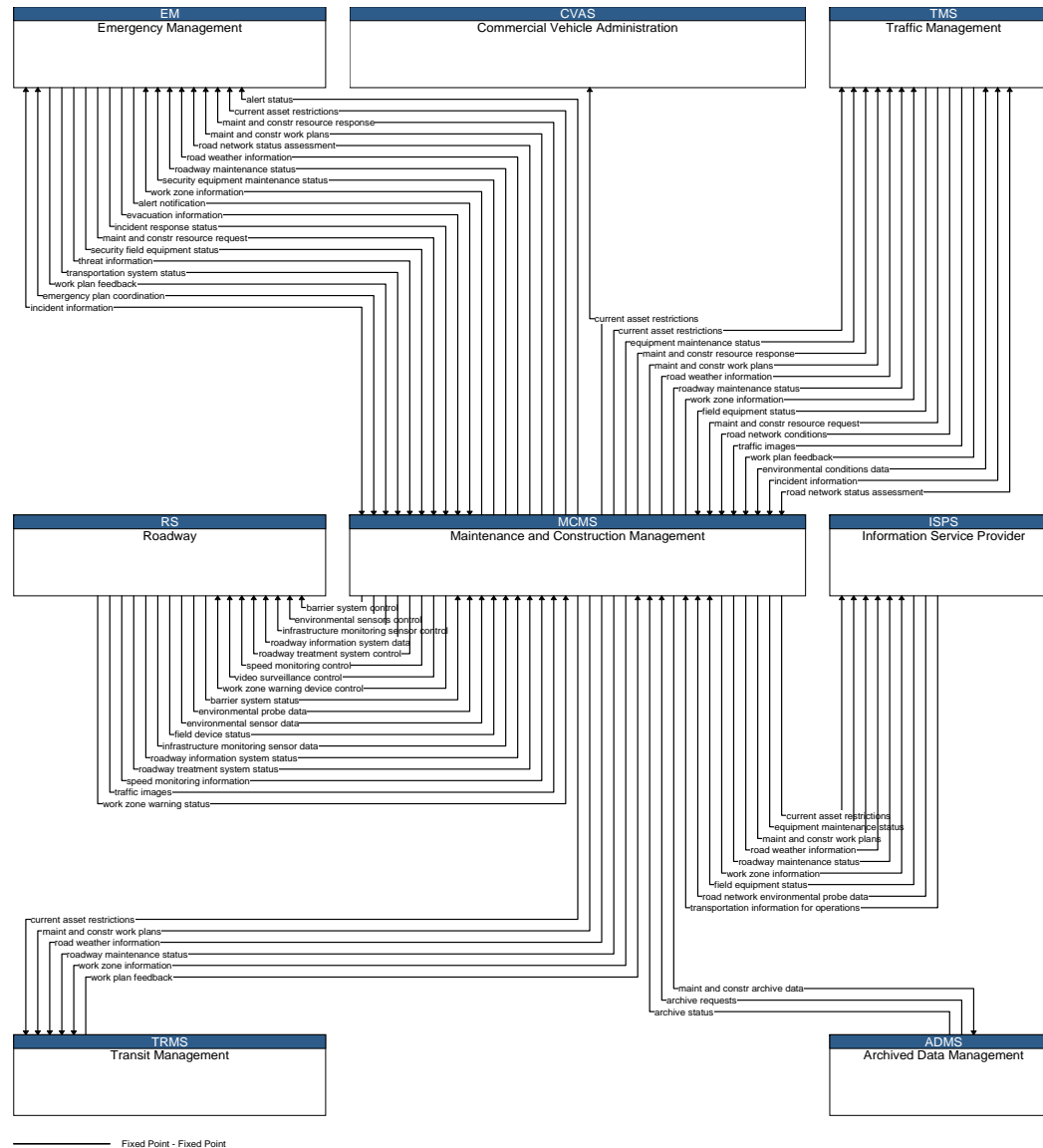


Figure 20: MCMS Subsystem Interfaces

# Maintenance and Construction Management

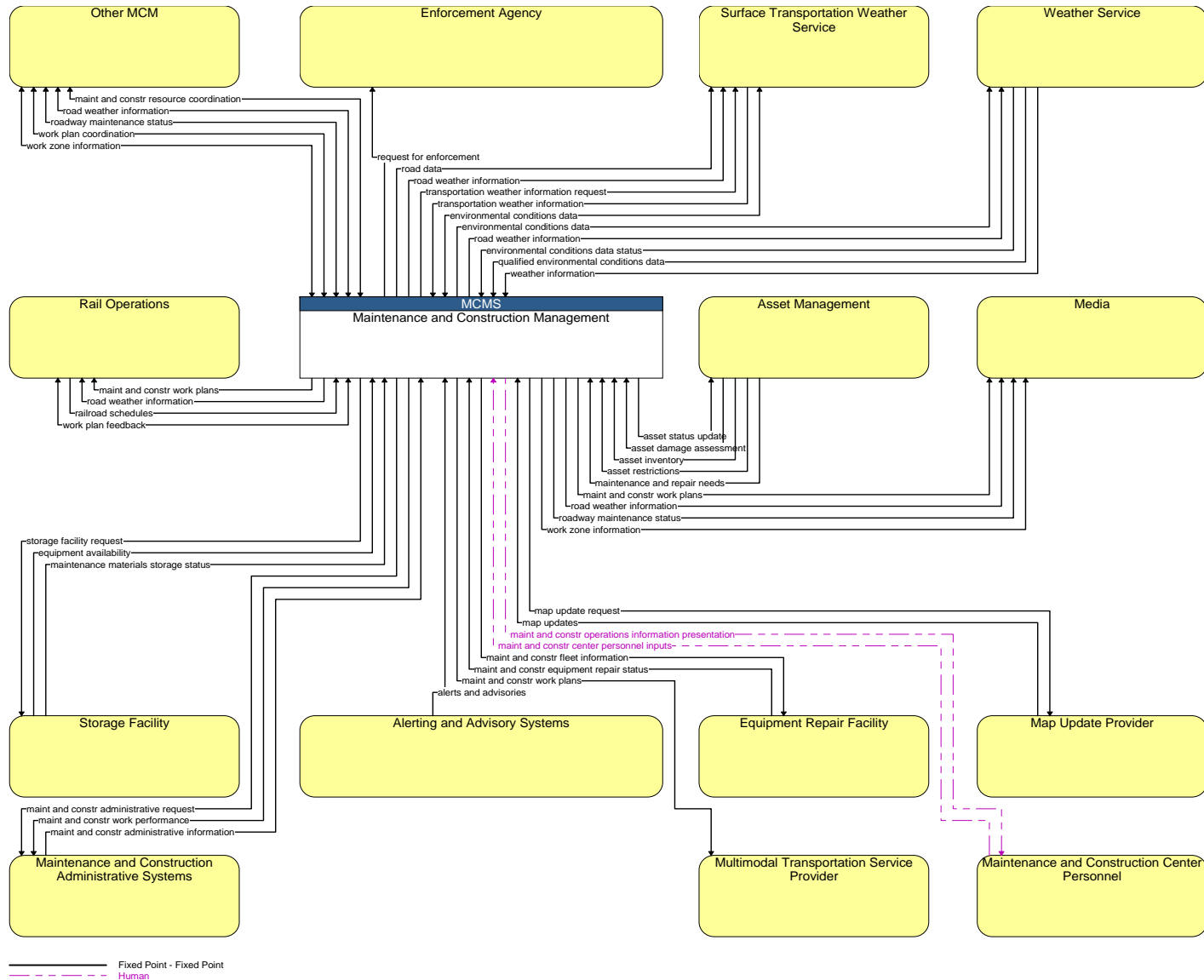


Figure 21: MCMS Terminator Interfaces

## 2.13 Maintenance and Construction Vehicle

The Maintenance and Construction Vehicle Subsystem (MCVS) resides in a maintenance, construction, or other specialized service vehicle or equipment and provides the sensory, processing, storage, and communications functions necessary to support highway maintenance and construction. All types of maintenance and construction vehicles are covered, including heavy equipment and supervisory vehicles. The subsystem provides two-way communications between drivers/operators and dispatchers and maintains and communicates current location and status information. A wide range of operational status is monitored, measured, and made available, depending on the specific type of vehicle or equipment. For example, for a snow plow, the information would include whether the plow is up or down and material usage information. The subsystem may also contain capabilities to monitor vehicle systems to support maintenance of the vehicle itself and other sensors that monitor environmental conditions including the road condition and surface weather information. This subsystem can represent a diverse set of mobile environmental sensing platforms, including wheeled vehicles and any other vehicle that collects and reports environmental information.

### 2.13.1 *Equipment Packages and Process Specifications for MCVS*

#### **Equipment Package: MCV Barrier System Control**

This on-board equipment package provides local control of automatic or remotely controlled gates and other barrier systems from a maintenance and construction vehicle. Using this equipment package, maintenance and construction field personnel (e.g., snow plow operators) can open and close gates and other barrier systems without leaving the vehicle, using Field-Vehicle Communications to control the barriers.

#### **Process Specifications**

**9.3.1.2 Operate WZ Devices On-Board**

**9.3.2.4 Provide M&C Field Personnel Interface for Work Zones**

#### **Equipment Package: MCV Environmental Monitoring**

This on-board equipment package collects current road and surface weather conditions from sensors on-board the maintenance and construction vehicle or by querying fixed sensors on or near the roadway. Environmental information including road surface temperature, air temperature, and wind speed is measured and spatially located and time stamped, and reported back to a center.

#### **Process Specifications**

**9.1.6 Provide M&C Vehicle Operator Interface for Maint**

**9.4.1 Collect Environmental Data On-Board**

#### **Equipment Package: MCV Infrastructure Monitoring**

This on-board equipment package monitors the condition of pavement, bridges, tunnels, associated hardware, and other transportation-related infrastructure (e.g., culverts). It includes vehicle-based sensors that directly monitor the infrastructure, communications that allow roadway-based infrastructure monitoring sensors to be controlled and read, and data communications that allows collected infrastructure condition information to be reported back to a center.

#### **Process Specifications**

**9.1.1 Manage M&C Systems On-Board**

#### **Equipment Package: MCV Roadway Maintenance and Construction**

This equipment package includes the on-board systems that support routine non-winter maintenance on a roadway system or right-of-way. Routine maintenance includes landscape maintenance, hazard removal (roadway debris, dead animals), routine maintenance activities (roadway cleaning, grass cutting), and repair and maintenance of both ITS and non-ITS equipment on the roadway (e.g., signs, traffic controllers, traffic detectors, dynamic message signs, traffic signals, etc.).

#### **Process Specifications**

**9.1.1 Manage M&C Systems On-Board**

**9.1.2 Collect M&C Vehicle Data On-Board**

**9.1.6 Provide M&C Vehicle Operator Interface for Maint**

#### **Equipment Package: MCV Vehicle Location Tracking**

## Maintenance and Construction Vehicle

This on-board equipment package tracks vehicle location and reports the position and timestamp information to a dispatch center.

### Process Specifications

#### 9.1.2 Collect M&C Vehicle Data On-Board

### Equipment Package: MCV Vehicle Safety Monitoring

This equipment package detects vehicle intrusions in the vicinity of the vehicle and warns crew workers and drivers of imminent encroachment. Crew movements are also monitored so that the crew can be warned of movement beyond the designated safe zone. This equipment package can be used for stationary work zones or in mobile applications where a safe zone is maintained around the moving vehicle.

### Process Specifications

#### 9.1.6 Provide M&C Vehicle Operator Interface for Maint

##### 9.3.1.4 Monitor Crew Movement On-Board

##### 9.3.2.1 Status Work Zone Activity

##### 9.3.4.3 Detect Work Zone Intrusion On-Board

##### 9.3.4.4 Provide On-Board Work Zone Intrusion Alert

### Equipment Package: MCV Vehicle System Monitoring and Diagnostics

This equipment package includes on-board sensors capable of monitoring the condition of each of the vehicle systems and diagnostics that can be used to support vehicle maintenance. The status of the vehicle and ancillary equipment and diagnostic information is provided to the vehicle operator, repair facility, and dispatch center.

### Process Specifications

#### 9.1.2 Collect M&C Vehicle Data On-Board

#### 9.1.6 Provide M&C Vehicle Operator Interface for Maint

### Equipment Package: MCV Winter Maintenance

This on-board equipment package supports snow plow operations and other roadway treatments (e.g., salt spraying and other material applications). It supports communications with the center to receive information and instructions that are provided to the vehicle operator and also supports remote control of on-board systems. The equipment package tracks operational status of snow and ice control operations and provides this information back to the center.

### Process Specifications

#### 9.1.1 Manage M&C Systems On-Board

#### 9.1.2 Collect M&C Vehicle Data On-Board

#### 9.1.6 Provide M&C Vehicle Operator Interface for Maint

### Equipment Package: MCV Work Zone Support

This on-board equipment package provides communications and support for local management of a work zone. It supports communications between field personnel and the managing center to keep the center apprised of current work zone status. It controls vehicle-mounted driver information systems (e.g., dynamic message signs) and uses short range communications to monitor and control other fixed or portable driver information systems in the work zone.

### Process Specifications

#### 9.3.1.2 Operate WZ Devices On-Board

##### 9.3.2.1 Status Work Zone Activity

##### 9.3.2.4 Provide M&C Field Personnel Interface for Work Zones

## 2.13.2 Interfaces for MCVS

**Basic Maintenance and Construction Vehicle**

=>

**Maintenance and Construction Vehicle**

**Physical Architecture Flow Name:**

maint and constr material information

## Maintenance and Construction Vehicle

Information on materials stored on the vehicle including quantity and current application rate.

**Logical Architecture Data Flow(s):**

fbmcb-materials\_status

**Physical Architecture Flow Name:** maint and constr vehicle measures

Raw vehicle diagnostics and operating status data reported by the maintenance vehicle platform including engine temperature, mileage, tire wear, brake wear, belt wear, and other operational status measures. In addition to this general vehicle status, this flow also includes the status of maintenance and construction-specific systems on the vehicle.

**Logical Architecture Data Flow(s):**

fbmcb-basic\_mcb\_measures

**Location Data Source** => **Maintenance and Construction Vehicle**

**Physical Architecture Flow Name:** position fix

Information which provides a traveler's or vehicle's geographical position.

**Logical Architecture Data Flow(s):**

From\_Location\_Data\_Source

**Maintenance and Construction Field Personnel** => **Maintenance and Construction Vehicle**

**Physical Architecture Flow Name:** crew movements

Visual or sensed presence of field crew location within a work zone that is monitored to enhance work zone safety.

**Logical Architecture Data Flow(s):**

fmcbp-crew\_movements

**Physical Architecture Flow Name:** maint and constr field personnel inputs

User input from field personnel including current maintenance and construction status information as well as on-board device control.

**Logical Architecture Data Flow(s):**

fmcbp-dispatch\_response  
fmcbp-vehicle\_systems\_control  
fmcbp-environmental\_sensor\_control  
fmcbp-field\_equip\_repair\_status  
fmcbp-m\_and\_c\_activity\_status  
fmcbp-work\_zone\_status\_inputs

**Maintenance and Construction Management** => **Maintenance and Construction Vehicle**

**Physical Architecture Flow Name:** environmental sensors control

Data used to configure and control environmental sensors.

**Logical Architecture Data Flow(s):**

environmental\_sensor\_control\_for\_mcb

**Physical Architecture Flow Name:** maint and constr dispatch information

Information used to dispatch maintenance and construction vehicles, equipment, and crews and information used to keep work zone crews informed. This information includes routing information, traffic information, road restrictions, incident information, environmental information, decision support information, maintenance schedule data, dispatch instructions, personnel assignments, alert notifications, and corrective actions.



## Maintenance and Construction Vehicle

### Logical Architecture Data Flow(s):

road\_network\_info\_to\_mcv  
winter\_dispatch\_orders\_to\_mcv  
suggested\_route\_to\_mcv  
status\_of\_other\_work\_zones  
mdss\_recommended\_actions\_for\_operator  
dispatch\_orders\_to\_mcv

**Physical Architecture Flow Name:** maint and constr vehicle system control

Configure and control data that supports remote control of on-board maintenance and construction vehicle systems and field equipment that is remotely controlled by the vehicle. For example, the data can be used to adjust material application rates and spread patterns.

### Logical Architecture Data Flow(s):

center\_control\_of\_on\_board\_work\_zone\_devices  
mcv\_infrastructure\_sensor\_control  
mcv\_vehicle\_systems\_control\_by\_fleet\_manager

**Maintenance and Construction Vehicle** => **Basic Maintenance and Construction Vehicle**

**Physical Architecture Flow Name:** maint and constr vehicle control

Control data sent from on-board ITS systems to control maintenance and construction vehicle equipment, including control of materials dispersion rate and other control functions that will vary with vehicle type and application.

### Logical Architecture Data Flow(s):

tbmvc-vehicle\_system\_control

**Maintenance and Construction Vehicle** => **Driver**

**Physical Architecture Flow Name:** driver information

Regulatory, warning, and guidance information provided to the driver while en route to support safe and efficient vehicle operation.

### Logical Architecture Data Flow(s):

td-mcv\_on\_board\_display  
td-traffic\_advisory\_from\_mcv  
td-work\_zone\_intrusion\_alert\_from\_mcv

**Maintenance and Construction Vehicle** => **Equipment Repair Facility**

**Physical Architecture Flow Name:** maint and constr vehicle conditions

Vehicle diagnostics information that is collected, filtered, and selectively reported by a maintenance and construction vehicle. The information includes engine temperature, mileage, tire wear, brake wear, belt wear, and any warnings or alarms concerning the operational condition of the vehicle and ancillary equipment.

### Logical Architecture Data Flow(s):

terf-basic\_mcv\_measures\_for equip\_repair

**Maintenance and Construction Vehicle** => **Maintenance and Construction Field**

**Physical Architecture Flow Name:** maint and constr field personnel information presentation

Information presented to maintenance and construction field personnel including vehicle routing and traffic information, road restrictions, environmental information, decision support information, maintenance schedules, dispatch instructions, maintenance personnel

## Maintenance and Construction Vehicle

assignments, vehicle maintenance information, work zone status information, and corrective actions.

### Logical Architecture Data Flow(s):

- tmcfp-road\_network\_info
- tmcfp-work\_zone\_status\_presentation
- tmcfp-suggested\_route
- tmcfp-dispatch\_info
- tmcfp-mdss\_recommended\_actions
- tmcfp-materials\_status\_onboard
- tmcfp-environmental\_sensor\_info
- tmcfp-mcv\_operational\_data

**Physical Architecture Flow Name:** maint and constr vehicle condition presentation

Presentation of vehicle diagnostics and operating status information to maintenance and construction field personnel including speed, engine temperature, mileage, tire wear, brake wear, belt wear, maintenance and construction system status, environmental sensor information, and other measures associated with the operation of a maintenance vehicle.

### Logical Architecture Data Flow(s):

- tmcfp-vehicle\_condition\_status

**Physical Architecture Flow Name:** work zone warning

Warnings provided to maintenance and construction field personnel, indicating a work zone emergency or safety issue such as the intrusion of a vehicle into the work zone area or movement of field crew into the travel lanes.

### Logical Architecture Data Flow(s):

- tmcfp-work\_zone\_intrusion\_alert\_from\_mcv
- tmcfp-work\_zone\_on\_board\_intrusion\_warning

**Maintenance and Construction Vehicle**

=>

**Maintenance and Construction Management**

**Physical Architecture Flow Name:** environmental sensor data

Current road conditions (e.g., surface temperature, subsurface temperature, moisture, icing, treatment status) and surface weather conditions (e.g., air temperature, wind speed, precipitation, visibility) as measured and reported by fixed and/or mobile environmental sensors. Operational status of the sensors is also included.

### Logical Architecture Data Flow(s):

- environmental\_sensor\_data\_from\_mcv
- environmental\_sensor\_status\_from\_mcv

**Physical Architecture Flow Name:** infrastructure conditions data

Current condition of pavement, bridges, culverts, signs, and other roadway infrastructure as measured by on-board sensors or read from infrastructure-based sensors. The data may include raw data or images (e.g., photo logs) that indicate the current status of the infrastructure.

### Logical Architecture Data Flow(s):

- mcv\_infrastructure\_sensor\_data
- mcv\_infrastructure\_sensor\_status

**Physical Architecture Flow Name:** maint and constr dispatch status

Current maintenance and construction status including work data, operator status, crew status, and equipment status.

### Logical Architecture Data Flow(s):

- m\_and\_c\_status\_from\_mcv\_operator
- field\_equip\_status\_from\_mcv\_operator
- dispatch\_response\_from\_mcv

**Physical Architecture Flow Name:** maint and constr vehicle conditions

## Maintenance and Construction Vehicle

Vehicle diagnostics information that is collected, filtered, and selectively reported by a maintenance and construction vehicle. The information includes engine temperature, mileage, tire wear, brake wear, belt wear, and any warnings or alarms concerning the operational condition of the vehicle and ancillary equipment.

### Logical Architecture Data Flow(s):

basic\_mcv\_measures\_for\_maint\_sched  
safety\_data\_for\_fleet\_mgmt

**Physical Architecture Flow Name:** maint and constr vehicle location data

The current location and related status (e.g., direction and speed) of the maintenance/construction vehicle.

### Logical Architecture Data Flow(s):

vehicle\_location\_for\_mcv\_tracking

**Physical Architecture Flow Name:** maint and constr vehicle operational data

Data that describes the maintenance and construction activity performed by the vehicle. Operational data includes materials usage (amount stored and current application rate), operational state of the maintenance equipment (e.g., blade up/down, spreader pattern), vehicle safety status, and other measures associated with the operation of a maintenance, construction, or other special purpose vehicle. Operational data may include basic operational status of the vehicle equipment or a more precise record of the work performed (e.g., application of crack sealant with precise locations and application characteristics).

### Logical Architecture Data Flow(s):

mcv\_operational\_data  
mcv\_materials\_status  
on\_board\_work\_zone\_device\_status

**Physical Architecture Flow Name:** work zone status

Current work zone status including current location (and future locations for moving work zones), impact to the roadway, required lane shifts, expected time(s) and duration of impact, anticipated delays, alternate routes, and suggested speed limits.

### Logical Architecture Data Flow(s):

work\_zone\_status\_from\_mcv

**Physical Architecture Flow Name:** work zone warning status

Status of a work zone safety monitoring and warning devices. This flow documents system activations and includes additional supporting information (e.g., an image) that allows verification of the alarm.

### Logical Architecture Data Flow(s):

work\_zone\_intrusion\_warning\_notification

**Maintenance and Construction Vehicle** => **Other MCV**

**Physical Architecture Flow Name:** maint and constr vehicle status coordination

Maintenance and construction vehicle status information that is shared between vehicles. This includes environmental conditions and the operational status of the vehicles.

### Logical Architecture Data Flow(s):

tomcv-env\_conditions  
tomcv-vehicle\_operational\_data

**Physical Architecture Flow Name:** work zone warning notification

Notification of a work zone emergency or safety issue. This flow identifies that a work zone emergency or safety issue has occurred so that warnings may be generated by more than one system in the work zone.

## Maintenance and Construction Vehicle

### Logical Architecture Data Flow(s):

tomcv-work\_zone\_intrusion\_detection\_on\_board  
tomcv-work\_zone\_intrusion\_alert\_on\_board  
tomcv-crew\_movements  
tomcv-work\_zone\_intrusion\_warning\_to\_crew

**Maintenance and Construction Vehicle** => **Roadway**

### Physical Architecture Flow Name: barrier system control

Information used to configure and control barrier systems that are represented by gates, barriers and other automated or remotely controlled systems used to manage entry to roadways.

### Logical Architecture Data Flow(s):

barrier\_system\_control\_from\_mcv

### Physical Architecture Flow Name: environmental sensor data

Current road conditions (e.g., surface temperature, subsurface temperature, moisture, icing, treatment status) and surface weather conditions (e.g., air temperature, wind speed, precipitation, visibility) as measured and reported by fixed and/or mobile environmental sensors. Operational status of the sensors is also included.

### Logical Architecture Data Flow(s):

environmental\_sensor\_data\_for\_roadway

### Physical Architecture Flow Name: environmental sensors control

Data used to configure and control environmental sensors.

### Logical Architecture Data Flow(s):

environmental\_sensor\_control\_for\_roadway

### Physical Architecture Flow Name: infrastructure monitoring sensor control

Data used to configure and control infrastructure monitoring sensors.

### Logical Architecture Data Flow(s):

infrastructure\_sensor\_control\_from\_mcv

### Physical Architecture Flow Name: roadway information system data

Information used to initialize, configure, and control roadside systems that provide driver information (e.g., dynamic message signs, highway advisory radio, beacon systems). This flow can provide message content and delivery attributes, local message store maintenance requests, control mode commands, status queries, and all other commands and associated parameters that support remote management of these systems.

### Logical Architecture Data Flow(s):

dms\_data\_from\_mcv

**Maintenance and Construction Vehicle** => **Vehicle**

### Physical Architecture Flow Name: vehicle signage data

In-vehicle signing data that augments regulatory, warning, and informational road signs and signals. The information provided would include static sign information (e.g., stop, curve warning, guide signs, service signs, and directional signs) and dynamic information (e.g., current signal states, grade crossing information, local traffic and road conditions, advisories, and detours).

### Logical Architecture Data Flow(s):

work\_zone\_intrusion\_alert\_on\_board\_for\_in\_vehicle\_signing

**Other MCV** => **Maintenance and Construction Vehicle**

## Maintenance and Construction Vehicle

**Physical Architecture Flow Name:** maint and constr vehicle status coordination

Maintenance and construction vehicle status information that is shared between vehicles. This includes environmental conditions and the operational status of the vehicles.

**Logical Architecture Data Flow(s):**

fomcv-vehicle\_operational\_data  
fomcv-env\_conditions

**Physical Architecture Flow Name:** work zone warning notification

Notification of a work zone emergency or safety issue. This flow identifies that a work zone emergency or safety issue has occurred so that warnings may be generated by more than one system in the work zone.

**Logical Architecture Data Flow(s):**

fomcv-crew\_movements  
fomcv-work\_zone\_intrusion\_alert\_on\_board  
fomcv-work\_zone\_intrusion\_detection\_on\_board  
fomcv-work\_zone\_intrusion\_warning\_to\_crew

**Roadway** => **Maintenance and Construction Vehicle**

**Physical Architecture Flow Name:** barrier system status

Current operating status of barrier systems. Barrier systems represent gates, barriers and other automated or remotely controlled systems used to manage entry to roadways. Status of the systems includes operating condition and current operational state.

**Logical Architecture Data Flow(s):**

barrier\_system\_status\_to\_mcv

**Physical Architecture Flow Name:** environmental sensor data

Current road conditions (e.g., surface temperature, subsurface temperature, moisture, icing, treatment status) and surface weather conditions (e.g., air temperature, wind speed, precipitation, visibility) as measured and reported by fixed and/or mobile environmental sensors. Operational status of the sensors is also included.

**Logical Architecture Data Flow(s):**

environmental\_sensor\_status\_from\_roadway  
environmental\_sensor\_data\_from\_roadway

**Physical Architecture Flow Name:** infrastructure monitoring sensor data

Data read from infrastructure-based sensors that monitor the condition or integrity of transportation infrastructure including bridges, tunnels, interchanges, pavement, culverts, signs, transit rail or guideway, and other roadway infrastructure. Includes sensor data and the operational status of the sensors.

**Logical Architecture Data Flow(s):**

infrastructure\_sensor\_status\_for\_mcv  
infrastructure\_sensor\_data\_for\_mcv

**Physical Architecture Flow Name:** roadway information system status

Current operating status of dynamic message signs, highway advisory radios, beacon systems, or other configurable field equipment that provides dynamic information to the driver.

**Logical Architecture Data Flow(s):**

dms\_status\_for\_mcv

**Physical Architecture Flow Name:** work zone warning notification

Notification of a work zone emergency or safety issue. This flow identifies that a work zone emergency or safety issue has occurred so that warnings may be generated by more than one system in the work zone.

## Maintenance and Construction Vehicle

### Logical Architecture Data Flow(s):

work\_zone\_intrusion\_detection\_for\_on\_board

**Roadway Environment**

=>

**Maintenance and  
Construction Vehicle**

### Physical Architecture Flow Name:

environmental conditions

Current road conditions (e.g., surface temperature, subsurface temperature, moisture, icing, treatment status) and surface weather conditions (e.g., air temperature, wind speed, precipitation, visibility) that are measured by environmental sensors.

### Logical Architecture Data Flow(s):

fre-environmental\_conditions\_at\_roadway

### Physical Architecture Flow Name:

roadway characteristics

Detectable or measurable road characteristics such as friction coefficient and general surface conditions, road geometry and markings, etc. These characteristics are monitored or measured by ITS sensors and used to support advanced vehicle safety and control and road maintenance capabilities.

### Logical Architecture Data Flow(s):

fre-roadway\_characteristics\_for\_mcv  
fre-roadway\_infrastructure\_characteristics

**Traffic**

=>

**Maintenance and  
Construction Vehicle**

### Physical Architecture Flow Name:

traffic characteristics

Physical traffic characteristics which are monitored and translated into macroscopic measures like occupancy, volume, density, and average speed. Point measures support presence detection and individual vehicle measures like speed.

### Logical Architecture Data Flow(s):

ftrf-vehicle\_presence

**Vehicle**

=>

**Maintenance and  
Construction Vehicle**

### Physical Architecture Flow Name:

safety system status

Current vehicle safety system status indicating the operating condition of these systems and the safety status of the vehicle and driver.

### Logical Architecture Data Flow(s):

safety\_data\_for\_mcv

## 2.13.3 Architecture Flow Diagrams for MCVS

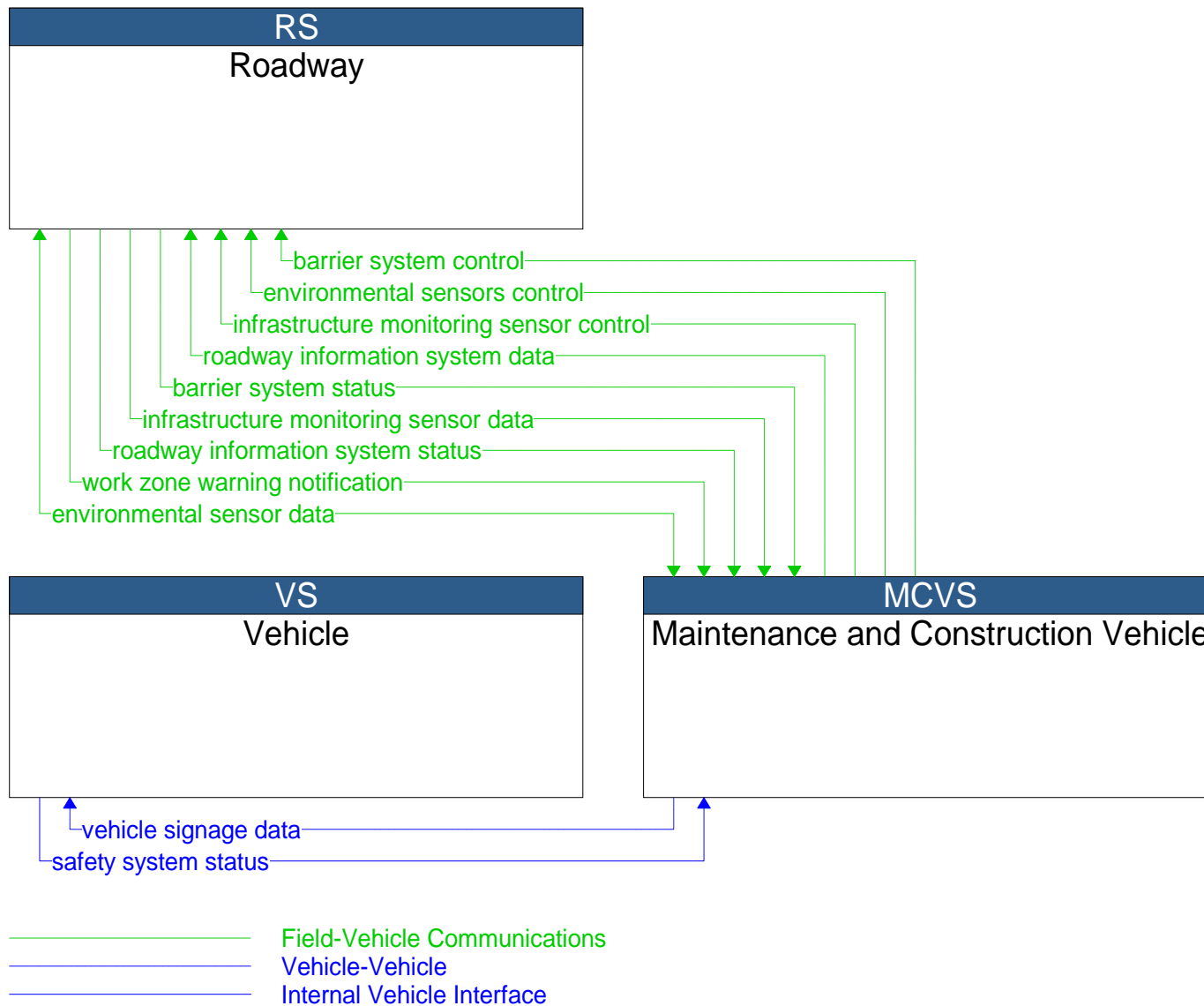


Figure 22: MCVS Subsystem Interfaces

Maintenance and Construction Vehicle

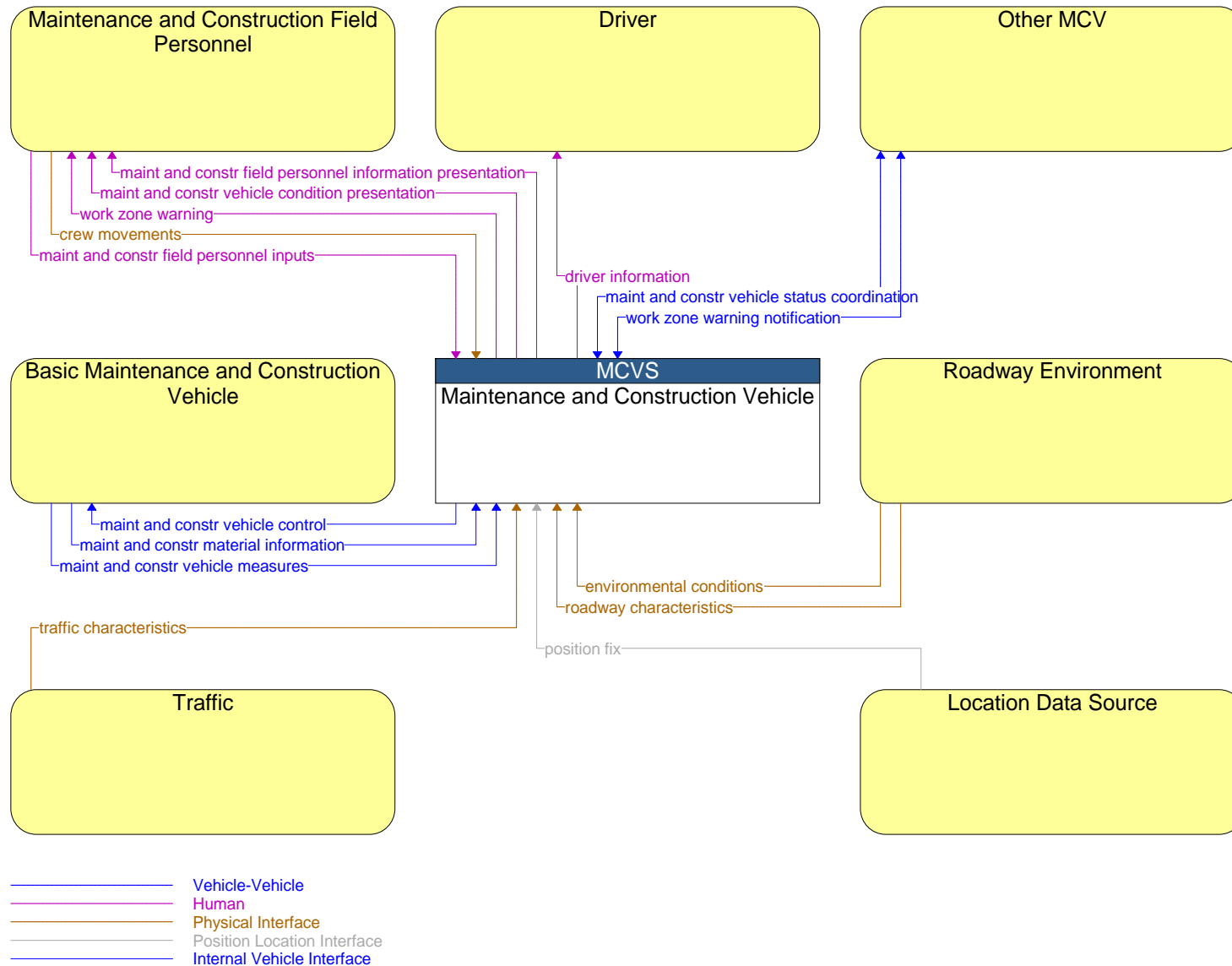


Figure 23: MCVS Terminator Interfaces



## 2.14 Parking Management

The Parking Management Subsystem (PMS) provides electronic monitoring and management of parking facilities. It supports a Field-Vehicle Communications link to the Vehicle Subsystem that allows electronic collection of parking fees and monitors and controls parking meters that support conventional parking fee collection. It also includes the instrumentation, signs, and other infrastructure that monitors parking lot usage and provides local information about parking availability and other general parking information. This portion of the subsystem functionality must be located in the parking facility where it can monitor, classify, and share information with customers and their vehicles. The subsystem also interfaces with the financial infrastructure and broadly disseminates parking information to other operational centers in the region. Note that the latter functionality may be located in a back office, remote from the parking facility.

### 2.14.1 *Equipment Packages and Process Specifications for PMS*

#### **Equipment Package: Parking Coordination**

This equipment package supports communication and coordination between equipped parking facilities and also supports regional coordination between parking facilities and traffic and transit management systems. This equipment package also shares information with transit management systems and information service providers to support multimodal travel planning, including parking reservations capabilities. Information including current parking availability, system status, and operating strategies are shared through this equipment package to enable local parking facility management that supports regional transportation strategies.

##### **Process Specifications**

- 1.2.5.1 **Provide Parking Lot Static Data**
- 1.2.5.2 **Coordinate Other Parking Data**
- 1.2.5.4 **Determine Dynamic Parking Lot State**
- 7.2.1.7 **Update Parking Lot Data**
- 7.2.1.9 **Manage Parking Lot Reservations**

#### **Equipment Package: Parking Data Collection**

This equipment package collects and stores parking information that is collected in the course of parking system operations performed by the Parking Management Subsystem. This data can be used directly by operations personnel or it can be made available to other data users and archives in the region.

##### **Process Specifications**

- 1.2.5.5 **Manage Parking Archive Data**

#### **Equipment Package: Parking Electronic Payment**

This equipment package supports electronic payment of parking fees using in-vehicle equipment (e.g., tags) or contact or proximity cards. It includes the field elements that provide the interface to the in-vehicle or card payment device and the back-office functionality that performs the transaction.

##### **Process Specifications**

- 5.4.3 **Process Parking Lot Violations**
- 7.2.1.1 **Read Parking Lot Vehicle Payment Data**
- 7.2.1.10 **Determine Advanced Charges**
- 7.2.1.2 **Calculate Vehicle Parking Lot Charges**
- 7.2.1.3 **Collect Bad Charge Payment Data**
- 7.2.1.4 **Check for Advanced Parking Lot Payment**
- 7.2.1.5 **Bill Driver for Parking Lot Charges**
- 7.2.1.6 **Manage Parking Lot Financial Processing**
- 7.2.1.7 **Update Parking Lot Data**
- 7.2.1.8 **Register for Advanced Parking Lot Payment**
- 7.2.2 **Produce Parking Lot Displays**

## Parking Management

- 7.2.3 Obtain Parking Lot Violator Image
- 7.2.5 Detect Vehicle for Parking Lot Payment

### Equipment Package: Parking Management

This equipment package detects and classifies vehicles at parking facility entrances, exits, and other designated locations within the facility. Current parking availability is monitored and used to inform drivers through dynamic message signs/displays so that vehicles are efficiently routed to available spaces. Parking facility information, including current parking rates and directions to entrances and available exits, is also provided to drivers. Coordination with traffic management supports local traffic control coordination in and around the parking facility.

#### Process Specifications

- 1.2.5.1 Provide Parking Lot Static Data
- 1.2.5.3 Provide Parking Lot Operator Interface
- 1.2.5.4 Determine Dynamic Parking Lot State
- 1.2.5.6 Detect Vehicles in Parking Lot
- 1.2.5.7 Output Parking Lot Information to Drivers

### Equipment Package: Parking Short Range Traveler Information Communications

This equipment package includes field elements that distribute parking information to vehicles for in-vehicle display. This equipment package controls the information distribution and includes the short range communications equipment that provides information to passing vehicles.

#### Process Specifications

- 1.2.5.7 Output Parking Lot Information to Drivers

## 2.14.2 Interfaces for PMS

### Archived Data Management => Parking Management

**Physical Architecture Flow Name:** archive requests

A request to a data source for information on available data (i.e. "catalog") or a request that defines the data to be archived. The request can be a general subscription intended to initiate a continuous or regular data stream or a specific request intended to initiate a one-time response from the recipient.

**Logical Architecture Data Flow(s):**

parking\_archive\_request

**Physical Architecture Flow Name:** archive status

Notification that data provided to an archive contains erroneous, missing, or suspicious data or verification that the data provided appears valid. If an error has been detected, the offending data and the nature of the potential problem are identified.

**Logical Architecture Data Flow(s):**

parking\_archive\_status

### DMV => Parking Management

**Physical Architecture Flow Name:** registration

Registered owner of vehicle and associated vehicle information.

**Logical Architecture Data Flow(s):**

fdmv-parking\_lot\_violation\_vehicle\_registration  
fdmv-parking\_lot\_violation\_state\_identity

### Financial Institution => Parking Management

## Parking Management

**Physical Architecture Flow Name:** transaction status

Response to transaction request. Normally dealing with a request for payment.

**Logical Architecture Data Flow(s):**

ffi-bad\_charges\_payment\_updates  
ffi-confirm\_charges\_payment

**Information Service Provider** => **Parking Management**

**Physical Architecture Flow Name:** parking lot data request

Request for parking lot occupancy, fares, and availability. The request can be a subscription that initiates as-needed information updates as well as a one-time request for information.

**Logical Architecture Data Flow(s):**

parking\_lot\_price\_data\_request  
parking\_lot\_data\_request  
parking\_lot\_dynamic\_information\_request\_by\_isp  
advanced\_traveler\_charges\_request  
parking\_lot\_static\_information\_request\_by\_isp  
advanced\_other\_charges\_request

**Physical Architecture Flow Name:** parking reservations request

Reservation request for parking lot.

**Logical Architecture Data Flow(s):**

parking\_lot\_reservation\_request

**Other Parking** => **Parking Management**

**Physical Architecture Flow Name:** parking coordination

Information that enables parking management activities to be coordinated between different parking operators or systems in a region.

**Logical Architecture Data Flow(s):**

fop-parking\_coordination\_data

**Parking Management** => **Archived Data Management**

**Physical Architecture Flow Name:** parking archive data

Data used to analyze and monitor trends in parking demand, pricing, and operational actions. Content may include a catalog of available information, the actual information to be archived, and associated meta data that describes the archived information.

**Logical Architecture Data Flow(s):**

parking\_archive\_data

**Parking Management** => **DMV**

**Physical Architecture Flow Name:** license request

Request supporting registration data based on license plate read during violation.

**Logical Architecture Data Flow(s):**

tdmv-parking\_lot\_violation\_vehicle\_license  
tdmv-parking\_lot\_violation\_identity\_code

**Parking Management** => **Driver**

**Physical Architecture Flow Name:** driver parking information

## Parking Management

Presentation of general parking information to drivers including lot status, parking availability, and directions to available spaces, entrances, and exits.

**Logical Architecture Data Flow(s):**

td-parking\_information

**Physical Architecture Flow Name:** roadside transaction status

The status of an electronic payment transaction provided directly to the driver via sign or other roadside infrastructure.

**Logical Architecture Data Flow(s):**

td-parking\_lot\_payment\_confirmed

td-parking\_lot\_payment\_invalid

**Parking Management** ==> **Enforcement Agency**

**Physical Architecture Flow Name:** payment violation notification

Notification to enforcement agency of a toll, parking, or transit fare payment violation.

**Logical Architecture Data Flow(s):**

tea-parking\_violation\_data

**Parking Management** ==> **Financial Institution**

**Physical Architecture Flow Name:** payment request

Request for payment from financial institution.

**Logical Architecture Data Flow(s):**

tfi-request\_charges\_payment

tfi-parking\_lot\_payment\_violator\_data

**Parking Management** ==> **Information Service Provider**

**Physical Architecture Flow Name:** parking information

General parking information and status, including current parking availability.

**Logical Architecture Data Flow(s):**

dynamic\_parking\_information\_for\_isp

static\_parking\_information\_for\_isp

parking\_lot\_price\_data

parking\_lot\_availability

**Physical Architecture Flow Name:** parking lot reservation confirmation

Confirmation for parking lot reservation.

**Logical Architecture Data Flow(s):**

parking\_lot\_reservation\_confirm

advanced\_traveler\_charges\_confirm

advanced\_other\_charges\_confirm

**Parking Management** ==> **Other Parking**

**Physical Architecture Flow Name:** parking coordination

Information that enables parking management activities to be coordinated between different parking operators or systems in a region.

**Logical Architecture Data Flow(s):**

top-parking\_coordination\_data

## Parking Management

**Physical Architecture Flow Name:** parking status

Presentation of information to the parking operator including operational status and transaction reports.

**Logical Architecture Data Flow(s):**

- tpo-transaction\_reports
- tpo-request\_advanced\_parking\_payment
- tpo-parking\_lot\_charge\_change\_request
- tpo-change\_lot\_state
- tpo-parking\_lot\_status
- tpo-archive\_status

**Parking Management** ==> **Traffic Management**

**Physical Architecture Flow Name:** parking demand management response

Response to parking demand management change requests indicating level of compliance with request.

**Logical Architecture Data Flow(s):**

- parking\_lot\_charge\_change\_response
- parking\_lot\_charge\_direct\_details

**Physical Architecture Flow Name:** parking information

General parking information and status, including current parking availability.

**Logical Architecture Data Flow(s):**

- dynamic\_parking\_information\_for\_traffic
- parking\_information\_for\_dissemination
- static\_parking\_information\_for\_traffic
- parking\_lot\_current\_state

**Parking Management** ==> **Transit Management**

**Physical Architecture Flow Name:** parking information

General parking information and status, including current parking availability.

**Logical Architecture Data Flow(s):**

- static\_parking\_information\_for\_transit
- dynamic\_parking\_information\_for\_transit

**Parking Management** ==> **Traveler Card**

**Physical Architecture Flow Name:** request for payment

Request to deduct cost of service from user's payment account.

**Logical Architecture Data Flow(s):**

- ttc-debited\_traveler\_parking\_payment
- ttc-request\_traveler\_parking\_payment

**Parking Management** ==> **Vehicle**

**Physical Architecture Flow Name:** vehicle parking information

Parking information for in-vehicle display that is provided to vehicles approaching or in parking facilities. The information provided would include static sign information (e.g., guide signs, service signs, height, width, and weight restrictions, and directional signs) and dynamic information (e.g., current parking availability and locations).

**Logical Architecture Data Flow(s):**

- parking\_to\_vehicle\_local\_parking\_data

## Parking Management

**Physical Architecture Flow Name:** vehicle payment request

Request for information supporting toll and parking payments.

**Logical Architecture Data Flow(s):**

parking\_lot\_payment\_request  
parking\_lot\_vehicle\_payment\_data\_request

**Physical Architecture Flow Name:** vehicle payment update

Data written to vehicle equipment to support electronic toll collection or parking payment.

**Logical Architecture Data Flow(s):**

parking\_lot\_payment\_debited  
parking\_lot\_vehicle\_payment\_data\_update  
parking\_lot\_vehicle\_payment\_data\_clear

**Parking Operator** ==> **Parking Management**

**Physical Architecture Flow Name:** parking operator inputs

User input from the parking operator to query current status and control the operation of the parking management system.

**Logical Architecture Data Flow(s):**

fpo-archive\_commands  
fpo-confirm\_advanced\_parking\_payment  
fpo-lot\_occupancy  
fpo-parking\_lot\_charge\_change\_response  
fpo-parking\_lot\_hours\_of\_operation  
fpo-parking\_lot\_data  
fpo-current\_lot\_state

**Physical Architecture Flow Name:** request for performance data

User input from the parking operator to request current parking service performance data.

**Logical Architecture Data Flow(s):**

fpo-transaction\_reports\_request

**Physical Architecture Flow Name:** parking demand management request

Request to change the demand for parking facility use through pricing or other mechanisms.

**Logical Architecture Data Flow(s):**

parking\_lot\_charge\_direct\_request  
parking\_lot\_charge\_change\_request

**Physical Architecture Flow Name:** parking lot data request

Request for parking lot occupancy, fares, and availability. The request can be a subscription that initiates as-needed information updates as well as a one-time request for information.

**Logical Architecture Data Flow(s):**

parking\_lot\_static\_information\_request\_by\_traffic  
parking\_lot\_dynamic\_information\_request\_by\_traffic

**Physical Architecture Flow Name:** parking lot inputs

Instructions for operation of local parking facilities to support regional traffic management objectives (e.g. which parking lot exits to use). Also, includes inputs from traffic sensors to support calculation of parking lot occupancy and support more effective management of parking entrances and exits.

**Logical Architecture Data Flow(s):**

## Parking Management

static\_data\_for\_parking\_lots  
selected\_parking\_lot\_control\_strategy  
parking\_lot\_input\_data

### **Transit Management** => **Parking Management**

**Physical Architecture Flow Name:** parking lot data request

Request for parking lot occupancy, fares, and availability. The request can be a subscription that initiates as-needed information updates as well as a one-time request for information.

**Logical Architecture Data Flow(s):**

parking\_lot\_dynamic\_information\_request\_by\_transit  
parking\_lot\_static\_information\_request\_by\_transit

### **Traveler Card** => **Parking Management**

**Physical Architecture Flow Name:** payment

Payment of some kind (e.g., toll, parking, fare) by traveler which, in most cases, can be related to a credit account.

**Logical Architecture Data Flow(s):**

ftc-traveler\_parking\_input\_credit\_identity  
ftc-confirm\_traveler\_parking\_payment

### **Vehicle** => **Parking Management**

**Physical Architecture Flow Name:** vehicle payment information

Information provided for payment of tolls and parking fees including identification that can be used to identify the payment account or source and related vehicle and service information that are used to determine the type and price of service requested.

**Logical Architecture Data Flow(s):**

parking\_lot\_payment\_confirmation  
parking\_lot\_vehicle\_payment\_data\_collect

### **Vehicle Characteristics** => **Parking Management**

**Physical Architecture Flow Name:** vehicle characteristics

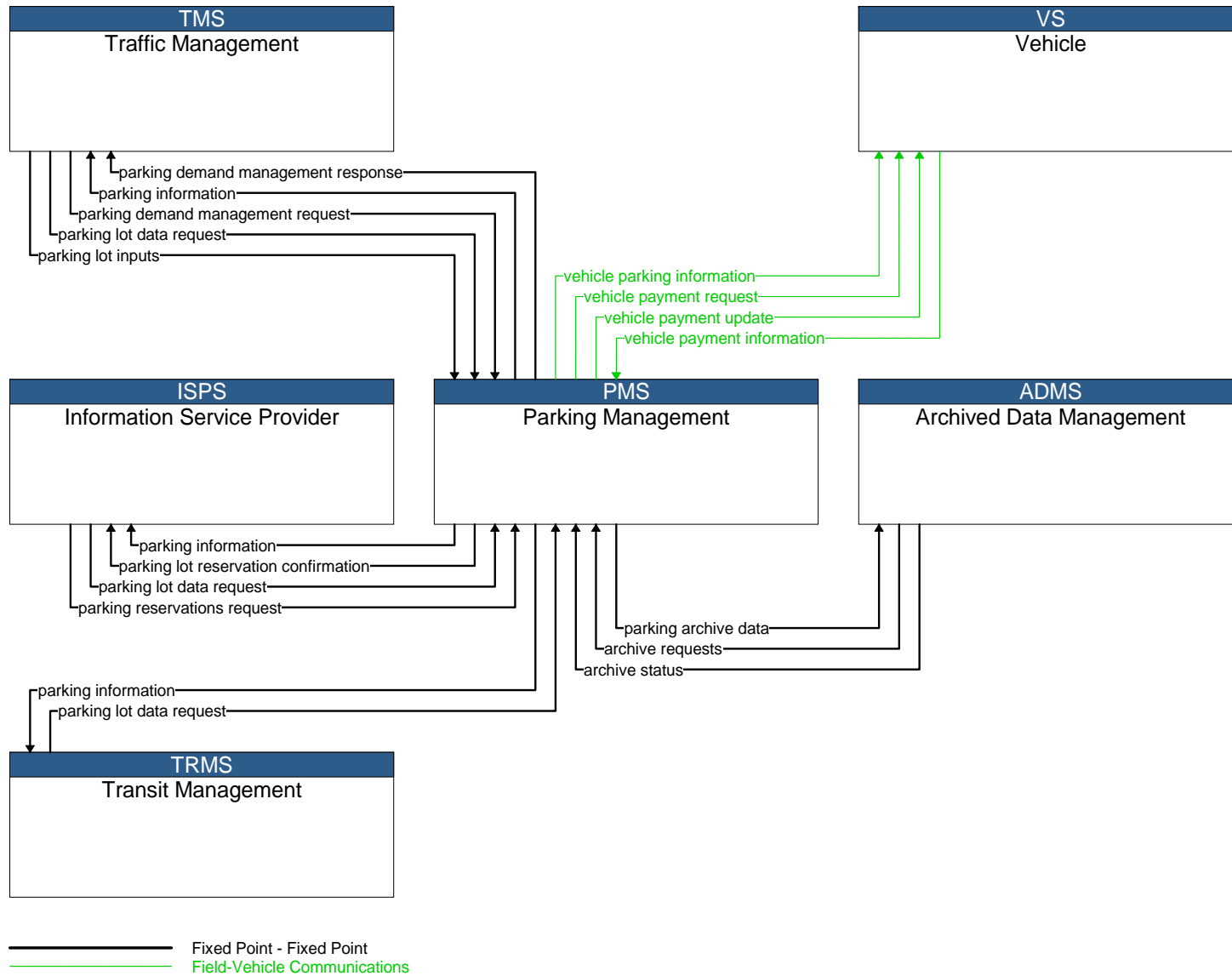
The physical or visible characteristics of an individual vehicle that can be measured to classify a vehicle and imaged to uniquely identify a vehicle.

**Logical Architecture Data Flow(s):**

From\_Vehicle\_Characteristics

## 2.14.3 Architecture Flow Diagrams for PMS

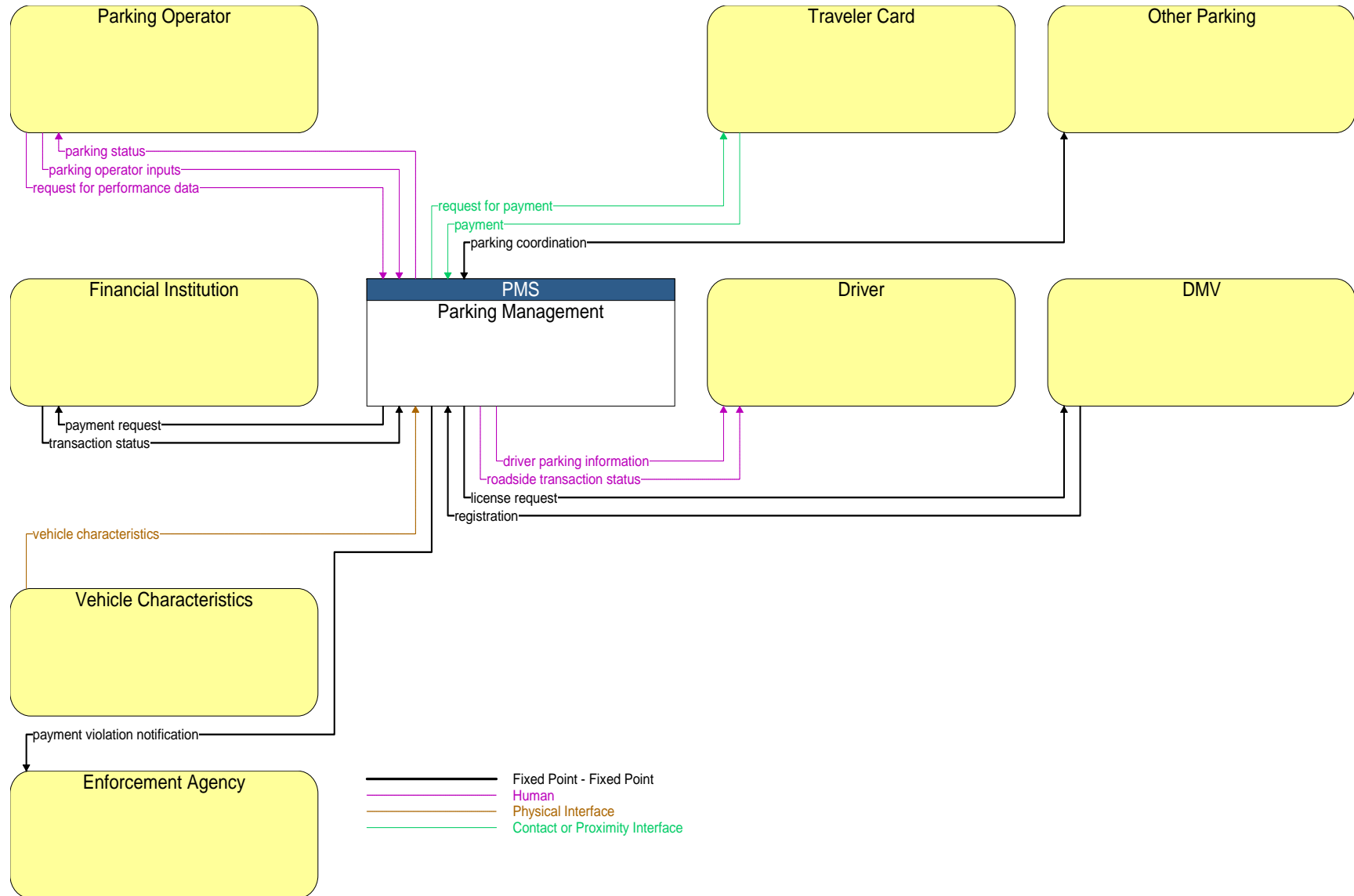
# Parking Management



**Figure 24: PMS Subsystem Interfaces**



# Parking Management



**Figure 25: PMS Terminator Interfaces**

## 2.15 Payment Administration

The Payment Administration Subsystem (PAS) provides general payment administration capabilities and supports the electronic transfer of authenticated funds from the customer to the transportation system operator or other service provider. Charges can be recorded for tolls, vehicle-mileage charging, congestion charging, or other goods and services. This subsystem supports traveler enrollment and collection of both pre-payment and post-payment transportation fees in coordination with the existing, and evolving financial infrastructure supporting electronic payment transactions. The system may establish and administer escrow accounts depending on the clearinghouse scheme and the type of payments involved. This subsystem posts a transaction to the customer account and generates a bill (for post-payment accounts), debits an escrow account, or interfaces to the financial infrastructure to debit a customer designated account. It supports communications with the Roadway Payment Subsystem to support fee collection operations. As an alternative, a wide-area wireless interface can be used to communicate directly with vehicle equipment. The subsystem also sets and administers the pricing structures and includes the capability to implement road pricing policies in coordination with the Traffic Management Subsystem. The electronic financial transactions in which this subsystem is an intermediary between the customer and the financial infrastructure shall be cryptographically protected and authenticated to preserve privacy and ensure authenticity and auditability.

### 2.15.1 Equipment Packages and Process Specifications for PAS

#### **Equipment Package: Center VMT Payment Administration**

This equipment package receives VMT data (time stamped roadways used by the vehicle since the last transmission) and computes the total cost to the vehicle owner for payment. Based on owner preference during vehicle registration, this cost is either billed to the owner or requested from an in-vehicle payment instrument. Communication with the vehicle can be direct over wide-area wireless communications or via fixed or mobile field equipment. Fixed or mobile field equipment might also indicate if a fault has been detected in the vehicle equipment. VMT data can be audited with both registration information and odometer information from the DMV associated with the vehicle registration. Payment for use of roadways not operated by the specific instance of the VMT Payment Administration that the vehicle is registered with, will be reconciled with the Center VMT Payment Administration EPs of those entities. Payments from vehicle owners and operators as well as payments to other Center VMT Payment Administration EPs are reconciled with a Financial institution. Actual VMT costs for roadways (by time, by roadway and by class of vehicle) are sent to ISPs to assist drivers in estimating specific trip costs. Payment violations can be reported to Enforcement Agencies when appropriate. Finally, vehicle owners can interact with the EP using personal devices or public terminals to setup and edit account preferences for owned vehicles, get account reports, and make payments.

#### **Process Specifications**

- 7.6.1.2 Calculate Vehicle VMT Charges**
- 7.6.1.4 Manage VMT Price Data**
- 7.6.1.5 Manage VMT Processing**
- 7.6.5 Exchange VMT Data with Other Payment Administration**
- 7.6.6.1 Provide VMT Services User Interface**
- 7.6.8 Provide VMT Enforcement Interface**

#### **Equipment Package: Toll Administration**

This equipment package provides administration and management of an electronic toll collection system. It provides the back office functions that support enrollment, pricing, payment reconciliation with financial institutions, and violation notification to enforcement agencies. It also supports dynamic pricing to support demand management. Secure communications with the financial infrastructure and distributed toll plazas support electronic payments and other ancillary requirements such as lost/stolen tag identification and management.

#### **Process Specifications**

- 5.4.2 Process Violations for Tolls**
- 7.1.1.3 Manage Bad Toll Payment Data**
- 7.1.1.6 Collect Probe Data From Toll Transactions**
- 7.1.1.7 Update Toll Price Data**

## Payment Administration

- 7.1.1.8 **Register for Advanced Toll Payment**
- 7.1.1.9 **Manage Toll Processing**
- 7.1.8 **Exchange Data with Other Payment Administration**

### **Equipment Package: Toll Data Collection**

This equipment package collects and stores toll information that is collected in the course of toll operations performed by the Toll Administration Subsystem. This data can be used directly by operations personnel or it can be made available to other data users and archives in the region.

#### **Process Specifications**

- 7.1.1.11 **Manage Toll Archive Data**

### **Equipment Package: Toll Operator Alert**

This equipment package provides wide-area alerts (safety/security broadcasts, child abductions, etc.) to toll operators. It provides the capability to monitor for active alerts and presents these alerts to administrative staff (the "Toll Administrator") and forwards these alerts to toll operators at the toll plazas/toll collection facilities. The Toll Administrator determines which alerts should be forwarded to toll operators and can inject alerts that are identified through other means.

#### **Process Specifications**

- 7.1.1.9 **Manage Toll Processing**

## 2.15.2 Interfaces for PAS

### **Archived Data Management => Payment Administration**

**Physical Architecture Flow Name:** archive requests

A request to a data source for information on available data (i.e. "catalog") or a request that defines the data to be archived. The request can be a general subscription intended to initiate a continuous or regular data stream or a specific request intended to initiate a one-time response from the recipient.

**Logical Architecture Data Flow(s):**

toll\_archive\_request

**Physical Architecture Flow Name:** archive status

Notification that data provided to an archive contains erroneous, missing, or suspicious data or verification that the data provided appears valid. If an error has been detected, the offending data and the nature of the potential problem are identified.

**Logical Architecture Data Flow(s):**

toll\_archive\_status

### **DMV => Payment Administration**

**Physical Architecture Flow Name:** registration

Registered owner of vehicle and associated vehicle information.

**Logical Architecture Data Flow(s):**

fdmv-toll\_violation\_state\_identity  
fdmv-vmt\_vehicle\_registration  
fdmv-vehicle\_state\_id  
fdmv-toll\_violation\_vehicle\_registration

### **Emergency Management => Payment Administration**

**Physical Architecture Flow Name:** alert notification

Notification of a major emergency such as a natural or man-made disaster, civil emergency, or

## Payment Administration

child abduction for distribution to the public. The flow identifies the alert originator, the nature of the emergency, the geographic area affected by the emergency, the effective time period, and information and instructions necessary for the public to respond to the alert. This flow may also identify specific information that should not be released to the public.

### Logical Architecture Data Flow(s):

wide\_area\_alert\_notification\_for\_tolls

**Physical Architecture Flow Name:** toll service change request

Request to change pricing, modify restrictions, or modify operations of a toll road facility

### Logical Architecture Data Flow(s):

evacuation\_toll\_change\_request

**Financial Institution** => **Payment Administration**

**Physical Architecture Flow Name:** transaction status

Response to transaction request. Normally dealing with a request for payment.

### Logical Architecture Data Flow(s):

ffi-confirm\_toll\_payment  
ffi-confirm\_vmt\_payment  
ffi-bad\_toll\_payment\_updates

**Fleet and Freight Management** => **Payment Administration**

**Physical Architecture Flow Name:** toll data request

Request made to obtain toll schedule information or pay a toll in advance. The request can be a subscription that initiates as-needed information updates as well as a one-time request for information.

### Logical Architecture Data Flow(s):

cvo\_advanced\_toll\_request  
cvo\_toll\_price\_request

**Information Service Provider** => **Payment Administration**

**Physical Architecture Flow Name:** toll data request

Request made to obtain toll schedule information or pay a toll in advance. The request can be a subscription that initiates as-needed information updates as well as a one-time request for information.

### Logical Architecture Data Flow(s):

toll\_price\_data\_request  
advanced\_traveler\_tolls\_request  
advanced\_other\_tolls\_request

**Other Payment Administration** => **Payment Administration**

**Physical Architecture Flow Name:** toll coordination

This flow supports reciprocity between toll agencies/service centers by exchanging information that supports reconciliation of toll charges by customers that are enrolled with other toll service centers. In addition to toll charge reconciliation, exchanged information may include toll schedule information, customer information and other toll service information that is coordinated between toll agencies or centers.

### Logical Architecture Data Flow(s):

fopa-toll\_pricing\_data  
fopa-toll\_charges\_reconciliation\_data

**Physical Architecture Flow Name:** VMT payment coordination

## Payment Administration

Coordinate apportionment of VMT data or charges between jurisdictions (e.g. federal government, states, various jurisdictions that might be public or private within a state). Apportionment reconciliation includes either sharing information about VMT data in other jurisdictions (so that the Other Payment Administration subsystems can make appropriate charges), or sharing revenue collected. When sharing revenue, this flow also includes VMT

**Logical Architecture Data Flow(s):** charging rate policies

fopa-vmt\_coordination\_data

### Payment Administration => Archived Data Management

**Physical Architecture Flow Name:** toll archive data

Data indicating toll facility usage and pricing schedules. Content may include a catalog of available information, the actual information to be archived, and associated meta data that describes the archived information.

**Logical Architecture Data Flow(s):**

toll\_archive\_data

### Payment Administration => DMV

**Physical Architecture Flow Name:** license request

Request supporting registration data based on license plate read during violation.

**Logical Architecture Data Flow(s):**

tdmv-vmt\_vehicle\_license  
tdmv-toll\_violation\_vehicle\_license  
tdmv-toll\_violation\_identity\_code  
tdmv-vmt\_identity\_code

### Payment Administration => Emergency Management

**Physical Architecture Flow Name:** alert status

Information indicating the current status of the emergency alert including identification of the traveler and driver information systems that are being used to provide the alert.

**Logical Architecture Data Flow(s):**

alert\_notification\_status\_from\_tolls

**Physical Architecture Flow Name:** toll service change response

Response to toll service change requests indicating level of compliance with request.

**Logical Architecture Data Flow(s):**

evacuation\_toll\_change\_response

### Payment Administration => Enforcement Agency

**Physical Architecture Flow Name:** payment violation notification

Notification to enforcement agency of a toll, parking, or transit fare payment violation.

**Logical Architecture Data Flow(s):**

tea-toll\_violation\_data  
tea-vmt\_equipment\_failure

**Physical Architecture Flow Name:** payment request

Request for payment from financial institution.

**Logical Architecture Data Flow(s):**

## Payment Administration

tfi-request\_vmt\_payment  
tfi-toll\_payment\_violator\_data  
tfi-request\_toll\_payment

**Payment Administration** => **Fleet and Freight Management**

**Physical Architecture Flow Name:** toll data

Current toll schedules for different types of vehicles as well as advanced toll payment information.

**Logical Architecture Data Flow(s):**

cvo\_toll\_price  
cvo\_advanced\_toll\_confirmation

**Payment Administration** => **Information Service Provider**

**Physical Architecture Flow Name:** toll data

Current toll schedules for different types of vehicles as well as advanced toll payment information.

**Logical Architecture Data Flow(s):**

advanced\_other\_tolls\_confirm  
advanced\_traveler\_tolls\_confirm  
toll\_price\_data

**Physical Architecture Flow Name:** toll probe data

Aggregate probe data derived from electronic toll collection operations. Data collected could include vehicle speeds and travel times for a given link or collection of links.

**Logical Architecture Data Flow(s):**

toll\_probe\_data\_for\_isp

**Physical Architecture Flow Name:** VMT data for ISP

Road use charge rate policies for distribution to travelers.

**Logical Architecture Data Flow(s):**

vmt\_price\_data

**Payment Administration** => **Other Payment Administration**

**Physical Architecture Flow Name:** toll coordination

This flow supports reciprocity between toll agencies/service centers by exchanging information that supports reconciliation of toll charges by customers that are enrolled with other toll service centers. In addition to toll charge reconciliation, exchanged information may include toll schedule information, customer information and other toll service information that is coordinated between toll agencies or centers.

**Logical Architecture Data Flow(s):**

topa-toll\_charges\_reconciliation\_data  
topa-toll\_pricing\_data

**Physical Architecture Flow Name:** VMT payment coordination

Coordinate apportionment of VMT data or charges between jurisdictions (e.g. federal government, states, various jurisdictions that might be public or private within a state). Apportionment reconciliation includes either sharing information about VMT data in other jurisdictions (so that the Other Payment Administration subsystems can make appropriate charges), or sharing revenue collected. When sharing revenue, this flow also includes VMT charging rate policies

**Logical Architecture Data Flow(s):**

## Payment Administration

topa-vmt\_coordination\_data

### **Payment Administration** => **Payment Administrator**

**Physical Architecture Flow Name:** payment information presentation

Presentation of information to personnel including revenues, reports, operational status information, and alert information.

**Logical Architecture Data Flow(s):**

tpa-request\_advanced\_toll  
tpa-archive\_status  
tpa-toll\_price\_changes\_request  
tpa-transaction\_reports  
tpa-vmt\_data  
tpa-alert\_notification

### **Payment Administration** => **Personal Information Access**

**Physical Architecture Flow Name:** traveler payment request

Request for payment for road use charges.

**Logical Architecture Data Flow(s):**

traveler\_personal\_vmt\_payment\_request

**Physical Architecture Flow Name:** user VMT account reports

Reports on VMT charges

**Logical Architecture Data Flow(s):**

traveler\_personal\_vmt\_account\_reports

### **Payment Administration** => **Remote Traveler Support**

**Physical Architecture Flow Name:** traveler payment request

Request for payment for road use charges.

**Logical Architecture Data Flow(s):**

traveler\_vmt\_payment\_request

**Physical Architecture Flow Name:** user VMT account reports

Reports on VMT charges

**Logical Architecture Data Flow(s):**

traveler\_vmt\_account\_reports

### **Payment Administration** => **Roadway Payment**

**Physical Architecture Flow Name:** toll advisories

Alerts and advisories provided to toll plazas to keep toll operators informed of identified threats that may impact toll operations or public safety on a toll facility.

**Logical Architecture Data Flow(s):**

alert\_notification\_for\_toll\_operator

**Physical Architecture Flow Name:** toll instructions

Information provided to configure and support toll plaza operations including toll pricing information.

**Logical Architecture Data Flow(s):**

toll\_bad\_payment\_check\_response  
toll\_price\_data\_for\_advanced\_toll  
toll\_price\_data\_for\_vehicle\_toll

## Payment Administration

advanced\_toll\_needed

**Physical Architecture Flow Name:** vehicle payment request

Request for information supporting toll and parking payments.

**Logical Architecture Data Flow(s):**

vmt\_vehicle\_payment\_data\_clear\_to\_field  
vmt\_payment\_request\_to\_field

**Payment Administration** => **Traffic Management**

**Physical Architecture Flow Name:** toll probe data

Aggregate probe data derived from electronic toll collection operations. Data collected could include vehicle speeds and travel times for a given link or collection of links.

**Logical Architecture Data Flow(s):**

toll\_probe\_data\_for\_traffic

**Physical Architecture Flow Name:** toll service change response

Response to toll service change requests indicating level of compliance with request.

**Logical Architecture Data Flow(s):**

toll\_price\_direct\_details  
toll\_price\_changes\_response

**Payment Administration** => **Vehicle**

**Physical Architecture Flow Name:** vehicle payment request

Request for information supporting toll and parking payments.

**Logical Architecture Data Flow(s):**

vmt\_payment\_request\_from\_admin  
vmt\_vehicle\_payment\_data\_clear\_from\_admin

**Physical Architecture Flow Name:** VMT cost data

VMT charges per link.

**Logical Architecture Data Flow(s):**

vmt\_cost\_data

**Payment Administrator** => **Payment Administration**

**Physical Architecture Flow Name:** payment administration requests

Personnel inputs that control system operations, including requests to change toll fees, confirmation that alerts should be provided to toll operators, management of VMT charge policies and management of VMT account processing, etc.

**Logical Architecture Data Flow(s):**

fpa-vmt\_parameters  
fpa-vmt\_price\_data  
fpa-toll\_price\_data  
fpa-alert\_notification\_input  
fpa-toll\_price\_changes\_response  
fpa-confirm\_advanced\_toll  
fpa-archive\_commands

**Personal Information Access** => **Payment Administration**

**Physical Architecture Flow Name:** traveler payment information

Payment information for road use charges.



## Payment Administration

### Logical Architecture Data Flow(s):

traveler\_personal\_vmt\_payment\_info

**Physical Architecture Flow Name:** user VMT account setup

Billing information, vehicle information (or registration information), and requests for reports.

### Logical Architecture Data Flow(s):

traveler\_personal\_vmt\_account\_setup\_info

**Remote Traveler Support** => **Payment Administration**

**Physical Architecture Flow Name:** traveler payment information

Payment information for road use charges.

### Logical Architecture Data Flow(s):

traveler\_vmt\_payment\_info

**Physical Architecture Flow Name:** user VMT account setup

Billing information, vehicle information (or registration information), and requests for reports.

### Logical Architecture Data Flow(s):

traveler\_vmt\_account\_setup\_info

**Roadway Payment** => **Payment Administration**

**Physical Architecture Flow Name:** toll transactions

Detailed list of transactions from a toll station.

### Logical Architecture Data Flow(s):

toll\_payment\_violator\_data  
confirm\_advanced\_tolls\_payment  
toll\_bad\_payment\_check\_request  
toll\_violation\_information  
current\_toll\_transactions

**Physical Architecture Flow Name:** vehicle payment information

Information provided for payment of tolls and parking fees including identification that can be used to identify the payment account or source and related vehicle and service information that are used to determine the type and price of service requested.

### Logical Architecture Data Flow(s):

vmt\_payment\_collected\_from\_field  
vmt\_payment\_confirmation\_from\_field

**Physical Architecture Flow Name:** VMT data

A vehicle's road use history that records where the vehicle has traveled over time. Optionally includes vehicle speeds as well as distance traveled for some applications. Information is accurate enough to distinguish between adjacent roads, adjacent lanes, and identify direction of travel on the roads.

### Logical Architecture Data Flow(s):

vehicle\_identity\_for\_vmt\_from\_roadway  
vehicle\_location\_for\_vmt\_from\_roadway

**Physical Architecture Flow Name:** VMT equipment fault

Provides fault status of the VMT data collection equipment in a vehicle and vehicle image and other characteristics to allow independent identification of the vehicle and its owner.

### Logical Architecture Data Flow(s):

advanced\_toll\_transactions

## Payment Administration

vmt\_vehicle\_image\_for\_enforcement  
vmt\_equipment\_fault

**Physical Architecture Flow Name:** toll service change request  
Request to change pricing, modify restrictions, or modify operations of a toll road facility

**Logical Architecture Data Flow(s):**  
toll\_price\_changes\_request  
toll\_price\_direct\_request

**Vehicle** => **Payment Administration**

**Physical Architecture Flow Name:** vehicle payment information  
Information provided for payment of tolls and parking fees including identification that can be used to identify the payment account or source and related vehicle and service information that are used to determine the type and price of service requested.

**Logical Architecture Data Flow(s):**  
vmt\_payment\_confirmation\_for\_admin  
vmt\_payment\_collected\_for\_admin

**Physical Architecture Flow Name:** VMT data

A vehicle's road use history that records where the vehicle has traveled over time. Optionally includes vehicle speeds as well as distance traveled for some applications. Information is accurate enough to distinguish between adjacent roads, adjacent lanes, and identify direction of travel on the roads.

**Logical Architecture Data Flow(s):**  
vehicle\_speed\_and\_distance\_for\_vmt  
vehicle\_identity\_for\_vmt  
vehicle\_location\_for\_vmt

### 2.15.3 Architecture Flow Diagrams for PAS

# Payment Administration

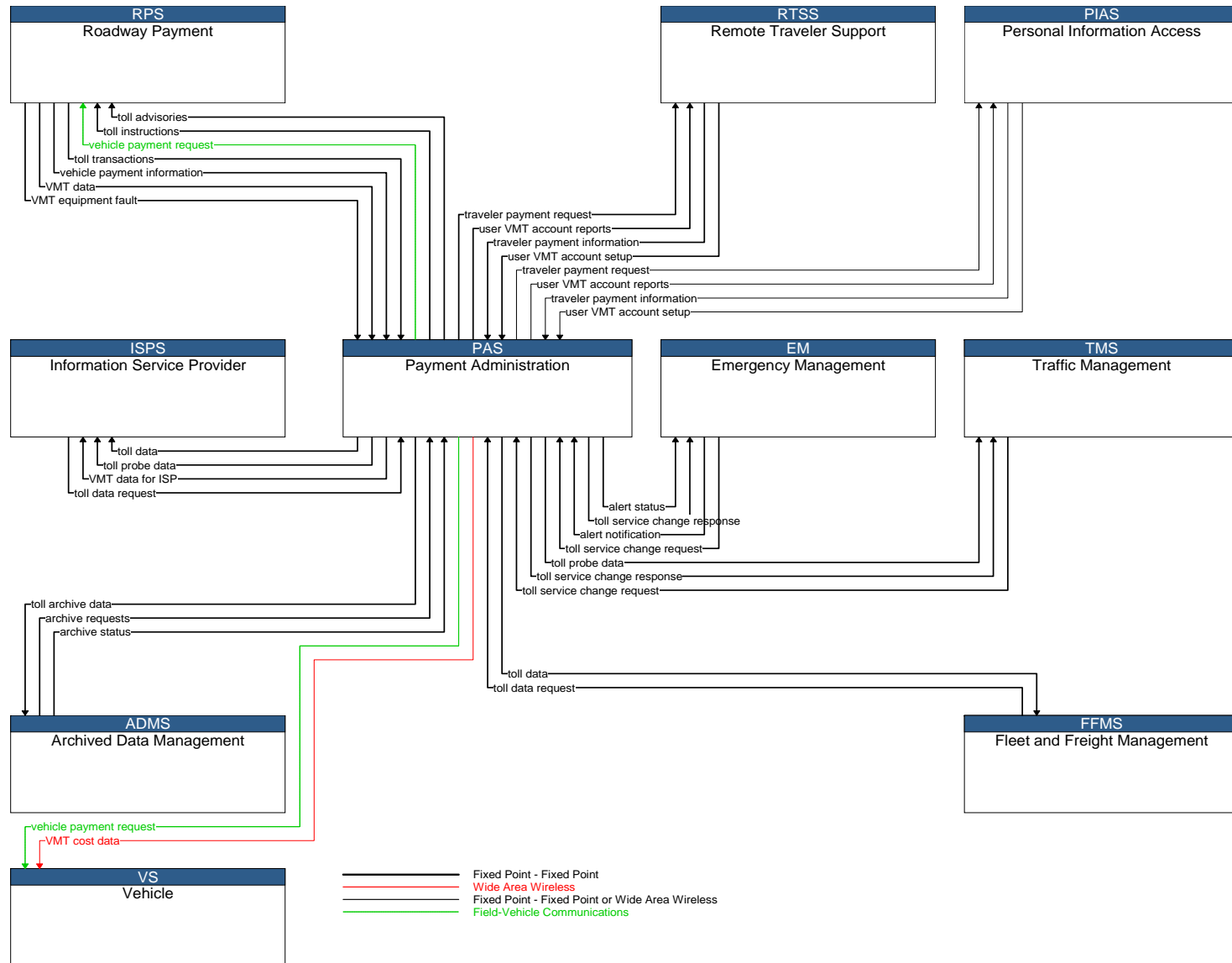


Figure 26: PAS Subsystem Interfaces

# Payment Administration

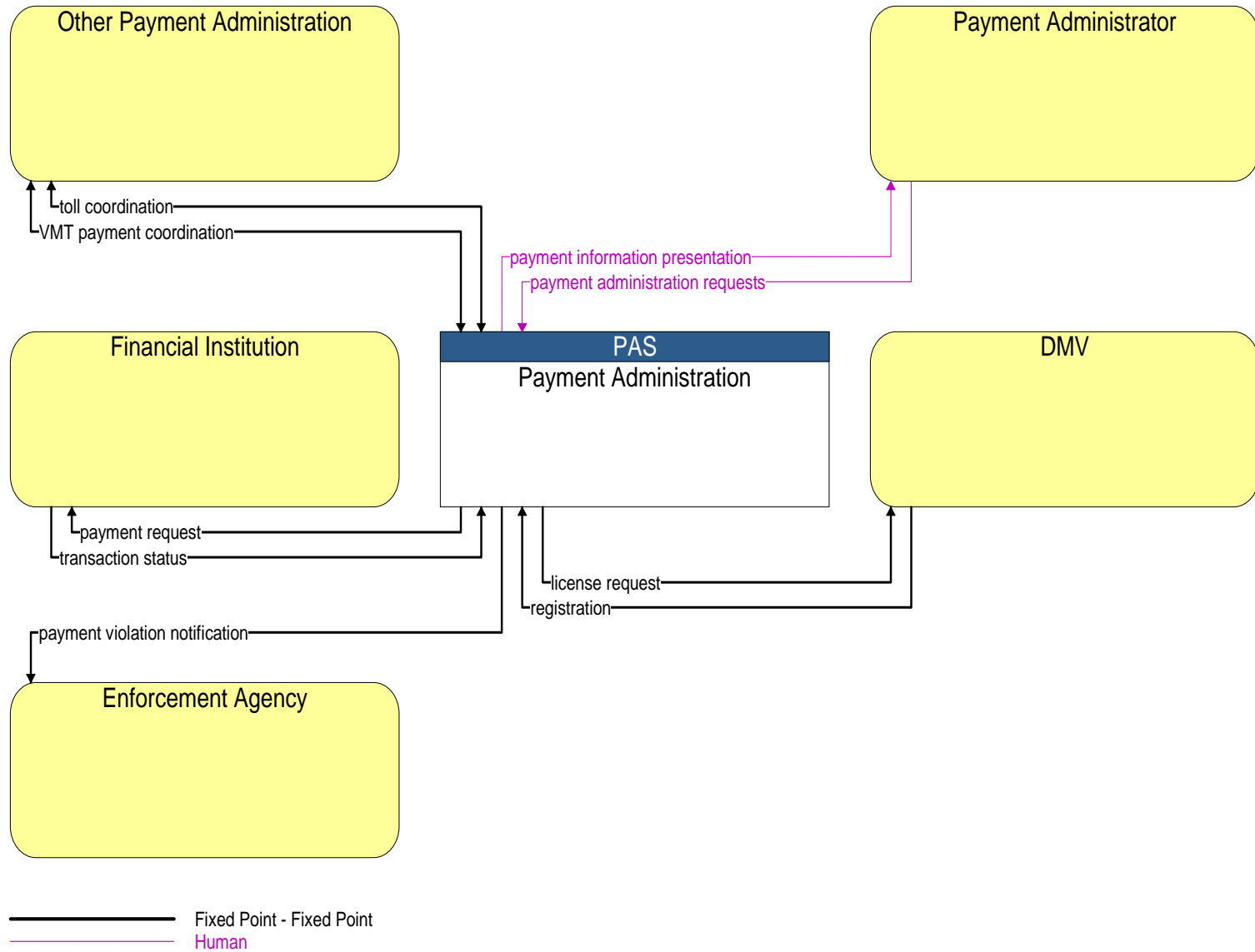


Figure 27: PAS Terminator Interfaces

## 2.16 Personal Information Access

The Personal Information Access Subsystem (PIAS) provides the capability for travelers to receive formatted traffic advisories from their homes, place of work, major trip generation sites, personal portable devices, over multiple types of electronic media. These capabilities also provide basic routing information and allow users to select those transportation modes that allow them to avoid congestion, or more advanced capabilities to allow users to specify those transportation parameters that are unique to their individual needs and receive travel information. This subsystem provides travelers with the capability to receive route planning from the infrastructure at fixed locations such as in their homes, their place of work, and at mobile locations using personal portable devices and vehicle-based devices. In addition to end user devices, this subsystem may also represent a device that is used by a merchant or other service provider to receive traveler information and relay important information to their customers. This subsystem also provides the capability to initiate a distress signal and cancel a prior-issued manual request for help.

### 2.16.1 *Equipment Packages and Process Specifications for PIAS*

#### **Equipment Package: Personal Autonomous Route Guidance**

This equipment package provides multi-modal route planning and transition by transition route guidance. It provides autonomous route guidance in the absence of real-time information or factors information provided by the infrastructure into its route selection and guidance algorithms if available. The equipment package also includes those truly autonomous systems that are not configured to receive or process any external data.

The route guidance capabilities of this equipment package are hosted on personal devices including personal computers and personal portable devices such as PDAs and pagers.

#### **Process Specifications**

**6.8.1.1.3 Provide Personal Portable Device Autonomous Guidance**

**6.8.1.2 Provide Personal Portable Device Guidance Interface**

**6.8.1.4 Update Traveler Navigable Map Database**

**6.8.3.4 Update Traveler Personal Display Map Data**

#### **Equipment Package: Personal Basic Information Reception**

This equipment package receives formatted traffic advisories, road conditions, transit information, broadcast alerts, and other general traveler information broadcasts and presents the information to the traveler. The traveler information broadcasts are received by personal devices including personal computers and personal portable devices such as personal digital assistants (PDAs) and pagers.

#### **Process Specifications**

**6.8.3.2 Provide Traveler with Personal Travel Information**

**6.8.3.3 Provide Traveler Personal Interface**

#### **Equipment Package: Personal Interactive Information Reception**

This equipment package provides traffic information, road conditions, transit information, yellow pages (traveler services) information, special event information, and other traveler information that is specifically tailored based on the traveler's request and/or previously submitted traveler profile information. The interactive traveler information capability is provided by personal devices including personal computers and personal portable devices such as personal digital assistants (PDAs).

#### **Process Specifications**

**6.8.3.1 Get Traveler Personal Request**

**6.8.3.2 Provide Traveler with Personal Travel Information**

**6.8.3.3 Provide Traveler Personal Interface**

**7.5.3 Provide Personal Traveler Card Interface**

**7.6.6.3 Provide VMT Services Personal Interface**

#### **Equipment Package: Personal Location Determination**

This equipment package receives current location information and provides this information to other equipment packages that use the location information to provide guidance and emergency notification services. The equipment package interfaces with and encapsulates positioning technology such as a GPS

## Personal Information Access

receiver that is embedded in the user's personal computer or other portable device.

### Process Specifications

#### 6.8.1.3 Process Personal Portable Device Location Data

#### Equipment Package: Personal Mayday I/F

This equipment package provides the capability for travelers to report an emergency or activate a panic button to summon assistance. The personal mayday capability is provided by a portable device such as a personal digital assistant (PDA).

### Process Specifications

#### 6.8.1.5 Provide Traveler Emergency Message Interface

#### 6.8.2.1 Build Traveler Personal Security Message

#### 6.8.2.2 Provide Traveler Emergency Communications Function

#### Equipment Package: Personal Trip Planning and Route Guidance

This equipment package provides a personalized trip plan to the traveler. The trip plan is calculated by the Information Service Provider based on preferences and constraints supplied by the traveler and provided to the traveler for confirmation. Reservations and advanced payment may also be processed by this equipment package to confirm the trip plan. Coordination with the Information Service Provider may continue during the trip so that the route plan can be modified to account for new information. Many equipment configurations are possible including systems that provide a basic trip plan to the traveler as well as more sophisticated systems that can provide transition by transition guidance to the traveler along a multi-modal route. Devices represented by this equipment package include desktop computers at home, work, or at major trip generation sites, plus personal portable devices such as PDAs and pagers.

### Process Specifications

#### 6.8.1.1.1 Determine Personal Portable Device Guidance Method

#### 6.8.1.1.2 Provide Personal Portable Device Dynamic Guidance

#### 6.8.1.2 Provide Personal Portable Device Guidance Interface

#### 6.8.1.4 Update Traveler Navigable Map Database

#### 6.8.3.1 Get Traveler Personal Request

#### 6.8.3.2 Provide Traveler with Personal Travel Information

#### 6.8.3.3 Provide Traveler Personal Interface

### 2.16.2 Interfaces for PIAS

#### Emergency Management => Personal Information Access

**Physical Architecture Flow Name:** emergency acknowledge

Acknowledge request for emergency assistance and provide additional details regarding actions and verification requirements.

**Logical Architecture Data Flow(s):**

emergency\_request\_personal\_traveler\_acknowledge

#### Information Service Provider => Personal Information Access

**Physical Architecture Flow Name:** broadcast traveler information

General traveler information that contains traffic and road conditions, link travel times, incidents, advisories, restrictions, transit service information, weather information, parking information, and other related traveler information.

**Logical Architecture Data Flow(s):**

traveler\_personal\_broadcast\_traffic\_data  
traveler\_personal\_broadcast\_weather\_data  
traveler\_personal\_broadcast\_border\_data

## Personal Information Access

- traveler\_personal\_broadcast\_transit\_data
- traveler\_personal\_broadcast\_price\_data
- traveler\_personal\_broadcast\_parking\_data
- traveler\_personal\_broadcast\_multimodal\_data
- traveler\_personal\_broadcast\_event\_information
- traveler\_personal\_broadcast\_incident\_information

**Physical Architecture Flow Name:** emergency traveler information

Public notification of an emergency such as a natural or man-made disaster, civil emergency, or child abduction. This flow also includes evacuation information including evacuation instructions, evacuation zones, recommended evacuation times, tailored evacuation routes and destinations, traffic and road conditions along the evacuation routes, traveler services and shelter information, and reentry times and instructions.

**Logical Architecture Data Flow(s):**

- traveler\_personal\_evacuation\_traveler\_information
- traveler\_personal\_emergency\_traveler\_information
- traveler\_personal\_transportation\_system\_status
- traveler\_personal\_wide\_area\_alert\_information

**Physical Architecture Flow Name:** interactive traveler information

Traveler information provided in response to a traveler request. The provided information includes traffic and road conditions, advisories, incidents, payment information, transit services, parking information, weather information, and other travel-related data updates and

**Logical Architecture Data Flow(s):**

- traveler\_personal\_interactive\_event\_information
- traveler\_personal\_interactive\_parking\_data
- traveler\_personal\_interactive\_price\_data
- traveler\_personal\_interactive\_traffic\_data
- traveler\_personal\_interactive\_transit\_data
- traveler\_personal\_interactive\_weather\_data
- traveler\_personal\_interactive\_border\_data
- traveler\_map\_update\_payment\_response
- traveler\_personal\_display\_update\_payment\_response
- traveler\_personal\_interactive\_multimodal\_data
- traveler\_personal\_interactive\_incident\_information

**Physical Architecture Flow Name:** travel services information

Travel service information and reservations for tourist attractions, lodging, dining, service stations, emergency services, and other services and businesses of interest to the traveler.

**Logical Architecture Data Flow(s):**

- traveler\_personal\_transaction\_confirmation
- traveler\_personal\_travel\_services\_provider\_data

**Physical Architecture Flow Name:** traveler alerts

Traveler information alerts reporting congestion, incidents, adverse road or weather conditions, parking availability, transit service delays or interruptions, and other information that may impact the traveler. Relevant alerts are provided based on traveler-supplied profile information including trip characteristics and preferences.

**Logical Architecture Data Flow(s):**

- traveler\_personal\_event\_alert
- traveler\_personal\_incident\_alert
- traveler\_personal\_multimodal\_alert
- traveler\_personal\_parking\_alert
- traveler\_personal\_traffic\_alert
- traveler\_personal\_transit\_alert
- traveler\_personal\_weather\_alert
- traveler\_personal\_border\_alert

**Physical Architecture Flow Name:** trip plan

## Personal Information Access

A travel itinerary identifying a route and associated traveler information and instructions identifying recommended modes and transfer information, ride sharing options, and transit and parking reservation information.

### Logical Architecture Data Flow(s):

traveler\_personal\_payment\_confirmation  
traveler\_guidance\_route  
traveler\_personal\_trip\_information

**Location Data Source** => **Personal Information Access**

**Physical Architecture Flow Name:** position fix

Information which provides a traveler's or vehicle's geographical position.

### Logical Architecture Data Flow(s):

From\_Location\_Data\_Source

**Map Update Provider** => **Personal Information Access**

**Physical Architecture Flow Name:** map updates

Map update which could include a new underlying static or real-time map or map layer(s) update.

### Logical Architecture Data Flow(s):

fmup-traveler\_personal\_display\_update  
fmup-traveler\_map\_update\_cost  
fmup-traveler\_personal\_display\_update\_cost  
fmup-traveler\_map\_update

**Payment Administration** => **Personal Information Access**

**Physical Architecture Flow Name:** traveler payment request

Request for payment for road use charges.

### Logical Architecture Data Flow(s):

traveler\_personal\_vmt\_payment\_request

**Physical Architecture Flow Name:** user VMT account reports

Reports on VMT charges

### Logical Architecture Data Flow(s):

traveler\_personal\_vmt\_account\_reports

**Personal Information Access** => **Emergency Management**

**Physical Architecture Flow Name:** emergency notification

An emergency request for assistance automatically initiated by a vehicle or originated by a traveler using an in-vehicle or personal device.

### Logical Architecture Data Flow(s):

emergency\_request\_personal\_traveler\_details

**Personal Information Access** => **Information Service Provider**

**Physical Architecture Flow Name:** emergency traveler information request

Request for alerts, evacuation information, and other emergency information provided to the traveling public.

### Logical Architecture Data Flow(s):

traveler\_personal\_emergency\_information\_request



## Personal Information Access

**Physical Architecture Flow Name:** travel services request

Request for travel service information including tourist attractions, lodging, restaurants, service stations, and emergency services. The request identifies the type of service, the area of interest, optional reservation request information, parameters that are used to prioritize or filter the returned information, and sorting preferences.

**Logical Architecture Data Flow(s):**

traveler\_personal\_transaction\_request  
traveler\_personal\_travel\_services\_data\_request  
traveler\_personal\_payment\_information\_for\_services

**Physical Architecture Flow Name:** traveler profile

Information about a traveler including equipment capabilities, personal preferences, and traveler alert subscriptions.

**Logical Architecture Data Flow(s):**

traveler\_personal\_alert\_subscriptions  
traveler\_personal\_profile

**Physical Architecture Flow Name:** traveler request

A request for traveler information including traffic, transit, toll, parking, road weather conditions, event, and passenger rail information. The request identifies the type of information, the area of interest, parameters that are used to prioritize or filter the returned information, and sorting preferences.

**Logical Architecture Data Flow(s):**

traveler\_map\_update\_payment\_request  
traveler\_personal\_display\_update\_payment\_request  
traveler\_personal\_information\_request

**Physical Architecture Flow Name:** trip confirmation

Acknowledgement by the driver/traveler of acceptance of a trip plan with associated personal and payment information required to confirm reservations.

**Logical Architecture Data Flow(s):**

traveler\_personal\_trip\_confirmation  
traveler\_route\_accepted  
traveler\_personal\_payment\_information

**Physical Architecture Flow Name:** trip request

Request for trip planning services that identifies the trip origin, destination(s), timing, preferences, and constraints. The request may also include a request for transit and parking reservations and ridesharing options associated with the trip.

**Logical Architecture Data Flow(s):**

traveler\_personal\_trip\_request  
traveler\_route\_request

**Personal Information Access** => **Map Update Provider**

**Physical Architecture Flow Name:** map update request

Request for a map update which could include a new underlying map or map layer updates.

**Logical Architecture Data Flow(s):**

tmup-traveler\_map\_update\_request  
tmup-request\_traveler\_personal\_display\_update  
tmup-request\_traveler\_personal\_display\_update\_cost  
tmup-traveler\_map\_update\_cost\_request

**Personal Information Access** => **Payment Administration**

**Physical Architecture Flow Name:** traveler payment information

## Personal Information Access

Payment information for road use charges.

**Logical Architecture Data Flow(s):**  
traveler\_personal\_vmt\_payment\_info

**Physical Architecture Flow Name:** user VMT account setup

Billing information, vehicle information (or registration information), and requests for reports.

**Logical Architecture Data Flow(s):**  
traveler\_personal\_vmt\_account\_setup\_info

**Personal Information Access** => **Transit Management**

**Physical Architecture Flow Name:** transit information user request

Request for special transit routing, real-time schedule information, and availability information.

**Logical Architecture Data Flow(s):**  
transit\_services\_personal\_request  
transit\_trip\_request\_from\_user

**Physical Architecture Flow Name:** trip confirmation

Acknowledgement by the driver/traveler of acceptance of a trip plan with associated personal and payment information required to confirm reservations.

**Logical Architecture Data Flow(s):**  
transit\_trip\_confirmation\_from\_user

**Personal Information Access** => **Traveler**

**Physical Architecture Flow Name:** traveler interface updates

Visual or audio information (e.g., routes, messages, guidance, emergency information) that is provided to the traveler.

**Logical Architecture Data Flow(s):**  
tt-personal\_extra\_trip\_data\_request  
tt-personal\_traveler\_information  
tt-guidance  
tt-guidance\_input\_request  
tt-guidance\_route\_details  
tt-personal\_trip\_planning\_responses  
tt-emergency\_message  
tt-guidance\_map\_update\_response

**Personal Information Access** => **Traveler Card**

**Physical Architecture Flow Name:** request for payment

Request to deduct cost of service from user's payment account.

**Logical Architecture Data Flow(s):**  
ttc-debited\_payment\_at\_personal\_device

**Physical Architecture Flow Name:** traveler card update

Information updated concerning traveler's personal data including items such as address, trip records, and profile data.

**Logical Architecture Data Flow(s):**  
ttc-traveler\_personal\_information\_update

**Transit Management** => **Personal Information Access**

**Physical Architecture Flow Name:** personal transit information

## Personal Information Access

General and personalized transit information for a particular fixed route, flexible route, or paratransit system.

**Logical Architecture Data Flow(s):**

transit\_services\_for\_personal\_devices  
transit\_vehicle\_arrival\_time  
personal\_parking\_facility\_information

**Physical Architecture Flow Name:** trip plan

A travel itinerary identifying a route and associated traveler information and instructions identifying recommended modes and transfer information, ride sharing options, and transit and parking reservation information.

**Logical Architecture Data Flow(s):**

transit\_trip\_plan\_for\_user

**Traveler** => **Personal Information Access**

**Physical Architecture Flow Name:** traveler inputs

User input from a traveler to summon assistance, request travel information, make a reservation, or request any other traveler service.

**Logical Architecture Data Flow(s):**

ft-guidance\_map\_update\_request  
ft-personal\_trip\_planning\_requests  
ft-personal\_map\_display\_update\_request  
ft-personal\_extra\_trip\_data  
ft-personal\_emergency\_request  
ft-guidance\_request  
ft-guidance\_data  
ft-guidance\_route\_accepted

**Traveler Card** => **Personal Information Access**

**Physical Architecture Flow Name:** payment

Payment of some kind (e.g., toll, parking, fare) by traveler which, in most cases, can be related to a credit account.

**Logical Architecture Data Flow(s):**

ftc-traveler\_personal\_input\_credit\_identity

**Physical Architecture Flow Name:** traveler card information

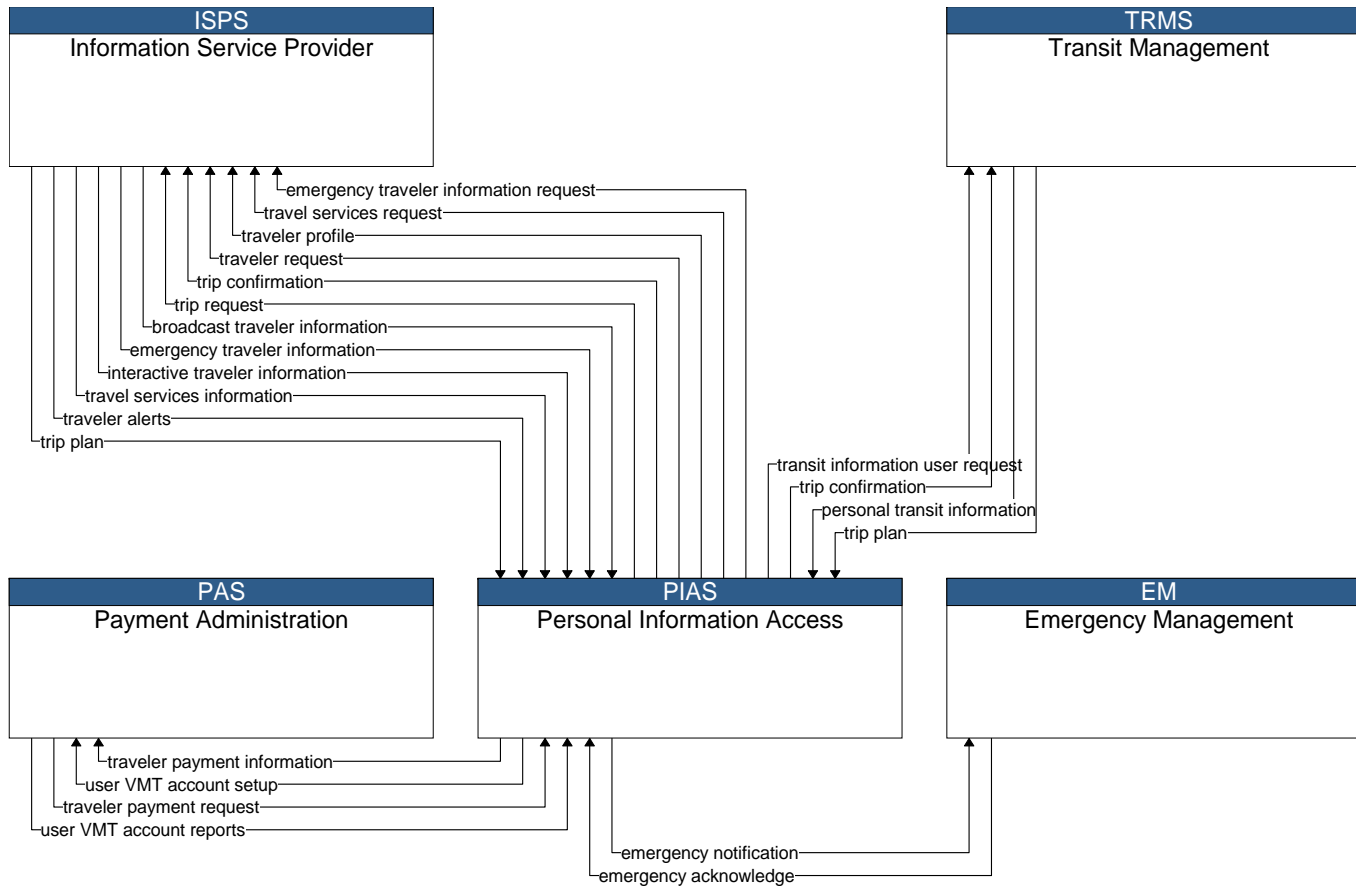
The traveler personal information such as name, address, license number, and trip records and profile data.

**Logical Architecture Data Flow(s):**

ftc-traveler\_personal\_information

### 2.16.3 Architecture Flow Diagrams for PIAS

Personal Information Access



———— Fixed Point - Fixed Point or Wide Area Wireless

**Figure 28: PIAS Subsystem Interfaces**

Personal Information Access

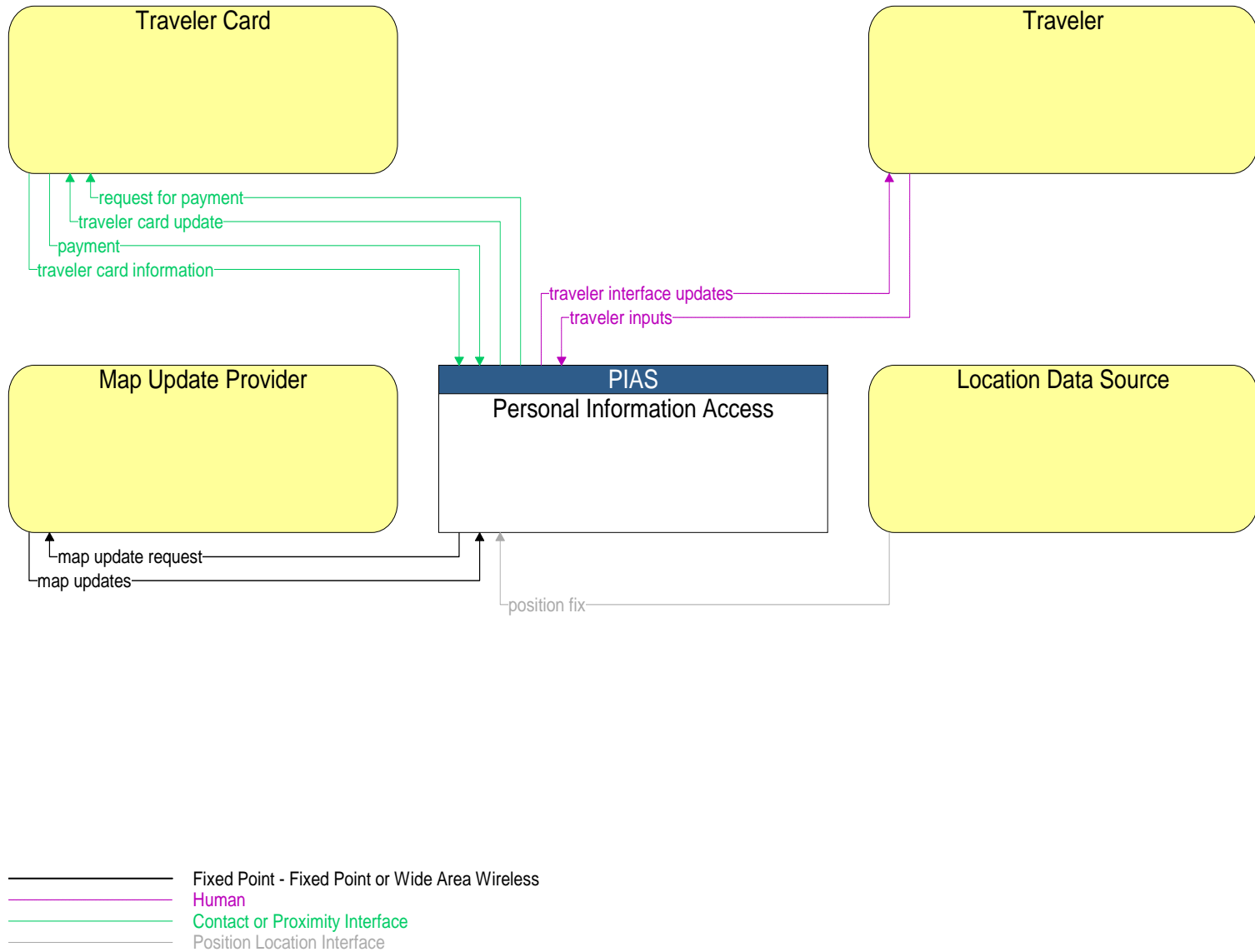


Figure 29: PIAS Terminator Interfaces

## 2.17 Remote Traveler Support

The Remote Traveler Support Subsystem (RTSS) provides access to traveler information at transit stations, transit stops, other fixed sites along travel routes (e.g., rest stops, merchant locations), and major trip generation locations such as special event centers, hotels, office complexes, amusement parks, and theaters. Traveler information access points include kiosks and informational displays supporting varied levels of interaction and information access. At transit stops, simple displays providing schedule information and imminent arrival signals can be provided. This basic information may be extended to include multi-modal information including traffic conditions and transit schedules along with yellow pages information to support mode and route selection at major trip generation sites. Personalized route planning and route guidance information can also be provided based on criteria supplied by the traveler. The subsystem also supports electronic payment of transit fares.

In addition to the traveler information provisions, this subsystem also supports security and safety monitoring of public areas. This monitoring includes traveler activated silent alarms, as well as surveillance and sensor equipment. The surveillance equipment includes video (e.g. CCTV cameras) and/or audio systems. The sensor equipment includes threat sensors (e.g. chemical agent, toxic industrial chemical, biological, explosives, and radiological sensors) and object detection sensors (e.g. metal detectors).

### 2.17.1 Equipment Packages and Process Specifications for RTSS

#### **Equipment Package: Remote Basic Information Reception**

This equipment package receives formatted traffic advisories, road conditions, transit information, broadcast alerts, and other general traveler information broadcasts and presents the information to the traveler with a public traveler interface. This equipment package includes the receiver and public display device such as a kiosk, large-scale display monitor or other public display.

##### **Process Specifications**

**6.3.2 Inform Traveler**

**6.3.3 Provide Traveler Kiosk Interface**

#### **Equipment Package: Remote Interactive Information Reception**

This equipment package provides traffic information, road conditions, transit information, yellow pages (traveler services) information, special event information, and other traveler information that is specifically tailored based on the traveler's request and/or previously submitted traveler profile information. The interactive traveler information capability is provided by a public traveler interface, such as a kiosk.

##### **Process Specifications**

**6.3.1 Get Traveler Request**

**6.3.2 Inform Traveler**

**6.3.3 Provide Traveler Kiosk Interface**

**6.3.4 Update Traveler Display Map Data at Kiosk**

**7.3.4 Provide Remote Terminal Traveler Card Interface**

**7.5.2 Provide Traveler Roadside Traveler Card Interface**

**7.5.4 Provide Traveler Kiosk Traveler Card Interface**

**7.6.6.2 Provide VMT Services Kiosk Interface**

#### **Equipment Package: Remote Transit Fare Management**

This equipment package provides the capability for the traveler to use a common fare medium for transit fares, tolls, and/or parking lot charges. It accepts a service request and means of payment, verifies eligibility, calculates the amount due, collects payment, and identifies payment problems. This equipment package may be implemented using a traveler card reader in a kiosk that includes a communications interface to the financial infrastructure to support payment collection and reconciliation.

##### **Process Specifications**

**4.7.2.1 Detect Traveler at Roadside**

**4.7.2.2 Determine Traveler Needs at Roadside**

## Remote Traveler Support

- 4.7.2.3 **Determine Transit Fare at Roadside**
- 4.7.2.4 **Manage Transit Fare Billing at Roadside**
- 4.7.2.5 **Provide Traveler Roadside Fare Interface**
- 4.7.2.6 **Update Roadside Transit Fare Data**
- 4.7.2.7 **Provide Transit Roadside Passenger Data**
- 7.3.4 **Provide Remote Terminal Traveler Card Interface**
- 7.5.2 **Provide Traveler Roadside Traveler Card Interface**

### **Equipment Package: Remote Transit Information Services**

This equipment package furnishes transit users with real-time travel-related information at transit stops, multi-modal transfer points, and other public transportation areas. It provides transit users with information on transit routes, schedules, transfer options, available services, fares, and real-time schedule adherence. In addition to tailored information for individual transit users, this equipment package supports general announcement and/or display of imminent arrival information and other information of general interest to transit users.

#### **Process Specifications**

- 4.7.1 **Provide Traveler Roadside & Vehicle Data Interface**
- 6.3.2 **Inform Traveler**

### **Equipment Package: Remote Traveler Security**

This equipment package provides the capability to report an emergency or summon assistance from secure areas such as transit stops, transit stations, modal transfer facilities, rest stops and picnic areas, park-and-ride areas, tourism and travel information areas, and emergency pull off areas. This package includes interfaces that support initiation of an alarm and presentation of the returned alarm acknowledgement as well as a broadcast message to advise or warn the traveler.

#### **Process Specifications**

- 5.1.7.1.5 **Report Traveler Emergencies**

### **Equipment Package: Traveler Secure Area Sensor Monitoring**

This equipment package includes sensors that monitor conditions of secure areas that are frequented by travelers (i.e., transit stops, transit stations, rest areas, park and ride lots, modal interchange facilities, etc.). The equipment package monitors areas for environmental threats (e.g., chemical agent, toxic industrial chemical, biological, explosives, and radiological sensors), intrusion and motion, and object detection.

#### **Process Specifications**

- 5.1.7.1.3 **Collect Traveler Secure Area Sensor Data**
- 5.1.7.1.4 **Process Traveler Secure Area Sensor Data**

### **Equipment Package: Traveler Secure Area Surveillance**

This equipment package manages surveillance equipment that monitors secure areas in the transportation system that are frequented by travelers (i.e., transit stops, transit stations, rest areas, park and ride lots, modal interchange facilities, etc.). This package collects the images and audio inputs at the secure area and provides the surveillance information to the Emergency Management Subsystem. The equipment package also provides local processing of the video or audio information, providing processed or analyzed results to the Emergency Management Subsystem. This equipment package provides the same functions as the Field Secure Area Surveillance equipment package.

#### **Process Specifications**

- 5.1.7.1.1 **Surveil Traveler Secure Area**
- 5.1.7.1.2 **Process Traveler Secure Area Surveillance**

## *2.17.2 Interfaces for RTSS*

**Emergency Management** => **Remote Traveler Support**

**Physical Architecture Flow Name:** alarm acknowledge

## Remote Traveler Support

Confirmation that alarm was received, instructions and additional information for the alarm initiator, and requests for additional information.

**Logical Architecture Data Flow(s):**

traveler\_alarm\_acknowledge  
secure\_area\_traveler\_alarm\_response

**Physical Architecture Flow Name:** secure area sensor control

Information used to configure and control threat sensors (e.g., thermal, acoustic, radiological, chemical), object, motion and intrusion detection sensors. The provided information controls sensor data collection, aggregation, filtering, and other local processing.

**Logical Architecture Data Flow(s):**

traveler\_sensor\_field\_proc\_parameters  
traveler\_intrusion\_motion\_sensor\_control  
traveler\_object\_detection\_sensor\_control  
traveler\_threat\_sensor\_control

**Physical Architecture Flow Name:** secure area surveillance control

Information used to configure and control audio and video surveillance systems used for transportation infrastructure security in secure areas. The provided information controls surveillance data collection, aggregation, filtering, and other local processing.

**Logical Architecture Data Flow(s):**

traveler\_surveillance\_field\_proc\_parameters  
traveler\_secure\_area\_surveillance\_control

**Information Service Provider** => **Remote Traveler Support**

**Physical Architecture Flow Name:** broadcast traveler information

General traveler information that contains traffic and road conditions, link travel times, incidents, advisories, restrictions, transit service information, weather information, parking information, and other related traveler information.

**Logical Architecture Data Flow(s):**

traveler\_broadcast\_event\_information  
traveler\_broadcast\_parking\_data  
traveler\_broadcast\_weather\_data  
traveler\_broadcast\_transit\_data  
traveler\_broadcast\_traffic\_data  
traveler\_broadcast\_multimodal\_data  
traveler\_broadcast\_price\_data  
traveler\_broadcast\_incident\_information  
traveler\_broadcast\_border\_data

**Physical Architecture Flow Name:** emergency traveler information

Public notification of an emergency such as a natural or man-made disaster, civil emergency, or child abduction. This flow also includes evacuation information including evacuation instructions, evacuation zones, recommended evacuation times, tailored evacuation routes and destinations, traffic and road conditions along the evacuation routes, traveler services and shelter information, and reentry times and instructions.

**Logical Architecture Data Flow(s):**

traveler\_transportation\_system\_status  
traveler\_evacuation\_traveler\_information  
traveler\_wide\_area\_alert\_information  
traveler\_emergency\_traveler\_information

**Physical Architecture Flow Name:** interactive traveler information

Traveler information provided in response to a traveler request. The provided information includes traffic and road conditions, advisories, incidents, payment information, transit services, parking information, weather information, and other travel-related data updates and confirmations.



## Remote Traveler Support

### Logical Architecture Data Flow(s):

traveler\_interactive\_price\_data  
traveler\_interactive\_border\_data  
advanced\_tolls\_and\_charges\_roadside\_confirm  
traveler\_interactive\_transit\_data  
traveler\_interactive\_traffic\_data  
traveler\_interactive\_event\_information  
traveler\_interactive\_incident\_information  
traveler\_interactive\_multimodal\_data  
traveler\_interactive\_parking\_data  
traveler\_interactive\_weather\_data

**Physical Architecture Flow Name:** travel services information

Travel service information and reservations for tourist attractions, lodging, dining, service stations, emergency services, and other services and businesses of interest to the traveler.

### Logical Architecture Data Flow(s):

traveler\_travel\_services\_provider\_data  
traveler\_transaction\_confirmation

**Physical Architecture Flow Name:** trip plan

A travel itinerary identifying a route and associated traveler information and instructions identifying recommended modes and transfer information, ride sharing options, and transit and parking reservation information.

### Logical Architecture Data Flow(s):

traveler\_trip\_information  
traveler\_payment\_confirmation

**Map Update Provider** => **Remote Traveler Support**

**Physical Architecture Flow Name:** map updates

Map update which could include a new underlying static or real-time map or map layer(s) update.

### Logical Architecture Data Flow(s):

fmup-traveler\_display\_update

**Physical Architecture Flow Name:** traveler payment request

Request for payment for road use charges.

### Logical Architecture Data Flow(s):

traveler\_vmt\_payment\_request

**Physical Architecture Flow Name:** user VMT account reports

Reports on VMT charges

### Logical Architecture Data Flow(s):

traveler\_vmt\_account\_reports

**Remote Traveler Support** => **Emergency Management**

**Physical Architecture Flow Name:** alarm notification

Notification of activation of an audible or silent alarm by a traveler in a public area or by a transit vehicle operator using an on-board device.

### Logical Architecture Data Flow(s):

traveler\_alarm\_request

**Physical Architecture Flow Name:** secure area sensor data

## Remote Traveler Support

Data provided by threat sensors (e.g., thermal, acoustic, radiological, chemical), and intrusion, motion, and object detection sensors in secure areas indicating the sensor's operational status, raw and processed sensor data, and alarm indicators when a threat has been detected.

### Logical Architecture Data Flow(s):

- field\_processed\_traveler\_object\_detection\_sensor\_data
- field\_processed\_traveler\_threat\_sensor\_data
- field\_processed\_traveler\_intrusion\_motion\_sensor\_data
- traveler\_intrusion\_motion\_sensor\_status
- traveler\_object\_detection\_sensor\_status
- traveler\_secure\_area\_sensor\_threat\_data
- traveler\_threat\_sensor\_data
- traveler\_object\_detection\_sensor\_data
- traveler\_threat\_sensor\_status
- traveler\_intrusion\_motion\_sensor\_data

**Physical Architecture Flow Name:** secure area surveillance data

Data collected from surveillance systems used to monitor secure areas. Includes video, audio, processed surveillance data, equipment operational status, and alarm indicators when a threat has been detected.

### Logical Architecture Data Flow(s):

- field\_processed\_traveler\_secure\_area\_images
- field\_processed\_traveler\_secure\_area\_audio
- traveler\_secure\_area\_audio
- traveler\_secure\_area\_surveillance\_threat\_data
- traveler\_secure\_area\_surveillance\_status
- traveler\_secure\_area\_images

**Remote Traveler Support** => **Information Service Provider**

**Physical Architecture Flow Name:** emergency traveler information request

Request for alerts, evacuation information, and other emergency information provided to the traveling public.

### Logical Architecture Data Flow(s):

- traveler\_emergency\_information\_request

**Physical Architecture Flow Name:** travel services request

Request for travel service information including tourist attractions, lodging, restaurants, service stations, and emergency services. The request identifies the type of service, the area of interest, optional reservation request information, parameters that are used to prioritize or filter the returned information, and sorting preferences.

### Logical Architecture Data Flow(s):

- traveler\_payment\_information\_for\_services
- traveler\_travel\_services\_data\_request
- traveler\_transaction\_request

**Physical Architecture Flow Name:** traveler request

A request for traveler information including traffic, transit, toll, parking, road weather conditions, event, and passenger rail information. The request identifies the type of information, the area of interest, parameters that are used to prioritize or filter the returned information, and sorting preferences.

### Logical Architecture Data Flow(s):

- traveler\_information\_request
- advanced\_tolls\_and\_charges\_roadside\_request

**Physical Architecture Flow Name:** trip confirmation

Acknowledgement by the driver/traveler of acceptance of a trip plan with associated personal and payment information required to confirm reservations.

## Remote Traveler Support

**Logical Architecture Data Flow(s):**  
traveler\_trip\_confirmation  
traveler\_payment\_information

**Physical Architecture Flow Name:** trip request

Request for trip planning services that identifies the trip origin, destination(s), timing, preferences, and constraints. The request may also include a request for transit and parking reservations and ridesharing options associated with the trip.

**Logical Architecture Data Flow(s):**  
traveler\_trip\_request

**Remote Traveler Support** => **Map Update Provider**

**Physical Architecture Flow Name:** map update request

Request for a map update which could include a new underlying map or map layer updates.

**Logical Architecture Data Flow(s):**  
tmup-request\_traveler\_display\_update

**Remote Traveler Support** => **Payment Administration**

**Physical Architecture Flow Name:** traveler payment information

Payment information for road use charges.

**Logical Architecture Data Flow(s):**  
traveler\_vmt\_payment\_info

**Physical Architecture Flow Name:** user VMT account setup

Billing information, vehicle information (or registration information), and requests for reports.

**Logical Architecture Data Flow(s):**  
traveler\_vmt\_account\_setup\_info

**Remote Traveler Support** => **Transit Management**

**Physical Architecture Flow Name:** transit fare and passenger status

Information provided from the traveler location that supports fare payments, passenger data, and associated record-keeping.

**Logical Architecture Data Flow(s):**  
transit\_roadside\_fare\_payment\_confirmation  
fare\_collection\_roadside\_violation\_information  
transit\_roadside\_passenger\_data  
traveler\_roadside\_image  
request\_roadside\_fare\_payment

**Physical Architecture Flow Name:** transit information user request

Request for special transit routing, real-time schedule information, and availability information.

**Logical Architecture Data Flow(s):**  
other\_services\_roadside\_request  
transit\_services\_travelers\_request  
transit\_trip\_request\_from\_kiosks

**Physical Architecture Flow Name:** trip confirmation

Acknowledgement by the driver/traveler of acceptance of a trip plan with associated personal and payment information required to confirm reservations.

**Logical Architecture Data Flow(s):**

## Remote Traveler Support

transit\_trip\_confirmation\_from\_kiosks

### Remote Traveler Support => Traveler

**Physical Architecture Flow Name:** traveler interface updates  
Visual or audio information (e.g., routes, messages, guidance, emergency information) that is provided to the traveler.

**Logical Architecture Data Flow(s):**  
tt-secure\_area\_broadcast\_message  
tt-remote\_emergency\_response  
tt-extra\_trip\_data\_request  
tt-trip\_planning\_responses  
tt-other\_services\_roadside\_confirmed  
tt-remote\_traveler\_information  
tt-transit\_vehicle\_information  
tt-transit\_information  
tt-roadside\_payment\_confirmed  
tt-roadside\_access\_message

### Remote Traveler Support => Traveler Card

**Physical Architecture Flow Name:** request for payment  
Request to deduct cost of service from user's payment account.

**Logical Architecture Data Flow(s):**  
ttc-debited\_traveler\_payment\_at\_roadside  
ttc-debited\_fare\_payment\_at\_roadside  
ttc-request\_fare\_payment\_at\_roadside  
ttc-debited\_traveler\_payment\_at\_roadside\_for\_transit

**Physical Architecture Flow Name:** traveler card update  
Information updated concerning traveler's personal data including items such as address, trip records, and profile data.

**Logical Architecture Data Flow(s):**  
ttc-traveler\_remote\_personal\_information\_update

### Secure Area Environment => Remote Traveler Support

**Physical Architecture Flow Name:** secure area characteristics  
The range of physical and environmental characteristics (visual, audible, presence, motion, chemical, biological, radiological, other) that are monitored by surveillance and sensor systems.

**Logical Architecture Data Flow(s):**  
fsae-area\_audio\_for\_remote\_traveler  
fsae-area\_characteristics\_for\_remote\_traveler  
fsae-area\_image\_for\_remote\_traveler

### Transit Management => Remote Traveler Support

**Physical Architecture Flow Name:** transit fare information  
Information provided by transit management that supports fare payment transactions and passenger data collection.

**Logical Architecture Data Flow(s):**  
transit\_roadside\_fare\_payment\_request  
request\_traveler\_roadside\_image  
transit\_roadside\_passenger\_data\_request  
confirm\_roadside\_fare\_payment  
transit\_roadside\_fare\_payment\_debited

## Remote Traveler Support

transit\_services\_for\_roadside\_fares  
transit\_roadside\_fare\_data

**Physical Architecture Flow Name:** transit traveler information

Transit information prepared to support transit users and other travelers. It contains transit schedules, real-time arrival information, fare schedules, alerts and advisories, and general transit service information.

**Logical Architecture Data Flow(s):**

transit\_vehicle\_user\_data  
other\_services\_roadside\_response  
transit\_services\_for\_travelers  
traveler\_secure\_area\_broadcast\_message  
transit\_vehicle\_arrival\_time  
transit\_wide\_area\_alert\_info  
parking\_facility\_information

**Physical Architecture Flow Name:** trip plan

A travel itinerary identifying a route and associated traveler information and instructions identifying recommended modes and transfer information, ride sharing options, and transit and parking reservation information.

**Logical Architecture Data Flow(s):**

transit\_trip\_plan\_for\_kiosks

**Traveler** => **Remote Traveler Support**

**Physical Architecture Flow Name:** traveler inputs

User input from a traveler to summon assistance, request travel information, make a reservation, or request any other traveler service.

**Logical Architecture Data Flow(s):**

ft-extra\_trip\_data  
ft-remote\_emergency\_request  
ft-trip\_planning\_requests  
ft-traveler\_roadside\_image  
ft-transit\_information\_request  
ft-other\_services\_roadside\_request  
ft-destination\_at\_roadside

**Traveler Card** => **Remote Traveler Support**

**Physical Architecture Flow Name:** payment

Payment of some kind (e.g., toll, parking, fare) by traveler which, in most cases, can be related to a credit account.

**Logical Architecture Data Flow(s):**

ftc-traveler\_roadside\_input\_credit\_identity  
ftc-traveler\_roadside\_input\_credit\_identity\_for\_transit  
ftc-confirm\_fare\_payment\_at\_roadside  
ftc-transit\_roadside\_tag\_data

**Physical Architecture Flow Name:** traveler card information

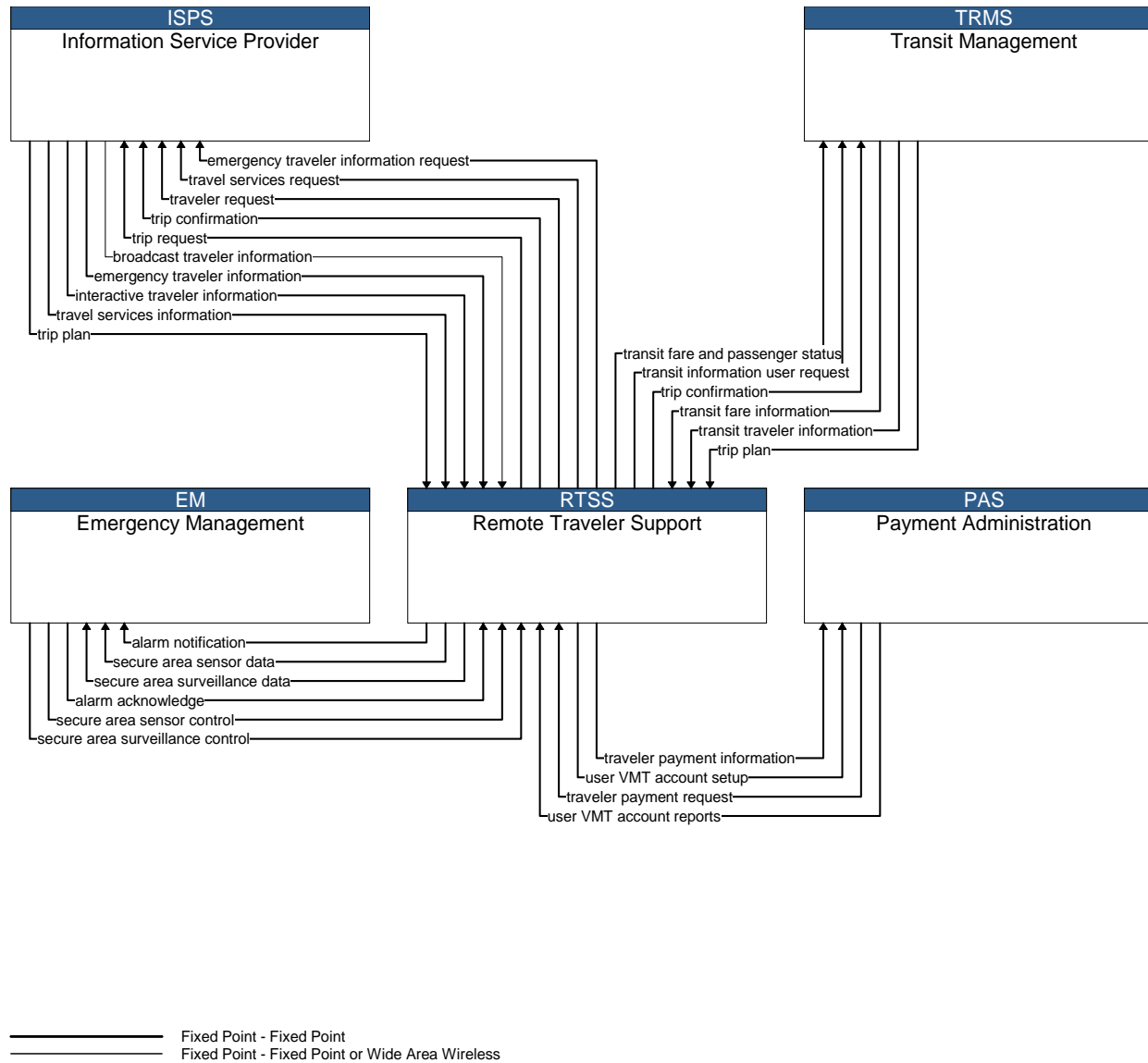
The traveler personal information such as name, address, license number, and trip records and profile data.

**Logical Architecture Data Flow(s):**

ftc-traveler\_remote\_personal\_information

### 2.17.3 Architecture Flow Diagrams for RTSS

# Remote Traveler Support



**Figure 30: RTSS Subsystem Interfaces**

# Remote Traveler Support

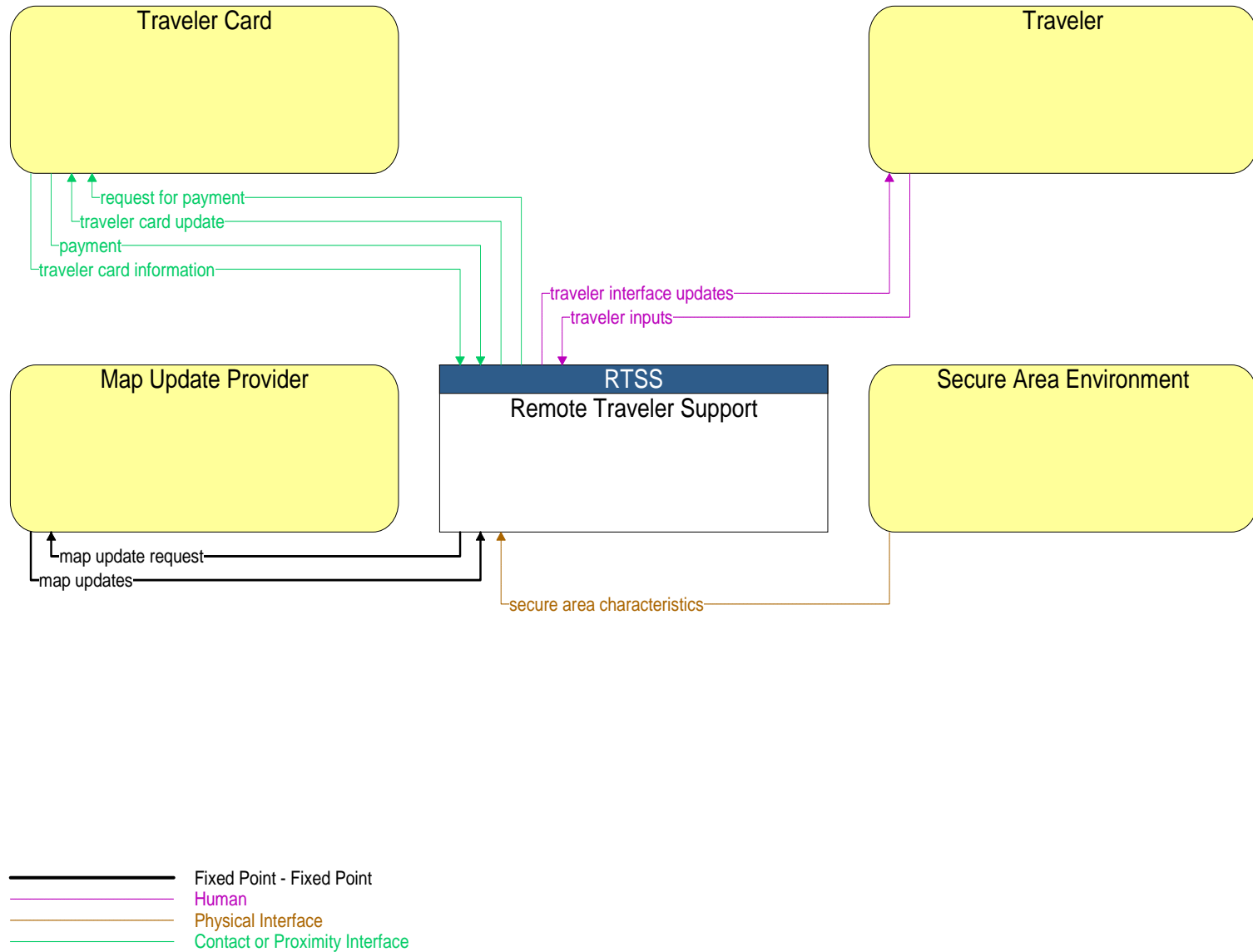


Figure 31: RTSS Terminator Interfaces

## 2.18 Roadway

The Roadway Subsystem (RS) includes the equipment distributed on and along the roadway that monitors and controls traffic and monitors and manages the roadway itself. Equipment includes traffic detectors, environmental sensors, traffic signals, highway advisory radios, dynamic message signs, CCTV cameras and video image processing systems, grade crossing warning systems, and freeway ramp metering systems. HOV lane management, reversible lane management functions, and barrier systems that control access to transportation infrastructure such as roadways, bridges and tunnels are also supported. This subsystem also provides the capability for environmental monitoring including sensors that measure road conditions, surface weather, and vehicle emissions. In adverse conditions, automated systems can be used to apply anti-icing materials, disperse fog, etc. Work zone systems including work zone surveillance, traffic control, driver warning, and work crew safety systems are also included. To enhance security, safeguard systems such as blast shields, exhaust systems and other automated and remotely controlled systems to protect transportation infrastructure is also provided. In advanced implementations, this subsystem supports automated vehicle safety systems by safely controlling access to and egress from an Automated Highway System through monitoring of, and communications with, AHS vehicles. Intersection collision avoidance functions are provided by determining the probability of a collision in the intersection and sending appropriate warnings and/or control actions to the approaching vehicles.

### 2.18.1 Equipment Packages and Process Specifications for RS

#### **Equipment Package: Advanced Rail Crossing**

This equipment package manages highway traffic at highway-rail intersections (HRIs) where operational requirements demand advanced features (e.g., where rail operational speeds are greater than 80 miles per hour). It includes all capabilities from the Standard Rail Crossing equipment package and augments these with additional safety features. The active warning systems supported by this equipment package include positive barrier systems which preclude entrance into the intersection when the barriers are activated. Like the Standard package, the HRI equipment is activated on notification by wayside interface equipment which detects, or communicates with the approaching train. In this equipment package, additional information about the arriving train is also provided by the wayside interface equipment so that the train's direction of travel, its estimated time of arrival, and the estimated duration of closure may be derived. This enhanced information may be conveyed to the driver prior to, or in context with, warning system activation. This equipment package also includes detection capabilities which enable it to detect an entrapped or otherwise immobilized vehicle within the HRI and provide an immediate notification to the wayside interface equipment and traffic management.

#### **Process Specifications**

- 1.1.1.1 Process Traffic Sensor Data
- 1.2.7.1 Process Indicator Output Data for Roads
- 1.2.7.4 Process In-vehicle Signage Data
- 1.6.1.1 Detect Roadway Events
- 1.6.1.2.4 Provide HSR Device Controls
- 1.6.1.4.1 Generate Alerts and Advisories
- 1.6.1.4.3 Report Alerts and Advisories
- 1.6.1.5 Detect HRI Hazards
- 1.6.1.6.1 Close HRI on Detection
- 1.6.1.6.2 Detect Imminent Vehicle/Train Collision
- 1.6.3.1 Interact with Wayside Systems
- 1.6.3.2 Advise and Protect Train Crews
- 1.6.3.3 Provide ATS Alerts
- 1.6.5.1 Provide Interactive Interface

#### **Equipment Package: Field Barrier System Control**

This equipment package includes the field equipment that controls barrier systems used to control access to transportation facilities and infrastructure. Barrier systems include automatic or remotely controlled gates,



## Roadway

barriers and other access control systems.

### **Process Specifications**

#### **1.2.7.10 Control Barrier Systems**

### **Equipment Package: Field Management Stations Operation**

This equipment package supports direct communications between field management stations and the local field equipment under their control.

### **Process Specifications**

#### **1.2.7.13 Provide Device Interface for Field Management Stations**

### **Equipment Package: Field Safeguard System Control**

This equipment package includes field equipment that controls safeguard systems for transportation facilities and infrastructure. Safeguard systems include blast shields, exhaust systems and other automatic or remotely controlled systems intended to mitigate the impact of an incident.

### **Process Specifications**

#### **5.7.6.1 Control Safeguard Systems**

### **Equipment Package: Multimodal Crossing Control**

This equipment package monitors multimodal crossings and monitors and controls traffic control equipment in the vicinity of the crossing. Equipment controlled includes warning lights, gates, dynamic message signs, and other systems associated with multimodal crossings. This equipment package manages draw bridges and miscellaneous other crossings between highway traffic and other modes. Railroad grade crossings are covered by the Standard Rail Crossing equipment package.

### **Process Specifications**

#### **1.1.1.1 Process Traffic Sensor Data**

#### **1.2.7.1 Process Indicator Output Data for Roads**

#### **1.2.7.2 Monitor Roadside Equipment Operation for Faults**

#### **1.2.7.5 Process Indicator Output Data for Freeways**

#### **1.2.7.9 Process Roadway Information Data**

### **Equipment Package: Roadside Lighting System Control**

This equipment package includes field equipment that controls lighting systems for transportation facilities and infrastructure. It includes the sensors, lighting controllers, and supporting field equipment that monitors and controls lighting systems. The equipment supports control based on sensed local conditions, stored timing plans, and remote commands from a center. It monitors lighting system status and reports status to the controlling center.

### **Process Specifications**

#### **1.2.7.11 Control Lighting System**

### **Equipment Package: Roadway Automated Treatment**

This equipment package automatically treats a roadway section based on environmental or atmospheric conditions or under center control. Treatments include fog dispersion, anti-icing chemicals, etc.

### **Process Specifications**

#### **9.2.6.2 Control Roadway Automated Treatment System**

### **Equipment Package: Roadway Automated Vehicle Operations**

This equipment package includes the field elements that control access to and egress from an automated highway and monitor and coordinate automated vehicle operations on the facility. It includes the equipment that monitors and controls the automated facility.

### **Process Specifications**

#### **3.2.5 Check Vehicle for Automated Operations Eligibility**

#### **3.2.6 Manage Check-in and Check-out**

#### **3.2.8 Provide Automated Lane Changing**

## Roadway

### **Equipment Package: Roadway Basic Surveillance**

This equipment package monitors traffic conditions using fixed equipment such as loop detectors and CCTV cameras.

#### **Process Specifications**

**1.1.1.1 Process Traffic Sensor Data**

**1.3.1.3 Process Traffic Images**

### **Equipment Package: Roadway Data Collection**

This equipment package collects traffic, road, and environmental conditions information for use in transportation planning, research, and other off-line applications where data quality and completeness take precedence over real-time performance. This equipment package includes the sensors, supporting roadside infrastructure, and communications equipment that collects and transfers information to a center for archival.

#### **Process Specifications**

**1.1.1.4 Manage Data Collection and Monitoring**

### **Equipment Package: Roadway Dynamic Lane Management and Shoulder Use**

This equipment package includes the field equipment, physical overhead lane signs and associated control electronics that are used to manage and control specific lanes and/or the shoulders. This equipment can be centrally controlled by a traffic management center or it can autonomously monitor traffic conditions and demand along the roadway and determine how to change the lane controls to respond to current conditions. Lane controls can be used to change the lane configuration of the roadway, reconfigure intersections and/or interchanges, allow use of shoulders as temporary travel lanes, designate lanes for use by special vehicles only, such as buses, high occupancy vehicles (HOVs), vehicles attending a special event, etc. and/or prohibit or restrict types of vehicles from using particular lanes. Guidance and information for drivers can be posted on dynamic message signs. This equipment also can automatically notify the enforcement agency of violators of the lane controls.

#### **Process Specifications**

**1.1.1.1 Process Traffic Sensor Data**

**1.1.2.11 Control Dynamic Lanes**

### **Equipment Package: Roadway Emissions Monitoring**

This equipment package monitors emissions and general air quality and communicates the collected information back to the emissions management subsystem where it can be monitored, analyzed, and used. This equipment package supports point monitoring of individual vehicle emissions as well as general monitoring of standard air quality measures.

#### **Process Specifications**

**1.2.7.9 Process Roadway Information Data**

**1.5.5 Detect Vehicle Emissions Levels**

**1.5.6 Detect Pollution Levels**

### **Equipment Package: Roadway Environmental Monitoring**

This equipment package measures environmental conditions and communicates the collected information back to a center where it can be monitored and analyzed. A broad array of general weather and road surface information may be collected. Weather conditions that may be measured include temperature, wind, humidity, precipitation, and visibility. Surface and sub-surface sensors can measure road surface temperature, moisture, icing, salinity, and other measures.

#### **Process Specifications**

**1.1.1.3 Process Environmental Sensor Data**

### **Equipment Package: Roadway Equipment Coordination**

This equipment package supports direct communications between field equipment. It includes field elements that control and send data to other field elements. This includes coordination between remote sensors and field devices (e.g., Dynamic Message Signs) and coordination between the field devices themselves (e.g., direct coordination between traffic controllers that are controlling adjacent intersections.).

#### **Process Specifications**

## Roadway

### 1.1.1.5 Provide Sensor Interface to Other Roadway Devices

### 1.2.7.8 Provide Device Interface to Other Roadway Devices

#### **Equipment Package: Roadway Field Device Monitoring**

This equipment package monitors the operational status of field devices and detects and reports fault conditions. Consolidated operational status (device status, configuration, and fault information) are reported to the Maintenance and Construction Management Subsystem for resolution and repair. A local interface is provided to field personnel for local monitoring and diagnostics, supporting field maintenance, repair, and replacement of field devices.

#### **Process Specifications**

### 9.2.3.6 Collect Field Equipment Status for Repair

#### **Equipment Package: Roadway HOV Control**

This equipment package monitors and controls high occupancy vehicle (HOV) and high occupancy toll (HOT) lanes. It includes traffic sensors that monitor HOV lane usage and display equipment such as lane control signals that provide lane status to drivers.

#### **Process Specifications**

### 1.1.1.1 Process Traffic Sensor Data

### 1.1.2.11 Control Dynamic Lanes

### 1.2.7.5 Process Indicator Output Data for Freeways

#### **Equipment Package: Roadway Incident Detection**

This equipment package provides incident detection using traffic detectors and surveillance equipment. It monitors for unusual traffic conditions that may indicate an incident or processes surveillance images, watching for potential incidents. This equipment package provides potential incident information as well as traffic flow and images to the center for processing and presentation to traffic operations personnel.

#### **Process Specifications**

### 1.1.1.1 Process Traffic Sensor Data

### 1.3.1.3 Process Traffic Images

#### **Equipment Package: Roadway Infrastructure Monitoring**

This equipment package monitors the condition of pavement, bridges, tunnels, associated hardware, and other transportation-related infrastructure (e.g., culverts). It includes sensors that monitor the infrastructure and the communications necessary to report this data to a center or vehicle-based maintenance system.

#### **Process Specifications**

### 1.1.1.2 Collect Infrastructure Sensor Data

#### **Equipment Package: Roadway Intersection Safety Warning**

This equipment package includes field elements that monitor vehicles approaching and occupying an intersection and warns drivers when hazardous conditions are detected. It detects impending red-light or stop sign violations and potential conflicts between vehicles occupying and approaching an intersection. When a potentially hazardous condition is detected, a warning is communicated to the approaching vehicles using short range communications or signs/signals in the intersection. For signalized intersections, an interface to the signal controller allows this equipment package to monitor signal status and possibly change or extend the signal phase to reduce the risk of a collision. This equipment package is defined to support a range of implementation options including initial implementations that rely on sensors and intelligence embedded in the intersection to increase safety of a general vehicle population through implementations that communicate with and supplement a vehicle population that is equipped with vehicle-based sensors and short range communications that enable the vehicles to detect and warn their own drivers of hazardous situations.

#### **Process Specifications**

### 1.1.1.1 Process Traffic Sensor Data

### 1.2.7.1 Process Indicator Output Data for Roads

### 1.2.7.6 Provide Intersection Collision Avoidance Data

#### **Equipment Package: Roadway Mixed Use Sensing**

## Roadway

This equipment package provides the field devices that provide sensing and warning systems used to interact with pedestrians, bicyclists, and other vehicles that operate on the main vehicle roadways, or on pathways which intersect the main vehicle roadways. These field devices include imaging sensors to provide sensing and recognition capabilities, which would allow automated warning or active protection systems for pedestrians, bicyclists, and other vehicles that operate on the main vehicle roadways, or on pathways which intersect the main vehicle roadways.

### **Process Specifications**

- 1.1.1.1 Process Traffic Sensor Data**
- 1.1.1.7 Process Road User Protection**
- 1.2.7.1 Process Indicator Output Data for Roads**
- 1.2.7.2 Monitor Roadside Equipment Operation for Faults**
- 1.2.7.9 Process Roadway Information Data**

### **Equipment Package: Roadway Probe Data Communications**

This equipment package collects probe data from passing vehicles that are equipped with a short range communications device. The probe data collected by this equipment package may include link travel times, average speeds, road conditions, and any other data that can be measured and communicated by passing vehicles. This equipment package consists of field equipment that communicates with passing vehicles using short range communications, collects the provided information, and sends the collected information back to a center for processing and distribution.

### **Process Specifications**

- 1.1.6 Collect Vehicle Traffic Probe Data**
- 1.1.7 Collect Vehicle Environmental Probe Data**

### **Equipment Package: Roadway Reversible Lanes**

This equipment package includes field elements that monitor and control reversible lane facilities. It includes the traffic sensors, surveillance equipment, lane control signals, physical lane access controls, and other field elements that manage traffic on these facilities. It provides current reversible lane facility status information and accepts requests and control commands from the controlling center.

### **Process Specifications**

- 1.1.1.1 Process Traffic Sensor Data**
- 1.1.2.11 Control Dynamic Lanes**
- 1.2.7.1 Process Indicator Output Data for Roads**
- 1.2.7.2 Monitor Roadside Equipment Operation for Faults**
- 1.2.7.5 Process Indicator Output Data for Freeways**
- 1.3.1.3 Process Traffic Images**

### **Equipment Package: Roadway Safety Warning System**

This equipment package monitors for potential safety hazards including wrong way drivers, debris on the road, and adverse road conditions (e.g., standing water, icy conditions) and warns approaching vehicles of potential hazards. This equipment package collects information from passing vehicles and roadside sensors and surveillance equipment, processes this information to identify potential hazards, and provides warnings to passing vehicles using field-vehicle communications.

### **Process Specifications**

- 1.1.1.6 Collect Vehicle Roadside Safety Data**
- 1.1.2.6 Process Collected Vehicle Safety Data**
- 1.2.7.4 Process In-vehicle Signage Data**
- 1.2.7.7 Process Vehicle Safety and Environmental Data for Output**

### **Equipment Package: Roadway Short Range Traveler Information Communications**

This equipment package includes field elements that distribute information to vehicles for in-vehicle display. The information may be provided by a center (e.g., variable information on traffic and road conditions in the

## Roadway

vicinity of the field equipment) or it may be determined and output locally (e.g., static sign information and signal phase and timing information). This equipment package includes the interface to the center or field equipment that controls the information distribution and the short range communications equipment that provides information to passing vehicles.

### Process Specifications

- 1.1.2.6 Process Collected Vehicle Safety Data
- 1.2.7.4 Process In-vehicle Signage Data
- 1.2.7.7 Process Vehicle Safety and Environmental Data for Output
- 6.7.3.5 Provide Short Range Traveler Information

### Equipment Package: Roadway Signal Controls

This equipment package includes the field elements that monitor and control signalized intersections. It includes the traffic signal controllers, signal heads, detectors, and other ancillary equipment that supports traffic signal control. It also includes field masters, and equipment that supports communications with a central monitoring and/or control system, as applicable. The communications link supports upload and download of signal timings and other parameters and reporting of current intersection status. This equipment package represents the field equipment used in all levels of traffic signal control from basic actuated systems that operate on fixed timing plans through adaptive systems. It also supports all signalized intersection configurations, including those that accommodate pedestrians.

### Process Specifications

- 1.1.1.1 Process Traffic Sensor Data
- 1.2.7.1 Process Indicator Output Data for Roads
- 1.2.7.2 Monitor Roadside Equipment Operation for Faults

### Equipment Package: Roadway Signal Preemption

This equipment package includes the field elements that receive signal preemption requests from emergency vehicles approaching a signalized intersection and overrides the current operation of the traffic signals to stop conflicting traffic and grant right-of-way to the approaching vehicle.

### Process Specifications

- 1.2.7.1 Process Indicator Output Data for Roads
- 1.2.7.2 Monitor Roadside Equipment Operation for Faults
- 1.2.7.3 Manage Local Signal Preemption Requests

### Equipment Package: Roadway Signal Priority

This equipment package includes the field elements that receive signal priority requests from transit vehicles approaching a signalized intersection. The request for priority may or may not be granted, based on the overall traffic situation at the intersection, adherence to the schedule of the transit vehicle, etc. If priority is granted, the operation of the traffic signal is adjusted to give an early green indication or hold a green indication that is already displaying

### Process Specifications

- 1.2.7.1 Process Indicator Output Data for Roads
- 1.2.7.14 Manage Local Signal Priority Requests
- 1.2.7.2 Monitor Roadside Equipment Operation for Faults

### Equipment Package: Roadway Speed Monitoring and Warning

This equipment package includes the field elements that monitor vehicle speeds. If the speed is determined to be excessive, then roadside equipment can suggest a safe driving speed. Environmental conditions may be monitored and factored into the safe speed advisories that are provided to the motorist. The characteristics of individual vehicles may also be monitored and used to warn vehicles with specific limitations that reduce safe operating speeds, e.g., rollover risk for tall vehicles. The operational status (state of the device, configuration, and fault data) is provided to the center. This equipment package can also provide an enforcement function, reporting speed violations to an enforcement agency.

### Process Specifications

## Roadway

- 1.1.1.1      **Process Traffic Sensor Data**
- 1.2.7.4      **Process In-vehicle Signage Data**
- 1.2.7.9      **Process Roadway Information Data**
- 9.3.3.1      **Collect Vehicle Speed**
- 9.3.3.4      **Support Vehicle Speed Enforcement**

### **Equipment Package: Roadway Traffic Information Dissemination**

This equipment package includes field elements that provides information to drivers, including dynamic message signs and highway advisory radio.

#### **Process Specifications**

- 1.2.7.1      **Process Indicator Output Data for Roads**
- 1.2.7.5      **Process Indicator Output Data for Freeways**
- 1.2.7.9      **Process Roadway Information Data**

### **Equipment Package: Roadway Traffic Metering**

This equipment package includes the field equipment used to meter traffic on ramps, through interchanges, and on the mainline roadway. The equipment includes dynamic messages signs to provide guidance and information to drivers at and approaching a meter, including information for any special bypass lanes.

#### **Process Specifications**

- 1.2.7.2      **Monitor Roadside Equipment Operation for Faults**
- 1.2.7.5      **Process Indicator Output Data for Freeways**

### **Equipment Package: Roadway Variable Speed Limits**

This equipment package includes the field equipment, physical overhead lane signs and associated control electronics that are used to manage and control variable speed limits systems. This equipment monitors traffic and environmental conditions along the roadway. The system can be centrally monitored and controlled by a traffic management center or it can be autonomous, calculating and setting suitable speed limits, usually by lane. This equipment located over and along the roadway displays the speed limits and additional information such as basic safety rules and current traffic information to drivers.

#### **Process Specifications**

- 9.3.3.1      **Collect Vehicle Speed**

### **Equipment Package: Roadway Warning**

This equipment package includes the field equipment used to warn drivers approaching hazards on a roadway. Warnings may be generated in response to roadway weather conditions, road surface conditions, traffic conditions including queues, obstacles or animals in the roadway, and any other transient events that can be sensed. The equipment monitors traffic and roadway conditions and may send data to a traffic management center for processing or may process it to determine when a warning should be issued. When it is determined that a warning should be issued, the equipment is used to alert approaching drivers via dynamic warning signs, flashing lights, in-vehicle messages, etc.

#### **Process Specifications**

- 1.2.7.12     **Control Roadway Warning System**
- 9.3.3.1      **Collect Vehicle Speed**

### **Equipment Package: Roadway Work Zone Safety**

This equipment package includes field elements that detect vehicle intrusions in work zones and warns crew workers and drivers of imminent encroachment. Crew movements are also monitored so that the crew can be warned of movement beyond the designated safe zone.

#### **Process Specifications**

- 9.3.1.3      **Monitor Crew Movement**
- 9.3.4.1      **Detect Work Zone Intrusion**
- 9.3.4.2      **Provide Work Zone Intrusion Alert**

## Roadway

### **Equipment Package: Roadway Work Zone Traffic Control**

This equipment package controls traffic in areas of the roadway where maintenance and construction activities are underway, monitoring and controlling traffic using field equipment such as CCTV cameras, dynamic messages signs, and gates/barriers. Work zone speeds and delays are provided to the motorist prior to the work zones.

#### **Process Specifications**

- 1.2.7.10 Control Barrier Systems**
- 1.2.7.9 Process Roadway Information Data**
- 1.3.1.3 Process Traffic Images**

### **Equipment Package: Standard Rail Crossing**

This equipment package manages highway traffic at highway-rail intersections (HRIs) where operational requirements do not dictate advanced features (e.g., where rail operational speeds are less than 80 miles per hour). Either passive (e.g., the crossbuck sign) or active warning systems (e.g., flashing lights and gates) are supported depending on the specific requirements for each intersection. These traditional HRI warning systems may also be augmented with other standard traffic management devices. The warning systems are activated on notification of an approaching train by interfaced wayside equipment. The equipment at the HRI may also be interconnected with adjacent signalized intersections so that local control can be adapted to highway-rail intersection activities. Health monitoring of the HRI equipment and interfaces is performed; detected abnormalities are reported through interfaces to the wayside interface equipment and the traffic management subsystem.

#### **Process Specifications**

- 1.1.1.1 Process Traffic Sensor Data**
- 1.2.7.1 Process Indicator Output Data for Roads**
- 1.6.1.2.1 Control HRI Traffic Signals**
- 1.6.1.2.2 Control HRI Warnings and Barriers**
- 1.6.1.2.3 Provide SSR Device Controls**
- 1.6.1.2.5 Manage Device Control**
- 1.6.1.2.6 Maintain Device State**
- 1.6.1.3 Perform Equipment Self-Test**
- 1.6.1.4.2 Provide Closure Parameters**
- 1.6.1.4.4 Report HRI Status on Approach**
- 1.6.1.7.1 Control Traffic Volume at Active HRI**
- 1.6.1.7.2 Close HRI on Command**
- 1.6.3.1 Interact with Wayside Systems**
- 1.6.5.1 Provide Interactive Interface**
- 1.6.5.2 Determine HRI Status**
- 1.6.5.3 Maintain HRI Closure Data**

## *2.18.2 Interfaces for RS*

### **Archived Data Management**

=> **Roadway**

**Physical Architecture Flow Name:** data collection and monitoring control

Information used to configure and control data collection and monitoring systems.

#### **Logical Architecture Data Flow(s):**

roadside\_archive\_control  
data\_collection\_device\_control

## Roadway

### Emergency Vehicle => Roadway

**Physical Architecture Flow Name:** barrier system control

Information used to configure and control barrier systems that are represented by gates, barriers and other automated or remotely controlled systems used to manage entry to roadways.

**Logical Architecture Data Flow(s):**  
barrier\_system\_control\_from\_emerg\_veh

**Physical Architecture Flow Name:** local signal preemption request

Direct control signal or message to a signalized intersection that results in preemption of the current control plan and grants right-of-way to the requesting vehicle.

**Logical Architecture Data Flow(s):**  
emergency\_vehicle\_preemptions

### Emissions Management => Roadway

**Physical Architecture Flow Name:** emissions sensor control

Data used to configure and control vehicle emissions sensors.

**Logical Architecture Data Flow(s):**  
vehicle\_emissions\_sensor\_control

**Physical Architecture Flow Name:** pollution sensor control

Data used to configure and control area pollution and air quality sensors.

**Logical Architecture Data Flow(s):**  
pollution\_sensor\_control

### Enforcement Agency => Roadway

**Physical Architecture Flow Name:** speed monitoring control

Information used to configure and control automated speed monitoring, speed warning, and speed enforcement systems.

**Logical Architecture Data Flow(s):**  
fea-enforcement\_parameters  
fea-speed\_sensor\_control

### Environment => Roadway

**Physical Architecture Flow Name:** pollutant levels

Atmospheric pollutant levels as monitored by air quality sensors.

**Logical Architecture Data Flow(s):**  
fe-pollutant\_levels

### Information Service Provider => Roadway

**Physical Architecture Flow Name:** broadcast traveler information

General traveler information that contains traffic and road conditions, link travel times, incidents, advisories, restrictions, transit service information, weather information, parking information, and other related traveler information.

**Logical Architecture Data Flow(s):**  
field\_broadcast\_parking\_data  
field\_broadcast\_transit\_data  
field\_broadcast\_price\_data  
field\_broadcast\_multimodal\_data



## Roadway

field\_broadcast\_incident\_information  
field\_broadcast\_border\_data  
field\_broadcast\_traffic\_data  
field\_broadcast\_event\_information  
field\_broadcast\_weather\_data

**Physical Architecture Flow Name:** emergency traveler information

Public notification of an emergency such as a natural or man-made disaster, civil emergency, or child abduction. This flow also includes evacuation information including evacuation instructions, evacuation zones, recommended evacuation times, tailored evacuation routes and destinations, traffic and road conditions along the evacuation routes, traveler services and shelter information, and reentry times and instructions.

**Logical Architecture Data Flow(s):**

field\_transportation\_system\_status  
field\_wide\_area\_alert\_information  
field\_emergency\_traveler\_information  
field\_evacuation\_traveler\_information

**Maintenance and Construction** => **Roadway**  
**Field Personnel**

**Physical Architecture Flow Name:** crew movements

Visual or sensed presence of field crew location within a work zone that is monitored to enhance work zone safety.

**Logical Architecture Data Flow(s):**

fmcfp-crew\_movements

**Physical Architecture Flow Name:** field device status request

User input from field personnel requesting operational status of field equipment (sensors, signals, signs, controllers, etc.).

**Logical Architecture Data Flow(s):**

fmcfp-field equip\_status\_request

**Maintenance and Construction** => **Roadway**  
**Management**

**Physical Architecture Flow Name:** barrier system control

Information used to configure and control barrier systems that are represented by gates, barriers and other automated or remotely controlled systems used to manage entry to roadways.

**Logical Architecture Data Flow(s):**

barrier\_system\_control\_from\_m\_and\_c

**Physical Architecture Flow Name:** environmental sensors control

Data used to configure and control environmental sensors.

**Logical Architecture Data Flow(s):**

environmental\_sensor\_control\_for\_roadway\_sensors

**Physical Architecture Flow Name:** infrastructure monitoring sensor control

Data used to configure and control infrastructure monitoring sensors.

**Logical Architecture Data Flow(s):**

infrastructure\_sensor\_control\_from\_m\_and\_c

**Physical Architecture Flow Name:** roadway information system data

Information used to initialize, configure, and control roadside systems that provide driver information (e.g., dynamic message signs, highway advisory radio, beacon systems). This

## Roadway

flow can provide message content and delivery attributes, local message store maintenance requests, control mode commands, status queries, and all other commands and associated parameters that support remote management of these systems.

**Logical Architecture Data Flow(s):**

work\_zone\_info\_for\_display  
dms\_data\_from\_m\_and\_c  
dms\_auto\_treat\_data\_from\_maint  
har\_data\_from\_m\_and\_c

**Physical Architecture Flow Name:** roadway treatment system control

Control data for remotely located, automated devices, that affect the roadway surface (e.g. de-icing applications).

**Logical Architecture Data Flow(s):**

roadway\_treatment\_system\_control

**Physical Architecture Flow Name:** speed monitoring control

Information used to configure and control automated speed monitoring, speed warning, and speed enforcement systems.

**Logical Architecture Data Flow(s):**

speed\_sensor\_control\_from\_m\_and\_c

**Physical Architecture Flow Name:** video surveillance control

Information used to configure and control video surveillance systems.

**Logical Architecture Data Flow(s):**

video\_control\_from\_m\_and\_c

**Physical Architecture Flow Name:** work zone warning device control

Data used to configure and control work zone safety monitoring and warning devices.

**Logical Architecture Data Flow(s):**

intrusion\_detection\_device\_control  
intrusion\_alert\_device\_control

**Maintenance and Construction Vehicle => Roadway**

**Physical Architecture Flow Name:** barrier system control

Information used to configure and control barrier systems that are represented by gates, barriers and other automated or remotely controlled systems used to manage entry to

**Logical Architecture Data Flow(s):**

barrier\_system\_control\_from\_mcv

**Physical Architecture Flow Name:** environmental sensor data

Current road conditions (e.g., surface temperature, subsurface temperature, moisture, icing, treatment status) and surface weather conditions (e.g., air temperature, wind speed, precipitation, visibility) as measured and reported by fixed and/or mobile environmental sensors. Operational status of the sensors is also included.

**Logical Architecture Data Flow(s):**

environmental\_sensor\_data\_for\_roadway

**Physical Architecture Flow Name:** environmental sensors control

Data used to configure and control environmental sensors.

**Logical Architecture Data Flow(s):**

environmental\_sensor\_control\_for\_roadway

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**Physical Architecture Flow Name:** infrastructure monitoring sensor control

Data used to configure and control infrastructure monitoring sensors.

**Logical Architecture Data Flow(s):**

infrastructure\_sensor\_control\_from\_mcv

**Physical Architecture Flow Name:** roadway information system data

Information used to initialize, configure, and control roadside systems that provide driver information (e.g., dynamic message signs, highway advisory radio, beacon systems). This flow can provide message content and delivery attributes, local message store maintenance requests, control mode commands, status queries, and all other commands and associated parameters that support remote management of these systems.

**Logical Architecture Data Flow(s):**

dms\_data\_from\_mcv

**Multimodal Crossings** => **Roadway**

**Physical Architecture Flow Name:** multimodal crossing status

Indication of operational status and pending requests for right-of-way from equipment supporting the non-highway mode at multimodal crossings.

**Logical Architecture Data Flow(s):**

fmmc-crossing\_status\_for\_highways

fmmc-crossing\_close\_time

fmmc-crossing\_close\_duration

fmmc-crossing\_status\_for\_roads

**Other Roadway** => **Roadway**

**Physical Architecture Flow Name:** roadway equipment coordination

The direct flow of information between field equipment. This includes transfer of information between sensors and driver information systems (e.g., DMS, HAR, variable speed limit signs, dynamic lane signs) or control devices (e.g., traffic signals, ramp meters), direct coordination between adjacent control devices, interfaces between detection and warning or alarm systems, and any other direct communications between field equipment.

**Logical Architecture Data Flow(s):**

fors-sensor\_data

fors-device\_control

fors-device\_status

fors-roadway\_info\_data\_from\_devices

fors-sensor\_control

fors-roadway\_info\_data\_from\_sensors

fors-sensor\_status

**Physical Architecture Flow Name:** signal control data

Information used to configure local traffic signal controllers.

**Logical Architecture Data Flow(s):**

fors-signal\_fault

fors-signal\_status

fors-signal\_control

**Pedestrians** => **Roadway**

**Physical Architecture Flow Name:** crossing call

Pedestrian request to cross the roadway. This may be an overt (e.g., push button) request from a pedestrian or the physical presence of a pedestrian that can be detected by sensors or

## Roadway

surveillance systems.

**Logical Architecture Data Flow(s):**

fp-pedestrian\_images  
fp-pedestrian\_data

**Physical Architecture Flow Name:** non-vehicular presence

Sensed presence of pedestrians and other non-motor vehicle travelers at roadway crossing or control points.

**Logical Architecture Data Flow(s):**

fp-pedestrian\_presence

**Potential Obstacles** => **Roadway**

**Physical Architecture Flow Name:** physical presence

Detection of an obstacle. Obstacle could include animals, vehicles, pedestrians, rocks in roadway etc.

**Logical Architecture Data Flow(s):**

From\_Potential\_Obstacles

**Roadway** => **Archived Data Management**

**Physical Architecture Flow Name:** probe archive data

Probe data that allows calculation of travel times, volumes, and other measures that support transportation planning. Optionally, this flow also includes origin and destination information for vehicles that opt to provide this information.

**Logical Architecture Data Flow(s):**

traffic\_probe\_data\_from\_vehicles\_archive\_data

**Physical Architecture Flow Name:** roadside archive data

A broad set of data derived from roadside sensors that includes current traffic conditions, environmental conditions, and any other data that can be directly collected by roadside sensors. This data also indicates the status of the sensors and reports of any identified sensor faults.

**Logical Architecture Data Flow(s):**

data\_collection\_device\_status  
roadside\_archive\_data

**Roadway** => **Basic Vehicle**

**Physical Architecture Flow Name:** broadcast advisories

General broadcast advisories that are provided over wide-area wireless communications direct to the vehicle radio. These analog advisory messages may provide similar content to ITS broadcast information flows, but include no digital data component. Existing Highway-Advisory Radio (HAR) advisory messages are a prime example of this flow.

**Logical Architecture Data Flow(s):**

tbv-har\_broadcast

**Roadway** => **Driver**

**Physical Architecture Flow Name:** driver information

Regulatory, warning, and guidance information provided to the driver while en route to support safe and efficient vehicle operation.

**Logical Architecture Data Flow(s):**

td-lane\_use\_indication\_for\_highways  
td-ramp\_state\_indication  
td-dms\_indication

## Roadway

td-intersection\_safety\_data  
td-roadway\_warning  
td-lane\_use\_indication\_for\_roads  
td-dynamic\_lane\_control  
td-signal\_indication  
td-work\_zone\_intrusion\_alert

### Roadway => Emergency Vehicle

**Physical Architecture Flow Name:** barrier system status

Current operating status of barrier systems. Barrier systems represent gates, barriers and other automated or remotely controlled systems used to manage entry to roadways. Status of the systems includes operating condition and current operational state.

**Logical Architecture Data Flow(s):**  
barrier\_system\_status\_to\_emerg\_veh

### Roadway => Emissions Management

**Physical Architecture Flow Name:** area pollution data

Measured air quality data, including measured levels of atmospheric pollutants including ozone, particulate matter, carbon monoxide, and nitrogen oxides, and operational status of the sensors.

**Logical Architecture Data Flow(s):**  
pollution\_sensor\_data  
pollution\_sensor\_status

**Physical Architecture Flow Name:** vehicle emissions data

Measured emissions of specific vehicles comprised of exhaust pollutants including hydrocarbons, carbon monoxide, and nitrogen oxides.

**Logical Architecture Data Flow(s):**  
vehicle\_emissions\_sensor\_status  
vehicle\_emissions\_alert  
vehicle\_emissions\_sensor\_data

### Roadway => Enforcement Agency

**Physical Architecture Flow Name:** speed monitoring information

System status including current operational state and logged information including measured speeds, warning messages displayed, and violation records.

**Logical Architecture Data Flow(s):**  
tea-speed\_sensor\_status

**Physical Architecture Flow Name:** traffic violation notification

Notification to enforcement agency of a detected traffic violation including speed violations, HOV violations, and dynamic lane violations.

**Logical Architecture Data Flow(s):**  
tea-speed\_violation\_notification  
tea-lane\_violation\_notification\_from\_roadway  
tea-shoulder\_violation\_notification\_from\_roadway

### Roadway => Information Service Provider

**Physical Architecture Flow Name:** environmental probe data

Data from vehicle safety and convenience systems that can be used to estimate environmental conditions, including measured air temperature, exterior light status, wiper status, sun sensor status, rain sensor status, traction control status, anti-lock brake status, and other collected vehicle system status and sensor information. The collected data is reported along

## Roadway

with the location, heading, and time that the data was collected. Both current data and snapshots of recent events (e.g., traction control or anti-lock brake system activations) may be reported.

### Logical Architecture Data Flow(s):

vehicle\_env\_probe\_status\_for\_isp  
vehicle\_env\_probe\_data\_for\_isp

**Physical Architecture Flow Name:** short range communications status

Status of the short range communications equipment including the current state or mode of operation and the current equipment status.

### Logical Architecture Data Flow(s):

trav\_info equip\_status\_for\_isp\_operator

**Physical Architecture Flow Name:** traffic probe data

Vehicle data that is used to determine traffic conditions. In a basic implementation, the data could be limited to time stamped unique identifiers that can be used to measure a vehicle's progress through the network. In more advanced implementations, the vehicle may report current position, speed, and heading and snapshots of recent events including route information, starts and stops, speed changes, and other information that can be used to estimate traffic conditions.

### Logical Architecture Data Flow(s):

vehicle\_traffic\_probe\_data\_for\_isp  
vehicle\_traffic\_probe\_status\_for\_isp

**Roadway** => **Maintenance and Construction Field Personnel**

**Physical Architecture Flow Name:** field device status presentation

Presentation of operational status of field equipment (sensors, signals, signs, controllers, etc.) to field personnel.

### Logical Architecture Data Flow(s):

tmcfp-field\_equip\_status

**Physical Architecture Flow Name:** work zone warning

Warnings provided to maintenance and construction field personnel, indicating a work zone emergency or safety issue such as the intrusion of a vehicle into the work zone area or movement of field crew into the travel lanes.

### Logical Architecture Data Flow(s):

tmcfp-work\_zone\_intrusion\_warning  
tmcfp-work\_zone\_intrusion\_alert

**Roadway** => **Maintenance and Construction Management**

**Physical Architecture Flow Name:** barrier system status

Current operating status of barrier systems. Barrier systems represent gates, barriers and other automated or remotely controlled systems used to manage entry to roadways. Status of the systems includes operating condition and current operational state.

### Logical Architecture Data Flow(s):

barrier\_system\_status\_to\_m\_and\_c

**Physical Architecture Flow Name:** environmental probe data

Data from vehicle safety and convenience systems that can be used to estimate environmental conditions, including measured air temperature, exterior light status, wiper status, sun sensor status, rain sensor status, traction control status, anti-lock brake status, and other collected vehicle system status and sensor information. The collected data is reported along with the location, heading, and time that the data was collected. Both current data and snapshots of recent events (e.g., traction control or anti-lock brake system activations) may be reported.

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### **Logical Architecture Data Flow(s):**

vehicle\_env\_probe\_data\_for\_maint  
vehicle\_env\_probe\_data\_for\_infrastructure\_maint  
vehicle\_env\_probe\_status\_for\_maint

**Physical Architecture Flow Name:** environmental sensor data

Current road conditions (e.g., surface temperature, subsurface temperature, moisture, icing, treatment status) and surface weather conditions (e.g., air temperature, wind speed, precipitation, visibility) as measured and reported by fixed and/or mobile environmental sensors. Operational status of the sensors is also included.

### **Logical Architecture Data Flow(s):**

environmental\_sensor\_status\_from\_roadway\_sensors  
environmental\_sensor\_data\_from\_roadway\_sensors

**Physical Architecture Flow Name:** field device status

Reports from field equipment (sensors, signals, signs, controllers, etc.) which indicate current operational status.

### **Logical Architecture Data Flow(s):**

field equip\_status\_for\_m\_and\_c

**Physical Architecture Flow Name:** infrastructure monitoring sensor data

Data read from infrastructure-based sensors that monitor the condition or integrity of transportation infrastructure including bridges, tunnels, interchanges, pavement, culverts, signs, transit rail or guideway, and other roadway infrastructure. Includes sensor data and the operational status of the sensors.

### **Logical Architecture Data Flow(s):**

infrastructure\_sensor\_data\_for\_m\_and\_c  
infrastructure\_sensor\_status\_for\_m\_and\_c

**Physical Architecture Flow Name:** roadway information system status

Current operating status of dynamic message signs, highway advisory radios, beacon systems, or other configurable field equipment that provides dynamic information to the driver.

### **Logical Architecture Data Flow(s):**

dms\_status\_for\_m\_and\_c  
har\_status\_for\_m\_and\_c  
dms\_auto\_treat\_status\_to\_maint

**Physical Architecture Flow Name:** roadway treatment system status

Current operational status of automated roadway treatment devices (e.g., anti-icing systems).

### **Logical Architecture Data Flow(s):**

roadway\_treatment\_system\_status

**Physical Architecture Flow Name:** speed monitoring information

System status including current operational state and logged information including measured speeds, warning messages displayed, and violation records.

### **Logical Architecture Data Flow(s):**

speed\_data\_for\_m\_and\_c\_speed\_monitoring  
speed\_sensor\_log\_for\_m\_and\_c  
speed\_sensor\_status\_for\_m\_and\_c  
speed\_violation\_notification\_for\_m\_and\_c

**Physical Architecture Flow Name:** traffic images

High fidelity, real-time traffic images suitable for surveillance monitoring by the operator or for use in machine vision applications.

## Roadway

### Logical Architecture Data Flow(s):

video\_device\_status\_for\_m\_and\_c  
work\_zone\_images

**Physical Architecture Flow Name:** work zone warning status

Status of a work zone safety monitoring and warning devices. This flow documents system activations and includes additional supporting information (e.g., an image) that allows verification of the alarm.

### Logical Architecture Data Flow(s):

work\_zone\_intrusion\_video\_image  
work\_zone\_intrusion\_alert  
work\_zone\_intrusion\_detected  
intrusion\_alert\_device\_status  
intrusion\_detection\_device\_status  
roadside\_crew\_warning\_given

**Roadway** => **Maintenance and Construction Management**

**Physical Architecture Flow Name:** barrier system status

Current operating status of barrier systems. Barrier systems represent gates, barriers and other automated or remotely controlled systems used to manage entry to roadways. Status of the systems includes operating condition and current operational state.

### Logical Architecture Data Flow(s):

barrier\_system\_status\_to\_mcv

**Physical Architecture Flow Name:** environmental sensor data

Current road conditions (e.g., surface temperature, subsurface temperature, moisture, icing, treatment status) and surface weather conditions (e.g., air temperature, wind speed, precipitation, visibility) as measured and reported by fixed and/or mobile environmental sensors. Operational status of the sensors is also included.

### Logical Architecture Data Flow(s):

environmental\_sensor\_data\_from\_roadway  
environmental\_sensor\_status\_from\_roadway

**Physical Architecture Flow Name:** infrastructure monitoring sensor data

Data read from infrastructure-based sensors that monitor the condition or integrity of transportation infrastructure including bridges, tunnels, interchanges, pavement, culverts, signs, transit rail or guideway, and other roadway infrastructure. Includes sensor data and the operational status of the sensors.

### Logical Architecture Data Flow(s):

infrastructure\_sensor\_status\_for\_mcv  
infrastructure\_sensor\_data\_for\_mcv

**Physical Architecture Flow Name:** roadway information system status

Current operating status of dynamic message signs, highway advisory radios, beacon systems, or other configurable field equipment that provides dynamic information to the driver.

### Logical Architecture Data Flow(s):

dms\_status\_for\_mcv

**Physical Architecture Flow Name:** work zone warning notification

Notification of a work zone emergency or safety issue. This flow identifies that a work zone emergency or safety issue has occurred so that warnings may be generated by more than one system in the work zone.

### Logical Architecture Data Flow(s):

work\_zone\_intrusion\_detection\_for\_on\_board



## Roadway

### Roadway => Map Update Provider

**Physical Architecture Flow Name:** traffic probe data

Vehicle data that is used to determine traffic conditions. In a basic implementation, the data could be limited to time stamped unique identifiers that can be used to measure a vehicle's progress through the network. In more advanced implementations, the vehicle may report current position, speed, and heading and snapshots of recent events including route information, starts and stops, speed changes, and other information that can be used to estimate traffic conditions.

**Logical Architecture Data Flow(s):**

tmup-traffic\_probe\_data

### Roadway => Multimodal Crossings

**Physical Architecture Flow Name:** highway control status

Current traffic control equipment status that indicates operational status and right-of-way availability to the non-highway transportation mode at a multimodal crossing.

**Logical Architecture Data Flow(s):**

tmmc-stop\_alternate\_mode\_at\_highways  
tmmc-road\_equipment\_status  
tmmc-highway\_equipment\_status  
tmmc-crossing\_clear\_at\_roads  
tmmc-stop\_alternate\_mode\_at\_roads  
tmmc-crossing\_clear\_at\_highways

### Roadway => Other Roadway

**Physical Architecture Flow Name:** roadway equipment coordination

The direct flow of information between field equipment. This includes transfer of information between sensors and driver information systems (e.g., DMS, HAR, variable speed limit signs, dynamic lane signs) or control devices (e.g., traffic signals, ramp meters), direct coordination between adjacent control devices, interfaces between detection and warning or alarm systems, and any other direct communications between field equipment.

**Logical Architecture Data Flow(s):**

tors-sensor\_data  
tors-device\_control  
tors-sensor\_status  
tors-sensor\_control  
tors-roadway\_info\_data\_from\_devices  
tors-device\_status  
tors-roadway\_info\_data\_from\_sensors

**Physical Architecture Flow Name:** signal control data

Information used to configure local traffic signal controllers.

**Logical Architecture Data Flow(s):**

tors-signal\_fault  
tors-signal\_control  
tors-signal\_status

### Roadway => Pedestrians

**Physical Architecture Flow Name:** crossing permission

Signal to pedestrians indicating permission to cross roadway.

**Logical Architecture Data Flow(s):**

tp-dms\_indication  
tp-cross\_request\_received

## Roadway

tp-cross\_road

## Roadway

=> **Surface Transportation  
Weather Service**

**Physical Architecture Flow Name:** environmental probe data

Data from vehicle safety and convenience systems that can be used to estimate environmental conditions, including measured air temperature, exterior light status, wiper status, sun sensor status, rain sensor status, traction control status, anti-lock brake status, and other collected vehicle system status and sensor information. The collected data is reported along with the location, heading, and time that the data was collected. Both current data and snapshots of recent events (e.g., traction control or anti-lock brake system activations) may be reported.

**Logical Architecture Data Flow(s):**

tstws-vehicle\_env\_probe\_data  
tstws-vehicle\_env\_probe\_status

**Physical Architecture Flow Name:** environmental sensor data

Current road conditions (e.g., surface temperature, subsurface temperature, moisture, icing, treatment status) and surface weather conditions (e.g., air temperature, wind speed, precipitation, visibility) as measured and reported by fixed and/or mobile environmental sensors. Operational status of the sensors is also included.

**Logical Architecture Data Flow(s):**

tstws-roadway\_env\_sensor\_status  
tstws-roadway\_env\_sensor\_data

## Roadway

=> **Traffic Management**

**Physical Architecture Flow Name:** automated roadway status

Current operational status of an automated vehicle operations facility, including the status of the field equipment and vehicles using the facility.

**Logical Architecture Data Flow(s):**

avo\_device\_status  
avo\_checking\_details

**Physical Architecture Flow Name:** barrier system status

Current operating status of barrier systems. Barrier systems represent gates, barriers and other automated or remotely controlled systems used to manage entry to roadways. Status of the systems includes operating condition and current operational state.

**Logical Architecture Data Flow(s):**

barrier\_system\_status  
barrier\_system\_device\_status

**Physical Architecture Flow Name:** environmental sensor data

Current road conditions (e.g., surface temperature, subsurface temperature, moisture, icing, treatment status) and surface weather conditions (e.g., air temperature, wind speed, precipitation, visibility) as measured and reported by fixed and/or mobile environmental sensors. Operational status of the sensors is also included.

**Logical Architecture Data Flow(s):**

environment\_sensor\_data  
environmental\_sensor\_status

**Physical Architecture Flow Name:** hov data

Current HOV lane information including both standard traffic flow measures and information regarding vehicle occupancy in HOV lanes, and operational status of the HOV monitoring equipment.

## Roadway

### **Logical Architecture Data Flow(s):**

- hov\_sensor\_status
- hov\_sensor\_data
- hov\_lane\_data\_input

**Physical Architecture Flow Name:** hri status

Status of the highway-rail intersection equipment including both the current state or mode of operation and the current equipment condition.

### **Logical Architecture Data Flow(s):**

- hri\_guidance\_for\_roadway\_info
- hri\_status
- hri\_traffic\_data
- traffic\_management\_request
- rail\_operations\_message

**Physical Architecture Flow Name:** intersection blockage notification

Notification that a highway-rail intersection is obstructed and supporting information.

### **Logical Architecture Data Flow(s):**

- intersection\_blocked
- hri\_blockage

**Physical Architecture Flow Name:** lane management information

System status including current operational state, violations, and logged information.

### **Logical Architecture Data Flow(s):**

- lane\_violation\_notification\_for\_traffic
- dynamic\_lane\_sensor\_data
- lane\_management\_device\_status
- lane\_management\_status

**Physical Architecture Flow Name:** lighting system status

Status of roadside lighting controls including operating condition and current operational state.

### **Logical Architecture Data Flow(s):**

- lighting\_system\_status
- lighting\_system\_device\_status

**Physical Architecture Flow Name:** reversible lane status

Current reversible lane status including traffic sensor and surveillance data and the operational status and mode of the reversible lane control equipment.

### **Logical Architecture Data Flow(s):**

- reversible\_lane\_control\_device\_status\_from\_highways
- reversible\_lane\_control\_device\_status\_from\_roads
- reversible\_lane\_sensor\_data
- reversible\_lane\_sensor\_status
- reversible\_lane\_video\_images

**Physical Architecture Flow Name:** right-of-way request notification

Notice that a request has occurred for signal prioritization, signal preemption, pedestrian call, multi-modal crossing activation, or other source for right-of-way.

### **Logical Architecture Data Flow(s):**

- multimodal\_crossing\_sensor\_status
- pedestrian\_sensor\_status
- pedestrian\_sensor\_data
- multimodal\_crossing\_sensor\_data
- signal\_preemption\_override
- signal\_priority\_override

## Roadway

**Physical Architecture Flow Name:** road user protection data

Current data as well as operational status from mixed roadway and right-of-way systems.

**Logical Architecture Data Flow(s):**

road\_user\_protection\_device\_status  
road\_user\_protection\_data\_for\_traffic

**Physical Architecture Flow Name:** roadway information system status

Current operating status of dynamic message signs, highway advisory radios, beacon systems, or other configurable field equipment that provides dynamic information to the driver.

**Logical Architecture Data Flow(s):**

dms\_status  
har\_status

**Physical Architecture Flow Name:** roadway warning system status

Current operating status of roadway warning systems.

**Logical Architecture Data Flow(s):**

roadway\_warning\_device\_status  
roadway\_warning\_system\_status

**Physical Architecture Flow Name:** safeguard system status

Current operating status of safeguard systems (remotely controlled equipment used to mitigate the impact of incidents on transportation infrastructure, such as blast shields, exhaust systems, etc.). Status of the systems includes operating condition and current operational state.

**Logical Architecture Data Flow(s):**

safeguard\_system\_device\_status  
safeguard\_system\_status

**Physical Architecture Flow Name:** short range communications status

Status of the short range communications equipment including the current state or mode of operation and the current equipment status.

**Logical Architecture Data Flow(s):**

vehicle\_sign\_status

**Physical Architecture Flow Name:** shoulder management information

System status including current operational state, violations and logged information.

**Logical Architecture Data Flow(s):**

shoulder\_violation\_notification\_for\_traffic  
shoulder\_management\_status  
shoulder\_management\_device\_status

**Physical Architecture Flow Name:** signal control status

Operational and status data of traffic signal control equipment including operating condition and current indications.

**Logical Architecture Data Flow(s):**

indicator\_input\_data\_from\_signals  
indicator\_status\_from\_signals

**Physical Architecture Flow Name:** signal fault data

Faults from traffic signal control equipment.

**Logical Architecture Data Flow(s):**

indicator\_faults\_from\_signals  
field\_management\_station\_fault\_indication

## Roadway

**Physical Architecture Flow Name:** speed monitoring information

System status including current operational state and logged information including measured speeds, warning messages displayed, and violation records.

**Logical Architecture Data Flow(s):**

- speed\_violation\_notification\_for\_traffic
- speed\_sensor\_status
- speed\_sensor\_log\_for\_traffic
- speed\_data\_for\_traffic\_speed\_monitoring

**Physical Architecture Flow Name:** traffic flow

Raw and/or processed traffic detector data which allows derivation of traffic flow variables (e.g., speed, volume, and density measures) and associated information (e.g., congestion, potential incidents). This flow includes the traffic data and the operational status of the traffic detectors.

**Logical Architecture Data Flow(s):**

- traffic\_sensor\_status
- incident\_analysis\_data
- traffic\_sensor\_data
- traffic\_image\_data

**Physical Architecture Flow Name:** traffic images

High fidelity, real-time traffic images suitable for surveillance monitoring by the operator or for use in machine vision applications.

**Logical Architecture Data Flow(s):**

- traffic\_video\_image\_for\_display
- dynamic\_lane\_video\_image
- video\_device\_status
- traffic\_video\_image
- incident\_video\_image

**Physical Architecture Flow Name:** traffic metering status

Current operational status and operating parameters for ramp meters, interchange meters, mainline meters and other control equipment associated with roadway metering operations.

**Logical Architecture Data Flow(s):**

- indicator\_status\_from\_traffic\_meters
- indicator\_input\_data\_from\_traffic\_meters

**Physical Architecture Flow Name:** traffic probe data

Vehicle data that is used to determine traffic conditions. In a basic implementation, the data could be limited to time stamped unique identifiers that can be used to measure a vehicle's progress through the network. In more advanced implementations, the vehicle may report current position, speed, and heading and snapshots of recent events including route information, starts and stops, speed changes, and other information that can be used to estimate traffic conditions.

**Logical Architecture Data Flow(s):**

- vehicle\_traffic\_probe\_equip\_status
- vehicle\_traffic\_probe\_data\_for\_traffic

**Physical Architecture Flow Name:** variable speed limit status

Current operating status of the variable speed limit systems including the state of the equipment.

**Logical Architecture Data Flow(s):**

- variable\_speed\_limit\_status

## Roadway

=> **Vehicle**

**Physical Architecture Flow Name:** access permission

Information returned indicating whether permission for access is granted and instructions for

## Roadway

proceeding.

### **Logical Architecture Data Flow(s):**

vehicle\_barrier\_access\_status

**Physical Architecture Flow Name:** automated vehicle control data

Instructions and control parameters for automated vehicle operation including current system conditions and advisories, control parameters (e.g., speed and performance profiles, headways), maneuver coordination, and check in/checkout instructions.

### **Logical Architecture Data Flow(s):**

avo\_check\_response  
lane\_change\_strategy  
lane\_change\_details

**Physical Architecture Flow Name:** broadcast traveler information

General traveler information that contains traffic and road conditions, link travel times, incidents, advisories, restrictions, transit service information, weather information, parking information, and other related traveler information.

### **Logical Architecture Data Flow(s):**

field\_to\_vehicle\_broadcast\_weather\_data  
field\_to\_vehicle\_broadcast\_transit\_data  
field\_to\_vehicle\_broadcast\_traffic\_data  
field\_to\_vehicle\_broadcast\_price\_data  
field\_to\_vehicle\_broadcast\_parking\_data  
field\_to\_vehicle\_broadcast\_multimodal\_data  
field\_to\_vehicle\_broadcast\_incident\_information  
field\_to\_vehicle\_broadcast\_border\_data  
field\_to\_vehicle\_broadcast\_event\_information

**Physical Architecture Flow Name:** emergency traveler information

Public notification of an emergency such as a natural or man-made disaster, civil emergency, or child abduction. This flow also includes evacuation information including evacuation instructions, evacuation zones, recommended evacuation times, tailored evacuation routes and destinations, traffic and road conditions along the evacuation routes, traveler services and shelter information, and reentry times and instructions.

### **Logical Architecture Data Flow(s):**

field\_to\_vehicle\_emergency\_traveler\_information  
field\_to\_vehicle\_evacuation\_traveler\_information  
field\_to\_vehicle\_transportation\_system\_status  
field\_to\_vehicle\_wide\_area\_alert\_information

**Physical Architecture Flow Name:** intersection status

Intersection status including current operational status, signal phase and timing information, intersection geometry, surface conditions, warnings of potential violations or hazardous conditions, and approaching vehicle information. This may include information about the position, velocity, acceleration, and turning status of approaching vehicles.

### **Logical Architecture Data Flow(s):**

intersection\_status\_data\_for\_vehicle  
intersection\_collision\_avoidance\_data

**Physical Architecture Flow Name:** roadway safety data

Information about potential safety hazards in the vehicle path such as stalled vehicles, wrong way drivers, debris, or standing water.

### **Logical Architecture Data Flow(s):**

roadside\_safety\_data\_to\_vehicle

**Physical Architecture Flow Name:** traffic probe reporting management

Data used to manage probe data reporting by vehicles. This flow indicates to the vehicle when

## Roadway

to report probe data, the type of probe data to send, and thresholds for nominal conditions when sending data can be skipped.

### Logical Architecture Data Flow(s):

vehicle\_traffic\_probe\_configuration

**Physical Architecture Flow Name:** vehicle signage data

In-vehicle signing data that augments regulatory, warning, and informational road signs and signals. The information provided would include static sign information (e.g., stop, curve warning, guide signs, service signs, and directional signs) and dynamic information (e.g., current signal states, grade crossing information, local traffic and road conditions, advisories,

### Logical Architecture Data Flow(s):

vehicle\_env\_probe\_data\_output  
vehicle\_signage\_emissions\_testing\_results  
intrusion\_alert\_for\_in\_vehicle\_signing  
vehicle\_signage\_data

**Roadway** => **Wayside Equipment**

**Physical Architecture Flow Name:** hri operational status

Status of the highway-rail grade crossing equipment including both the current state or mode of operation and the current equipment condition.

### Logical Architecture Data Flow(s):

twe-hri\_status

**Physical Architecture Flow Name:** intersection blockage notification

Notification that a highway-rail intersection is obstructed and supporting information.

### Logical Architecture Data Flow(s):

twe-stop\_train\_indication  
twe-stop\_highway\_indication

**Roadway** => **Weather Service**

**Physical Architecture Flow Name:** environmental probe data

Data from vehicle safety and convenience systems that can be used to estimate environmental conditions, including measured air temperature, exterior light status, wiper status, sun sensor status, rain sensor status, traction control status, anti-lock brake status, and other collected vehicle system status and sensor information. The collected data is reported along with the location, heading, and time that the data was collected. Both current data and snapshots of recent events (e.g., traction control or anti-lock brake system activations) may be reported.

### Logical Architecture Data Flow(s):

tws-vehicle\_env\_probe\_status  
tws-vehicle\_env\_probe\_data

**Physical Architecture Flow Name:** environmental sensor data

Current road conditions (e.g., surface temperature, subsurface temperature, moisture, icing, treatment status) and surface weather conditions (e.g., air temperature, wind speed, precipitation, visibility) as measured and reported by fixed and/or mobile environmental sensors. Operational status of the sensors is also included.

### Logical Architecture Data Flow(s):

tws-roadway\_env\_sensor\_data  
tws-roadway\_env\_sensor\_status

**Roadway Environment** => **Roadway**

**Physical Architecture Flow Name:** environmental conditions

## Roadway

Current road conditions (e.g., surface temperature, subsurface temperature, moisture, icing, treatment status) and surface weather conditions (e.g., air temperature, wind speed, precipitation, visibility) that are measured by environmental sensors.

### Logical Architecture Data Flow(s):

- fre-physical\_conditions
- fre-environmental\_conditions
- fre-roadway\_infrastructure\_characteristics

**Surface Transportation Weather Service** => **Roadway**

**Physical Architecture Flow Name:** environmental sensors control

Data used to configure and control environmental sensors.

### Logical Architecture Data Flow(s):

- fstws-roadway\_env\_sensor\_control

**Traffic** => **Roadway**

**Physical Architecture Flow Name:** traffic characteristics

Physical traffic characteristics which are monitored and translated into macroscopic measures like occupancy, volume, density, and average speed. Point measures support presence detection and individual vehicle measures like speed.

### Logical Architecture Data Flow(s):

- ftrf-vehicle\_pollutant\_levels
- ftrf-traffic\_images
- ftrf-vehicle\_presence
- ftrf-traffic\_data

**Traffic Management** => **Roadway**

**Physical Architecture Flow Name:** automated roadway control data

Control commands and operating parameters provided to field equipment that controls and monitors automated vehicle operations.

### Logical Architecture Data Flow(s):

- avo\_control\_data\_changes
- automated\_lane\_changing\_control\_data

**Physical Architecture Flow Name:** barrier system control

Information used to configure and control barrier systems that are represented by gates, barriers and other automated or remotely controlled systems used to manage entry to roadways.

### Logical Architecture Data Flow(s):

- barrier\_system\_control

**Physical Architecture Flow Name:** environmental sensors control

Data used to configure and control environmental sensors.

### Logical Architecture Data Flow(s):

- env\_sensor\_control\_to\_roadway

**Physical Architecture Flow Name:** hri control data

Data required for HRI information transmitted at railroad grade crossings and within railroad operations.

### Logical Architecture Data Flow(s):

- rail\_operations\_device\_command
- rail\_operations\_advisories



## Roadway

indicator\_sign\_control\_data\_for\_hri  
hri\_traffic\_surveillance

**Physical Architecture Flow Name:** hri request

A request for highway-rail intersection status or a specific control request intended to modify HRI operation.

**Logical Architecture Data Flow(s):**

tms\_requests  
rail\_operations\_requests

**Physical Architecture Flow Name:** lane management control

Information used to configure and control dynamic lane management systems.

**Logical Architecture Data Flow(s):**

lane\_management\_control

**Physical Architecture Flow Name:** lighting system control data

Information used to configure and control roadside lighting systems.

**Logical Architecture Data Flow(s):**

lighting\_system\_control

**Physical Architecture Flow Name:** reversible lane control

Control of automated reversible lane configuration and driver information systems.

**Logical Architecture Data Flow(s):**

reversible\_lane\_control\_for\_roads  
reversible\_lane\_control\_for\_highways

**Physical Architecture Flow Name:** road user protection device control

Control requests and operating parameters for mixed roadway and right-of-way systems.

**Logical Architecture Data Flow(s):**

road\_user\_protection\_device\_configuration

**Physical Architecture Flow Name:** roadway information system data

Information used to initialize, configure, and control roadside systems that provide driver information (e.g., dynamic message signs, highway advisory radio, beacon systems). This flow can provide message content and delivery attributes, local message store maintenance requests, control mode commands, status queries, and all other commands and associated parameters that support remote management of these systems.

**Logical Architecture Data Flow(s):**

dms\_traffic\_metering\_data  
har\_data  
dms\_data  
har\_wide\_area\_alert\_information  
dms\_variable\_speed\_limit\_data  
dms\_control\_data  
dms\_wide\_area\_alert\_information

**Physical Architecture Flow Name:** roadway warning system control

Information used to configure and control roadway warning systems.

**Logical Architecture Data Flow(s):**

roadway\_warning\_system\_control

**Physical Architecture Flow Name:** safeguard system control

Data that controls safeguard systems (remotely controlled equipment used to mitigate the impact of incidents on transportation infrastructure, such as blast shields, exhaust systems,

## Roadway

**Logical Architecture Data Flow(s):**

safeguard\_system\_control

**Physical Architecture Flow Name:** shoulder management control

Information used to configure and control systems that allow use of a shoulder as a lane for vehicular traffic.

**Logical Architecture Data Flow(s):**

shoulder\_management\_control

**Physical Architecture Flow Name:** signal control commands

Control of traffic signal controllers or field masters including clock synchronization.

**Logical Architecture Data Flow(s):**

indicator\_control\_data\_for\_signal\_control

**Physical Architecture Flow Name:** signal control device configuration

Data used to configure traffic signal control equipment including local controllers and system masters.

**Logical Architecture Data Flow(s):**

indicator\_control\_configuration\_data\_for\_signal\_control

**Physical Architecture Flow Name:** signal control plans

Traffic signal timing parameters including minimum green time and interval durations for basic operation and cycle length, splits, offset, phase sequence, etc. for coordinated systems.

**Logical Architecture Data Flow(s):**

signal\_system\_timing\_plan

**Physical Architecture Flow Name:** signal system configuration

Data used to configure traffic signal systems including configuring control sections and mode of operation (time based or traffic responsive).

**Logical Architecture Data Flow(s):**

signal\_system\_configuration

**Physical Architecture Flow Name:** speed monitoring control

Information used to configure and control automated speed monitoring, speed warning, and speed enforcement systems.

**Logical Architecture Data Flow(s):**

speed\_sensor\_control\_from\_traffic

**Physical Architecture Flow Name:** traffic metering control

Control commands and operating parameters for ramp meters, interchange meters, mainline meters, and other systems equipment associated with roadway metering operations.

**Logical Architecture Data Flow(s):**

indicator\_control\_data\_for\_traffic\_metering  
indicator\_control\_monitoring\_data\_for\_traffic\_metering

**Physical Architecture Flow Name:** traffic sensor control

Information used to configure and control traffic sensor systems.

**Logical Architecture Data Flow(s):**

sensor\_configuration\_data

**Physical Architecture Flow Name:** variable speed limit control

Information used to configure and control variable speed limit systems including the equipment used to provide current speed limits and other information to drivers and the equipment used to monitor traffic and environmental conditions along the roadway.

## Roadway

### Logical Architecture Data Flow(s):

variable\_speed\_limit\_control

**Physical Architecture Flow Name:** vehicle signage data

In-vehicle signing data that augments regulatory, warning, and informational road signs and signals. The information provided would include static sign information (e.g., stop, curve warning, guide signs, service signs, and directional signs) and dynamic information (e.g., current signal states, grade crossing information, local traffic and road conditions, advisories, and detours).

### Logical Architecture Data Flow(s):

vehicle\_sign\_data

**Physical Architecture Flow Name:** video surveillance control

Information used to configure and control video surveillance systems.

### Logical Architecture Data Flow(s):

incident\_video\_image\_control

**Transit Vehicle** => **Roadway**

**Physical Architecture Flow Name:** local signal priority request

Request from a vehicle to a signalized intersection for priority at that intersection.

### Logical Architecture Data Flow(s):

transit\_vehicle\_roadway\_priorities

**Vehicle** => **Roadway**

**Physical Architecture Flow Name:** access request

Request for access to an access-controlled transportation facility.

### Logical Architecture Data Flow(s):

vehicle\_barrier\_access\_request

**Physical Architecture Flow Name:** automated vehicle status

Data provided by an automated vehicle identifying its current mode and operational status, current position and motion, preferred route, and information provided to support checking/checkout and coordinated maneuvers while on the automated facility.

### Logical Architecture Data Flow(s):

avo\_route\_data

avo\_vehicle\_condition

**Physical Architecture Flow Name:** environmental probe data

Data from vehicle safety and convenience systems that can be used to estimate environmental conditions, including measured air temperature, exterior light status, wiper status, sun sensor status, rain sensor status, traction control status, anti-lock brake status, and other collected vehicle system status and sensor information. The collected data is reported along with the location, heading, and time that the data was collected. Both current data and snapshots of recent events (e.g., traction control or anti-lock brake system activations) may be reported.

### Logical Architecture Data Flow(s):

vehicle\_env\_probe\_data

**Physical Architecture Flow Name:** probe archive data

Probe data that allows calculation of travel times, volumes, and other measures that support transportation planning. Optionally, this flow also includes origin and destination information for vehicles that opt to provide this information.

### Logical Architecture Data Flow(s):

vehicle\_guidance\_probe\_data\_for\_archive

## Roadway

vehicle\_traffic\_probe\_data\_for\_archive

**Physical Architecture Flow Name:** traffic probe data

Vehicle data that is used to determine traffic conditions. In a basic implementation, the data could be limited to time stamped unique identifiers that can be used to measure a vehicle's progress through the network. In more advanced implementations, the vehicle may report current position, speed, and heading and snapshots of recent events including route information, starts and stops, speed changes, and other information that can be used to estimate traffic conditions.

**Logical Architecture Data Flow(s):**

vehicle\_traffic\_probe\_data  
vehicle\_guidance\_probe\_data

**Physical Architecture Flow Name:** vehicle diagnostics data

Information about the vehicle and its current operational status that supports vehicle performance monitoring, service, and repair. The flow identifies the vehicle and vehicle type and provides information about the vehicle's current operational status, the current performance of engine-related components, and notification of any identified malfunctions.

**Logical Architecture Data Flow(s):**

vehicle\_status\_details\_for\_emissions

**Physical Architecture Flow Name:** vehicle intersection safety data

Vehicle path and acceleration data provided by vehicles approaching or occupying an intersection. It identifies the intersection, vehicle position and motion, the anticipated lane and movement that will be used in the intersection, and notification of potential violations or other detected safety hazards.

**Logical Architecture Data Flow(s):**

vehicle\_status\_for\_intersection

**Physical Architecture Flow Name:** vehicle occupancy

The number of occupants detected by the vehicle.

**Logical Architecture Data Flow(s):**

vehicle\_occupants\_detected

**Physical Architecture Flow Name:** vehicle profile

Information about a vehicle including vehicle type and equipment capabilities.

**Logical Architecture Data Flow(s):**

vehicle\_characteristics\_for\_roadway

**Physical Architecture Flow Name:** vehicle safety data

Vehicle safety data indicating vehicle location, vehicle motion (speed, heading, acceleration), vehicle control (brakes, steering, throttle, exterior lights), basic vehicle characteristics (length, width). May also include additional vehicle status (e.g., anti-lock brake activation, stability control system activation).

**Logical Architecture Data Flow(s):**

vehicle\_roadside\_safety\_data

**Vehicle Characteristics** => **Roadway**

**Physical Architecture Flow Name:** vehicle characteristics

The physical or visible characteristics of an individual vehicle that can be measured to classify a vehicle and imaged to uniquely identify a vehicle.

**Logical Architecture Data Flow(s):**

From\_Vehicle\_Characteristics

**Wayside Equipment** => **Roadway**

## Roadway

**Physical Architecture Flow Name:** arriving train information

Information for a train approaching a highway-rail intersection that may include direction and allow calculation of approximate arrival time and closure duration.

**Logical Architecture Data Flow(s):**

fwe-train\_data

**Physical Architecture Flow Name:** track status

Current status of the wayside equipment and notification of an arriving train.

**Logical Architecture Data Flow(s):**

fwe-approaching\_train\_announcement

fwe-wayside\_equipment\_status

**Weather Service** => **Roadway**

**Physical Architecture Flow Name:** environmental sensors control

Data used to configure and control environmental sensors.

**Logical Architecture Data Flow(s):**

fws-roadway\_env\_sensor\_control

### 2.18.3 *Architecture Flow Diagrams for RS*

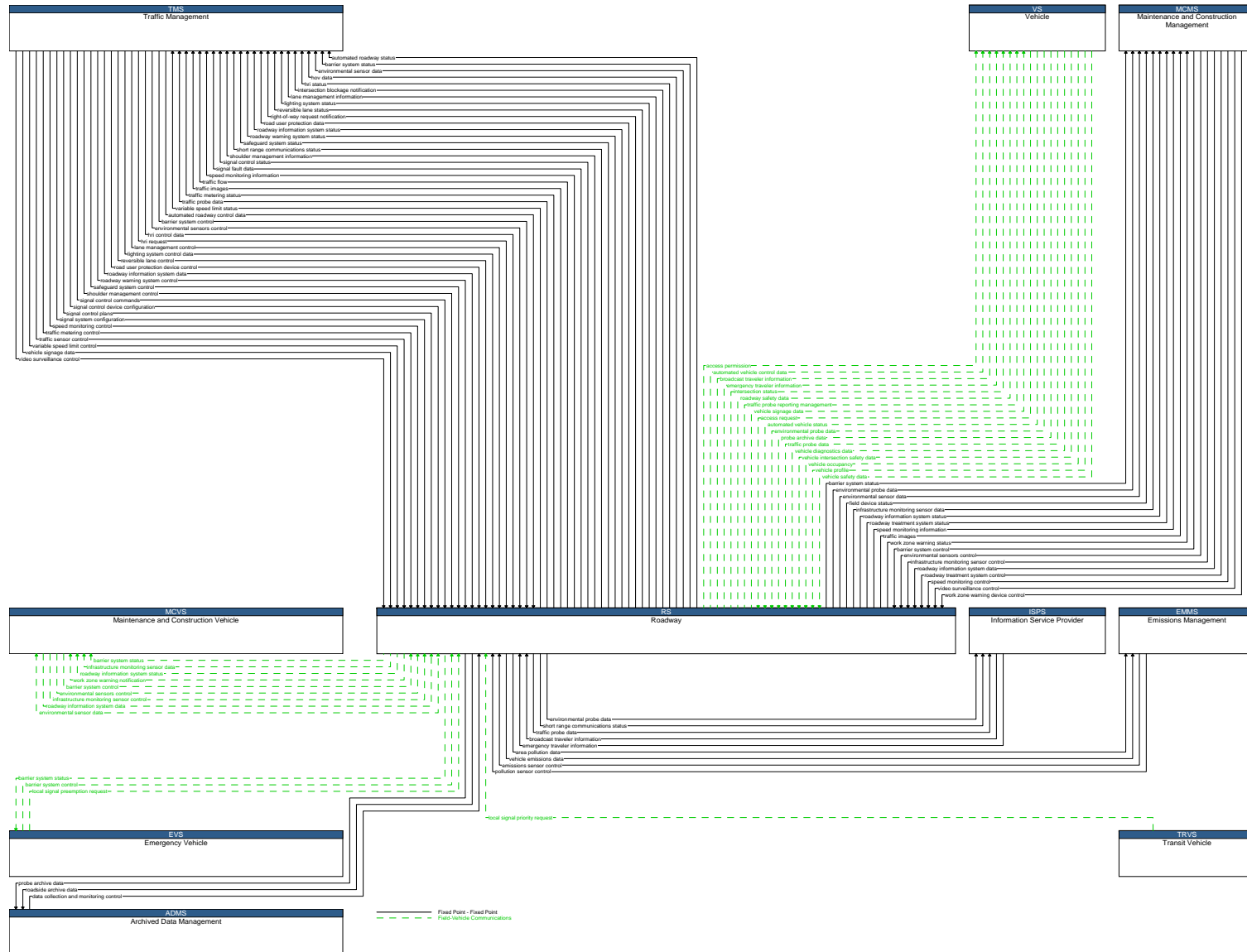


Figure 32: RS Subsystem Interfaces

# Roadway

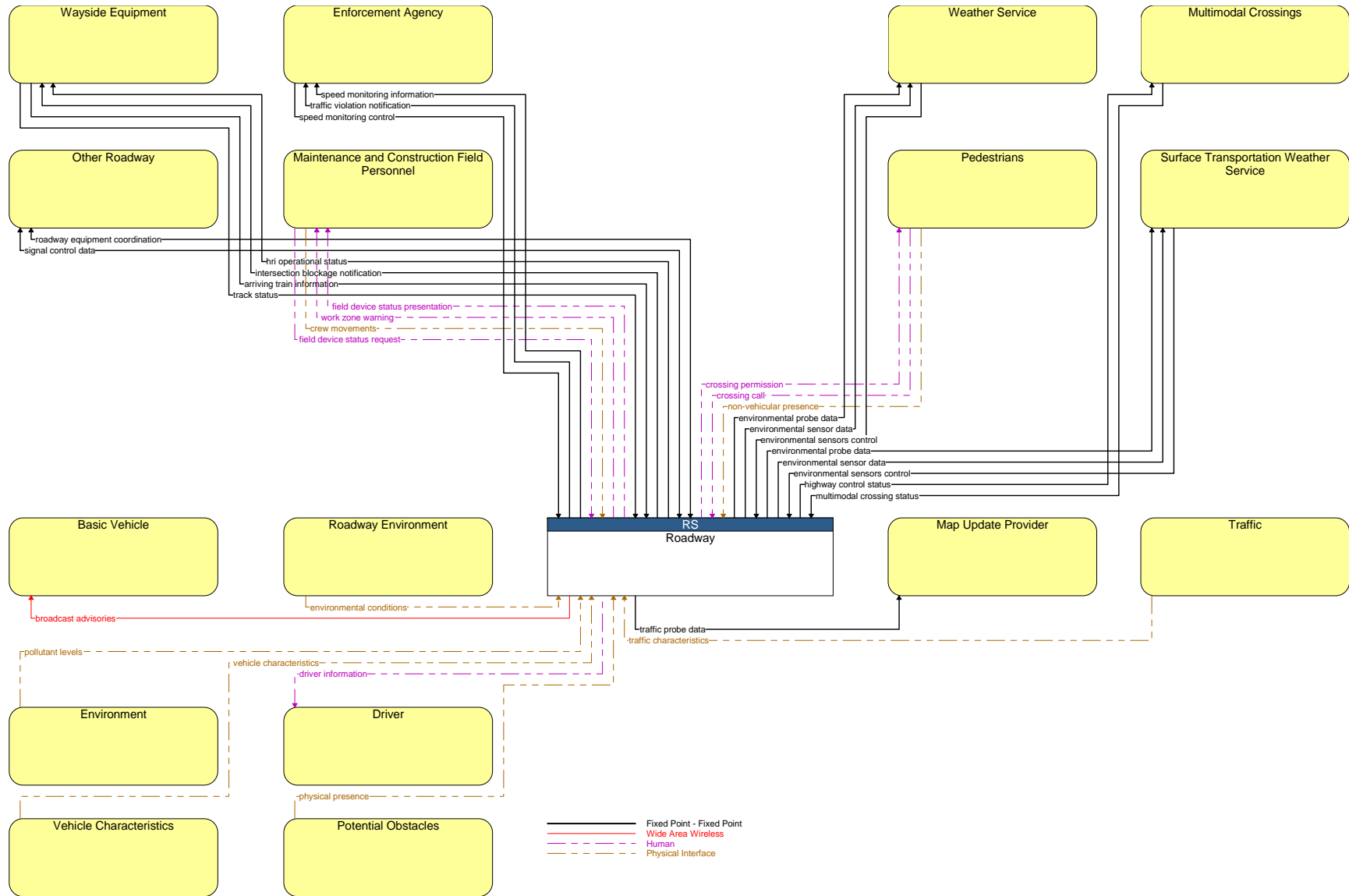


Figure 33: RS Terminator Interfaces

## 2.19 Roadway Payment

The Roadway Payment Subsystem (RPS) represents the roadway components of a toll collection, vehicle miles traveled (VMT), congestion charging, and other systems that support payment from a vehicle. As a toll collection system, this subsystem provides the capability for vehicle operators to pay tolls without stopping their vehicles. It supports use of locally determined pricing structures and includes the capability to implement various variable road pricing policies. Each transaction is accompanied by feedback to the customer indicating the general status of the customer account. A record of the transactions is provided to the Payment Administration Subsystem for reconciliation and so that the customer can periodically receive a detailed record of the transactions.

The RPS can represent equipment at fixed locations or mobile equipment that supports spot inspection to verify the vehicle equipment is configured correctly and operational. Fixed roadway equipment supports relay of VMT data and equipment status to the Payment Administration Subsystem. RPS elements can be located at traditional toll collection locations (i.e. toll plazas) to support traditional roadway toll functions, as well as at gas stations or public or privately operated auto mechanic shops or vehicle inspection stations) for relaying VMT data.

### 2.19.1 Equipment Packages and Process Specifications for RPS

#### Equipment Package: Roadway VMT Payment

This equipment package receives VMT data (time stamped roadways used by the vehicle since the last transmission) and forwards this to the Payment Administration subsystem. The EP also receives VMT equipment status from the vehicle and with vehicle characteristics sensed from the vehicle (number of axels, weight, vehicle tag image/ID) determines if there is any fault in the vehicle. If so, it forwards the fault information to the Payment Administration subsystem. Finally, it forwards vehicle payment requests from the PAS to the Vehicle and forwards vehicle payment information from the vehicle to the PAS.

#### Process Specifications

- 7.6.1.1 Collect VMT Data
- 7.6.1.3 Bill Driver for VMT
- 7.6.2 Obtain VMT Vehicle Image
- 7.6.7 Collect VMT Equipment Status

#### Equipment Package: Toll Plaza Toll Collection

This equipment package provides toll plazas the capability to identify properly equipped vehicles, collect electronic tolls, and provide a positive indication to the driver that a toll was collected. Violators are identified and images are collected. Toll transactions are stored and reported to the Payment Administration Subsystem.

#### Process Specifications

- 7.1.1.1 Read Vehicle Payment Data for Tolls
- 7.1.1.10 Determine Advanced Toll Bill
- 7.1.1.2 Calculate Vehicle Toll
- 7.1.1.4 Check for Advanced Tolls Payment
- 7.1.1.5 Bill Driver for Tolls
- 7.1.2 Produce Roadside Displays
- 7.1.3 Obtain Toll Violator Image
- 7.1.5 Detect Vehicle for Tolls

### 2.19.2 Interfaces for RPS

**Payment Administration** => **Roadway Payment**

**Physical Architecture Flow Name:** toll advisories

Alerts and advisories provided to toll plazas to keep toll operators informed of identified threats



## Roadway Payment

that may impact toll operations or public safety on a toll facility.

### Logical Architecture Data Flow(s):

alert\_notification\_for\_toll\_operator

**Physical Architecture Flow Name:** toll instructions

Information provided to configure and support toll plaza operations including toll pricing information.

### Logical Architecture Data Flow(s):

advanced\_toll\_needed  
toll\_price\_data\_for\_advanced\_toll  
toll\_price\_data\_for\_vehicle\_toll  
toll\_bad\_payment\_check\_response

**Physical Architecture Flow Name:** vehicle payment request

Request for information supporting toll and parking payments.

### Logical Architecture Data Flow(s):

vmt\_vehicle\_payment\_data\_clear\_to\_field  
vmt\_payment\_request\_to\_field

**Roadway Payment** => **Driver**

**Physical Architecture Flow Name:** roadside transaction status

The status of an electronic payment transaction provided directly to the driver via sign or other roadside infrastructure.

### Logical Architecture Data Flow(s):

td-toll\_payment\_invalid  
td-toll\_payment\_confirmed

**Roadway Payment** => **Payment Administration**

**Physical Architecture Flow Name:** toll transactions

Detailed list of transactions from a toll station.

### Logical Architecture Data Flow(s):

confirm\_advanced\_tolls\_payment  
current\_toll\_transactions  
toll\_bad\_payment\_check\_request  
toll\_payment\_violator\_data  
toll\_violation\_information

**Physical Architecture Flow Name:** vehicle payment information

Information provided for payment of tolls and parking fees including identification that can be used to identify the payment account or source and related vehicle and service information that are used to determine the type and price of service requested.

### Logical Architecture Data Flow(s):

vmt\_payment\_collected\_from\_field  
vmt\_payment\_confirmation\_from\_field

**Physical Architecture Flow Name:** VMT data

A vehicle's road use history that records where the vehicle has traveled over time. Optionally includes vehicle speeds as well as distance traveled for some applications. Information is accurate enough to distinguish between adjacent roads, adjacent lanes, and identify direction of travel on the roads.

### Logical Architecture Data Flow(s):

vehicle\_location\_for\_vmt\_from\_roadway  
vehicle\_identity\_for\_vmt\_from\_roadway

## Roadway Payment

**Physical Architecture Flow Name:** VMT equipment fault

Provides fault status of the VMT data collection equipment in a vehicle and vehicle image and other characteristics to allow independent identification of the vehicle and its owner.

**Logical Architecture Data Flow(s):**

vmt\_equipment\_fault  
vmt\_vehicle\_image\_for\_enforcement  
advanced\_toll\_transactions

**Roadway Payment** => **Toll Operator**

**Physical Architecture Flow Name:** toll operator information presentation

Information presented to the toll collection point operator, including toll transaction information, alerts, and advisories.

**Logical Architecture Data Flow(s):**

tto-transaction\_reports  
tto-alert\_notification

**Roadway Payment** => **Vehicle**

**Physical Architecture Flow Name:** vehicle payment request

Request for information supporting toll and parking payments.

**Logical Architecture Data Flow(s):**

toll\_payment\_request  
toll\_vehicle\_payment\_data\_request  
vmt\_payment\_request

**Physical Architecture Flow Name:** vehicle payment update

Data written to vehicle equipment to support electronic toll collection or parking payment.

**Logical Architecture Data Flow(s):**

toll\_payment\_debited  
toll\_vehicle\_payment\_data\_update  
vmt\_vehicle\_payment\_data\_clear  
toll\_vehicle\_payment\_data\_clear

**Toll Operator** => **Roadway Payment**

**Physical Architecture Flow Name:** toll operator requests

User input from the toll operator to request information at the toll collection site.

**Logical Architecture Data Flow(s):**

fto-local\_toll\_price\_variations

**Vehicle** => **Roadway Payment**

**Physical Architecture Flow Name:** vehicle payment information

Information provided for payment of tolls and parking fees including identification that can be used to identify the payment account or source and related vehicle and service information that are used to determine the type and price of service requested.

**Logical Architecture Data Flow(s):**

vmt\_payment\_confirmation  
toll\_vehicle\_payment\_data\_collect  
toll\_payment\_confirmation  
vmt\_payment\_collected

## Roadway Payment

**Physical Architecture Flow Name:** VMT data

A vehicle's road use history that records where the vehicle has traveled over time. Optionally includes vehicle speeds as well as distance traveled for some applications. Information is accurate enough to distinguish between adjacent roads, adjacent lanes, and identify direction of travel on the roads.

**Logical Architecture Data Flow(s):**

vehicle\_identity\_for\_vmt\_roadway  
vehicle\_location\_for\_vmt\_roadway  
vehicle\_speed\_and\_distance\_for\_vmt\_roadway

**Physical Architecture Flow Name:** VMT equipment status

Provides an indication of the operational status of the VMT data collection equipment in a vehicle. Also indicates vehicle ID (VIN) so that the registration of the equipment to a specific vehicle can be verified and confirmed by comparison with vehicle characteristics.

**Logical Architecture Data Flow(s):**

vmt\_equipment\_status

**Vehicle Characteristics** => **Roadway Payment**

**Physical Architecture Flow Name:** vehicle characteristics

The physical or visible characteristics of an individual vehicle that can be measured to classify a vehicle and imaged to uniquely identify a vehicle.

**Logical Architecture Data Flow(s):**

From\_Vehicle\_Characteristics

### 2.19.3 Architecture Flow Diagrams for RPS

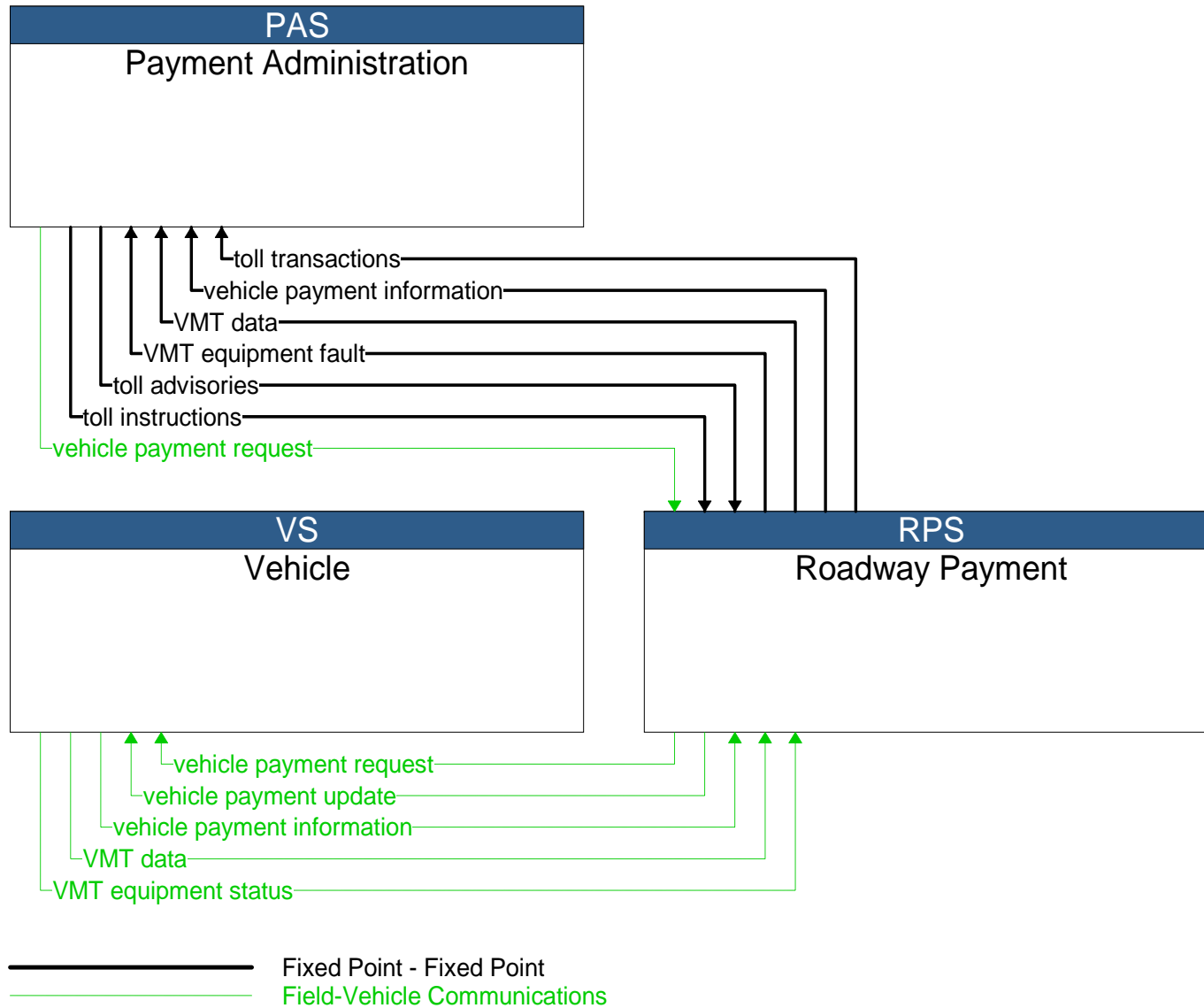


Figure 34: RPS Subsystem Interfaces

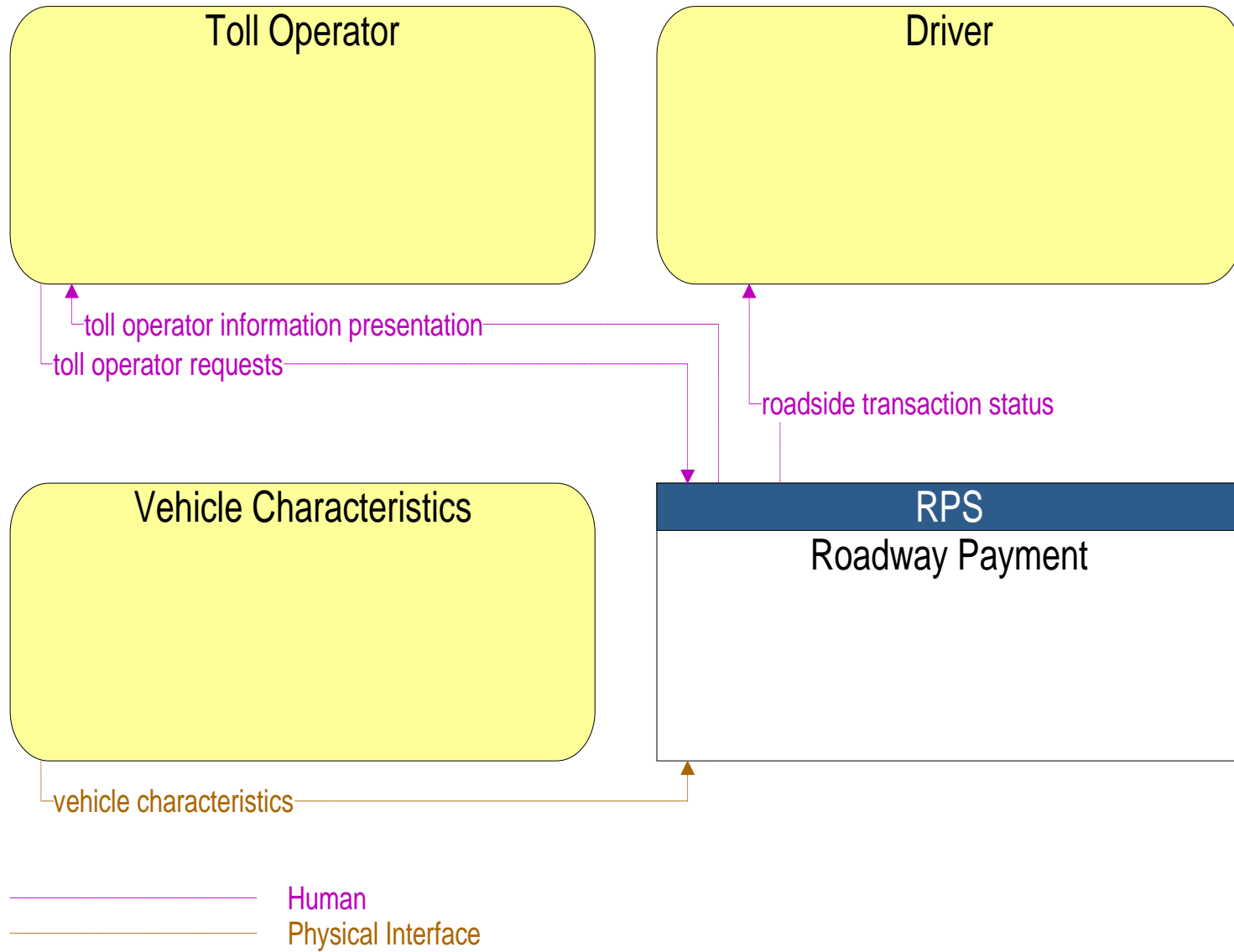


Figure 35: RPS Terminator Interfaces

## 2.20 Security Monitoring

The Security Monitoring Subsystem (SMS) includes surveillance and sensor equipment used to provide enhanced security and safety for transportation facilities or infrastructure. The equipment represented by this subsystem is located in non-public areas of transportation facilities (e.g. maintenance and transit yards) or located on or near non-roadway parts of the transportation infrastructure (e.g. transit railway and guideways). This subsystem also includes surveillance and sensor equipment located on or near major roadway features such as bridges, tunnels, and interchanges, when the equipment's primary function is one of security and safety. If the primary function of the equipment is traffic surveillance or incident detection, then the surveillance or sensors would be covered as part of the Roadway Subsystem. Similarly, the surveillance and sensor equipment for public areas of transportation facilities is covered in the Remote Traveler Support Subsystem. The surveillance equipment includes video (e.g. CCTV cameras) and/or audio systems. The sensor equipment includes threat sensors (e.g. chemical agent, toxic industrial chemical, biological, explosives, and radiological sensors), object detection (e.g. metal detectors), intrusion or motion detection, and infrastructure integrity monitoring (e.g. rail track continuity checking or bridge structural integrity monitoring). Limited processing of collected sensor and surveillance data is also included in this subsystem to support threat detection and classification.

### 2.20.1 Equipment Packages and Process Specifications for SMS

#### **Equipment Package: Field Secure Area Sensor Monitoring**

This equipment package includes sensors that monitor conditions of secure areas including facilities (e.g. transit yards) and transportation infrastructure (e.g. bridges, tunnels, interchanges, and transit railways or guideways). A range of acoustic, environmental threat (e.g. chemical agent, toxic industrial chemical, biological, explosives, and radiological sensors), infrastructure condition and integrity and motion and object sensors are included.

#### **Process Specifications**

##### **5.1.7.2.3 Collect Secure Area Sensor Data**

##### **5.1.7.2.4 Process Secure Area Sensor Data**

#### **Equipment Package: Field Secure Area Surveillance**

This equipment package includes video and audio surveillance equipment that monitors conditions of secure areas including facilities (e.g. transit yards) and transportation infrastructure (e.g. as bridges, tunnels, interchanges, and transit railways or guideways). It provides the surveillance information to the Emergency Management Subsystem for possible threat detection. The equipment package also provides local processing of the video or audio information, providing processed or analyzed results to the Emergency Management Subsystem. This equipment package provides the same functions as the Traveler Secure Area Surveillance equipment package.

#### **Process Specifications**

##### **5.1.7.2.1 Surveil Secure Area**

##### **5.1.7.2.2 Process Secure Area Surveillance**

### 2.20.2 Interfaces for SMS

**Emergency Management** => **Security Monitoring**

**Physical Architecture Flow Name:** infrastructure monitoring sensor control

Data used to configure and control infrastructure monitoring sensors.

**Logical Architecture Data Flow(s):**

infrastructure\_integrity\_sensor\_control

**Physical Architecture Flow Name:** secure area sensor control

Information used to configure and control threat sensors (e.g., thermal, acoustic, radiological, chemical), object, motion and intrusion detection sensors. The provided information controls sensor data collection, aggregation, filtering, and other local processing.

## Security Monitoring

### Logical Architecture Data Flow(s):

- intrusion\_motion\_sensor\_control
- object\_detection\_sensor\_control
- secure\_area\_sensor\_field\_proc\_parameters
- threat\_sensor\_control

**Physical Architecture Flow Name:** secure area surveillance control

Information used to configure and control audio and video surveillance systems used for transportation infrastructure security in secure areas. The provided information controls surveillance data collection, aggregation, filtering, and other local processing.

### Logical Architecture Data Flow(s):

- secure\_area\_surveillance\_control
- secure\_area\_surveillance\_field\_proc\_parameters

**Secure Area Environment** => **Security Monitoring**

**Physical Architecture Flow Name:** secure area characteristics

The range of physical and environmental characteristics (visual, audible, presence, motion, chemical, biological, radiological, other) that are monitored by surveillance and sensor systems.

### Logical Architecture Data Flow(s):

- fsae-area\_characteristics
- fsae-area\_audio
- fsae-area\_image

**Security Monitoring** => **Emergency Management**

**Physical Architecture Flow Name:** infrastructure monitoring sensor data

Data read from infrastructure-based sensors that monitor the condition or integrity of transportation infrastructure including bridges, tunnels, interchanges, pavement, culverts, signs, transit rail or guideway, and other roadway infrastructure. Includes sensor data and the operational status of the sensors.

### Logical Architecture Data Flow(s):

- infrastructure\_integrity\_sensor\_status
- field\_processed\_infrastructure\_integrity\_sensor\_data

**Physical Architecture Flow Name:** secure area sensor data

Data provided by threat sensors (e.g., thermal, acoustic, radiological, chemical), and intrusion, motion, and object detection sensors in secure areas indicating the sensor's operational status, raw and processed sensor data, and alarm indicators when a threat has been detected.

### Logical Architecture Data Flow(s):

- field\_processed\_intrusion\_motion\_sensor\_data
- field\_processed\_object\_detection\_sensor\_data
- field\_processed\_threat\_sensor\_data
- intrusion\_motion\_sensor\_data
- intrusion\_motion\_sensor\_status
- object\_detection\_sensor\_data
- object\_detection\_sensor\_status
- secure\_area\_sensor\_threat\_data
- threat\_sensor\_data
- threat\_sensor\_status
- infrastructure\_integrity\_sensor\_data

**Physical Architecture Flow Name:** secure area surveillance data

Data collected from surveillance systems used to monitor secure areas. Includes video, audio, processed surveillance data, equipment operational status, and alarm indicators when a threat has been detected.

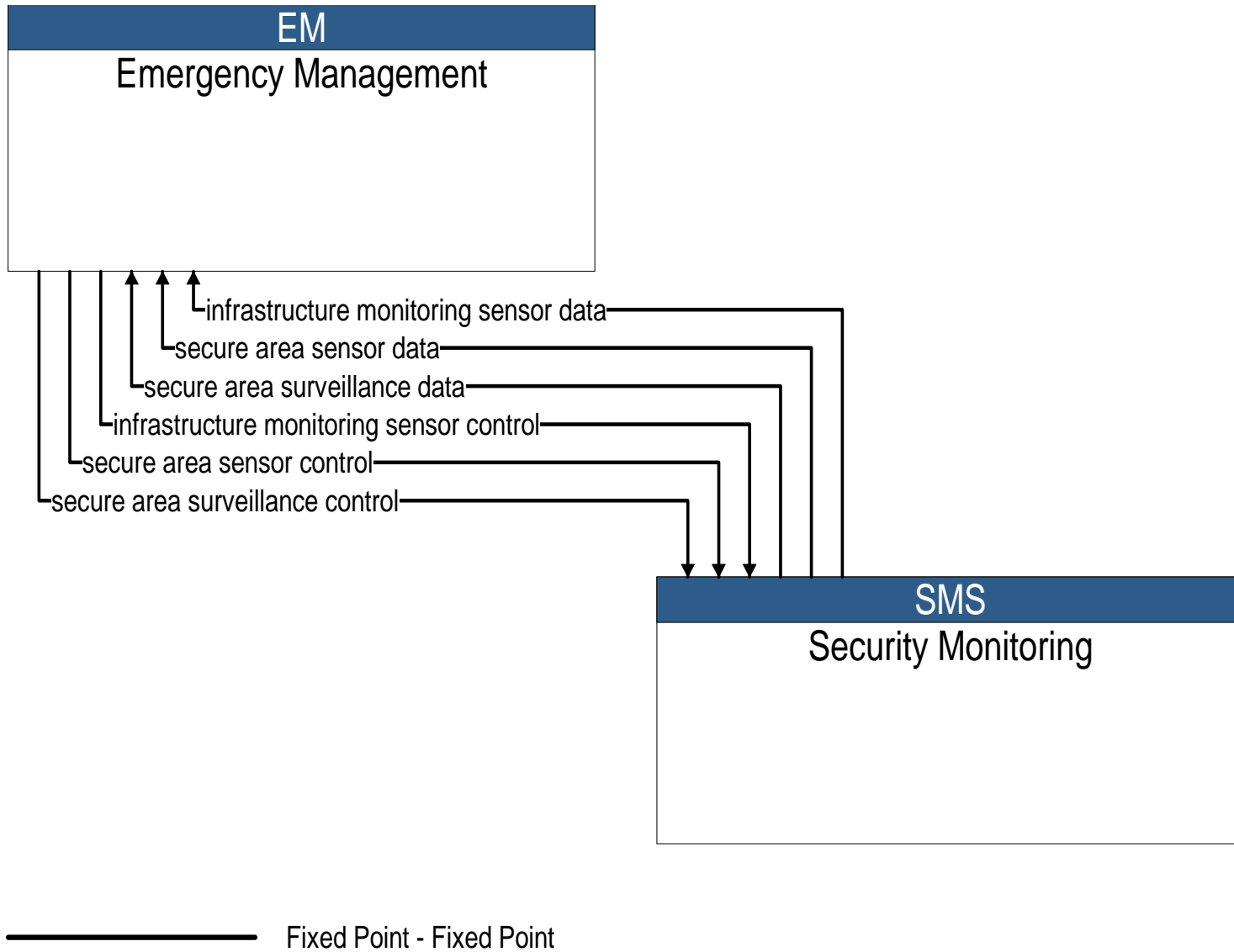
### Logical Architecture Data Flow(s):

## Security Monitoring

field\_processed\_secure\_area\_images  
field\_processed\_secure\_area\_audio  
secure\_area\_audio  
secure\_area\_images  
secure\_area\_surveillance\_status  
secure\_area\_surveillance\_threat\_data

### *2.20.3 Architecture Flow Diagrams for SMS*





**Figure 36: SMS Subsystem Interfaces**

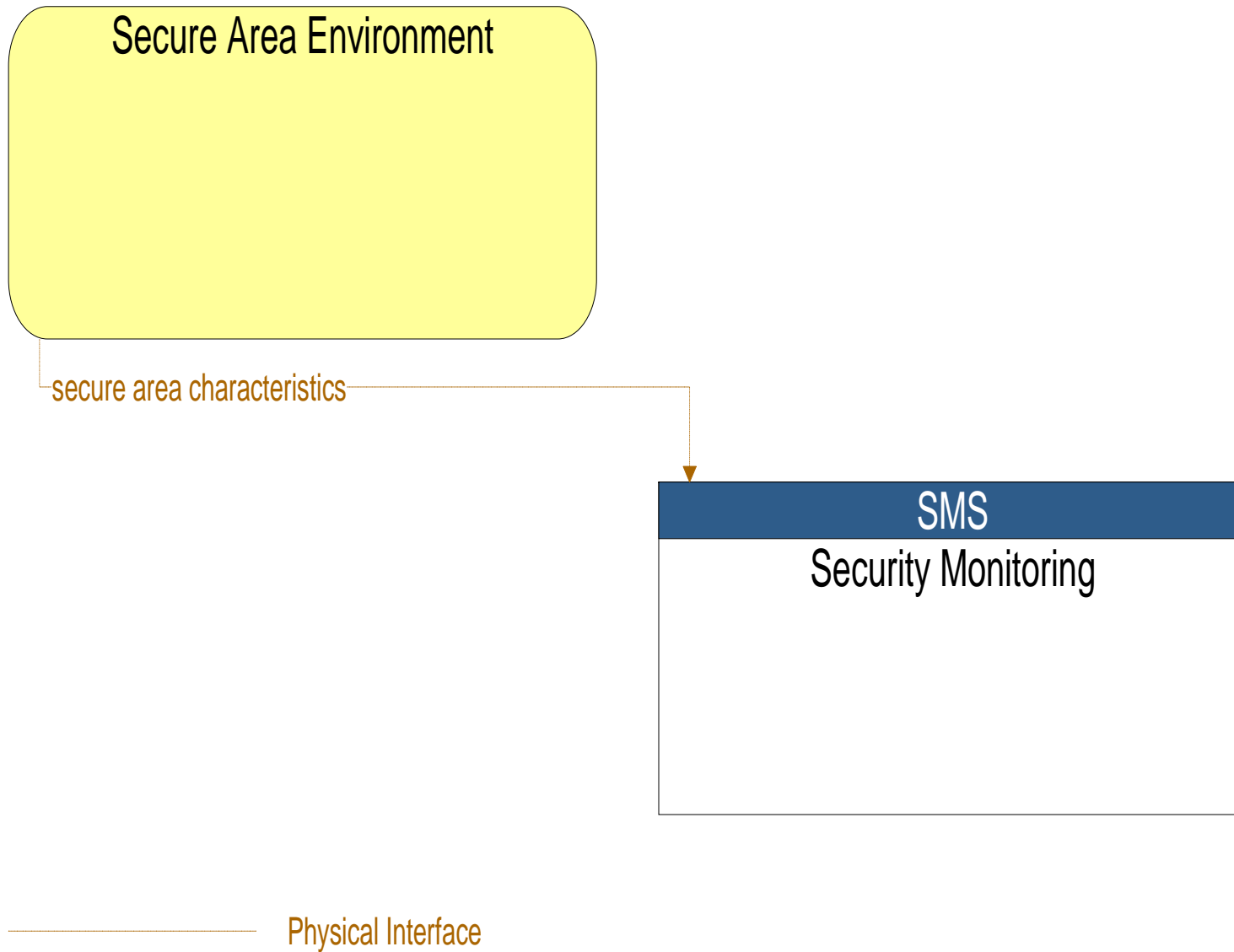


Figure 37: SMS Terminator Interfaces

## 2.21 Traffic Management

The Traffic Management Subsystem (TMS) monitors and controls traffic and the road network. It represents centers that manage a broad range of transportation facilities including freeway systems, rural and suburban highway systems, and urban and suburban traffic control systems. This subsystem communicates with the Roadway Subsystem to monitor and manage traffic flow and monitor the condition of the roadway, surrounding environmental conditions, and field equipment status. This subsystem coordinates with the Maintenance and Construction Management Subsystem to maintain the road network and coordinate and adapt to maintenance activities, closures, and detours. Incidents are detected, verified, and incident information is provided to allied agencies, drivers (through Roadway Subsystem highway advisory radio and dynamic message signs), and information service providers. This subsystem also manages traffic and transportation resources to support allied agencies in responding to, and recovering from, incidents ranging from minor traffic incidents through major disasters. When required, special traffic management strategies are implemented to support evacuation and reentry. The Traffic Management Subsystem supports HOV lane management and coordination, road pricing, and other demand management policies that can alleviate congestion and influence mode selection. It also manages reversible lane facilities and barrier and safeguard systems that control access to transportation infrastructure. The subsystem communicates with other Traffic Management Subsystems to coordinate traffic information and control strategies in neighboring jurisdictions. It also coordinates with rail operations to support safer and more efficient highway traffic management at highway-rail intersections. Finally, the Traffic Management Subsystem provides the capabilities to exercise control over those devices utilized for automated highway system (AHS) traffic and vehicle control.

### 2.21.1 Equipment Packages and Process Specifications for TMS

#### **Equipment Package: Barrier System Management**

This equipment package remotely monitors and controls barrier systems for transportation facilities and infrastructure under control of center personnel. Barrier systems include automatic or remotely controlled gates, barriers and other access control systems. The equipment package also provides an interface to other centers to allow monitoring and control of the barriers from other centers (e.g., public safety or emergency operations centers).

#### **Process Specifications**

**1.1.4.2 Provide Traffic Operations Personnel Traffic Data Interface**

**1.2.4.5 Manage Barrier Systems**

#### **Equipment Package: Collect Traffic Surveillance**

This equipment package remotely monitors and controls traffic sensors and surveillance (e.g., CCTV) equipment, and collects, processes and stores the collected traffic data. Current traffic information and other real-time transportation information is also collected from other centers. The collected information is provided to traffic operations personnel and made available to other centers.

#### **Process Specifications**

**1.1.2.1 Process Traffic Data for Storage**

**1.1.2.2 Process Traffic Data**

**1.1.2.3 Update Data Source Static Data**

**1.1.4.1 Retrieve Traffic Data**

**1.1.4.2 Provide Traffic Operations Personnel Traffic Data Interface**

**1.1.4.4 Update Traffic Display Map Data**

**1.3.2.6 Manage Traffic Routing**

**1.3.4.2 Provide Traffic Operations Personnel Incident Data Interface**

**1.3.4.6 Process Video Data**

#### **Equipment Package: HRI Traffic Management**

This equipment package monitors and controls highway-rail intersection (HRI) equipment. Various levels of roadside equipment may be interfaced to this equipment package including standard speed active warning systems and high speed systems which provide additional information on approaching trains and detect and

## Traffic Management

report obstructions in the HRI. This equipment package remotely monitors and reports the status of the HRI equipment and sends control plan updates to the HRI equipment.

### Process Specifications

- 1.6.2.1 Exchange Data with Rail Operations
- 1.6.2.2 Manage Alerts and Advisories
- 1.6.4.1 Manage HRI Closures
- 1.6.4.2 Exchange Data with Traffic Management

### Equipment Package: Rail Operations Coordination

This equipment package provides coordination between rail operations and traffic management centers. It receives train schedules, maintenance schedules, incidents, priority messages, and any other forecast events that will impact highway-rail intersection (HRI) closures from Rail Operations. The provided information is used to develop forecast HRI closure times and durations which may be applied in advanced traffic control strategies or delivered as enhanced traveler information. This equipment package includes the processing and algorithms necessary to derive HRI closure times and the communications capabilities necessary to communicate with rail operations and interface to the traffic control and information distribution capabilities included in other Traffic Management Subsystem equipment packages.

### Process Specifications

- 1.1.3 Generate Predictive Traffic Model
- 1.6.2.1 Exchange Data with Rail Operations
- 1.6.2.3 Manage Rail Traffic Control Data

### Equipment Package: Safeguard System Management

This equipment package remotely monitors and controls safeguard systems for transportation facilities and infrastructure. Safeguard systems include blast shielding, exhaust systems and other automatic or remotely controlled systems intended to mitigate the impact of an incident. When access to a transportation facility is impacted by the activation of a safeguard system, travelers and appropriate subsystems are notified.

### Process Specifications

- 1.1.4.2 Provide Traffic Operations Personnel Traffic Data Interface
- 5.7.6.2 Manage Safeguard Systems

### Equipment Package: TMC Automated Vehicle Operations

This equipment package remotely monitors and controls an automated highway facility. It monitors automated highway system operation and provides use and control parameters that control system operation. It could be used to monitor and control any automated facility with properly equipped vehicles, including applications that automate vehicle control in work zones.

### Process Specifications

- 3.2.7 Manage Automatic Vehicle Operations

### Equipment Package: TMC Demand Management Coordination

This equipment package provides the capability to gather information on regional toll, parking, and transit usage and request changes to pricing and other mechanisms to manage overall transportation demand.

### Process Specifications

- 1.1.2.1 Process Traffic Data for Storage
- 1.1.2.2 Process Traffic Data
- 1.2.1 Select Strategy
- 1.2.6.1 Maintain Traffic and Sensor Static Data
- 1.2.6.2 Provide Static Data Store Output Interface
- 1.4.1 Provide Traffic Operations Personnel Demand Interface
- 1.4.2 Collect Demand Forecast Data
- 1.4.4 Implement Demand Management Policy

### **Equipment Package: TMC Dynamic Lane Management and Shoulder Use**

This equipment package remotely monitors and controls the system that is used to dynamically manage travel lanes, including temporary use of shoulders as travel lanes. It monitors traffic conditions and demand measured in the field and determines when the lane configuration of the roadway should be changed, when intersections and/or interchanges should be reconfigured, when the shoulders should be used for travel (as a lane), when lanes should be designated for use by special vehicles only, such as buses, high occupancy vehicles (HOVs), vehicles attending a special event, etc. and/or when types of vehicles should be prohibited or restricted from using particular lanes. It controls the field equipment used to manage and control specific lanes and the shoulders. It also can automatically notify the enforcement agency of lane control violations.

#### **Process Specifications**

- 1.1.2.10 Provide Dynamic Lane Management**
- 1.1.2.9 Monitor Dynamic Lanes**
- 1.1.4.1 Retrieve Traffic Data**
- 1.1.4.2 Provide Traffic Operations Personnel Traffic Data Interface**

### **Equipment Package: TMC Environmental Monitoring**

This equipment package assimilates current and forecast road conditions and surface weather information using a combination of weather service provider information, information collected by other centers such as the Maintenance and Construction Management Subsystem, and data collected from environmental sensors deployed on and about the roadway. The collected environmental information is monitored and presented to the operator. This information can be used to issue general traveler advisories and support location specific warnings to drivers. Other equipment packages process the collected information and provide decision support.

#### **Process Specifications**

- 1.1.2.8 Process Roadway Environmental Data**
- 1.1.4.1 Retrieve Traffic Data**
- 1.1.4.2 Provide Traffic Operations Personnel Traffic Data Interface**
- 1.3.2.1 Store Possible Incident Data**
- 1.3.4.2 Provide Traffic Operations Personnel Incident Data Interface**

### **Equipment Package: TMC Evacuation Support**

This equipment package supports development, coordination, and execution of special traffic management strategies during evacuation and subsequent reentry of a population in the vicinity of a disaster or major emergency. A traffic management strategy is developed based on anticipated demand, the capacity of the road network including access to and from the evacuation routes, and existing and forecast conditions. The strategy supports efficient evacuation and also protects and optimizes movement of response vehicles and other resources that are responding to the emergency. This equipment package coordinates the evacuation with the Traffic Management Subsystem (representing centers in other affected jurisdictions) and the Emergency Management Subsystem.

#### **Process Specifications**

- 1.1.5 Exchange Data with Other Traffic Centers**
- 1.2.1 Select Strategy**
- 1.3.6 Traffic Disaster Response Control**
- 1.3.7 Traffic Evacuation Control**

### **Equipment Package: TMC HOV Lane Management**

This equipment package provides center monitoring and control of HOV lanes. It coordinates freeway ramp meters and connector signals with HOV lane usage signals to provide preferential treatment to HOV lanes. In advanced implementations, it automatically detects HOV violators.

#### **Process Specifications**

- 1.1.2.10 Provide Dynamic Lane Management**
- 1.1.2.4 Monitor HOV lane use**
- 1.2.4.2 Output Control Data for Freeways**

### 5.4.1 Process TM Detected Violations

#### **Equipment Package: TMC Incident Detection**

This equipment package identifies and reports incidents to Traffic Operations Personnel. It remotely monitors and controls traffic sensor and surveillance systems that support incident detection and verification. It analyzes and reduces the collected sensor and surveillance data, external alerting and advisory and incident reporting systems, anticipated demand information from intermodal freight depots, border crossings, special event information, and identifies and reports incidents and hazardous conditions

#### **Process Specifications**

- 1.1.4.1 Retrieve Traffic Data
- 1.1.4.2 Provide Traffic Operations Personnel Traffic Data Interface
- 1.1.5 Exchange Data with Other Traffic Centers
- 1.3.1.1 Analyze Traffic Data for Incidents
- 1.3.1.2 Maintain Static Data for Incident Management
- 1.3.2.1 Store Possible Incident Data
- 1.3.2.2 Review and Classify Possible Incidents
- 1.3.2.3 Review and Classify Planned Events
- 1.3.2.4 Provide Planned Events Store Interface
- 1.3.2.5 Provide Current Incidents Store Interface
- 1.3.3 Respond to Current Incidents
- 1.3.4.2 Provide Traffic Operations Personnel Incident Data Interface
- 1.3.4.6 Process Video Data

#### **Equipment Package: TMC Incident Dispatch Coordination/Communication**

This equipment package formulates and manages an incident response that takes into account the incident potential, incident impacts, and resources required for incident management. It supports dispatch of emergency response and service vehicles as well as coordination with other cooperating agencies. It provides access to traffic management resources that provide surveillance of the incident, traffic control in the surrounding area, and support for the incident response. It monitors the incident response and collects performance measures such as incident response and clearance times.

#### **Process Specifications**

- 1.1.2.2 Process Traffic Data
- 1.1.4.1 Retrieve Traffic Data
- 1.1.5 Exchange Data with Other Traffic Centers
- 1.2.1 Select Strategy
- 1.3.2.1 Store Possible Incident Data
- 1.3.2.2 Review and Classify Possible Incidents
- 1.3.2.3 Review and Classify Planned Events
- 1.3.2.6 Manage Traffic Routing
- 1.3.3 Respond to Current Incidents
- 1.3.4.1 Retrieve Incident Data
- 1.3.4.2 Provide Traffic Operations Personnel Incident Data Interface
- 1.3.4.3 Provide Media Incident Data Interface
- 1.3.4.4 Update Incident Display Map Data
- 1.3.4.5 Manage Resources for Incidents
- 1.3.4.6 Process Video Data

## Traffic Management

- 1.3.5 **Manage Incident Response Planning**
- 1.3.6 **Traffic Disaster Response Control**
- 1.3.7 **Traffic Evacuation Control**
- 1.6.2.1 **Exchange Data with Rail Operations**

### **Equipment Package: TMC In-Vehicle Signing Management**

This equipment package controls and monitors field equipment that supports in-vehicle signing. Sign information that may include static regulatory, service, and directional sign information as well as variable information such as traffic and road conditions can be provided to the field equipment, which uses short range communications to send the information to in-vehicle equipment. Information that is currently being communicated to passing vehicles and the operational status of the field equipment is monitored by this equipment package. The operational status of the field equipment is reported to operations personnel.

#### **Process Specifications**

- 1.1.4.2 **Provide Traffic Operations Personnel Traffic Data Interface**
- 1.2.4.3 **Output In-vehicle Signage Data**
- 1.2.8 **Collect Traffic Field Equipment Fault Data**

### **Equipment Package: TMC Lighting System Control**

This equipment package provides the capability for traffic managers to monitor and manage the electrical lighting systems along the roadside. This capability includes implementing control plans for lighting systems that may be activated by time-of-day plans or by activating changes to the lighting based on traffic or incidents.

#### **Process Specifications**

- 1.1.4.2 **Provide Traffic Operations Personnel Traffic Data Interface**
- 1.2.4.6 **Manage Lighting System**

### **Equipment Package: TMC Multimodal Coordination**

This equipment package supports center-to-center coordination between the Traffic Management and Transit Management Subsystems. It monitors transit operations and provides traffic signal priority for transit vehicles on request from the Transit Management Subsystem.

#### **Process Specifications**

- 1.2.2.1 **Determine Indicator State for Freeway Management**
- 1.2.2.2 **Determine Indicator State for Road Management**
- 1.2.3 **Determine Ramp State**
- 1.4.2 **Collect Demand Forecast Data**

### **Equipment Package: TMC Multimodal Crossing Management**

This equipment package remotely monitors and manages multimodal crossings, including draw bridges and other crossings between highway traffic and other modes. Equipment controlled includes warning lights, gates, dynamic message signs, and other systems that provide driver information and control traffic at multimodal crossings. Railroad grade crossings are covered by the HRI Traffic Management equipment package.

#### **Process Specifications**

- 1.1.2.2 **Process Traffic Data**
- 1.1.4.1 **Retrieve Traffic Data**
- 1.2.4.1 **Output Control Data for Roads**
- 1.2.4.4 **Output Roadway Information Data**
- 1.2.8 **Collect Traffic Field Equipment Fault Data**
- 1.3.2.2 **Review and Classify Possible Incidents**

### **Equipment Package: TMC Probe Information Collection**

This equipment package collects, assimilates, and disseminates vehicle probe data collected from roadside short range communications equipment and centers controlling transit vehicles, toll collection points, and route-guided vehicles. It estimates traffic and road conditions based on the aggregated probe data and

## Traffic Management

disseminates this information to other centers.

### **Process Specifications**

- 1.1.2.1 Process Traffic Data for Storage**
- 1.1.2.5 Process Traffic Probe Data**
- 1.1.4.1 Retrieve Traffic Data**

### **Equipment Package: TMC Regional Traffic Management**

This equipment package supports coordination between traffic management centers in order to share traffic information between centers as well as control of traffic management field equipment. This coordination supports wide area optimization and regional coordination that spans jurisdictional boundaries; for example, coordinated signal control in a metropolitan area or coordination between freeway operations and arterial signal control within a corridor.

### **Process Specifications**

- 1.1.4.2 Provide Traffic Operations Personnel Traffic Data Interface**
- 1.1.5 Exchange Data with Other Traffic Centers**

### **Equipment Package: TMC Reversible Lane Management**

This equipment package remotely monitors and controls reversible lanes. It provides an interface to reversible lane field equipment (traffic sensors, surveillance equipment, lane control signals, physical lane access controls, etc.) and to traffic operations personnel to support central monitoring and control of these facilities.

### **Process Specifications**

- 1.1.2.10 Provide Dynamic Lane Management**
- 1.1.2.2 Process Traffic Data**
- 1.1.2.7 Monitor Reversible Lanes**
- 1.1.4.2 Provide Traffic Operations Personnel Traffic Data Interface**
- 1.2.1 Select Strategy**
- 1.2.4.1 Output Control Data for Roads**
- 1.2.4.2 Output Control Data for Freeways**
- 1.2.8 Collect Traffic Field Equipment Fault Data**
- 1.3.1.1 Analyze Traffic Data for Incidents**
- 1.3.4.2 Provide Traffic Operations Personnel Incident Data Interface**

### **Equipment Package: TMC Roadway Warning**

This equipment package remotely monitors and controls the systems used to warn drivers approaching hazards on a roadway. It monitors data on roadway conditions from sensors in the field and generates warnings in response to roadway weather conditions, road surface conditions, traffic conditions including queues, obstacles or animals in the roadway, and any other transient events that can be sensed.

### **Process Specifications**

- 1.1.4.2 Provide Traffic Operations Personnel Traffic Data Interface**
- 1.2.4.7 Manage Roadway Warning System**

### **Equipment Package: TMC Signal Control**

This equipment package provides the capability for traffic managers to monitor and manage the traffic flow at signalized intersections. This capability includes analyzing and reducing the collected data from traffic surveillance equipment and developing and implementing control plans for signalized intersections. Control plans may be developed and implemented that coordinate signals at many intersections under the domain of a single traffic management subsystem and are responsive to traffic conditions and adapt to support incidents, preemption and priority requests, pedestrian crossing calls, etc.

### **Process Specifications**

- 1.1.2.2 Process Traffic Data**
- 1.1.4.2 Provide Traffic Operations Personnel Traffic Data Interface**



## Traffic Management

- 1.2.1      **Select Strategy**
- 1.2.2.2    **Determine Indicator State for Road Management**
- 1.2.4.1    **Output Control Data for Roads**
- 1.2.8      **Collect Traffic Field Equipment Fault Data**

### **Equipment Package: TMC Speed Monitoring and Warning**

This equipment package remotely monitors and controls speed monitoring and speed warning systems. It remotely monitors vehicle speeds and presents this information to traffic operations personnel. It configures and controls the speed monitoring and warning equipment that provides safe speed advisories to the motorist. This equipment package can also notify an enforcement agency if excessive speeds are identified.

#### **Process Specifications**

- 1.1.4.2    **Provide Traffic Operations Personnel Traffic Data Interface**
- 9.3.3.3    **Manage Vehicle Speed on Roadway**

### **Equipment Package: TMC Traffic Information Dissemination**

This equipment package disseminates traffic and road conditions, closure and detour information, incident information, driver advisories, and other traffic-related data to other centers, the media, and driver information systems. It monitors and controls driver information system field equipment including dynamic message signs and highway advisory radio, managing dissemination of driver information through these systems.

#### **Process Specifications**

- 1.1.4.1    **Retrieve Traffic Data**
- 1.1.4.2    **Provide Traffic Operations Personnel Traffic Data Interface**
- 1.1.4.3    **Provide Direct Media Traffic Data Interface**
- 1.2.4.4    **Output Roadway Information Data**
- 1.3.2.1    **Store Possible Incident Data**

### **Equipment Package: TMC Traffic Management Decision Support**

This equipment package recommends courses of action to the traffic operator based on current and forecast road and traffic conditions. Traffic incidents, special events, maintenance activities and other events or conditions that impact capacity or demand are monitored. Historical data and models are used to compare the impact of potential courses of action and make recommendations to the operator. Decisions are supported through presentation of filtered and fused network-wide road and traffic conditions that identify network imbalances and recommended courses of action. The recommended actions may include predefined incident response plans, signal timing plan changes, DMS/HAR messages, truck restrictions, lane control strategies, metering strategies, and adjustment of variable speed limits. Multimodal strategies may also be recommended that include suggested transit strategies and suggested route and mode choices for travelers. Once a course of action is selected, other equipment packages implement these actions within the traffic management center and coordinate the response with other centers in the region.

#### **Process Specifications**

- 1.3.4.2    **Provide Traffic Operations Personnel Incident Data Interface**
- 1.3.5      **Manage Incident Response Planning**

### **Equipment Package: TMC Traffic Metering**

This equipment package provides center monitoring and control of traffic metering systems including on ramps, through interchanges, and on the mainline roadway. All types of metering are covered including pre-timed/fixed time, time-based, dynamic and adaptive metering strategies and special bypasses. Metering rates can be calculated based upon historical data or current conditions including traffic, air quality, etc.

#### **Process Specifications**

- 1.1.4.2    **Provide Traffic Operations Personnel Traffic Data Interface**
- 1.2.1      **Select Strategy**
- 1.2.2.1    **Determine Indicator State for Freeway Management**

## Traffic Management

- 1.2.3 **Determine Ramp State**
- 1.2.4.2 **Output Control Data for Freeways**

### **Equipment Package: TMC Traffic Network Performance Evaluation**

This equipment package measures traffic network performance and predicts travel demand patterns to support traffic flow optimization, demand management, and incident management. This equipment package collects traffic data from sensors and surveillance equipment as well as input from other traffic management centers, emissions management, transit operations, and event promoters and uses this information to measure traffic network performance. It collects route planning information from information service providers and integrates and uses this information to predict future traffic conditions. The planned control strategies can be passed back to the Information Service Provider so that the intended strategies can be reflected in future route planning.

#### **Process Specifications**

- 1.1.2.1 **Process Traffic Data for Storage**
- 1.1.2.2 **Process Traffic Data**
- 1.1.3 **Generate Predictive Traffic Model**
- 1.1.4.1 **Retrieve Traffic Data**
- 1.1.4.2 **Provide Traffic Operations Personnel Traffic Data Interface**
- 1.1.5 **Exchange Data with Other Traffic Centers**
- 1.2.6.1 **Maintain Traffic and Sensor Static Data**
- 1.2.6.2 **Provide Static Data Store Output Interface**
- 1.3.2.1 **Store Possible Incident Data**
- 1.4.1 **Provide Traffic Operations Personnel Demand Interface**
- 1.4.2 **Collect Demand Forecast Data**
- 1.4.3 **Update Demand Display Map Data**
- 1.4.5 **Calculate Forecast Demand**

### **Equipment Package: TMC Transportation Operations Data Collection**

This equipment package collects real-time information on the state of the regional transportation system for operational use by the center. It includes communication and data processing capabilities that provide real-time access to regional transportation information that is stored in a regional repository. This equipment package establishes communications with the repository, requests or subscribes to information relevant to the center, receives and processes the information, and then distributes the information to other equipment packages and the system operator for use. Although request and subscription flows are not explicitly included in the National ITS Architecture, interactive data services are supported by this equipment package.

#### **Process Specifications**

- 1.1.2.1 **Process Traffic Data for Storage**
- 1.1.4.2 **Provide Traffic Operations Personnel Traffic Data Interface**

### **Equipment Package: TMC Variable Speed Limits**

This equipment package provides center monitoring and control of variable speed limits systems. It monitors data on traffic and environmental conditions collected from sensors along the roadway. Based on the measured data, it calculates and sets suitable speed limits usually by lane. It controls equipment that posts the current speed limits and displays additional information such as basic safety rules and current traffic information to drivers.

#### **Process Specifications**

- 1.2.8 **Collect Traffic Field Equipment Fault Data**
- 9.3.3.3 **Manage Vehicle Speed on Roadway**

### **Equipment Package: TMC Work Zone Traffic Management**

This equipment package coordinates work plans with maintenance systems so that work zones are established that have minimum traffic impact. Traffic control strategies are implemented to further mitigate

## Traffic Management

traffic impacts associated with work zones that are established, providing work zone information on driver information systems such as dynamic message signs.

### Process Specifications

**1.1.4.2 Provide Traffic Operations Personnel Traffic Data Interface**

**1.2.4.4 Output Roadway Information Data**

**1.3.1.1 Analyze Traffic Data for Incidents**

**1.3.2.1 Store Possible Incident Data**

**1.3.2.2 Review and Classify Possible Incidents**

### Equipment Package: Traffic Data Collection

This equipment package collects and stores traffic information that is collected in the course of traffic operations performed by the Traffic Management Subsystem. This data can be used directly by operations personnel or it can be made available to other data users and archives in the region.

### Process Specifications

**1.1.4.5 Manage Traffic Archive Data**

### Equipment Package: Traffic Equipment Maintenance

This equipment package monitors the operational status of field equipment and detects failures. It presents field equipment status to Traffic Operations Personnel and reports failures to the Maintenance and Construction Management Subsystem. The equipment package tracks the repair or replacement of the failed equipment. The entire range of ITS field equipment may be monitored by this equipment package including sensors (traffic, infrastructure, environmental, security, speed, etc.) and devices (highway advisory radio, dynamic message signs, automated roadway treatment systems, barrier and safeguard systems, cameras, traffic signals and override equipment, ramp meters, beacons, security surveillance equipment, etc.).

### Process Specifications

**1.1.4.4 Update Traffic Display Map Data**

**1.2.8 Collect Traffic Field Equipment Fault Data**

## 2.21.2 Interfaces for TMS

### Alerting and Advisory Systems => Traffic Management

**Physical Architecture Flow Name:** alerts and advisories

Assessments (general incident and vulnerability awareness information), advisories (identification of threats or recommendations to increase preparedness levels), and alerts (information on imminent or in-progress emergencies). This flow also provides supporting descriptive detail on incidents, threats, and vulnerabilities to increase preparedness and support effective response to threats against the surface transportation system.

**Logical Architecture Data Flow(s):**

faas-alerts\_and\_advisories\_for\_traffic

### Archived Data Management => Traffic Management

**Physical Architecture Flow Name:** archive requests

A request to a data source for information on available data (i.e. "catalog") or a request that defines the data to be archived. The request can be a general subscription intended to initiate a continuous or regular data stream or a specific request intended to initiate a one-time response from the recipient.

**Logical Architecture Data Flow(s):**

traffic\_management\_archive\_request

**Physical Architecture Flow Name:** archive status

Notification that data provided to an archive contains erroneous, missing, or suspicious data or verification that the data provided appears valid. If an error has been detected, the offending

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data and the nature of the potential problem are identified.

### Logical Architecture Data Flow(s):

traffic\_management\_archive\_status

**Physical Architecture Flow Name:** archived data products

Raw or processed data, meta data, data catalogs and other data products provided to a user system upon request. The response may also include any associated transaction information.

### Logical Architecture Data Flow(s):

traffic\_archive\_data\_product

**Border Inspection Systems** => **Traffic Management**

**Physical Architecture Flow Name:** border incident information

Notification of existence of incident in the vicinity of the border. Information would include expected severity, location, time and nature of incident. As additional information is gathered and the incident evolves, updated incident information is provided.

### Logical Architecture Data Flow(s):

fbis-border\_traffic\_incident

**Physical Architecture Flow Name:** border wait times data

Measure of current, actual, or predicted wait time at border. Measurement provided by vehicle type, lane, and type of lane (e.g. NEXUS vs. regular).

### Logical Architecture Data Flow(s):

fbis-actual\_border\_wait\_time\_for\_traffic  
fbis-current\_border\_wait\_time\_for\_traffic  
fbis-predicted\_border\_wait\_time\_for\_traffic

**Physical Architecture Flow Name:** lane management inputs

This flow provides inputs to dynamic lane management systems including the types of vehicles to allow in each lane.

### Logical Architecture Data Flow(s):

fbis-border\_lane\_management  
fbis-lane\_management\_inputs

**Physical Architecture Flow Name:** remote surveillance control

The control commands used to remotely operate another center's sensors or surveillance equipment so that roadside surveillance assets can be shared by more than one agency.

### Logical Architecture Data Flow(s):

fbis-border\_remote\_video\_control

**DMV** => **Traffic Management**

**Physical Architecture Flow Name:** registration

Registered owner of vehicle and associated vehicle information.

### Logical Architecture Data Flow(s):

fdmv-traffic\_violation\_vehicle\_registration  
fdmv-traffic\_violation\_state\_identity

**Emergency Management** => **Traffic Management**

**Physical Architecture Flow Name:** alert notification

Notification of a major emergency such as a natural or man-made disaster, civil emergency, or child abduction for distribution to the public. The flow identifies the alert originator, the nature of the emergency, the geographic area affected by the emergency, the effective time period, and information and instructions necessary for the public to respond to the alert. This flow

## Traffic Management

may also identify specific information that should not be released to the public.

### **Logical Architecture Data Flow(s):**

traveler\_information\_restrictions\_for\_traffic  
deactivate\_traveler\_information\_restrictions\_for\_traffic  
wide\_area\_alert\_notification\_for\_traffic

**Physical Architecture Flow Name:** emergency plan coordination

Information that supports coordination of emergency management plans, continuity of operations plans, emergency response and recovery plans, evacuation plans, and other emergency plans between agencies. This includes general plans that are coordinated prior to an incident and shorter duration tactical plans that are prepared during an incident.

### **Logical Architecture Data Flow(s):**

evacuation\_plan\_coordination\_to\_traffic  
disaster\_response\_plan\_coordination\_to\_traffic

**Physical Architecture Flow Name:** emergency route request

Request for access routes for emergency response vehicles and equipment. This may be a request for ingress or egress routes or other emergency routes.

### **Logical Architecture Data Flow(s):**

emergency\_route\_request

**Physical Architecture Flow Name:** emergency traffic control request

Special request to preempt the current traffic control strategy in effect at one or more signalized intersections or highway segments, activate traffic control and closure systems such as gates and barriers, activate safeguard systems, or use driver information systems. For example, this flow can request all signals to red-flash, request a progression of traffic control preemptions along an emergency vehicle route, request a specific evacuation traffic control plan, request activation of a road closure barrier system, or place a public safety or emergency-related message on a dynamic message sign.

### **Logical Architecture Data Flow(s):**

barrier\_system\_activation\_request\_from\_emerg  
emergency\_traffic\_control\_request  
safeguard\_system\_activation\_request\_from\_emerg  
roadway\_information\_data\_to\_traffic

**Physical Architecture Flow Name:** evacuation information

Evacuation instructions and information including evacuation zones, evacuation times, and reentry times.

### **Logical Architecture Data Flow(s):**

evacuation\_information\_for\_traffic\_management

**Physical Architecture Flow Name:** incident information

Notification of existence of incident and expected severity, location, time and nature of incident. As additional information is gathered and the incident evolves, updated incident information is provided. Incidents include any event that impacts transportation system operation ranging from routine incidents (e.g., disabled vehicle at the side of the road) through large-scale natural or human-caused disasters that involve loss of life, injuries, extensive property damage, and multi-jurisdictional response. This also includes special events, closures, and other planned events that may impact the transportation system.

### **Logical Architecture Data Flow(s):**

incident\_details

**Physical Architecture Flow Name:** incident response status

Status of the current incident response including a summary of incident status and its impact on the transportation system, traffic management strategies implemented at the site (e.g., closures, diversions, traffic signal control overrides), and current and planned response activities.

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### Logical Architecture Data Flow(s):

incident\_response\_status

**Physical Architecture Flow Name:** remote surveillance control

The control commands used to remotely operate another center's sensors or surveillance equipment so that roadside surveillance assets can be shared by more than one agency.

### Logical Architecture Data Flow(s):

remote\_video\_image\_control

**Physical Architecture Flow Name:** resource deployment status

Status of resource deployment identifying the resources (vehicles, equipment, materials, and personnel) available and their current status. General resource inventory information and specific status of deployed resources may be included.

### Logical Architecture Data Flow(s):

em\_resource\_response\_to\_traffic

**Physical Architecture Flow Name:** resource request

A request for resources to implement special traffic control measures, assist in clean up, verify an incident, etc. The request may poll for resource availability or request pre-staging, staging, or immediate deployment of resources. Resources may be explicitly requested or a service may be requested and the specific resource deployment may be determined by the responding agency.

### Logical Architecture Data Flow(s):

resource\_request  
traffic\_evacuation\_resource\_request

**Physical Architecture Flow Name:** road closure notification

Notification that agency personnel have closed a road due to adverse weather, major incident, or other reason.

### Logical Architecture Data Flow(s):

roadway\_closure\_from\_emergency

**Physical Architecture Flow Name:** threat information

Threats regarding transportation infrastructure, facilities, or systems detected by a variety of methods (sensors, surveillance, threat analysis of advisories from outside agencies, etc.

### Logical Architecture Data Flow(s):

threat\_info\_for\_traffic

**Physical Architecture Flow Name:** transportation system status

Current status and condition of transportation infrastructure (e.g., tunnels, bridges, interchanges, TMC offices, maintenance facilities). In case of disaster or major incident, this flow provides an assessment of damage sustained by the surface transportation system including location and extent of the damage, estimate of remaining capacity and necessary restrictions, and time frame for repair and recovery.

### Logical Architecture Data Flow(s):

evacuation\_transportation\_system\_status\_for\_traffic  
disaster\_transportation\_system\_status\_for\_traffic  
infrastructure\_integrity\_status\_for\_traffic

## Emissions Management

=> **Traffic Management**

**Physical Architecture Flow Name:** widearea statistical pollution information

Aggregated region-wide measured emissions data and possible pollution incident information.

### Logical Architecture Data Flow(s):

pollution\_incident  
pollution\_state\_data

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wide\_area\_pollution\_data

**Event Promoters** => **Traffic Management**

**Physical Architecture Flow Name:** event plans

Plans for major events possibly impacting traffic.

**Logical Architecture Data Flow(s):**

fevp-event\_information

**Information Service Provider** => **Traffic Management**

**Physical Architecture Flow Name:** fare and price information

Current transit, parking, and toll fee schedule information.

**Logical Architecture Data Flow(s):**

parking\_lot\_charge\_details  
toll\_price\_details  
transit\_fare\_details

**Physical Architecture Flow Name:** logged vehicle routes

Anticipated route information for guided vehicles, special vehicles (e.g., oversize vehicles) or groups of vehicles (e.g., governor's motorcade) that may require changes in traffic control strategy.

**Logical Architecture Data Flow(s):**

current\_other\_routes\_use  
special\_vehicle\_priority\_routing  
logged\_special\_vehicle\_route  
current\_transit\_routes\_use  
route\_segment\_use\_prediction

**Physical Architecture Flow Name:** road network traffic probe data

Aggregated route usage, travel times, and other aggregated data collected from probe vehicles that can be used to estimate current traffic conditions.

**Logical Architecture Data Flow(s):**

current\_road\_network\_use  
traffic\_probe\_info\_from\_isp\_for\_traffic

**Physical Architecture Flow Name:** transportation information for operations

Information on the state of transportation system operations including traffic and road conditions, advisories, incidents, transit service information, weather information, parking information, and other related data.

**Logical Architecture Data Flow(s):**

transportation\_information\_for\_traffic\_operations

**Intermodal Freight Depot** => **Traffic Management**

**Physical Architecture Flow Name:** intermodal freight event information

Plans for movement of intermodal freight from the depot area possibly impacting traffic. May also include requests for special treatment at traffic signals or dynamic lane management systems.

**Logical Architecture Data Flow(s):**

fifd-intermodal\_freight\_event  
fifd-intermodal\_freight\_event\_lane\_information

**Maintenance and Construction Management** => **Traffic Management**

**Physical Architecture Flow Name:** current asset restrictions

## Traffic Management

Restrictions levied on transportation asset usage based on infrastructure design, surveys, tests, or analyses. This includes standard facility design height, width, and weight restrictions, special restrictions such as spring weight restrictions, and temporary facility restrictions that are imposed during maintenance and construction.

**Logical Architecture Data Flow(s):**

asset\_restrictions\_for\_traffic

**Physical Architecture Flow Name:** environmental conditions data

Current road conditions (e.g., surface temperature, subsurface temperature, moisture, icing, treatment status) and surface weather conditions (e.g., air temperature, wind speed, precipitation, visibility) as measured and reported by fixed and/or mobile environmental sensors and aggregated by the data collector. Attributes relating to the data collection (and aggregation) are also included.

**Logical Architecture Data Flow(s):**

environment\_sensor\_data\_for\_traffic

**Physical Architecture Flow Name:** equipment maintenance status

Current status of field equipment maintenance actions.

**Logical Architecture Data Flow(s):**

field equip\_maint\_status

**Physical Architecture Flow Name:** incident information

Notification of existence of incident and expected severity, location, time and nature of incident. As additional information is gathered and the incident evolves, updated incident information is provided. Incidents include any event that impacts transportation system operation ranging from routine incidents (e.g., disabled vehicle at the side of the road) through large-scale natural or human-caused disasters that involve loss of life, injuries, extensive property damage, and multi-jurisdictional response. This also includes special events, closures, and other planned events that may impact the transportation system.

**Logical Architecture Data Flow(s):**

incident\_info\_for\_traffic

**Physical Architecture Flow Name:** maint and constr resource response

Current status of maintenance and construction resources including availability and deployment status. General resource inventory information covering vehicles, equipment, materials, and people and specific resource deployment status may be included.

**Logical Architecture Data Flow(s):**

m\_and\_c\_resource\_response\_to\_traffic

**Physical Architecture Flow Name:** maint and constr work plans

Future construction and maintenance work schedules and activities including anticipated closures with anticipated impact to the roadway, alternate routes, anticipated delays, closure times, and durations.

**Logical Architecture Data Flow(s):**

m\_and\_c\_work\_plans\_for\_traffic

**Physical Architecture Flow Name:** road network status assessment

Assessment of damage sustained by the road network including location and extent of the damage, estimate of remaining capacity, required closures, alternate routes, necessary restrictions, and time frame for repair and recovery.

**Logical Architecture Data Flow(s):**

m\_and\_c\_status\_assessment\_for\_traffic

**Physical Architecture Flow Name:** road weather information

Road conditions and weather information that are made available by road maintenance operations to other transportation system operators.



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### Logical Architecture Data Flow(s):

road\_weather\_info\_for\_traffic

**Physical Architecture Flow Name:** roadway maintenance status

Summary of maintenance fleet operations affecting the road network. This includes the status of winter maintenance (snow plow schedule and current status).

### Logical Architecture Data Flow(s):

roadway\_maint\_status\_for\_traffic

**Physical Architecture Flow Name:** work zone information

Summary of maintenance and construction work zone activities affecting the road network including the nature of the maintenance or construction activity, location, impact to the roadway, expected time(s) and duration of impact, anticipated delays, alternate routes, and suggested speed limits. This information may be augmented with images that provide a visual indication of current work zone status and traffic impacts.

### Logical Architecture Data Flow(s):

work\_zone\_images\_for\_traffic  
work\_zone\_info\_for\_traffic

**Map Update Provider** => **Traffic Management**

**Physical Architecture Flow Name:** map updates

Map update which could include a new underlying static or real-time map or map layer(s) update.

### Logical Architecture Data Flow(s):

fmup-demand\_display\_update  
fmup-incident\_display\_update  
fmup-traffic\_display\_update

**Physical Architecture Flow Name:** external reports

Traffic and incident information that is collected by the media through a variety of mechanisms (e.g., radio station call-in programs, air surveillance).

### Logical Architecture Data Flow(s):

fm-incident\_information

**Multimodal Crossings** => **Traffic Management**

**Physical Architecture Flow Name:** lane management inputs

This flow provides inputs to dynamic lane management systems including the types of vehicles to allow in each lane.

### Logical Architecture Data Flow(s):

fmmc-lane\_management\_inputs

**Physical Architecture Flow Name:** multimodal crossing status

Indication of operational status and pending requests for right-of-way from equipment supporting the non-highway mode at multimodal crossings.

### Logical Architecture Data Flow(s):

fmmc-crossing\_closure\_schedule

**Other Traffic Management** => **Traffic Management**

**Physical Architecture Flow Name:** device control request

Request for device control action

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### **Logical Architecture Data Flow(s):**

fotm-device\_control\_request

### **Physical Architecture Flow Name:** device data

Data from detectors, environmental sensor stations, and traffic control devices including device inventory information.

### **Logical Architecture Data Flow(s):**

fotm-device\_inventory

fotm-device\_data

### **Physical Architecture Flow Name:** device status

Status information from devices

### **Logical Architecture Data Flow(s):**

fotm-device\_status

### **Physical Architecture Flow Name:** emergency traffic coordination

Coordination supporting disaster response including evacuation and reentry. Includes coordination of special traffic control strategies that support efficient evacuation and reentry while protecting and optimizing movement of response vehicles and other resources responding to the emergency.

### **Logical Architecture Data Flow(s):**

fotm-traffic\_control\_strategy\_for\_disaster\_or\_evacuation

fotm-disaster\_network\_status

fotm-evacuation\_information

fotm-network\_status\_for\_evacuation

### **Physical Architecture Flow Name:** incident information

Notification of existence of incident and expected severity, location, time and nature of incident. As additional information is gathered and the incident evolves, updated incident information is provided. Incidents include any event that impacts transportation system operation ranging from routine incidents (e.g., disabled vehicle at the side of the road) through large-scale natural or human-caused disasters that involve loss of life, injuries, extensive property damage, and multi-jurisdictional response. This also includes special events, closures, and other planned events that may impact the transportation system.

### **Logical Architecture Data Flow(s):**

fotm-permit\_coordination\_for\_traffic

fotm-planned\_event\_data

fotm-current\_event\_data

### **Physical Architecture Flow Name:** road network conditions

Current and forecasted traffic information, road and weather conditions, and other road network status. Either raw data, processed data, or some combination of both may be provided by this architecture flow. Information on diversions and alternate routes, closures, and special traffic restrictions (lane/shoulder use, weight restrictions, width restrictions, HOV requirements) in effect is included along with a definition of the links, nodes, and routes that make up the road network.

### **Logical Architecture Data Flow(s):**

fotm-roadway\_detours\_and\_closures

fotm-traffic\_data

fotm-road\_network\_inventory\_and\_status

fotm-road\_weather\_data

### **Physical Architecture Flow Name:** traffic images

High fidelity, real-time traffic images suitable for surveillance monitoring by the operator or for use in machine vision applications.

### **Logical Architecture Data Flow(s):**

fotm-traffic\_image\_data

**Parking Management**

=>

**Traffic Management**

## Traffic Management

**Physical Architecture Flow Name:** parking demand management response

Response to parking demand management change requests indicating level of compliance with request.

**Logical Architecture Data Flow(s):**

parking\_lot\_charge\_direct\_details  
parking\_lot\_charge\_change\_response

**Physical Architecture Flow Name:** parking information

General parking information and status, including current parking availability.

**Logical Architecture Data Flow(s):**

dynamic\_parking\_information\_for\_traffic  
static\_parking\_information\_for\_traffic  
parking\_information\_for\_dissemination  
parking\_lot\_current\_state

**Payment Administration** => **Traffic Management**

**Physical Architecture Flow Name:** toll probe data

Aggregate probe data derived from electronic toll collection operations. Data collected could include vehicle speeds and travel times for a given link or collection of links.

**Logical Architecture Data Flow(s):**

toll\_probe\_data\_for\_traffic

**Physical Architecture Flow Name:** toll service change response

Response to toll service change requests indicating level of compliance with request.

**Logical Architecture Data Flow(s):**

toll\_price\_changes\_response  
toll\_price\_direct\_details

**Rail Operations** => **Traffic Management**

**Physical Architecture Flow Name:** railroad advisories

Real-time notification of railway-related incident or advisory.

**Logical Architecture Data Flow(s):**

fro-incident\_notification

**Physical Architecture Flow Name:** railroad schedules

Train schedules, maintenance schedules, and other information from the railroad that supports forecast of HRI closures.

**Logical Architecture Data Flow(s):**

fro-maintenance\_schedules  
fro-train\_schedules

**Roadway** => **Traffic Management**

**Physical Architecture Flow Name:** automated roadway status

Current operational status of an automated vehicle operations facility, including the status of the field equipment and vehicles using the facility.

**Logical Architecture Data Flow(s):**

avo\_device\_status  
avo\_checking\_details

**Physical Architecture Flow Name:** barrier system status

Current operating status of barrier systems. Barrier systems represent gates, barriers and

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other automated or remotely controlled systems used to manage entry to roadways. Status of the systems includes operating condition and current operational state.

**Logical Architecture Data Flow(s):**

barrier\_system\_status  
barrier\_system\_device\_status

**Physical Architecture Flow Name:** environmental sensor data

Current road conditions (e.g., surface temperature, subsurface temperature, moisture, icing, treatment status) and surface weather conditions (e.g., air temperature, wind speed, precipitation, visibility) as measured and reported by fixed and/or mobile environmental sensors. Operational status of the sensors is also included.

**Logical Architecture Data Flow(s):**

environment\_sensor\_data  
environmental\_sensor\_status

**Physical Architecture Flow Name:** hov data

Current HOV lane information including both standard traffic flow measures and information regarding vehicle occupancy in HOV lanes, and operational status of the HOV monitoring equipment.

**Logical Architecture Data Flow(s):**

hov\_lane\_data\_input  
hov\_sensor\_status  
hov\_sensor\_data

**Physical Architecture Flow Name:** hri status

Status of the highway-rail intersection equipment including both the current state or mode of operation and the current equipment condition.

**Logical Architecture Data Flow(s):**

hri\_guidance\_for\_roadway\_info  
traffic\_management\_request  
hri\_status  
hri\_traffic\_data  
rail\_operations\_message

**Physical Architecture Flow Name:** intersection blockage notification

Notification that a highway-rail intersection is obstructed and supporting information.

**Logical Architecture Data Flow(s):**

intersection\_blocked  
hri\_blockage

**Physical Architecture Flow Name:** lane management information

System status including current operational state, violations, and logged information.

**Logical Architecture Data Flow(s):**

dynamic\_lane\_sensor\_data  
lane\_violation\_notification\_for\_traffic  
lane\_management\_status  
lane\_management\_device\_status

**Physical Architecture Flow Name:** lighting system status

Status of roadside lighting controls including operating condition and current operational state.

**Logical Architecture Data Flow(s):**

lighting\_system\_device\_status  
lighting\_system\_status

**Physical Architecture Flow Name:** reversible lane status

## Traffic Management

Current reversible lane status including traffic sensor and surveillance data and the operational status and mode of the reversible lane control equipment.

**Logical Architecture Data Flow(s):**

reversible\_lane\_control\_device\_status\_from\_roads  
reversible\_lane\_sensor\_data  
reversible\_lane\_sensor\_status  
reversible\_lane\_control\_device\_status\_from\_highways  
reversible\_lane\_video\_images

**Physical Architecture Flow Name:** right-of-way request notification

Notice that a request has occurred for signal prioritization, signal preemption, pedestrian call, multi-modal crossing activation, or other source for right-of-way.

**Logical Architecture Data Flow(s):**

signal\_priority\_override  
signal\_preemption\_override  
multimodal\_crossing\_sensor\_status  
multimodal\_crossing\_sensor\_data  
pedestrian\_sensor\_status  
pedestrian\_sensor\_data

**Physical Architecture Flow Name:** road user protection data

Current data as well as operational status from mixed roadway and right-of-way systems.

**Logical Architecture Data Flow(s):**

road\_user\_protection\_data\_for\_traffic  
road\_user\_protection\_device\_status

**Physical Architecture Flow Name:** roadway information system status

Current operating status of dynamic message signs, highway advisory radios, beacon systems, or other configurable field equipment that provides dynamic information to the driver.

**Logical Architecture Data Flow(s):**

har\_status  
dms\_status

**Physical Architecture Flow Name:** roadway warning system status

Current operating status of roadway warning systems.

**Logical Architecture Data Flow(s):**

roadway\_warning\_system\_status  
roadway\_warning\_device\_status

**Physical Architecture Flow Name:** safeguard system status

Current operating status of safeguard systems (remotely controlled equipment used to mitigate the impact of incidents on transportation infrastructure, such as blast shields, exhaust systems, etc.). Status of the systems includes operating condition and current operational state.

**Logical Architecture Data Flow(s):**

safeguard\_system\_status  
safeguard\_system\_device\_status

**Physical Architecture Flow Name:** short range communications status

Status of the short range communications equipment including the current state or mode of operation and the current equipment status.

**Logical Architecture Data Flow(s):**

vehicle\_sign\_status

**Physical Architecture Flow Name:** shoulder management information

System status including current operational state, violations and logged information.

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### **Logical Architecture Data Flow(s):**

- shoulder\_management\_device\_status
- shoulder\_management\_status
- shoulder\_violation\_notification\_for\_traffic

**Physical Architecture Flow Name:** signal control status

Operational and status data of traffic signal control equipment including operating condition and current indications.

### **Logical Architecture Data Flow(s):**

- indicator\_input\_data\_from\_signals
- indicator\_status\_from\_signals

**Physical Architecture Flow Name:** signal fault data

Faults from traffic signal control equipment.

### **Logical Architecture Data Flow(s):**

- field\_management\_station\_fault\_indication
- indicator\_faults\_from\_signals

**Physical Architecture Flow Name:** speed monitoring information

System status including current operational state and logged information including measured speeds, warning messages displayed, and violation records.

### **Logical Architecture Data Flow(s):**

- speed\_sensor\_status
- speed\_data\_for\_traffic\_speed\_monitoring
- speed\_sensor\_log\_for\_traffic
- speed\_violation\_notification\_for\_traffic

**Physical Architecture Flow Name:** traffic flow

Raw and/or processed traffic detector data which allows derivation of traffic flow variables (e.g., speed, volume, and density measures) and associated information (e.g., congestion, potential incidents). This flow includes the traffic data and the operational status of the traffic detectors.

### **Logical Architecture Data Flow(s):**

- traffic\_image\_data
- traffic\_sensor\_status
- incident\_analysis\_data
- traffic\_sensor\_data

**Physical Architecture Flow Name:** traffic images

High fidelity, real-time traffic images suitable for surveillance monitoring by the operator or for use in machine vision applications.

### **Logical Architecture Data Flow(s):**

- incident\_video\_image
- dynamic\_lane\_video\_image
- traffic\_video\_image
- traffic\_video\_image\_for\_display
- video\_device\_status

**Physical Architecture Flow Name:** traffic metering status

Current operational status and operating parameters for ramp meters, interchange meters, mainline meters and other control equipment associated with roadway metering operations.

### **Logical Architecture Data Flow(s):**

- indicator\_input\_data\_from\_traffic\_meters
- indicator\_status\_from\_traffic\_meters

**Physical Architecture Flow Name:** traffic probe data

Vehicle data that is used to determine traffic conditions. In a basic implementation, the data

## Traffic Management

could be limited to time stamped unique identifiers that can be used to measure a vehicle's progress through the network. In more advanced implementations, the vehicle may report current position, speed, and heading and snapshots of recent events including route information, starts and stops, speed changes, and other information that can be used to estimate traffic conditions.

### Logical Architecture Data Flow(s):

vehicle\_traffic\_probe\_data\_for\_traffic  
vehicle\_traffic\_probe equip\_status

**Physical Architecture Flow Name:** variable speed limit status

Current operating status of the variable speed limit systems including the state of the equipment.

### Logical Architecture Data Flow(s):

variable\_speed\_limit\_status

**Surface Transportation Weather Service** => **Traffic Management**

**Physical Architecture Flow Name:** environmental conditions data

Current road conditions (e.g., surface temperature, subsurface temperature, moisture, icing, treatment status) and surface weather conditions (e.g., air temperature, wind speed, precipitation, visibility) as measured and reported by fixed and/or mobile environmental sensors and aggregated by the data collector. Attributes relating to the data collection (and aggregation) are also included.

### Logical Architecture Data Flow(s):

fstws-env\_sensor\_data\_for\_traffic

**Physical Architecture Flow Name:** transportation weather information

Current and forecast road conditions and weather information (e.g., surface condition, flooding, wind advisories, visibility, etc.) associated with the transportation network. This information is of a resolution, timeliness, and accuracy to be useful in transportation decision making.

### Logical Architecture Data Flow(s):

fstws-surface\_trans\_weather\_observations  
fstws-surface\_trans\_weather\_forecasts

**Traffic Management** => **Archived Data Management**

**Physical Architecture Flow Name:** archived data product requests

A user-specified request for archived data products (i.e. data, meta data, or data catalogs). The request also includes information that is used to identify and authenticate the user and support electronic payment requirements, if any.

### Logical Architecture Data Flow(s):

traffic\_archive\_data\_product\_request

**Physical Architecture Flow Name:** traffic archive data

Information describing the use and vehicle composition on transportation facilities and the traffic control strategies employed. Content may include a catalog of available information, the actual information to be archived, and associated meta data that describes the archived information.

### Logical Architecture Data Flow(s):

traffic\_management\_archive\_data

**Traffic Management** => **Border Inspection Systems**

**Physical Architecture Flow Name:** border incident information

Notification of existence of incident in the vicinity of the border. Information would include expected severity, location, time and nature of incident. As additional information is gathered and the incident evolves, updated incident information is provided.

## Traffic Management

### Logical Architecture Data Flow(s):

tbis-traffic\_border\_incident

**Physical Architecture Flow Name:** traffic images

High fidelity, real-time traffic images suitable for surveillance monitoring by the operator or for use in machine vision applications.

### Logical Architecture Data Flow(s):

tbis-traffic\_border\_incident\_video

**Traffic Management** => **DMV**

**Physical Architecture Flow Name:** license request

Request supporting registration data based on license plate read during violation.

### Logical Architecture Data Flow(s):

tdmv-traffic\_violation\_identity\_code  
tdmv-traffic\_violation\_vehicle\_license

**Traffic Management** => **Emergency Management**

**Physical Architecture Flow Name:** alert status

Information indicating the current status of the emergency alert including identification of the traveler and driver information systems that are being used to provide the alert.

### Logical Architecture Data Flow(s):

alert\_notification\_status\_from\_traffic

**Physical Architecture Flow Name:** emergency plan coordination

Information that supports coordination of emergency management plans, continuity of operations plans, emergency response and recovery plans, evacuation plans, and other emergency plans between agencies. This includes general plans that are coordinated prior to an incident and shorter duration tactical plans that are prepared during an incident.

### Logical Architecture Data Flow(s):

evacuation\_plan\_coordination\_from\_traffic  
disaster\_response\_plan\_coordination\_from\_traffic

**Physical Architecture Flow Name:** emergency routes

Suggested ingress and egress routes for access to and between the scene and staging areas or other specialized emergency access routes.

### Logical Architecture Data Flow(s):

emergency\_route\_response

**Physical Architecture Flow Name:** emergency traffic control information

Status of a special traffic control strategy or system activation implemented in response to an emergency traffic control request, a request for emergency access routes, a request for evacuation, a request to activate closure systems, a request to employ driver information systems to support public safety objectives, or other special requests. Identifies the selected traffic control strategy and system control status.

### Logical Architecture Data Flow(s):

traffic\_evacuation\_status  
barrier\_system\_status\_to\_emerg  
roadway\_information\_status\_from\_traffic  
safeguard\_system\_status\_to\_emerg  
emergency\_traffic\_control\_response

**Physical Architecture Flow Name:** incident information

Notification of existence of incident and expected severity, location, time and nature of



## Traffic Management

incident. As additional information is gathered and the incident evolves, updated incident information is provided. Incidents include any event that impacts transportation system operation ranging from routine incidents (e.g., disabled vehicle at the side of the road) through large-scale natural or human-caused disasters that involve loss of life, injuries, extensive property damage, and multi-jurisdictional response. This also includes special events, closures, and other planned events that may impact the transportation system.

**Logical Architecture Data Flow(s):**

- wrong\_way\_vehicle\_detection
- planned\_events\_for\_em\_response
- incident\_response\_clear
- incident\_alert\_details

**Physical Architecture Flow Name:** incident response status

Status of the current incident response including a summary of incident status and its impact on the transportation system, traffic management strategies implemented at the site (e.g., closures, diversions, traffic signal control overrides), and current and planned response activities.

**Logical Architecture Data Flow(s):**

- current\_traffic\_incident\_response

**Physical Architecture Flow Name:** resource deployment status

Status of resource deployment identifying the resources (vehicles, equipment, materials, and personnel) available and their current status. General resource inventory information and specific status of deployed resources may be included.

**Logical Architecture Data Flow(s):**

- resource\_deployment\_status

**Physical Architecture Flow Name:** resource request

A request for resources to implement special traffic control measures, assist in clean up, verify an incident, etc. The request may poll for resource availability or request pre-staging, staging, or immediate deployment of resources. Resources may be explicitly requested or a service may be requested and the specific resource deployment may be determined by the responding agency.

**Logical Architecture Data Flow(s):**

- em\_resource\_request\_from\_traffic

**Physical Architecture Flow Name:** road network conditions

Current and forecasted traffic information, road and weather conditions, and other road network status. Either raw data, processed data, or some combination of both may be provided by this architecture flow. Information on diversions and alternate routes, closures, and special traffic restrictions (lane/shoulder use, weight restrictions, width restrictions, HOV requirements) in effect is included along with a definition of the links, nodes, and routes that make up the road network.

**Logical Architecture Data Flow(s):**

- roadway\_detours\_and\_closures\_for\_em\_response
- roadway\_detours\_and\_closures\_for\_em
- traffic\_data\_for\_emergency\_services
- traffic\_data\_for\_em\_response

**Physical Architecture Flow Name:** road network status assessment

Assessment of damage sustained by the road network including location and extent of the damage, estimate of remaining capacity, required closures, alternate routes, necessary restrictions, and time frame for repair and recovery.

**Logical Architecture Data Flow(s):**

- network\_status\_from\_traffic\_for\_disaster
- network\_status\_from\_traffic\_for\_evacuation

**Physical Architecture Flow Name:** traffic images

High fidelity, real-time traffic images suitable for surveillance monitoring by the operator or for

## Traffic Management

use in machine vision applications.

**Logical Architecture Data Flow(s):**  
incident\_video\_for\_emergency\_services

**Traffic Management** => **Emissions Management**

**Physical Architecture Flow Name:** pollution state data request  
Aggregated emissions data information request.

**Logical Architecture Data Flow(s):**  
pollution\_state\_data\_request

**Traffic Management** => **Enforcement Agency**

**Physical Architecture Flow Name:** request for enforcement  
Request for traffic enforcement of speed limits, lane controls, etc. on a roadway including in a work zone or other special situations.

**Logical Architecture Data Flow(s):**  
tea-enforcement\_request\_from\_traffic  
tea-request\_shoulder\_enforcement  
tea-request\_lane\_enforcement

**Physical Architecture Flow Name:** traffic violation notification  
Notification to enforcement agency of a detected traffic violation including speed violations, HOV violations, and dynamic lane violations.

**Logical Architecture Data Flow(s):**  
tea-shoulder\_violation\_notification  
tea-traffic\_violation\_data  
tea-lane\_violation\_notification

**Traffic Management** => **Event Promoters**

**Physical Architecture Flow Name:** event confirmation  
Confirmation that special event details have been received and processed.

**Logical Architecture Data Flow(s):**  
tevp-event\_confirmation

**Traffic Management** => **Information Service Provider**

**Physical Architecture Flow Name:** incident information  
Notification of existence of incident and expected severity, location, time and nature of incident. As additional information is gathered and the incident evolves, updated incident information is provided. Incidents include any event that impacts transportation system operation ranging from routine incidents (e.g., disabled vehicle at the side of the road) through large-scale natural or human-caused disasters that involve loss of life, injuries, extensive property damage, and multi-jurisdictional response. This also includes special events, closures, and other planned events that may impact the transportation system.

**Logical Architecture Data Flow(s):**  
traffic\_incident\_data\_for\_isp  
planned\_events

**Physical Architecture Flow Name:** road network conditions  
Current and forecasted traffic information, road and weather conditions, and other road network status. Either raw data, processed data, or some combination of both may be provided by this architecture flow. Information on diversions and alternate routes, closures, and special

## Traffic Management

traffic restrictions (lane/shoulder use, weight restrictions, width restrictions, HOV requirements) in effect is included along with a definition of the links, nodes, and routes that make up the road network.

### Logical Architecture Data Flow(s):

reversible\_lane\_signal\_state\_for\_roads  
link\_data\_for\_guidance  
prediction\_data  
traffic\_road\_weather\_data\_for\_isp  
current\_highway\_network\_state  
traffic\_data\_for\_isp  
current\_road\_network\_state  
reversible\_lane\_signal\_state\_for\_freeways  
roadway\_detours\_and\_closures\_for\_isp

**Physical Architecture Flow Name:** traffic images

High fidelity, real-time traffic images suitable for surveillance monitoring by the operator or for use in machine vision applications.

### Logical Architecture Data Flow(s):

traffic\_video\_for\_isp

## Traffic Management

=> **Intermodal Freight Depot**

**Physical Architecture Flow Name:** intermodal freight traffic confirmation

Confirmation that details concerning the movement of intermodal freight on the roadway network have been received and processed. May also include information on traffic conditions affecting the depot including information concerning any special traffic control accommodations or restrictions for commercial vehicles.

### Logical Architecture Data Flow(s):

tifd-traffic\_data\_for\_intermodal\_freight  
tifd-intermodal\_freight\_event\_confirmation

## Traffic Management

=> **Maintenance and Construction Management**

**Physical Architecture Flow Name:** environmental conditions data

Current road conditions (e.g., surface temperature, subsurface temperature, moisture, icing, treatment status) and surface weather conditions (e.g., air temperature, wind speed, precipitation, visibility) as measured and reported by fixed and/or mobile environmental sensors and aggregated by the data collector. Attributes relating to the data collection (and

### Logical Architecture Data Flow(s):

environment\_sensor\_data\_for\_maint

**Physical Architecture Flow Name:** field equipment status

Identification of field equipment requiring repair and known information about the associated faults.

### Logical Architecture Data Flow(s):

field\_equipment\_status\_from\_traffic

**Physical Architecture Flow Name:** incident information

Notification of existence of incident and expected severity, location, time and nature of incident. As additional information is gathered and the incident evolves, updated incident information is provided. Incidents include any event that impacts transportation system operation ranging from routine incidents (e.g., disabled vehicle at the side of the road) through large-scale natural or human-caused disasters that involve loss of life, injuries, extensive property damage, and multi-jurisdictional response. This also includes special events, closures, and other planned events that may impact the transportation system.

### Logical Architecture Data Flow(s):

## Traffic Management

planned\_events\_for\_maint  
incident\_info\_from\_traffic

**Physical Architecture Flow Name:** maint and constr resource request

Request for road maintenance and construction resources that can be used in the diversion of traffic (cones, portable signs), clearance of a road hazard, repair of ancillary damage, or any other incident response. The request may poll for resource availability or request pre-staging, staging, or immediate dispatch of resources.

**Logical Architecture Data Flow(s):**

roadway\_maint\_action\_req\_from\_traffic  
winter\_maint\_action\_req\_from\_traffic  
m\_and\_c\_resource\_request\_from\_traffic

**Physical Architecture Flow Name:** road network conditions

Current and forecasted traffic information, road and weather conditions, and other road network status. Either raw data, processed data, or some combination of both may be provided by this architecture flow. Information on diversions and alternate routes, closures, and special traffic restrictions (lane/shoulder use, weight restrictions, width restrictions, HOV requirements) in effect is included along with a definition of the links, nodes, and routes that make up the road network.

**Logical Architecture Data Flow(s):**

environmental\_sensor\_data\_from\_traffic\_management  
road\_network\_info\_from\_traffic  
roadway\_detours\_and\_closures\_for\_m\_and\_c

**Physical Architecture Flow Name:** road network status assessment

Assessment of damage sustained by the road network including location and extent of the damage, estimate of remaining capacity, required closures, alternate routes, necessary restrictions, and time frame for repair and recovery.

**Logical Architecture Data Flow(s):**

disaster\_network\_status\_from\_traffic\_to\_m\_and\_c

**Physical Architecture Flow Name:** traffic images

High fidelity, real-time traffic images suitable for surveillance monitoring by the operator or for use in machine vision applications.

**Logical Architecture Data Flow(s):**

traffic\_video\_for\_mcm

**Physical Architecture Flow Name:** work plan feedback

Comments and suggested changes to proposed construction and maintenance work schedules and activities. This information influences work plan schedules so that they minimize impact to other system operations and the overall transportation system.

**Logical Architecture Data Flow(s):**

m\_and\_c\_plan\_feedback\_from\_traffic

**Traffic Management** => **Map Update Provider**

**Physical Architecture Flow Name:** map update request

Request for a map update which could include a new underlying map or map layer updates.

**Logical Architecture Data Flow(s):**

tmup-request\_traffic\_display\_update  
tmup-request\_incident\_display\_update  
tmup-map\_static\_data  
tmup-request\_demand\_display\_update

**Traffic Management** => **Media**

## Traffic Management

**Physical Architecture Flow Name:** traffic information for media

Report of traffic conditions including traffic incident reports and traffic images for public dissemination through the media. The reports may also include information on diversions and alternate routes, closures, and special traffic restrictions in effect.

**Logical Architecture Data Flow(s):**

tm-incident\_data  
tm-traffic\_data  
tm-traffic\_video\_images

**Traffic Management** => **Other Traffic Management**

**Physical Architecture Flow Name:** device control request

Request for device control action

**Logical Architecture Data Flow(s):**

totm-device\_control\_request

**Physical Architecture Flow Name:** device data

Data from detectors, environmental sensor stations, and traffic control devices including device inventory information.

**Logical Architecture Data Flow(s):**

totm-device\_data  
totm-device\_inventory

**Physical Architecture Flow Name:** device status

Status information from devices

**Logical Architecture Data Flow(s):**

totm-device\_status

**Physical Architecture Flow Name:** emergency traffic coordination

Coordination supporting disaster response including evacuation and reentry. Includes coordination of special traffic control strategies that support efficient evacuation and reentry while protecting and optimizing movement of response vehicles and other resources responding to the emergency.

**Logical Architecture Data Flow(s):**

totm-disaster\_network\_status  
totm-evacuation\_information  
totm-network\_status\_for\_evacuation  
totm-traffic\_control\_strategy\_for\_disaster\_or\_evacuation

**Physical Architecture Flow Name:** incident information

Notification of existence of incident and expected severity, location, time and nature of incident. As additional information is gathered and the incident evolves, updated incident information is provided. Incidents include any event that impacts transportation system operation ranging from routine incidents (e.g., disabled vehicle at the side of the road) through large-scale natural or human-caused disasters that involve loss of life, injuries, extensive property damage, and multi-jurisdictional response. This also includes special events, closures, and other planned events that may impact the transportation system.

**Logical Architecture Data Flow(s):**

totm-permit\_coordination\_for\_traffic  
totm-planned\_event\_data  
totm-current\_event\_data

**Physical Architecture Flow Name:** road network conditions

Current and forecasted traffic information, road and weather conditions, and other road network status. Either raw data, processed data, or some combination of both may be provided by this architecture flow. Information on diversions and alternate routes, closures, and special

## Traffic Management

traffic restrictions (lane/shoulder use, weight restrictions, width restrictions, HOV requirements) in effect is included along with a definition of the links, nodes, and routes that make up the road network.

### Logical Architecture Data Flow(s):

totm-road\_weather\_data  
totm-traffic\_data  
totm-road\_network\_inventory\_and\_status  
totm-roadway\_detours\_and\_closures

**Physical Architecture Flow Name:** traffic images

High fidelity, real-time traffic images suitable for surveillance monitoring by the operator or for use in machine vision applications.

### Logical Architecture Data Flow(s):

totm-traffic\_image\_data

## Traffic Management

=>

## Parking Management

**Physical Architecture Flow Name:** parking demand management request

Request to change the demand for parking facility use through pricing or other mechanisms.

### Logical Architecture Data Flow(s):

parking\_lot\_charge\_change\_request  
parking\_lot\_charge\_direct\_request

**Physical Architecture Flow Name:** parking lot data request

Request for parking lot occupancy, fares, and availability. The request can be a subscription that initiates as-needed information updates as well as a one-time request for information.

### Logical Architecture Data Flow(s):

parking\_lot\_static\_information\_request\_by\_traffic  
parking\_lot\_dynamic\_information\_request\_by\_traffic

**Physical Architecture Flow Name:** parking lot inputs

Instructions for operation of local parking facilities to support regional traffic management objectives (e.g. which parking lot exits to use). Also, includes inputs from traffic sensors to support calculation of parking lot occupancy and support more effective management of parking entrances and exits.

### Logical Architecture Data Flow(s):

parking\_lot\_input\_data  
static\_data\_for\_parking\_lots  
selected\_parking\_lot\_control\_strategy

## Traffic Management

=>

## Payment Administration

**Physical Architecture Flow Name:** toll service change request

Request to change pricing, modify restrictions, or modify operations of a toll road facility

### Logical Architecture Data Flow(s):

toll\_price\_changes\_request  
toll\_price\_direct\_request

## Traffic Management

=>

## Rail Operations

**Physical Architecture Flow Name:** hri advisories

Notification of Highway-Rail Intersection equipment failure, intersection blockage, or other condition requiring attention, and maintenance activities at or near highway rail intersections.

## Traffic Management

### Logical Architecture Data Flow(s):

tro-incident\_notification  
tro-event\_schedules  
tro-equipment\_status

## Traffic Management

=>

## Roadway

**Physical Architecture Flow Name:** automated roadway control data

Control commands and operating parameters provided to field equipment that controls and monitors automated vehicle operations.

### Logical Architecture Data Flow(s):

automated\_lane\_changing\_control\_data  
avo\_control\_data\_changes

**Physical Architecture Flow Name:** barrier system control

Information used to configure and control barrier systems that are represented by gates, barriers and other automated or remotely controlled systems used to manage entry to

### Logical Architecture Data Flow(s):

barrier\_system\_control

**Physical Architecture Flow Name:** environmental sensors control

Data used to configure and control environmental sensors.

### Logical Architecture Data Flow(s):

env\_sensor\_control\_to\_roadway

**Physical Architecture Flow Name:** hri control data

Data required for HRI information transmitted at railroad grade crossings and within railroad operations.

### Logical Architecture Data Flow(s):

rail\_operations\_advisories  
indicator\_sign\_control\_data\_for\_hri  
rail\_operations\_device\_command  
hri\_traffic\_surveillance

**Physical Architecture Flow Name:** hri request

A request for highway-rail intersection status or a specific control request intended to modify HRI operation.

### Logical Architecture Data Flow(s):

rail\_operations\_requests  
tms\_requests

**Physical Architecture Flow Name:** lane management control

Information used to configure and control dynamic lane management systems.

### Logical Architecture Data Flow(s):

lane\_management\_control

**Physical Architecture Flow Name:** lighting system control data

Information used to configure and control roadside lighting systems.

### Logical Architecture Data Flow(s):

lighting\_system\_control

**Physical Architecture Flow Name:** reversible lane control

Control of automated reversible lane configuration and driver information systems.

### Logical Architecture Data Flow(s):

## Traffic Management

reversible\_lane\_control\_for\_highways  
reversible\_lane\_control\_for\_roads

**Physical Architecture Flow Name:** road user protection device control

Control requests and operating parameters for mixed roadway and right-of-way systems.

**Logical Architecture Data Flow(s):**

road\_user\_protection\_device\_configuration

**Physical Architecture Flow Name:** roadway information system data

Information used to initialize, configure, and control roadside systems that provide driver information (e.g., dynamic message signs, highway advisory radio, beacon systems). This flow can provide message content and delivery attributes, local message store maintenance requests, control mode commands, status queries, and all other commands and associated parameters that support remote management of these systems.

**Logical Architecture Data Flow(s):**

dms\_control\_data  
dms\_variable\_speed\_limit\_data  
dms\_wide\_area\_alert\_information  
har\_data  
dms\_traffic\_metering\_data  
har\_wide\_area\_alert\_information  
dms\_data

**Physical Architecture Flow Name:** roadway warning system control

Information used to configure and control roadway warning systems.

**Logical Architecture Data Flow(s):**

roadway\_warning\_system\_control

**Physical Architecture Flow Name:** safeguard system control

Data that controls safeguard systems (remotely controlled equipment used to mitigate the impact of incidents on transportation infrastructure, such as blast shields, exhaust systems, etc.).

**Logical Architecture Data Flow(s):**

safeguard\_system\_control

**Physical Architecture Flow Name:** shoulder management control

Information used to configure and control systems that allow use of a shoulder as a lane for vehicular traffic.

**Logical Architecture Data Flow(s):**

shoulder\_management\_control

**Physical Architecture Flow Name:** signal control commands

Control of traffic signal controllers or field masters including clock synchronization.

**Logical Architecture Data Flow(s):**

indicator\_control\_data\_for\_signal\_control

**Physical Architecture Flow Name:** signal control device configuration

Data used to configure traffic signal control equipment including local controllers and system masters.

**Logical Architecture Data Flow(s):**

indicator\_control\_configuration\_data\_for\_signal\_control

**Physical Architecture Flow Name:** signal control plans

Traffic signal timing parameters including minimum green time and interval durations for basic operation and cycle length, splits, offset, phase sequence, etc. for coordinated systems.



## Traffic Management

### Logical Architecture Data Flow(s):

signal\_system\_timing\_plan

**Physical Architecture Flow Name:** signal system configuration

Data used to configure traffic signal systems including configuring control sections and mode of operation (time based or traffic responsive).

### Logical Architecture Data Flow(s):

signal\_system\_configuration

**Physical Architecture Flow Name:** speed monitoring control

Information used to configure and control automated speed monitoring, speed warning, and speed enforcement systems.

### Logical Architecture Data Flow(s):

speed\_sensor\_control\_from\_traffic

**Physical Architecture Flow Name:** traffic metering control

Control commands and operating parameters for ramp meters, interchange meters, mainline meters, and other systems equipment associated with roadway metering operations.

### Logical Architecture Data Flow(s):

indicator\_control\_data\_for\_traffic\_metering  
indicator\_control\_monitoring\_data\_for\_traffic\_metering

**Physical Architecture Flow Name:** traffic sensor control

Information used to configure and control traffic sensor systems.

### Logical Architecture Data Flow(s):

sensor\_configuration\_data

**Physical Architecture Flow Name:** variable speed limit control

Information used to configure and control variable speed limit systems including the equipment used to provide current speed limits and other information to drivers and the equipment used to monitor traffic and environmental conditions along the roadway.

### Logical Architecture Data Flow(s):

variable\_speed\_limit\_control

**Physical Architecture Flow Name:** vehicle signage data

In-vehicle signing data that augments regulatory, warning, and informational road signs and signals. The information provided would include static sign information (e.g., stop, curve warning, guide signs, service signs, and directional signs) and dynamic information (e.g., current signal states, grade crossing information, local traffic and road conditions, advisories, and detours).

### Logical Architecture Data Flow(s):

vehicle\_sign\_data

**Physical Architecture Flow Name:** video surveillance control

Information used to configure and control video surveillance systems.

### Logical Architecture Data Flow(s):

incident\_video\_image\_control

## Traffic Management

=> **Surface Transportation  
Weather Service**

**Physical Architecture Flow Name:** environmental conditions data

Current road conditions (e.g., surface temperature, subsurface temperature, moisture, icing, treatment status) and surface weather conditions (e.g., air temperature, wind speed, precipitation, visibility) as measured and reported by fixed and/or mobile environmental sensors and aggregated by the data collector. Attributes relating to the data collection (and aggregation) are also included.

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### Logical Architecture Data Flow(s):

tstws-env\_sensor\_data\_from\_traffic

**Physical Architecture Flow Name:** transportation weather information request

A request for transportation weather information that may specify the area of interest (a geographic region, particular routes within a region, specific road segments), the type of information that is required, the desired spatial resolution of the information, and time horizon.

### Logical Architecture Data Flow(s):

tstws-trans\_weather\_info\_request

## Traffic Management

=>

## Traffic Operations Personnel

**Physical Architecture Flow Name:** traffic operator data

Presentation of traffic operations data to the operator including traffic conditions, current operating status of field equipment, maintenance activity status, incident status, video images, security alerts, emergency response plan updates and other information. This data keeps the operator appraised of current road network status, provides feedback to the operator as traffic control actions are implemented, provides transportation security inputs, and supports review of historical data and preparation for future traffic operations activities.

### Logical Architecture Data Flow(s):

ttop-vehicle\_speed\_sensor\_data  
ttop-undefined\_response\_details  
ttop-traffic\_control\_information\_display  
ttop-weather\_information  
ttop-resource\_response  
ttop-possible\_incidents\_data  
ttop-possible\_defined\_response\_output  
ttop-incident\_video\_image\_output  
ttop-incident\_information\_display  
ttop-video\_image\_output  
ttop-demand\_policy\_information  
ttop-demand\_policy\_activation\_result  
ttop-demand\_forecast\_result  
ttop-demand\_forecast\_data  
ttop-demand\_data  
ttop-defined\_incident\_responses\_data  
ttop-traveler\_information\_restrictions  
ttop-lighting\_system\_status  
ttop-roadway\_warning\_system\_status  
ttop-dynamic\_lane\_status  
ttop-vehicle\_signage\_status  
ttop-wrong\_way\_detection  
ttop-roadway\_info\_status  
ttop-roadway\_incident\_status  
ttop-deactivate\_information\_restrictions  
ttop-disaster\_response\_plan\_input\_request  
ttop-video\_device\_status  
ttop-env\_sensor\_status  
ttop-device\_control\_request\_from\_other\_center  
ttop-barrier\_safeguard\_status  
ttop-archive\_status  
ttop-current\_field\_equip\_fault\_data  
ttop-evacuation\_plan\_input\_request  
ttop-wide\_area\_alert\_notification

## Traffic Management

=>

## Transit Management

**Physical Architecture Flow Name:** incident information

Notification of existence of incident and expected severity, location, time and nature of

## Traffic Management

incident. As additional information is gathered and the incident evolves, updated incident information is provided. Incidents include any event that impacts transportation system operation ranging from routine incidents (e.g., disabled vehicle at the side of the road) through large-scale natural or human-caused disasters that involve loss of life, injuries, extensive property damage, and multi-jurisdictional response. This also includes special events, closures, and other planned events that may impact the transportation system.

### **Logical Architecture Data Flow(s):**

- planned\_events
- incident\_response\_log\_for\_transit
- current\_incidents\_data\_for\_transit

**Physical Architecture Flow Name:** request transit information

Request for transit service information and current transit status.

### **Logical Architecture Data Flow(s):**

- transit\_fare\_direct\_request
- transit\_conditions\_demand\_request
- transit\_services\_demand\_request

**Physical Architecture Flow Name:** road network conditions

Current and forecasted traffic information, road and weather conditions, and other road network status. Either raw data, processed data, or some combination of both may be provided by this architecture flow. Information on diversions and alternate routes, closures, and special traffic restrictions (lane/shoulder use, weight restrictions, width restrictions, HOV requirements) in effect is included along with a definition of the links, nodes, and routes that make up the road network.

### **Logical Architecture Data Flow(s):**

- prediction\_data
- roadway\_detours\_and\_closures\_for\_transit
- traffic\_data\_for\_transit

**Physical Architecture Flow Name:** traffic control priority status

Status of signal priority request functions at the roadside (e.g. enabled or disabled).

### **Logical Architecture Data Flow(s):**

- transit\_ramp\_priority\_given
- transit\_highway\_priority\_given
- transit\_road\_priority\_given

**Physical Architecture Flow Name:** traffic images

High fidelity, real-time traffic images suitable for surveillance monitoring by the operator or for use in machine vision applications.

### **Logical Architecture Data Flow(s):**

- traffic\_video\_for\_transit

**Physical Architecture Flow Name:** transit demand management request

Request to change the demand for transit facility use through pricing or other mechanisms.

### **Logical Architecture Data Flow(s):**

- transit\_services\_changes\_request

## Traffic Management

=>

## Weather Service

**Physical Architecture Flow Name:** environmental conditions data

Current road conditions (e.g., surface temperature, subsurface temperature, moisture, icing, treatment status) and surface weather conditions (e.g., air temperature, wind speed, precipitation, visibility) as measured and reported by fixed and/or mobile environmental sensors and aggregated by the data collector. Attributes relating to the data collection (and aggregation) are also included.

### **Logical Architecture Data Flow(s):**

## Traffic Management

tws-env\_sensor\_data\_from\_traffic

**Traffic Operations Personnel** => **Traffic Management**  
**Physical Architecture Flow Name:** traffic operator inputs

User input from traffic operations personnel including requests for information, configuration changes, commands to adjust current traffic control strategies (e.g., adjust signal timing plans, change DMS messages), and other traffic operations data entry.

**Logical Architecture Data Flow(s):**

ftop-roadway\_info\_input  
ftop-alert\_notification\_status  
ftop-device\_control\_request\_to\_other\_center  
ftop-lighting\_system\_control\_parameters  
ftop-archive\_command  
ftop-evacuation\_plan\_input  
ftop-output\_possible\_defined\_responses  
ftop-decision\_support\_parameters  
ftop-weather\_request\_information  
ftop-env\_sensor\_control  
ftop-vehicle\_signage\_input  
ftop-roadway\_incident\_input  
ftop-dynamic\_lane\_mgmt\_control  
ftop-field\_equip\_fault\_data\_request  
ftop-field\_equip\_fault\_data\_input  
ftop-variable\_speed\_limit\_control\_parameters  
ftop-time\_dependent\_operations\_input  
ftop-imbalance\_parameters  
ftop-reversible\_lane\_restriction\_data  
ftop-roadway\_warning\_system\_control  
ftop-hov\_control\_parameters  
ftop-resource\_request  
ftop-barrier\_safeguard\_control\_parameters  
ftop-defined\_incident\_response\_data\_request  
ftop-defined\_incident\_response\_data\_update  
ftop-demand\_data\_request  
ftop-demand\_data\_update\_request  
ftop-demand\_forecast\_request  
ftop-demand\_policy\_activation  
ftop-demand\_policy\_information\_request  
ftop-demand\_policy\_updates  
ftop-incident\_camera\_action\_request  
ftop-incident\_data\_amendment  
ftop-video\_camera\_strategy\_change  
ftop-request\_possible\_incidents\_data  
ftop-update\_defined\_incident\_responses  
ftop-traffic\_data\_parameter\_updates  
ftop-disaster\_response\_plan\_input  
ftop-vehicle\_speed\_sensor\_control  
ftop-incident\_information\_requests  
ftop-traffic\_information\_requests  
ftop-roadway\_characteristics  
ftop-strategy\_override  
ftop-static\_data

**Transit Management** => **Traffic Management**

**Physical Architecture Flow Name:** emergency transit schedule information

Information on transit schedule and service changes that adapt the service to better meet needs of responders and the general public in an emergency situation, including special service schedules supporting evacuation.

## Traffic Management

### Logical Architecture Data Flow(s):

emergency\_transit\_schedule\_information\_for\_traffic  
evacuation\_transit\_schedule\_information\_for\_traffic

**Physical Architecture Flow Name:** traffic control priority request

Request for signal priority at one or more intersections along a particular route.

### Logical Architecture Data Flow(s):

transit\_ramp\_overall\_priority  
transit\_highway\_overall\_priority  
transit\_road\_overall\_priority

**Physical Architecture Flow Name:** transit demand management response

Response to transit demand management change requests indicating level of compliance with request.

### Logical Architecture Data Flow(s):

transit\_services\_changes\_response

**Physical Architecture Flow Name:** transit probe data

Aggregate probe data derived from tracking transit vehicles. Data collected could include transit vehicle speeds and travel times for a given link or collection of links.

### Logical Architecture Data Flow(s):

transit\_probe\_data\_for\_traffic

**Physical Architecture Flow Name:** transit system data

Current transit system operations information indicating current transit routes, the level of service on each route, and the progress of individual vehicles along their routes for use in forecasting demand and estimating current transportation network performance.

### Logical Architecture Data Flow(s):

transit\_running\_data\_for\_demand  
transit\_services\_for\_demand  
transit\_fare\_direct\_details

## Weather Service

=> **Traffic Management**

**Physical Architecture Flow Name:** environmental conditions data status

Status of the data quality of environmental conditions data provided by a data contributor. Includes not only status by sensor, but statistical data regarding the quality checking of data provided.

### Logical Architecture Data Flow(s):

fws-traffic\_environment\_sensor\_data\_status

**Physical Architecture Flow Name:** qualified environmental conditions data

Current road conditions (e.g., surface temperature, subsurface temperature, moisture, icing, treatment status) and surface weather conditions (e.g., air temperature, wind speed, precipitation, visibility) that has had quality checks performed on it and has been formatted and consolidated by the Clarus system. Attributes relating to the data collection (and aggregation) are also included.

### Logical Architecture Data Flow(s):

fws-env\_sensor\_data\_for\_traffic

**Physical Architecture Flow Name:** weather information

Accumulated forecasted and current weather data (e.g., temperature, pressure, wind speed, wind direction, humidity, precipitation, visibility, light conditions, etc.).

### Logical Architecture Data Flow(s):

fws-weather\_forecasts  
fws-current\_weather\_observations

2.21.3 *Architecture Flow Diagrams for TMS*

# Traffic Management

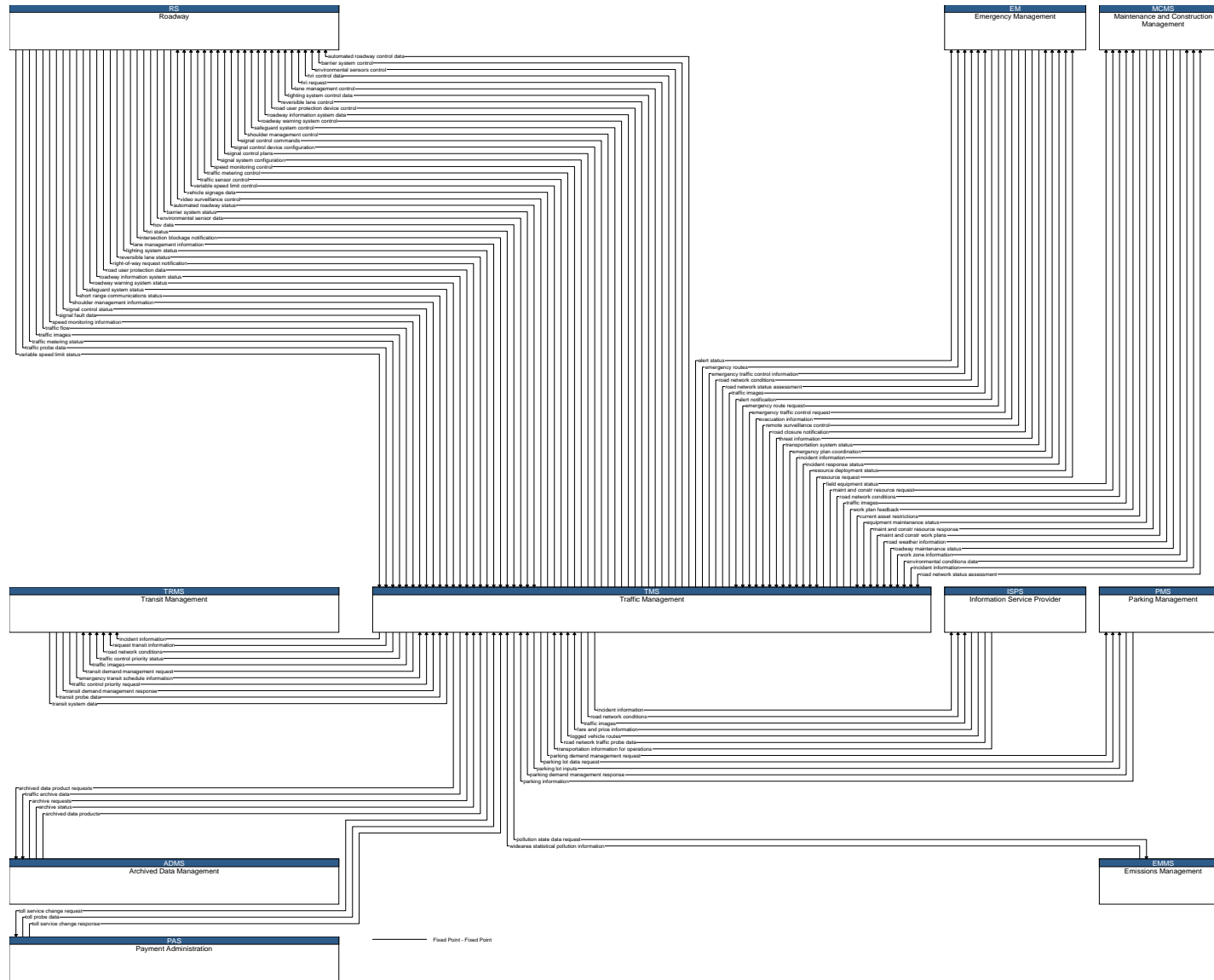
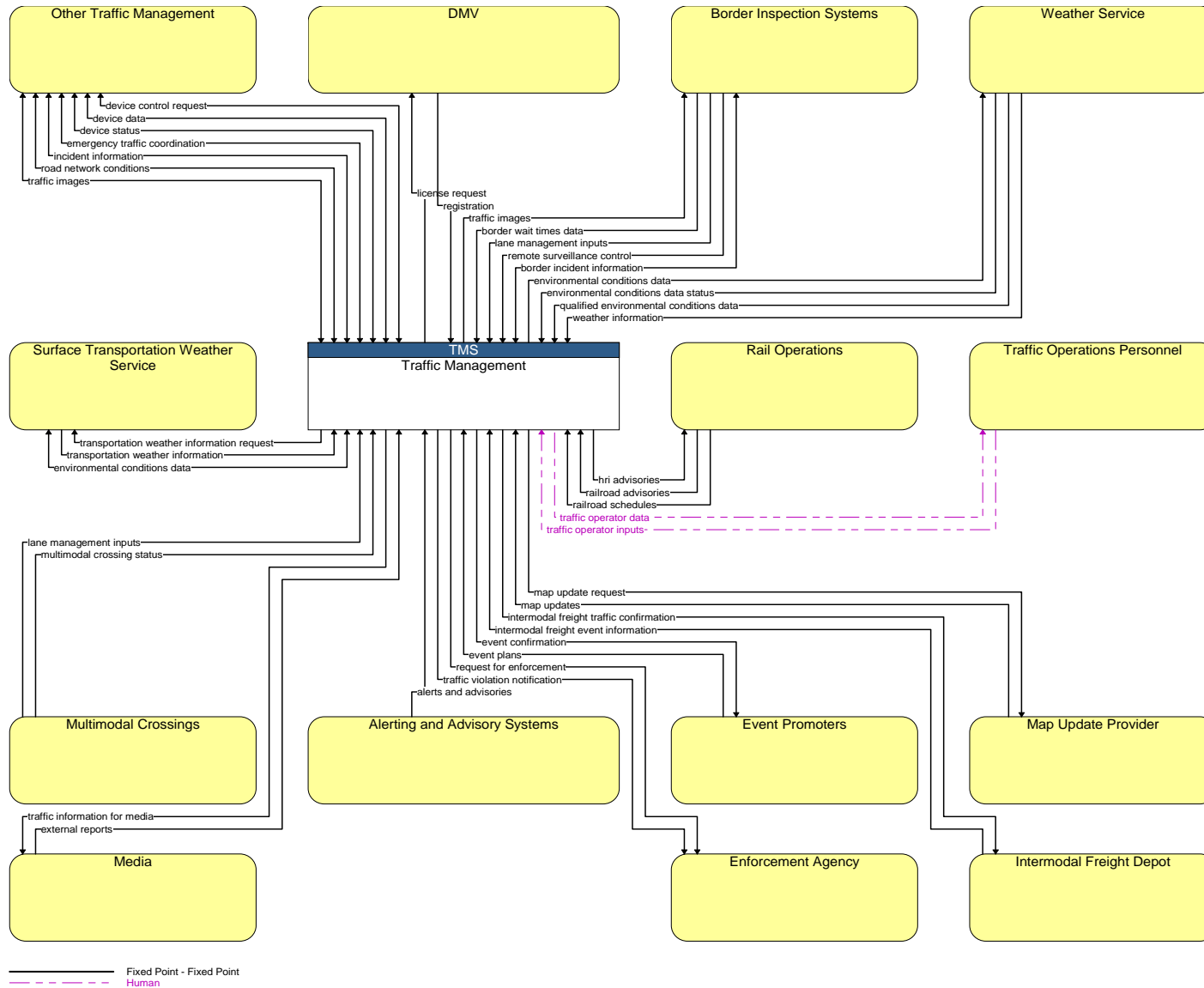


Figure 38: TMS Subsystem Interfaces

# Traffic Management



**Figure 39: TMS Terminator Interfaces**



## 2.22 Transit Management

The Transit Management Subsystem (TRMS) manages transit vehicle fleets and coordinates with other modes and transportation services. It provides operations, maintenance, customer information, planning and management functions for the transit property. It spans distinct central dispatch and garage management systems and supports the spectrum of fixed route, flexible route, paratransit services, transit rail, and bus rapid transit (BRT) service. The subsystem's interfaces allow for communication between transit departments and with other operating entities such as emergency response services and traffic management systems. This subsystem receives special event and real-time incident data from the traffic management subsystem. It provides current transit operations data to other center subsystems. It interfaces with the Emergency Management Subsystem to allow coordinated use of transit vehicles to facilitate response to major emergencies or evacuations. The Transit Management Subsystem collects and stores accurate ridership levels and implements fare structures for use in electronic fare collection. It collects operational and maintenance data from transit vehicles, manages vehicle service histories, and assigns vehicle operators and maintenance personnel to vehicles and routes. The Transit Management Subsystem also provides the capability for automated planning and scheduling of public transit operations. The scheduling capability includes schedule writing, block building and runcutting. The subsystem furnishes travelers with real-time travel information, continuously updated schedules, schedule adherence information, transfer options, and transit routes and fares. In addition, the subsystem supports transit security features. This includes monitoring silent alarms, both passenger and operator initiated, on-board transit vehicles. It also includes the capability to support transit vehicle operator authentication and the capability to remotely disable a transit vehicle. The subsystem includes the capability to monitor for a transit vehicle being off the assigned route. The subsystem also includes the capability to alert operators and police to potential incidents identified by these security features.

### 2.22.1 *Equipment Packages and Process Specifications for TRMS*

#### **Equipment Package: Transit Center Connection Protection**

This equipment package manages the coordination of transit transfers between routes within a single transit agency, between routes of different transit agencies, or between different modes (e.g. a bus transit route and a ferry route). This equipment package also supports the capability for an individual traveler to obtain connection protection throughout a specific transit trip.

#### **Process Specifications**

- 4.1.4        Manage Transit Vehicle Deviations**
- 4.1.8        Manage Individual Service Requests**
- 4.2.3.8     Provide Interface for Transit Service Raw Data**
- 7.4.1.5     Process Traveler Other Services Payments**

#### **Equipment Package: Transit Center Fare Management**

This equipment package manages fare collection and passenger load management at the transit center. It provides the back office functions that support transit fare collection, supporting payment reconciliation with links to financial institutions and enforcement agencies for fare violations. It collects data required to determine accurate ridership levels, establish fares, and distribute fare information. This equipment package loads fare data into the vehicle prior to the beginning of normal operations and unloads fare collection data from the vehicle at the close out of normal operations.

#### **Process Specifications**

- 4.2.3.5     Manage Transit Operational Data Store**
- 4.2.3.7     Provide Interface for Other Transit Management Data**
- 4.6.7        Manage Transit Vehicle Advanced Payments**
- 5.4.4        Process Fare Payment Violations**
- 5.4.5        Process Vehicle Fare Collection Violations**
- 5.4.7        Process Roadside Fare Collection Violations**
- 7.3.1.1     Register for Advanced Transit Fare Payment**
- 7.3.1.2     Determine Advanced Transit Fares**

## Transit Management

- 7.3.1.3 **Manage Transit Fare Financial Processing**
- 7.3.1.4 **Check for Advanced Transit Fare Payment**
- 7.3.1.5 **Bill Traveler for Transit Fare**
- 7.3.1.6 **Collect Bad Transit Fare Payment Data**
- 7.3.1.7 **Update Transit Fare Data**
- 7.3.3 **Get Traveler Image for Violation**
- 7.4.1.5 **Process Traveler Other Services Payments**

### **Equipment Package: Transit Center Fixed-Route Operations**

This equipment package manages fixed route transit operations. It supports creation of schedules, blocks and runs for fixed and flexible route transit services. The package allows fixed-route and flexible-route transit services to disseminate schedules and automatically updates customer service operator systems with the most current schedule information. This equipment package also supports automated dispatch of transit vehicles. Current vehicle schedule adherence and optimum scenarios for schedule adjustment are also provided. This equipment package also receives and processes transit vehicle loading data.

#### **Process Specifications**

- 4.1.4 **Manage Transit Vehicle Deviations**
- 4.1.6 **Manage Transit Vehicle Operations**
- 4.2.2 **Provide Transit Plans Store Interface**
- 4.2.3.1 **Generate Transit Routes**
- 4.2.3.2 **Generate Transit Schedules**
- 4.2.3.3 **Produce Transit Service Data for External Use**
- 4.2.3.4 **Provide Transit Operations Personnel Interface for Services Generation**
- 4.2.3.5 **Manage Transit Operational Data Store**
- 4.2.3.6 **Produce Transit Service Data for Manage Transit Use**

### **Equipment Package: Transit Center Information Services**

This equipment package collects the latest available information for a transit service and makes it available to transit customers and to Information Service Providers for further distribution. Customers are provided information at transit stops and other public transportation areas before they embark and on-board the transit vehicle once they are enroute. Information provided can include the latest available information on transit routes, schedules, transfer options, fares, real-time schedule adherence, current incidents, weather conditions, yellow pages, and special events. In addition to general service information, tailored information (e.g., itineraries) are provided to individual transit users.

#### **Process Specifications**

- 4.1.5 **Provide Transit Vehicle Status and Probe Information**
- 4.1.6 **Manage Transit Vehicle Operations**
- 4.2.3.3 **Produce Transit Service Data for External Use**
- 4.2.3.6 **Produce Transit Service Data for Manage Transit Use**
- 4.2.3.7 **Provide Interface for Other Transit Management Data**

### **Equipment Package: Transit Center Multi-Modal Coordination**

The equipment package supports transit service coordination between transit properties and coordinates with other surface and air transportation modes. As part of service coordination, this equipment package shares schedule and trip information, as well as transit transfer cluster (a collection of stop points, stations, or terminals where transfers can be made conveniently) and transfer point information between Multimodal Transportation Service Providers, Transit Agencies, and ISPs. An interface to Traffic Management also supports demand management strategies.

#### **Process Specifications**

- 4.1.4 **Manage Transit Vehicle Deviations**

## Transit Management

- 4.1.5 **Provide Transit Vehicle Status and Probe Information**
- 4.1.6 **Manage Transit Vehicle Operations**
- 4.2.3.2 **Generate Transit Schedules**
- 4.2.3.3 **Produce Transit Service Data for External Use**
- 4.2.3.4 **Provide Transit Operations Personnel Interface for Services Generation**
- 4.2.3.7 **Provide Interface for Other Transit Management Data**
- 4.2.3.8 **Provide Interface for Transit Service Raw Data**

### **Equipment Package: Transit Center Paratransit Operations**

This equipment package manages demand responsive transit services, including paratransit services. It supports planning and scheduling of these services, allowing paratransit and other demand response transit services to plan efficient routes and better estimate arrival times. This equipment package also supports automated dispatch of paratransit vehicles and tracks passenger pick-ups and drop-offs. Customer service operator systems are updated with the most current schedule information.

#### **Process Specifications**

- 4.1.4 **Manage Transit Vehicle Deviations**
- 4.1.6 **Manage Transit Vehicle Operations**
- 4.2.1.1 **Process Demand Responsive Transit Trip Request**
- 4.2.1.2 **Compute Demand Responsive Transit Vehicle Availability**
- 4.2.1.3 **Generate Demand Responsive Transit Schedule and Routes**
- 4.2.1.4 **Confirm Demand Responsive Transit Schedule and Route**
- 4.2.3.3 **Produce Transit Service Data for External Use**
- 4.2.3.4 **Provide Transit Operations Personnel Interface for Services Generation**

### **Equipment Package: Transit Center Passenger Counting**

This equipment package receives and processes transit vehicle loading data using two-way communications from equipped transit vehicles.

#### **Process Specifications**

- 4.1.6 **Manage Transit Vehicle Operations**
- 4.2.3.5 **Manage Transit Operational Data Store**

### **Equipment Package: Transit Center Security**

This equipment package monitors transit vehicle operator or traveler activated alarms received from on-board a transit vehicle. It supports transit vehicle operator authentication and provides the capability to remotely disable a transit vehicle. This equipment package also includes the capability to alert operators and police to potential incidents identified by these security features.

#### **Process Specifications**

- 4.1.6 **Manage Transit Vehicle Operations**
- 4.2.3.7 **Provide Interface for Other Transit Management Data**
- 4.4.1 **Provide Transit Security and Emergency Management**
- 4.4.2 **Coordinate Multiple Agency Responses to Transit Incidents**
- 4.4.3 **Generate Responses for Transit Incidents**
- 4.4.4 **Provide Transit Operations Personnel Security Interface**

### **Equipment Package: Transit Center Signal Priority**

The equipment package monitors transit schedule performance and generates requests for transit priority on routes and at certain intersections. This equipment package may coordinate with the Traffic Management Subsystem to provide transit priority along the selected route. It also coordinates with the Transit Vehicle Subsystem to monitor and manage local transit signal priority requests at individual intersections.

## Transit Management

### Process Specifications

- 4.1.4        **Manage Transit Vehicle Deviations**
- 4.1.6        **Manage Transit Vehicle Operations**
- 4.2.3.6      **Produce Transit Service Data for Manage Transit Use**

### Equipment Package: Transit Center Vehicle Tracking

This equipment package monitors transit vehicle location. The location information is collected via a data communication link between the transit vehicles and the transit center. The location information is presented to the transit operator on a digitized map of the transit service area. The location data may be used to determine real time schedule adherence and update the transit system's schedule in real-time. The real-time schedule information is provided to Information Service Providers and the Transit Center Information Services equipment package, which furnish the information to travelers.

### Process Specifications

- 4.1.5        **Provide Transit Vehicle Status and Probe Information**
- 4.1.6        **Manage Transit Vehicle Operations**
- 4.2.3.9      **Update Transit Map Data**

### Equipment Package: Transit Data Collection

This equipment package collects and stores transit information that is collected in the course of transit operations performed by the Transit Management Subsystem. This data can be used directly by operations personnel or it can be made available to other data users and archives in the region.

### Process Specifications

- 4.2.4        **Manage Transit Archive Data**

### Equipment Package: Transit Environmental Monitoring

This equipment package assimilates current and forecast road conditions and surface weather information from a variety of sources, including both weather service providers and vehicle probes. The collected environmental information is monitored and forwarded to other agencies to more effectively manage transit

### Process Specifications

- 4.1.6        **Manage Transit Vehicle Operations**

### Equipment Package: Transit Evacuation Support

This equipment package manages transit resources to support evacuation and subsequent reentry of a population in the vicinity of a disaster or other emergency. It supports coordination of regional evacuation plans, identifying the transit role in a regional evacuation and identifying transit resources that would be used. During an evacuation, this equipment package coordinates the use of transit and school bus fleets, supporting evacuation of those with special needs and the general population. Transit service and fare schedules are adjusted and updated service and fare information is made available through traveler information systems. This equipment package coordinates the functions in other Transit equipment packages to support these requirements.

### Process Specifications

- 4.4.1        **Provide Transit Security and Emergency Management**
- 4.4.4        **Provide Transit Operations Personnel Security Interface**

### Equipment Package: Transit Garage Maintenance

This equipment package provides advanced maintenance functions for the transit property. It collects operational and maintenance data from transit vehicles, manages vehicle service histories, and monitors operators and vehicles. It collects vehicle mileage data and uses it to automatically generate preventative maintenance schedules for each vehicle by utilizing vehicle tracking data from a prerequisite vehicle tracking equipment package. In addition, it provides information to proper service personnel to support maintenance activities and records and verifies that maintenance work was performed.

### Process Specifications

- 4.1.5        **Provide Transit Vehicle Status and Probe Information**
- 4.1.6        **Manage Transit Vehicle Operations**
- 4.3.1        **Monitor Transit Vehicle Condition**
- 4.3.2        **Generate Transit Vehicle Maintenance Schedules**



## Transit Management

effective response to threats against the surface transportation system.

**Logical Architecture Data Flow(s):**  
faas-alerts\_and\_advisories\_for\_transit

### Archived Data Management => Transit Management

**Physical Architecture Flow Name:** archive requests

A request to a data source for information on available data (i.e. "catalog") or a request that defines the data to be archived. The request can be a general subscription intended to initiate a continuous or regular data stream or a specific request intended to initiate a one-time response from the recipient.

**Logical Architecture Data Flow(s):**  
transit\_archive\_request

**Physical Architecture Flow Name:** archive status

Notification that data provided to an archive contains erroneous, missing, or suspicious data or verification that the data provided appears valid. If an error has been detected, the offending data and the nature of the potential problem are identified.

**Logical Architecture Data Flow(s):**  
transit\_archive\_status

**Physical Architecture Flow Name:** archived data products

Raw or processed data, meta data, data catalogs and other data products provided to a user system upon request. The response may also include any associated transaction information.

**Logical Architecture Data Flow(s):**  
transit\_archive\_data\_product

### Emergency Management => Transit Management

**Physical Architecture Flow Name:** alert notification

Notification of a major emergency such as a natural or man-made disaster, civil emergency, or child abduction for distribution to the public. The flow identifies the alert originator, the nature of the emergency, the geographic area affected by the emergency, the effective time period, and information and instructions necessary for the public to respond to the alert. This flow may also identify specific information that should not be released to the public.

**Logical Architecture Data Flow(s):**  
wide\_area\_alert\_notification\_for\_transit  
traveler\_information\_restrictions\_for\_transit  
deactivate\_traveler\_information\_restrictions\_for\_transit

**Physical Architecture Flow Name:** emergency plan coordination

Information that supports coordination of emergency management plans, continuity of operations plans, emergency response and recovery plans, evacuation plans, and other emergency plans between agencies. This includes general plans that are coordinated prior to an incident and shorter duration tactical plans that are prepared during an incident.

**Logical Architecture Data Flow(s):**  
disaster\_response\_plan\_coordination\_to\_transit  
evacuation\_plan\_coordination\_to\_transit

**Physical Architecture Flow Name:** emergency transit service request

Request to modify transit service and fare schedules to address emergencies, including requests for transit services to evacuate people from and/or deploy response agency personnel to an emergency scene. The request may poll for resource availability or request pre-staging, staging, or immediate dispatch of transit resources.

**Logical Architecture Data Flow(s):**

## Transit Management

transit\_evacuation\_resource\_request  
request\_for\_emergency\_transit\_support

**Physical Architecture Flow Name:** evacuation information

Evacuation instructions and information including evacuation zones, evacuation times, and reentry times.

**Logical Architecture Data Flow(s):**  
evacuation\_information\_for\_transit\_management

**Physical Architecture Flow Name:** incident information

Notification of existence of incident and expected severity, location, time and nature of incident. As additional information is gathered and the incident evolves, updated incident information is provided. Incidents include any event that impacts transportation system operation ranging from routine incidents (e.g., disabled vehicle at the side of the road) through large-scale natural or human-caused disasters that involve loss of life, injuries, extensive property damage, and multi-jurisdictional response. This also includes special events, closures, and other planned events that may impact the transportation system.

**Logical Architecture Data Flow(s):**  
emergency\_data\_for\_transit

**Physical Architecture Flow Name:** incident response status

Status of the current incident response including a summary of incident status and its impact on the transportation system, traffic management strategies implemented at the site (e.g., closures, diversions, traffic signal control overrides), and current and planned response activities.

**Logical Architecture Data Flow(s):**  
transit\_incident\_coordination\_data  
incident\_response\_status\_to\_transit

**Physical Architecture Flow Name:** threat information

Threats regarding transportation infrastructure, facilities, or systems detected by a variety of methods (sensors, surveillance, threat analysis of advisories from outside agencies, etc.

**Logical Architecture Data Flow(s):**  
threat\_info\_for\_transit

**Physical Architecture Flow Name:** transportation system status

Current status and condition of transportation infrastructure (e.g., tunnels, bridges, interchanges, TMC offices, maintenance facilities). In case of disaster or major incident, this flow provides an assessment of damage sustained by the surface transportation system including location and extent of the damage, estimate of remaining capacity and necessary restrictions, and time frame for repair and recovery.

**Logical Architecture Data Flow(s):**  
infrastructure\_integrity\_status\_for\_transit  
disaster\_transportation\_system\_status\_for\_transit  
evacuation\_transportation\_system\_status\_for\_transit

**Event Promoters** => **Transit Management**

**Physical Architecture Flow Name:** event plans

Plans for major events possibly impacting traffic.

**Logical Architecture Data Flow(s):**  
fevp-event\_data\_for\_transit

**Financial Institution** => **Transit Management**

**Physical Architecture Flow Name:** transaction status

Response to transaction request. Normally dealing with a request for payment.

## Transit Management

### Logical Architecture Data Flow(s):

ffi-other\_services\_payment\_confirm  
ffi-bad\_fare\_payment\_updates  
ffi-confirm\_fare\_payment

### Information Service Provider

=> **Transit Management**

#### Physical Architecture Flow Name:

demand responsive transit request

Request for paratransit support.

### Logical Architecture Data Flow(s):

paratransit\_trip\_request

#### Physical Architecture Flow Name:

selected routes

Routes selected based on route request criteria.

### Logical Architecture Data Flow(s):

transit\_trip\_confirmation  
paratransit\_service\_confirmation  
advanced\_tolls\_and\_charges\_vehicle\_confirm

#### Physical Architecture Flow Name:

transit information request

Request for transit operations information including schedule and fare information. The request can be a subscription that initiates as-needed information updates as well as a one-time request for information.

### Logical Architecture Data Flow(s):

advanced\_other\_fares\_request  
transit\_fare\_data\_request  
transit\_services\_guidance\_request  
advanced\_traveler\_fares\_request

#### Physical Architecture Flow Name:

transit trip request

Request for a transit trip plan that is responsive to traveler requirements such as schedule, cost, or duration.

### Logical Architecture Data Flow(s):

transit\_trip\_request

#### Physical Architecture Flow Name:

transportation information for operations

Information on the state of transportation system operations including traffic and road conditions, advisories, incidents, transit service information, weather information, parking information, and other related data.

### Logical Architecture Data Flow(s):

transportation\_information\_for\_transit\_operations

### Maintenance and Construction Management

=> **Transit Management**

#### Physical Architecture Flow Name:

current asset restrictions

Restrictions levied on transportation asset usage based on infrastructure design, surveys, tests, or analyses. This includes standard facility design height, width, and weight restrictions, special restrictions such as spring weight restrictions, and temporary facility restrictions that are imposed during maintenance and construction.

### Logical Architecture Data Flow(s):

asset\_restrictions\_for\_transit

#### Physical Architecture Flow Name:

maint and constr work plans



## Transit Management

Future construction and maintenance work schedules and activities including anticipated closures with anticipated impact to the roadway, alternate routes, anticipated delays, closure times, and durations.

**Logical Architecture Data Flow(s):**

m\_and\_c\_work\_plans\_for\_transit

**Physical Architecture Flow Name:** road weather information

Road conditions and weather information that are made available by road maintenance operations to other transportation system operators.

**Logical Architecture Data Flow(s):**

road\_weather\_info\_for\_transit

**Physical Architecture Flow Name:** roadway maintenance status

Summary of maintenance fleet operations affecting the road network. This includes the status of winter maintenance (snow plow schedule and current status).

**Logical Architecture Data Flow(s):**

roadway\_maint\_status\_for\_transit

**Physical Architecture Flow Name:** work zone information

Summary of maintenance and construction work zone activities affecting the road network including the nature of the maintenance or construction activity, location, impact to the roadway, expected time(s) and duration of impact, anticipated delays, alternate routes, and suggested speed limits. This information may be augmented with images that provide a visual indication of current work zone status and traffic impacts.

**Logical Architecture Data Flow(s):**

work\_zone\_info\_for\_transit

**Map Update Provider** => **Transit Management**

**Physical Architecture Flow Name:** map updates

Map update which could include a new underlying static or real-time map or map layer(s) update.

**Logical Architecture Data Flow(s):**

fmup-transit\_map\_update

**Multimodal Transportation Service Provider** => **Transit Management**

**Physical Architecture Flow Name:** multimodal service data

Multimodal transportation schedules and other service information.

**Logical Architecture Data Flow(s):**

fmtsp-transit\_service\_data

**Physical Architecture Flow Name:** service response

Multimodal (possibly non-roadway) transit provider services information and trip reservation confirmations.

**Logical Architecture Data Flow(s):**

fmtsp-individual\_service\_response

**Other Transit Management** => **Transit Management**

**Physical Architecture Flow Name:** transit fare coordination

Fare and pricing information shared between local/regional transit organizations.

**Logical Architecture Data Flow(s):**

## Transit Management

fotrm-transit\_fare\_data\_coordination

**Physical Architecture Flow Name:** transit service coordination

Schedule coordination information shared between local/regional transit organizations.

**Logical Architecture Data Flow(s):**

fotrm-individual\_service\_response

fotrm-transit\_service\_data

**Physical Architecture Flow Name:** transit traveler information coordination

Transit schedules, real-time arrival information, fare schedules, and general transit service information shared between transit organizations to support transit traveler information systems.

**Logical Architecture Data Flow(s):**

fotrm-transit\_traveler\_information

**Parking Management** => **Transit Management**

**Physical Architecture Flow Name:** parking information

General parking information and status, including current parking availability.

**Logical Architecture Data Flow(s):**

static\_parking\_information\_for\_transit

dynamic\_parking\_information\_for\_transit

**Personal Information Access** => **Transit Management**

**Physical Architecture Flow Name:** transit information user request

Request for special transit routing, real-time schedule information, and availability information.

**Logical Architecture Data Flow(s):**

transit\_services\_personal\_request

transit\_trip\_request\_from\_user

**Physical Architecture Flow Name:** trip confirmation

Acknowledgement by the driver/traveler of acceptance of a trip plan with associated personal and payment information required to confirm reservations.

**Logical Architecture Data Flow(s):**

transit\_trip\_confirmation\_from\_user

**Remote Traveler Support** => **Transit Management**

**Physical Architecture Flow Name:** transit fare and passenger status

Information provided from the traveler location that supports fare payments, passenger data, and associated record-keeping.

**Logical Architecture Data Flow(s):**

transit\_roadside\_passenger\_data

traveler\_roadside\_image

transit\_roadside\_fare\_payment\_confirmation

fare\_collection\_roadside\_violation\_information

request\_roadside\_fare\_payment

**Physical Architecture Flow Name:** transit information user request

Request for special transit routing, real-time schedule information, and availability information.

**Logical Architecture Data Flow(s):**

transit\_trip\_request\_from\_kiosks

other\_services\_roadside\_request

transit\_services\_travelers\_request

## Transit Management

**Physical Architecture Flow Name:** trip confirmation

Acknowledgement by the driver/traveler of acceptance of a trip plan with associated personal and payment information required to confirm reservations.

**Logical Architecture Data Flow(s):**  
transit\_trip\_confirmation\_from\_kiosks

**Surface Transportation Weather Service** => **Transit Management**

**Physical Architecture Flow Name:** transportation weather information

Current and forecast road conditions and weather information (e.g., surface condition, flooding, wind advisories, visibility, etc.) associated with the transportation network. This information is of a resolution, timeliness, and accuracy to be useful in transportation decision making.

**Logical Architecture Data Flow(s):**  
fstws-surface\_trans\_weather\_forecasts  
fstws-surface\_trans\_weather\_observations

**Traffic Management** => **Transit Management**

**Physical Architecture Flow Name:** incident information

Notification of existence of incident and expected severity, location, time and nature of incident. As additional information is gathered and the incident evolves, updated incident information is provided. Incidents include any event that impacts transportation system operation ranging from routine incidents (e.g., disabled vehicle at the side of the road) through large-scale natural or human-caused disasters that involve loss of life, injuries, extensive property damage, and multi-jurisdictional response. This also includes special events, closures, and other planned events that may impact the transportation system.

**Logical Architecture Data Flow(s):**  
planned\_events  
incident\_response\_log\_for\_transit  
current\_incidents\_data\_for\_transit

**Physical Architecture Flow Name:** request transit information

Request for transit service information and current transit status.

**Logical Architecture Data Flow(s):**  
transit\_conditions\_demand\_request  
transit\_fare\_direct\_request  
transit\_services\_demand\_request

**Physical Architecture Flow Name:** road network conditions

Current and forecasted traffic information, road and weather conditions, and other road network status. Either raw data, processed data, or some combination of both may be provided by this architecture flow. Information on diversions and alternate routes, closures, and special traffic restrictions (lane/shoulder use, weight restrictions, width restrictions, HOV requirements) in effect is included along with a definition of the links, nodes, and routes that make up the road network.

**Logical Architecture Data Flow(s):**  
roadway\_detours\_and\_closures\_for\_transit  
prediction\_data  
traffic\_data\_for\_transit

**Physical Architecture Flow Name:** traffic control priority status

Status of signal priority request functions at the roadside (e.g. enabled or disabled).

**Logical Architecture Data Flow(s):**  
transit\_road\_priority\_given

## Transit Management

transit\_ramp\_priority\_given  
transit\_highway\_priority\_given

**Physical Architecture Flow Name:** traffic images

High fidelity, real-time traffic images suitable for surveillance monitoring by the operator or for use in machine vision applications.

**Logical Architecture Data Flow(s):**  
traffic\_video\_for\_transit

**Physical Architecture Flow Name:** transit demand management request

Request to change the demand for transit facility use through pricing or other mechanisms.

**Logical Architecture Data Flow(s):**  
transit\_services\_changes\_request

## Transit Management => Archived Data Management

**Physical Architecture Flow Name:** archived data product requests

A user-specified request for archived data products (i.e. data, meta data, or data catalogs). The request also includes information that is used to identify and authenticate the user and support electronic payment requirements, if any.

**Logical Architecture Data Flow(s):**  
transit\_archive\_data\_product\_request

**Physical Architecture Flow Name:** transit archive data

Data used to describe and monitor transit demand, fares, operations, and system performance. Content may include a catalog of available information, the actual information to be archived, and associated meta data that describes the archived information.

**Logical Architecture Data Flow(s):**  
transit\_archive\_data

## Transit Management => Emergency Management

**Physical Architecture Flow Name:** alert status

Information indicating the current status of the emergency alert including identification of the traveler and driver information systems that are being used to provide the alert.

**Logical Architecture Data Flow(s):**  
alert\_notification\_status\_from\_transit

**Physical Architecture Flow Name:** emergency plan coordination

Information that supports coordination of emergency management plans, continuity of operations plans, emergency response and recovery plans, evacuation plans, and other emergency plans between agencies. This includes general plans that are coordinated prior to an incident and shorter duration tactical plans that are prepared during an incident.

**Logical Architecture Data Flow(s):**  
disaster\_response\_plan\_coordination\_from\_transit  
evacuation\_plan\_coordination\_from\_transit

**Physical Architecture Flow Name:** emergency transit schedule information

Information on transit schedule and service changes that adapt the service to better meet needs of responders and the general public in an emergency situation, including special service schedules supporting evacuation.

**Logical Architecture Data Flow(s):**  
transit\_schedule\_information\_during\_emergencies

## Transit Management

transit\_schedule\_information\_during\_evacuation

**Physical Architecture Flow Name:** emergency transit service response

Response indicating changes to transit service, fares, and/or restrictions that will be made and status of transit resources to be deployed to support emergency response and/or evacuation.

**Logical Architecture Data Flow(s):**

transit\_evacuation\_status  
response\_for\_emergency\_transit\_support

**Physical Architecture Flow Name:** transit emergency data

Initial notification of transit emergency at a transit stop or on transit vehicles and further coordination as additional details become available and the response is coordinated.

**Logical Architecture Data Flow(s):**

transit\_emergency\_data  
transit\_coordination\_data  
transit\_incident\_details

**Physical Architecture Flow Name:** transit system status assessment

Assessment of damage sustained by the public transportation system including location and extent of the damage, current operational status including an estimate of remaining capacity and necessary restrictions, and time frame for repair and recovery.

**Logical Architecture Data Flow(s):**

transit\_system\_status

**Transit Management** ==> **Enforcement Agency**

**Physical Architecture Flow Name:** payment violation notification

Notification to enforcement agency of a toll, parking, or transit fare payment violation.

**Logical Architecture Data Flow(s):**

tea-fare\_collection\_roadside\_violation\_data  
tea-fare\_collection\_vehicle\_violation\_data  
tea-fare\_payment\_violation\_data

**Transit Management** ==> **Event Promoters**

**Physical Architecture Flow Name:** event confirmation

Confirmation that special event details have been received and processed.

**Logical Architecture Data Flow(s):**

tevp-event\_confirmation\_from\_transit

**Transit Management** ==> **Financial Institution**

**Physical Architecture Flow Name:** payment request

Request for payment from financial institution.

**Logical Architecture Data Flow(s):**

tfi-fare\_payment\_violator\_data  
tfi-other\_services\_payment\_request  
tfi-request\_fare\_payment

**Transit Management** ==> **Information Service Provider**

**Physical Architecture Flow Name:** demand responsive transit plan

Plan regarding overall demand responsive transit schedules and deployment.

## Transit Management

### Logical Architecture Data Flow(s):

paratransit\_personal\_schedule

**Physical Architecture Flow Name:** emergency transit schedule information

Information on transit schedule and service changes that adapt the service to better meet needs of responders and the general public in an emergency situation, including special service schedules supporting evacuation.

### Logical Architecture Data Flow(s):

transit\_evacuation\_data\_for\_isp

**Physical Architecture Flow Name:** transit and fare schedules

Transit service information including routes, schedules, and fare information.

### Logical Architecture Data Flow(s):

transit\_transfer\_point\_list  
transit\_fare\_data\_for\_isp  
transit\_services\_for\_guidance  
transit\_services\_for\_isp  
transit\_fare\_data

**Physical Architecture Flow Name:** transit incident information

Information on transit incidents that impact transit services for public dissemination.

### Logical Architecture Data Flow(s):

transit\_incident\_data

**Physical Architecture Flow Name:** transit probe data

Aggregate probe data derived from tracking transit vehicles. Data collected could include transit vehicle speeds and travel times for a given link or collection of links.

### Logical Architecture Data Flow(s):

transit\_probe\_data\_for\_isp

**Physical Architecture Flow Name:** transit request confirmation

Confirmation of a request for transit information or service.

### Logical Architecture Data Flow(s):

advanced\_other\_fares\_confirm  
advanced\_tolls\_and\_charges\_vehicle\_request  
advanced\_traveler\_fares\_confirm

**Physical Architecture Flow Name:** transit schedule adherence information

Dynamic transit schedule adherence and transit vehicle location information.

### Logical Architecture Data Flow(s):

transit\_vehicle\_deviations\_details

**Physical Architecture Flow Name:** transit trip plan

An origin-destination transit trip that may involve multiple modes and connections. (could use current trip plan that is PIAS to ISP, but since this is center to center a separate AF might be called for).

### Logical Architecture Data Flow(s):

individual\_transit\_trip\_plan

## Transit Management

=>

## Maintenance and Construction Management

**Physical Architecture Flow Name:** work plan feedback

Comments and suggested changes to proposed construction and maintenance work schedules

## Transit Management

and activities. This information influences work plan schedules so that they minimize impact to other system operations and the overall transportation system.

**Logical Architecture Data Flow(s):**  
m\_and\_c\_plan\_feedback\_from\_transit

### Transit Management => Map Update Provider

**Physical Architecture Flow Name:** map update request  
Request for a map update which could include a new underlying map or map layer updates.

**Logical Architecture Data Flow(s):**  
tmup-transit\_map\_update\_request

### Transit Management => Media

**Physical Architecture Flow Name:** transit incidents for media  
Report of an incident impacting transit operations for public dissemination through the media.

**Logical Architecture Data Flow(s):**  
tm-transit\_emergency\_information  
tm-transit\_incident\_information

**Physical Architecture Flow Name:** transit information for media  
Report of transit schedule deviations for public dissemination through the media.

**Logical Architecture Data Flow(s):**  
tm-transit\_schedule\_deviations\_to\_media

### Transit Management => Multimodal Transportation Service Provider

**Physical Architecture Flow Name:** service request  
Request to multimodal (possibly non-roadway) transit provider for general services information and specific trip information or reservation.

**Logical Architecture Data Flow(s):**  
tmtsp-individual\_service\_request  
tmtsp-service\_request

**Physical Architecture Flow Name:** transit multimodal information  
Transit schedule information for coordination at modal interchange points.

**Logical Architecture Data Flow(s):**  
tmtsp-transit\_arrival\_deviations  
tmtsp-transit\_service\_data

### Transit Management => Other Transit Management

**Physical Architecture Flow Name:** transit fare coordination  
Fare and pricing information shared between local/regional transit organizations.

**Logical Architecture Data Flow(s):**  
totrm-transit\_fare\_data\_coordination

**Physical Architecture Flow Name:** transit service coordination  
Schedule coordination information shared between local/regional transit organizations.

**Logical Architecture Data Flow(s):**

## Transit Management

totrm-transit\_service\_data  
totrm-individual\_service\_request

**Physical Architecture Flow Name:** transit traveler information coordination

Transit schedules, real-time arrival information, fare schedules, and general transit service information shared between transit organizations to support transit traveler information systems.

**Logical Architecture Data Flow(s):**

totrm-transit\_traveler\_information

**Transit Management** => **Parking Management**

**Physical Architecture Flow Name:** parking lot data request

Request for parking lot occupancy, fares, and availability. The request can be a subscription that initiates as-needed information updates as well as a one-time request for information.

**Logical Architecture Data Flow(s):**

parking\_lot\_static\_information\_request\_by\_transit  
parking\_lot\_dynamic\_information\_request\_by\_transit

**Transit Management** => **Personal Information Access**

**Physical Architecture Flow Name:** personal transit information

General and personalized transit information for a particular fixed route, flexible route, or paratransit system.

**Logical Architecture Data Flow(s):**

transit\_services\_for\_personal\_devices  
transit\_vehicle\_arrival\_time  
personal\_parking\_facility\_information

**Physical Architecture Flow Name:** trip plan

A travel itinerary identifying a route and associated traveler information and instructions identifying recommended modes and transfer information, ride sharing options, and transit and parking reservation information.

**Logical Architecture Data Flow(s):**

transit\_trip\_plan\_for\_user

**Transit Management** => **Remote Traveler Support**

**Physical Architecture Flow Name:** transit fare information

Information provided by transit management that supports fare payment transactions and passenger data collection.

**Logical Architecture Data Flow(s):**

transit\_roadside\_fare\_payment\_request  
transit\_roadside\_fare\_payment\_debited  
transit\_services\_for\_roadside\_fares  
confirm\_roadside\_fare\_payment  
request\_traveler\_roadside\_image  
transit\_roadside\_passenger\_data\_request  
transit\_roadside\_fare\_data

**Physical Architecture Flow Name:** transit traveler information

Transit information prepared to support transit users and other travelers. It contains transit schedules, real-time arrival information, fare schedules, alerts and advisories, and general transit service information.

**Logical Architecture Data Flow(s):**

transit\_services\_for\_travelers



## Transit Management

other\_services\_roadside\_response  
traveler\_secure\_area\_broadcast\_message  
transit\_vehicle\_arrival\_time  
parking\_facility\_information  
transit\_vehicle\_user\_data  
transit\_wide\_area\_alert\_info

**Physical Architecture Flow Name:** trip plan

A travel itinerary identifying a route and associated traveler information and instructions identifying recommended modes and transfer information, ride sharing options, and transit and parking reservation information.

**Logical Architecture Data Flow(s):**  
transit\_trip\_plan\_for\_kiosks

**Transit Management** => **Surface Transportation Weather Service**

**Physical Architecture Flow Name:** transportation weather information request

A request for transportation weather information that may specify the area of interest (a geographic region, particular routes within a region, specific road segments), the type of information that is required, the desired spatial resolution of the information, and time horizon.

**Logical Architecture Data Flow(s):**  
tstws-trans\_weather\_info\_request

**Transit Management** => **Traffic Management**

**Physical Architecture Flow Name:** emergency transit schedule information

Information on transit schedule and service changes that adapt the service to better meet needs of responders and the general public in an emergency situation, including special service schedules supporting evacuation.

**Logical Architecture Data Flow(s):**  
emergency\_transit\_schedule\_information\_for\_traffic  
evacuation\_transit\_schedule\_information\_for\_traffic

**Physical Architecture Flow Name:** traffic control priority request

Request for signal priority at one or more intersections along a particular route.

**Logical Architecture Data Flow(s):**  
transit\_road\_overall\_priority  
transit\_highway\_overall\_priority  
transit\_ramp\_overall\_priority

**Physical Architecture Flow Name:** transit demand management response

Response to transit demand management change requests indicating level of compliance with request.

**Logical Architecture Data Flow(s):**  
transit\_services\_changes\_response

**Physical Architecture Flow Name:** transit probe data

Aggregate probe data derived from tracking transit vehicles. Data collected could include transit vehicle speeds and travel times for a given link or collection of links.

**Logical Architecture Data Flow(s):**  
transit\_probe\_data\_for\_traffic

**Physical Architecture Flow Name:** transit system data

Current transit system operations information indicating current transit routes, the level of

## Transit Management

service on each route, and the progress of individual vehicles along their routes for use in forecasting demand and estimating current transportation network performance.

### Logical Architecture Data Flow(s):

- transit\_running\_data\_for\_demand
- transit\_fare\_direct\_details
- transit\_services\_for\_demand

## Transit Management

=> **Transit Operations**

**Physical Architecture Flow Name:** transit operations status

Presentation of information to transit operations personnel including accumulated schedule and fare information, ridership and on-time performance information, emergency response plans, transit personnel information, maintenance records, and other information intended to support overall planning and management of a transit property.

### Logical Architecture Data Flow(s):

- ttrop-transit\_vehicle\_inventory
- ttrop-transaction\_reports
- ttrop-transit\_fare\_output
- ttrop-transit\_operations\_information
- ttrop-transit\_services\_output
- ttrop-transit\_vehicle\_data
- ttrop-transit\_vehicle\_disable\_status
- ttrop-transit\_vehicle\_maintenance\_information
- ttrop-transit\_vehicle\_operator\_information
- ttrop-transp\_information\_for\_transit\_operations
- ttrop-traffic\_and\_maint\_and\_const\_data
- ttrop-wide\_area\_alert\_notification
- ttrop-parking\_information
- ttrop-work\_schedule
- ttrop-weather\_information
- ttrop-paratransit\_service
- ttrop-archive\_status
- ttrop-coordination\_request
- ttrop-emergency\_plan\_response
- ttrop-emergency\_request
- ttrop-infrastructure\_integrity\_status
- ttrop-potential\_incidents\_alarm
- ttrop-parameters
- ttrop-technician\_information
- ttrop-passenger\_loading\_error
- ttrop-proposed\_corrections
- ttrop-response\_parameter\_output
- ttrop-media\_parameters

## Transit Management

=> **Transit Vehicle**

**Physical Architecture Flow Name:** alarm acknowledge

Confirmation that alarm was received, instructions and additional information for the alarm initiator, and requests for additional information.

### Logical Architecture Data Flow(s):

- secure\_transit\_vehicle\_alarm\_acknowledge\_for\_transit
- on\_board\_traveler\_alarm\_response\_from\_transit

**Physical Architecture Flow Name:** bad tag list

List of invalid transit user tags which may have previously failed a fare payment transaction.

### Logical Architecture Data Flow(s):

- bad\_tag\_list\_update

## Transit Management

**Physical Architecture Flow Name:** fare management information

Transit fare information and transaction data used to manage transit fare processing on the transit vehicle.

**Logical Architecture Data Flow(s):**

- transit\_services\_for\_vehicle\_fares
- transit\_vehicle\_fare\_payment\_request
- transit\_vehicle\_fare\_payment\_debited
- transit\_vehicle\_fare\_data
- request\_traveler\_vehicle\_image
- emergency\_transit\_fares
- confirm\_vehicle\_fare\_payment
- transit\_vehicle\_advanced\_payment\_response

**Physical Architecture Flow Name:** remote vehicle disable

Signal used to remotely disable a transit vehicle.

**Logical Architecture Data Flow(s):**

- transit\_vehicle\_disable\_reset
- remote\_transit\_vehicle\_disable

**Physical Architecture Flow Name:** request for vehicle measures

Request for vehicle performance and maintenance data collected by onboard sensors.

**Logical Architecture Data Flow(s):**

- transit\_vehicle\_collected\_maintenance\_data\_request

**Physical Architecture Flow Name:** transit schedule information

Current and projected transit schedule information used to initialize the transit vehicle with a vehicle assignment, monitor schedule performance, and develop corrective actions on-board.

**Logical Architecture Data Flow(s):**

- transit\_services\_for\_eta
- transit\_vehicle\_service\_enable
- transit\_vehicle\_assignment\_for\_vehicle
- signal\_priority\_rules
- transit\_services\_for\_corrections
- schedule\_change\_for\_connection\_protection

**Physical Architecture Flow Name:** transit traveler information

Transit information prepared to support transit users and other travelers. It contains transit schedules, real-time arrival information, fare schedules, alerts and advisories, and general transit service information.

**Logical Architecture Data Flow(s):**

- traveler\_transit\_information
- transit\_traveler\_wide\_area\_alert\_info
- transit\_vehicle\_advisory\_eta
- other\_services\_vehicle\_response
- individual\_transit\_user\_trip\_plan
- traveler\_transit\_information\_for\_transit\_advisories
- secure\_transit\_vehicle\_broadcast\_message

**Physical Architecture Flow Name:** transit vehicle operator authentication update

Results of authentication process or update of on-board authentication database.

**Logical Architecture Data Flow(s):**

- transit\_vehicle\_operator\_authentication\_database\_update
- transit\_vehicle\_operator\_authentication

**Physical Architecture Flow Name:** transit vehicle operator information

## Transit Management

Transit service instructions, wide area alerts, traffic information, road conditions, and other information for both transit and paratransit operators.

### Logical Architecture Data Flow(s):

paratransit\_transit\_vehicle\_operator\_instructions  
approved\_corrective\_plan  
road\_network\_info\_for\_transit  
transit\_vehicle\_operator\_wide\_area\_alerts

**Transit Management** => **Transit Vehicle Operator**  
**Physical Architecture Flow Name:** route assignment

Route assignment information for transit vehicle operator.

### Logical Architecture Data Flow(s):

ttvo-route\_assignments

**Transit Operations Personnel** => **Transit Management**

**Physical Architecture Flow Name:** transit operations personnel inputs

User input from transit operations personnel including instructions governing service availability, schedules, emergency response plans, transit personnel assignments, transit maintenance requirements, and other inputs that establish general system operating requirements and procedures.

### Logical Architecture Data Flow(s):

ftrop-archive\_commands  
ftrop-alert\_notification\_status  
ftrop-approved\_corrections  
ftrop-transit\_vehicle\_operator\_route\_preferences  
ftrop-request\_response\_parameter\_output  
ftrop-coordination\_data  
ftrop-disable\_transit\_vehicle  
ftrop-fare\_updates  
ftrop-initiate\_service\_updates  
ftrop-media\_parameter\_request  
ftrop-media\_parameter\_updates  
ftrop-parking\_information\_request  
ftrop-passenger\_loading\_updates  
ftrop-planning\_parameters  
ftrop-planning\_parameters\_update\_request  
ftrop-emergency\_plan\_response  
ftrop-technician\_information\_request  
ftrop-transit\_display\_update\_request  
ftrop-trans\_weather\_info\_request  
ftrop-transit\_services\_output\_request  
ftrop-transit\_vehicle\_inventory\_input  
ftrop-transit\_vehicle\_maintenance\_information\_request  
ftrop-transit\_vehicle\_operator\_information\_updates  
ftrop-transit\_vehicle\_maintenance\_specs  
ftrop-response\_parameters  
ftrop-technician\_information\_updates  
ftrop-request\_transit\_vehicle\_data  
ftrop-transit\_vehicle\_maintenance\_updates  
ftrop-request\_fare\_output  
ftrop-security\_action  
ftrop-transit\_operations\_inputs  
ftrop-transit\_vehicle\_operator\_information\_request

**Transit Vehicle** => **Transit Management**  
**Physical Architecture Flow Name:** alarm notification

## Transit Management

Notification of activation of an audible or silent alarm by a traveler in a public area or by a transit vehicle operator using an on-board device.

**Logical Architecture Data Flow(s):**

secure\_transit\_vehicle\_alarm\_request\_for\_transit

**Physical Architecture Flow Name:** demand response passenger and use data

Data collected on board a demand response vehicle relating to the picking up and discharging of passengers.

**Logical Architecture Data Flow(s):**

paratransit\_transit\_vehicle\_availability

paratransit\_service\_status

**Physical Architecture Flow Name:** fare collection data

Fare collection information including the summary of on-board fare system data and financial payment transaction data.

**Logical Architecture Data Flow(s):**

request\_vehicle\_fare\_payment

transit\_vehicle\_advanced\_payment\_request

fare\_collection\_vehicle\_violation\_information

traveler\_vehicle\_image

transit\_vehicle\_passenger\_data

transit\_vehicle\_fare\_payment\_confirmation

**Physical Architecture Flow Name:** request for bad tag list

Request for list of bad vehicle tag IDs.

**Logical Architecture Data Flow(s):**

bad\_tag\_list\_request

**Physical Architecture Flow Name:** transit traveler request

Request by a Transit traveler to summon assistance, request transit information, or request any other transit services.

**Logical Architecture Data Flow(s):**

other\_services\_vehicle\_request

transit\_services\_for\_eta\_request

**Physical Architecture Flow Name:** transit user information

Information about individual transit users boarding a transit vehicle, used to track a user's progress on a scheduled transit trip.

**Logical Architecture Data Flow(s):**

transit\_user\_information

**Physical Architecture Flow Name:** transit vehicle conditions

Operating conditions of transit vehicle (e.g., engine running, oil pressure, fuel level and usage).

**Logical Architecture Data Flow(s):**

transit\_vehicle\_disable\_acknowledge

transit\_vehicle\_collected\_maintenance\_data

**Physical Architecture Flow Name:** transit vehicle loading data

Data collected on board the transit vehicle relating to passenger boarding and alighting.

**Logical Architecture Data Flow(s):**

transit\_vehicle\_passenger\_loading

**Physical Architecture Flow Name:** transit vehicle location data

Current transit vehicle location and related operational conditions data provided by a transit

## Transit Management

vehicle.

**Logical Architecture Data Flow(s):**

paratransit\_vehicle\_location  
transit\_vehicle\_location\_for\_security  
transit\_vehicle\_service\_update  
transit\_vehicle\_location\_for\_store

**Physical Architecture Flow Name:** transit vehicle operator authentication information

Information regarding on-board transit operator authentication

**Logical Architecture Data Flow(s):**

request\_transit\_operator\_authentication  
transit\_vehicle\_operator\_authentication\_status

**Physical Architecture Flow Name:** transit vehicle schedule performance

Estimated times of arrival and anticipated schedule deviations reported by a transit vehicle.

**Logical Architecture Data Flow(s):**

transit\_vehicle\_deviations\_from\_schedule  
transit\_vehicle\_eta  
transit\_vehicle\_location\_for\_deviation  
transit\_vehicle\_schedule\_deviation  
transit\_service\_status  
transit\_vehicle\_running\_times

**Transit Vehicle Operator** => **Transit Management**

**Physical Architecture Flow Name:** transit vehicle operator availability

Transit vehicle operator availability data that can be used to develop vehicle operator assignments and detailed operations schedules.

**Logical Architecture Data Flow(s):**

ftvo-information\_updates

**Weather Service** => **Transit Management**

**Physical Architecture Flow Name:** weather information

Accumulated forecasted and current weather data (e.g., temperature, pressure, wind speed, wind direction, humidity, precipitation, visibility, light conditions, etc.).

**Logical Architecture Data Flow(s):**

fws-current\_weather\_observations  
fws-weather\_forecasts

### 2.22.3 Architecture Flow Diagrams for TRMS

# Transit Management

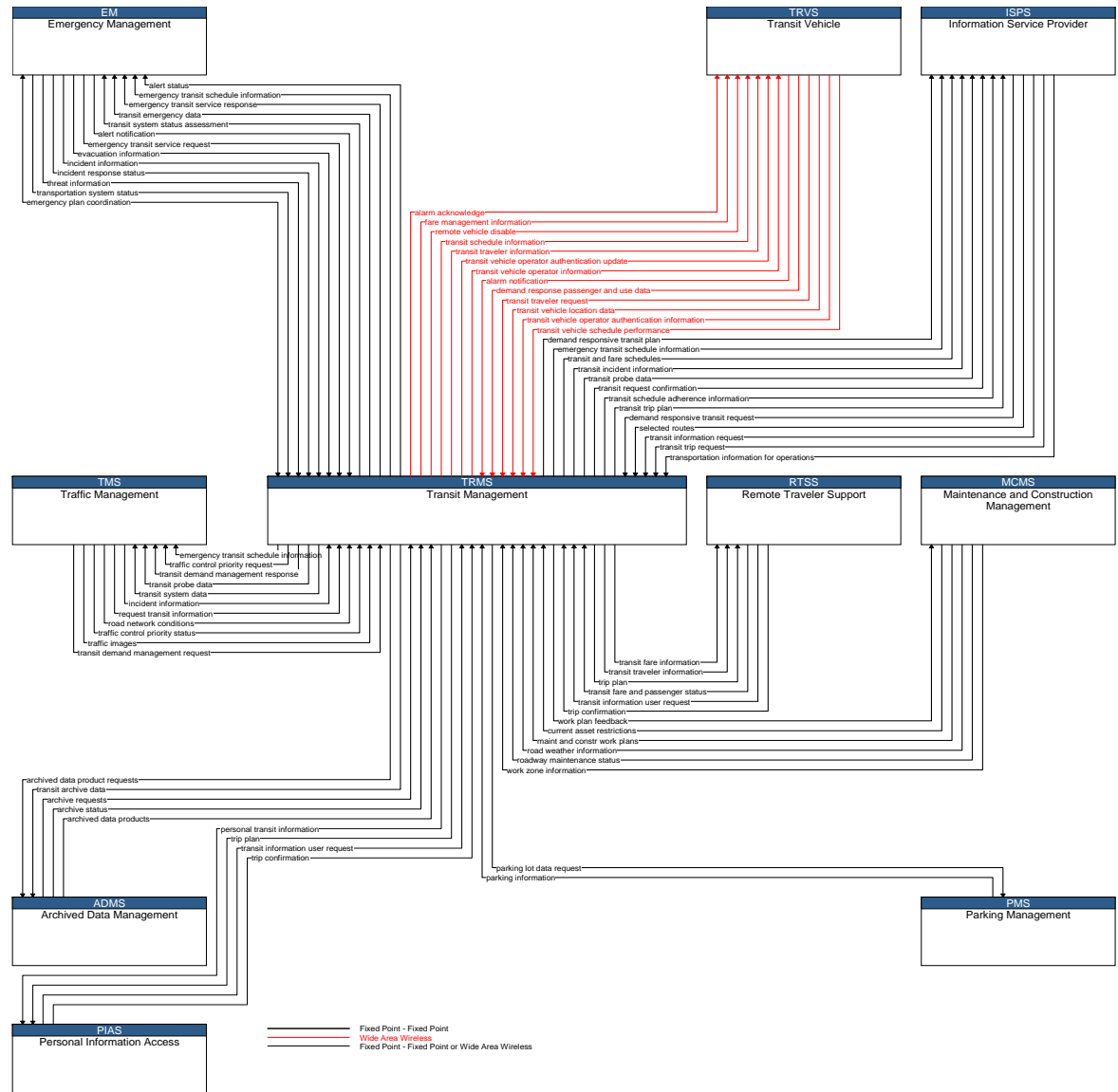


Figure 40: TRMS Subsystem Interfaces

# Transit Management

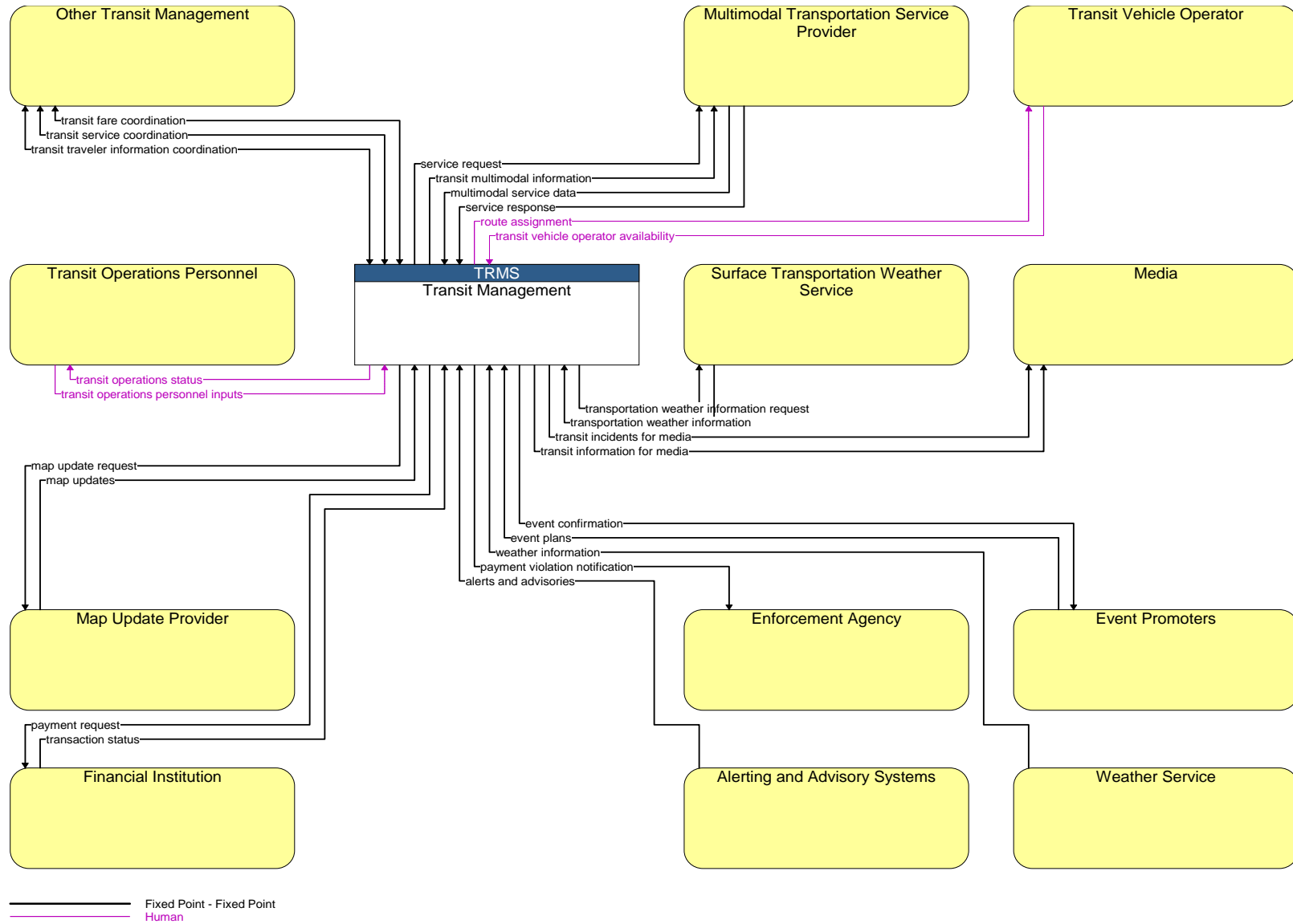


Figure 41: TRMS Terminator Interfaces



## 2.23 Transit Vehicle

The Transit Vehicle Subsystem (TRVS) resides in a transit vehicle and provides the sensory, processing, storage, and communications functions necessary to support safe and efficient movement of passengers. The types of transit vehicles containing this subsystem include buses, paratransit vehicles, light rail vehicles, other vehicles designed to carry passengers, and supervisory vehicles. The subsystem collects accurate ridership levels and supports electronic fare collection. The subsystem supports a traffic signal prioritization function that communicates with the roadside subsystem to improve on-schedule performance. Automated vehicle location functions enhance the information available to the Transit Management Subsystem enabling more efficient operations. On-board sensors support transit vehicle maintenance. The subsystem supports on-board security and safety monitoring. This monitoring includes transit user or vehicle operator activated alarms (silent or audible), as well as surveillance and sensor equipment. The surveillance equipment includes video (e.g. CCTV cameras), audio systems and/or event recorder systems. The sensor equipment includes threat sensors (e.g. chemical agent, toxic industrial chemical, biological, explosives, and radiological sensors) and object detection sensors (e.g. metal detectors). In addition, the subsystem supports vehicle operator authentication prior to operation of the vehicle and remote vehicle disabling. The subsystem also furnishes travelers with real-time travel information, continuously updated schedules, transfer options, routes, and fares.

### 2.23.1 Equipment Packages and Process Specifications for TRVS

#### **Equipment Package: On-board Connection Protection**

This on-board equipment package monitors vehicle schedule performance and provides it to the transit center for connection protection processing. This equipment package receives operator instructions relating to managing connection protection. This equipment package also recognizes individual travelers who have arranged for connection protection and provides information regarding them to the transit center.

##### **Process Specifications**

**4.1.2 Determine Transit Vehicle Service Status**

**4.6.2 Determine Traveler Needs on Vehicle**

#### **Equipment Package: On-board Maintenance**

This on-board equipment package collects and processes transit vehicle maintenance data including mileage and vehicle operating conditions. This maintenance information is provided to the management center and used to schedule future vehicle maintenance and repair.

##### **Process Specifications**

**4.1.1 Process On-Board Systems Data**

#### **Equipment Package: On-board Paratransit Operations**

This on-board equipment package forwards paratransit and flexible-route dispatch requests to the operator and forwards acknowledgements to the center. It coordinates with, and assists the operator in managing multi-stop runs associated with demand responsive transit services including paratransit. The equipment package collects transit vehicle passenger data and makes it available to the center.

##### **Process Specifications**

**4.2.1.5 Process Demand Responsive Transit Vehicle Availability Data**

**4.2.1.6 Provide Demand Responsive Transit Vehicle Operator Interface**

#### **Equipment Package: On-board Passenger Counting**

This on-board equipment package collects transit vehicle loading data and makes it available to the center. It provides two-way communication between the transit vehicle and center.

##### **Process Specifications**

**4.1.1 Process On-Board Systems Data**

#### **Equipment Package: On-board Schedule Management**

This on-board equipment package monitors schedule performance and identifies corrective actions when a deviation is detected. It provides two-way communication between the transit vehicle and center, enabling the center to communicate with the vehicle operator and monitor on-board systems.

##### **Process Specifications**

## Transit Vehicle

### 4.1.2 Determine Transit Vehicle Service Status

#### **Equipment Package: On-board Transit Fare Management**

This on-board equipment package supports fare collection using a standard fare card or other non-monetary fare medium and detects payment violations. Collected fare data are made available to the center.

#### **Process Specifications**

- 4.1.7 Provide Transit Advisory Interface on Vehicle
- 4.6.1 Manage Transit Fare Billing on Vehicle
- 4.6.2 Determine Traveler Needs on Vehicle
- 4.6.3 Determine Transit Fare on Vehicle
- 4.6.4 Provide Traveler Fare Payment Interface on Vehicle
- 4.6.5 Update Transit Vehicle Fare Data
- 4.6.6 Provide Transit Vehicle Fare Collection Data
- 7.3.5 Provide Transit Vehicle Traveler Card Interface

#### **Equipment Package: On-board Transit In Vehicle Signing Communications**

This equipment package provides the capability for the transit vehicle to distribute information to vehicles in the vicinity for in-vehicle display. The information provided supplements external signs and signals on the transit vehicle and may include notification that the vehicle (e.g., a school bus) is making a passenger stop or notice that the transit vehicle is attempting to merge and is requesting gap assistance. This equipment package includes an interface to the transit operator and the short range communications equipment that provides information to passing vehicles.

#### **Process Specifications**

- 4.1.2 Determine Transit Vehicle Service Status

#### **Equipment Package: On-board Transit Information Services**

This equipment package furnishes en-route transit users with real-time travel-related information on-board a transit vehicle. Current information that can be provided to transit users includes transit routes, schedules, transfer options, fares, real-time schedule adherence, current incidents, weather conditions, non-motorized transportation services, and special events are provided. In addition to tailored information for individual transit users, this equipment package also supports general annunciation and/or display of general schedule information, imminent arrival information, and other information of general interest to transit users.

#### **Process Specifications**

- 4.1.7 Provide Transit Advisory Interface on Vehicle

#### **Equipment Package: On-board Transit Security**

This equipment package provides security and safety functions on-board the transit vehicle. It includes surveillance and sensor systems that monitor the on-board environment, silent alarms that can be activated by transit user or vehicle operator, operator authentication, and a remote vehicle disable function. The surveillance equipment includes video (e.g. CCTV cameras), audio systems and/or event recorder systems. The sensor equipment includes threat sensors (e.g. chemical agent, toxic industrial chemical, biological, explosives, and radiological sensors) and object detection sensors (e.g. metal detectors).

#### **Process Specifications**

- 4.1.1 Process On-Board Systems Data
- 4.1.3 Provide Transit Vehicle Location Data
- 5.1.7.3.1 Surveil Secure Vehicle Area
- 5.1.7.3.2 Process Secure Vehicle Area Surveillance
- 5.1.7.3.3 Collect Secure Vehicle Area Sensor Data
- 5.1.7.3.4 Process Secure Vehicle Area Sensor Data
- 5.1.7.3.5 Manage Secure Vehicle Emergencies
- 5.1.7.3.6 Provide Transit Vehicle Operator Interface for Emergencies

## Transit Vehicle

### **Equipment Package: On-board Transit Signal Priority**

This on-board equipment package provides the capability for transit vehicles to request signal priority at signalized intersections, ramps, and interchanges through short range communication directly with traffic control equipment at the roadside.

#### **Process Specifications**

**4.1.2 Determine Transit Vehicle Service Status**

**4.1.3 Provide Transit Vehicle Location Data**

### **Equipment Package: On-board Transit Trip Monitoring**

This on-board equipment package tracks vehicle location, monitors fuel usage, collects operational status (doors opened/closed, running times, etc.) and sends the collected, time stamped data to the Transit Management Subsystem.

#### **Process Specifications**

**4.1.1 Process On-Board Systems Data**

**4.1.3 Provide Transit Vehicle Location Data**

## 2.23.2 Interfaces for TRVS

**Basic Transit Vehicle** => **Transit Vehicle**

**Physical Architecture Flow Name:** transit vehicle measures

Transit vehicle status measured by on-board ITS equipment.

#### **Logical Architecture Data Flow(s):**

fbtv-transit\_vehicle\_disable\_acknowledge

fbtv-availability

fbtv-vehicle\_maintenance\_data

fbtv-vehicle\_trip\_data

**Emergency Management** => **Transit Vehicle**

**Physical Architecture Flow Name:** alarm acknowledge

Confirmation that alarm was received, instructions and additional information for the alarm initiator, and requests for additional information.

#### **Logical Architecture Data Flow(s):**

on\_board\_traveler\_alarm\_response

secure\_transit\_vehicle\_alarm\_acknowledge

**Physical Architecture Flow Name:** secure area sensor control

Information used to configure and control threat sensors (e.g., thermal, acoustic, radiological, chemical), object, motion and intrusion detection sensors. The provided information controls sensor data collection, aggregation, filtering, and other local processing.

#### **Logical Architecture Data Flow(s):**

vehicle\_secure\_area\_sensor\_field\_proc\_parameters

vehicle\_object\_detection\_sensor\_control

vehicle\_threat\_sensor\_control

**Physical Architecture Flow Name:** secure area surveillance control

Information used to configure and control audio and video surveillance systems used for transportation infrastructure security in secure areas. The provided information controls surveillance data collection, aggregation, filtering, and other local processing.

#### **Logical Architecture Data Flow(s):**

vehicle\_secure\_area\_surveillance\_control

vehicle\_secure\_area\_surveillance\_field\_proc\_parameters

## Transit Vehicle

### Location Data Source => Transit Vehicle

**Physical Architecture Flow Name:** position fix

Information which provides a traveler's or vehicle's geographical position.

**Logical Architecture Data Flow(s):**

From\_Location\_Data\_Source

### Secure Area Environment => Transit Vehicle

**Physical Architecture Flow Name:** secure area characteristics

The range of physical and environmental characteristics (visual, audible, presence, motion, chemical, biological, radiological, other) that are monitored by surveillance and sensor systems.

**Logical Architecture Data Flow(s):**

fsae-area\_image\_for\_transit\_vehicle

fsae-area\_audio\_for\_transit\_vehicle

fsae-area\_characteristics\_for\_transit\_vehicle

### Transit Management => Transit Vehicle

**Physical Architecture Flow Name:** alarm acknowledge

Confirmation that alarm was received, instructions and additional information for the alarm initiator, and requests for additional information.

**Logical Architecture Data Flow(s):**

secure\_transit\_vehicle\_alarm\_acknowledge\_for\_transit

on\_board\_traveler\_alarm\_response\_from\_transit

**Physical Architecture Flow Name:** bad tag list

List of invalid transit user tags which may have previously failed a fare payment transaction.

**Logical Architecture Data Flow(s):**

bad\_tag\_list\_update

**Physical Architecture Flow Name:** fare management information

Transit fare information and transaction data used to manage transit fare processing on the transit vehicle.

**Logical Architecture Data Flow(s):**

transit\_vehicle\_fare\_data

transit\_vehicle\_fare\_payment\_request

transit\_vehicle\_fare\_payment\_debited

request\_traveler\_vehicle\_image

transit\_vehicle\_advanced\_payment\_response

transit\_services\_for\_vehicle\_fares

emergency\_transit\_fares

confirm\_vehicle\_fare\_payment

**Physical Architecture Flow Name:** remote vehicle disable

Signal used to remotely disable a transit vehicle.

**Logical Architecture Data Flow(s):**

transit\_vehicle\_disable\_reset

remote\_transit\_vehicle\_disable

**Physical Architecture Flow Name:** request for vehicle measures

Request for vehicle performance and maintenance data collected by onboard sensors.

**Logical Architecture Data Flow(s):**

## Transit Vehicle

transit\_vehicle\_collected\_maintenance\_data\_request

**Physical Architecture Flow Name:** transit schedule information

Current and projected transit schedule information used to initialize the transit vehicle with a vehicle assignment, monitor schedule performance, and develop corrective actions on-board.

**Logical Architecture Data Flow(s):**

transit\_vehicle\_assignment\_for\_vehicle  
transit\_vehicle\_service\_enable  
schedule\_change\_for\_connection\_protection  
transit\_services\_for\_eta  
signal\_priority\_rules  
transit\_services\_for\_corrections

**Physical Architecture Flow Name:** transit traveler information

Transit information prepared to support transit users and other travelers. It contains transit schedules, real-time arrival information, fare schedules, alerts and advisories, and general transit service information.

**Logical Architecture Data Flow(s):**

transit\_vehicle\_advisory\_eta  
traveler\_transit\_information  
transit\_traveler\_wide\_area\_alert\_info  
traveler\_transit\_information\_for\_transit\_advisories  
individual\_transit\_user\_trip\_plan  
other\_services\_vehicle\_response  
secure\_transit\_vehicle\_broadcast\_message

**Physical Architecture Flow Name:** transit vehicle operator authentication update

Results of authentication process or update of on-board authentication database.

**Logical Architecture Data Flow(s):**

transit\_vehicle\_operator\_authentication  
transit\_vehicle\_operator\_authentication\_database\_update

**Physical Architecture Flow Name:** transit vehicle operator information

Transit service instructions, wide area alerts, traffic information, road conditions, and other information for both transit and paratransit operators.

**Logical Architecture Data Flow(s):**

road\_network\_info\_for\_transit  
approved\_corrective\_plan  
transit\_vehicle\_operator\_wide\_area\_alerts  
paratransit\_transit\_vehicle\_operator\_instructions

**Transit Vehicle** => **Basic Transit Vehicle**

**Physical Architecture Flow Name:** basic transit vehicle controls

Control signal disabling or enabling transit vehicle sent as a result of a transit vehicle operator authentication action or a remote disable command.

**Logical Architecture Data Flow(s):**

tbtv-transit\_vehicle\_disable\_reset\_command  
tbtv-transit\_vehicle\_disable\_command

**Transit Vehicle** => **Emergency Management**

**Physical Architecture Flow Name:** alarm notification

Notification of activation of an audible or silent alarm by a traveler in a public area or by a transit vehicle operator using an on-board device.

**Logical Architecture Data Flow(s):**

## Transit Vehicle

secure\_transit\_vehicle\_alarm\_request  
transit\_vehicle\_location\_for\_alarms

**Physical Architecture Flow Name:** secure area sensor data

Data provided by threat sensors (e.g., thermal, acoustic, radiological, chemical), and intrusion, motion, and object detection sensors in secure areas indicating the sensor's operational status, raw and processed sensor data, and alarm indicators when a threat has been detected.

**Logical Architecture Data Flow(s):**

vehicle\_threat\_sensor\_status  
vehicle\_secure\_area\_sensor\_threat\_data  
field\_processed\_vehicle\_object\_detection\_sensor\_data  
field\_processed\_vehicle\_threat\_sensor\_data  
vehicle\_object\_detection\_sensor\_data  
vehicle\_object\_detection\_sensor\_status  
vehicle\_threat\_sensor\_data  
transit\_vehicle\_location\_for\_sensors

**Physical Architecture Flow Name:** secure area surveillance data

Data collected from surveillance systems used to monitor secure areas. Includes video, audio, processed surveillance data, equipment operational status, and alarm indicators when a threat has been detected.

**Logical Architecture Data Flow(s):**

vehicle\_secure\_area\_surveillance\_status  
vehicle\_secure\_area\_images  
vehicle\_secure\_area\_audio  
field\_processed\_vehicle\_secure\_area\_audio  
field\_processed\_vehicle\_secure\_area\_images  
vehicle\_secure\_area\_surveillance\_threat\_data

**Physical Architecture Flow Name:** transit vehicle location data

Current transit vehicle location and related operational conditions data provided by a transit vehicle.

**Logical Architecture Data Flow(s):**

transit\_vehicle\_location\_for\_surveillance\_and\_security

**Transit Vehicle** => **Roadway**

**Physical Architecture Flow Name:** local signal priority request

Request from a vehicle to a signalized intersection for priority at that intersection.

**Logical Architecture Data Flow(s):**

transit\_vehicle\_roadway\_priorities

**Transit Vehicle** => **Transit Management**

**Physical Architecture Flow Name:** alarm notification

Notification of activation of an audible or silent alarm by a traveler in a public area or by a transit vehicle operator using an on-board device.

**Logical Architecture Data Flow(s):**

secure\_transit\_vehicle\_alarm\_request\_for\_transit

**Physical Architecture Flow Name:** demand response passenger and use data

Data collected on board a demand response vehicle relating to the picking up and discharging of passengers.

**Logical Architecture Data Flow(s):**

paratransit\_transit\_vehicle\_availability  
paratransit\_service\_status

## Transit Vehicle

**Physical Architecture Flow Name:** fare collection data

Fare collection information including the summary of on-board fare system data and financial payment transaction data.

**Logical Architecture Data Flow(s):**

- transit\_vehicle\_fare\_payment\_confirmation
- request\_vehicle\_fare\_payment
- transit\_vehicle\_passenger\_data
- traveler\_vehicle\_image
- fare\_collection\_vehicle\_violation\_information
- transit\_vehicle\_advanced\_payment\_request

**Physical Architecture Flow Name:** request for bad tag list

Request for list of bad vehicle tag IDs.

**Logical Architecture Data Flow(s):**

- bad\_tag\_list\_request

**Physical Architecture Flow Name:** transit traveler request

Request by a Transit traveler to summon assistance, request transit information, or request any other transit services.

**Logical Architecture Data Flow(s):**

- transit\_services\_for\_eta\_request
- other\_services\_vehicle\_request

**Physical Architecture Flow Name:** transit user information

Information about individual transit users boarding a transit vehicle, used to track a user's progress on a scheduled transit trip.

**Logical Architecture Data Flow(s):**

- transit\_user\_information

**Physical Architecture Flow Name:** transit vehicle conditions

Operating conditions of transit vehicle (e.g., engine running, oil pressure, fuel level and usage).

**Logical Architecture Data Flow(s):**

- transit\_vehicle\_collected\_maintenance\_data
- transit\_vehicle\_disable\_acknowledge

**Physical Architecture Flow Name:** transit vehicle loading data

Data collected on board the transit vehicle relating to passenger boarding and alighting.

**Logical Architecture Data Flow(s):**

- transit\_vehicle\_passenger\_loading

**Physical Architecture Flow Name:** transit vehicle location data

Current transit vehicle location and related operational conditions data provided by a transit vehicle.

**Logical Architecture Data Flow(s):**

- transit\_vehicle\_service\_update
- transit\_vehicle\_location\_for\_security
- paratransit\_vehicle\_location
- transit\_vehicle\_location\_for\_store

**Physical Architecture Flow Name:** transit vehicle operator authentication information

Information regarding on-board transit operator authentication

**Logical Architecture Data Flow(s):**

- transit\_vehicle\_operator\_authentication\_status
- request\_transit\_operator\_authentication

## Transit Vehicle

**Physical Architecture Flow Name:** transit vehicle schedule performance

Estimated times of arrival and anticipated schedule deviations reported by a transit vehicle.

**Logical Architecture Data Flow(s):**

transit\_vehicle\_running\_times  
transit\_vehicle\_eta  
transit\_vehicle\_location\_for\_deviation  
transit\_vehicle\_schedule\_deviation  
transit\_service\_status  
transit\_vehicle\_deviations\_from\_schedule

**Transit Vehicle** => **Transit Vehicle Operator**

**Physical Architecture Flow Name:** transit vehicle operator display

Visual and audible outputs to the transit vehicle operator including vehicle surveillance information, alarm information, vehicle system status, information from the operations center, and information indicating the status of all other on-board ITS services.

**Logical Architecture Data Flow(s):**

ttvo-transit\_vehicle\_schedule\_deviations  
ttvo-corrective\_instructions  
ttvo-secure\_transit\_vehicle\_emergency\_response  
ttvo-transit\_vehicle\_disable\_status  
ttvo-paratransit\_information  
ttvo-secure\_transit\_vehicle\_surveillance  
ttvo-batch\_mode\_data\_transfer\_status  
ttvo-alert\_notification  
ttvo-request\_fare\_transaction\_mode\_set\_up

**Transit Vehicle** => **Traveler**

**Physical Architecture Flow Name:** traveler interface updates

Visual or audio information (e.g., routes, messages, guidance, emergency information) that is provided to the traveler.

**Logical Architecture Data Flow(s):**

tt-other\_services\_vehicle\_confirmed  
tt-vehicle\_payment\_confirmed  
tt-vehicle\_access\_message  
tt-traveler\_information  
tt-secure\_transit\_vehicle\_emergency\_response  
tt-secure\_transit\_vehicle\_broadcast\_message  
tt-advisory\_information

**Transit Vehicle** => **Traveler Card**

**Physical Architecture Flow Name:** request for payment

Request to deduct cost of service from user's payment account.

**Logical Architecture Data Flow(s):**

ttc-debited\_traveler\_payment\_at\_vehicle  
ttc-debited\_payment\_on\_transit\_vehicle  
ttc-request\_fare\_payment\_on\_transit\_vehicle

**Transit Vehicle** => **Vehicle**

**Physical Architecture Flow Name:** vehicle signage data

In-vehicle signing data that augments regulatory, warning, and informational road signs and signals. The information provided would include static sign information (e.g., stop, curve warning, guide signs, service signs, and directional signs) and dynamic information (e.g.,



## Transit Vehicle

current signal states, grade crossing information, local traffic and road conditions, advisories, and detours).

### Logical Architecture Data Flow(s):

transit\_vehicle\_status\_for\_signing

## Transit Vehicle Operator => Transit Vehicle

**Physical Architecture Flow Name:** transit vehicle operator inputs

Transit vehicle operator inputs to on-board ITS equipment, including tactile and verbal inputs. Includes authentication information, on-board system control, emergency requests, and fare transaction data.

### Logical Architecture Data Flow(s):

ftvo-paratransit\_status  
ftvo-transit\_service\_status  
ftvo-secure\_transit\_vehicle\_emergency\_request  
ftvo-request\_logon\_authentication  
ftvo-request\_batch\_mode\_data\_transfer  
ftvo-fare\_transaction\_mode\_set\_up  
ftvo-secure\_transit\_vehicle\_surveillance\_control

## Traveler => Transit Vehicle

**Physical Architecture Flow Name:** boarding and alighting

Detection of transit passenger boarding and alighting. This flow represents the travelers' physical presence as they board a transit vehicle that can be detected or monitored by on-board sensors.

### Logical Architecture Data Flow(s):

ft-boarding\_and\_alighting  
ft-traveler\_vehicle\_image

**Physical Architecture Flow Name:** traveler inputs

User input from a traveler to summon assistance, request travel information, make a reservation, or request any other traveler service.

### Logical Architecture Data Flow(s):

ft-other\_services\_vehicle\_request  
ft-request\_advisory\_information  
ft-secure\_transit\_vehicle\_emergency\_request  
ft-destination\_on\_vehicle

## Traveler Card => Transit Vehicle

**Physical Architecture Flow Name:** payment

Payment of some kind (e.g., toll, parking, fare) by traveler which, in most cases, can be related to a credit account.

### Logical Architecture Data Flow(s):

ftc-confirm\_fare\_payment\_on\_transit\_vehicle  
ftc-transit\_vehicle\_tag\_data  
ftc-traveler\_vehicle\_input\_credit\_identity\_for\_transit

### 2.23.3 Architecture Flow Diagrams for TRVS

Transit Vehicle

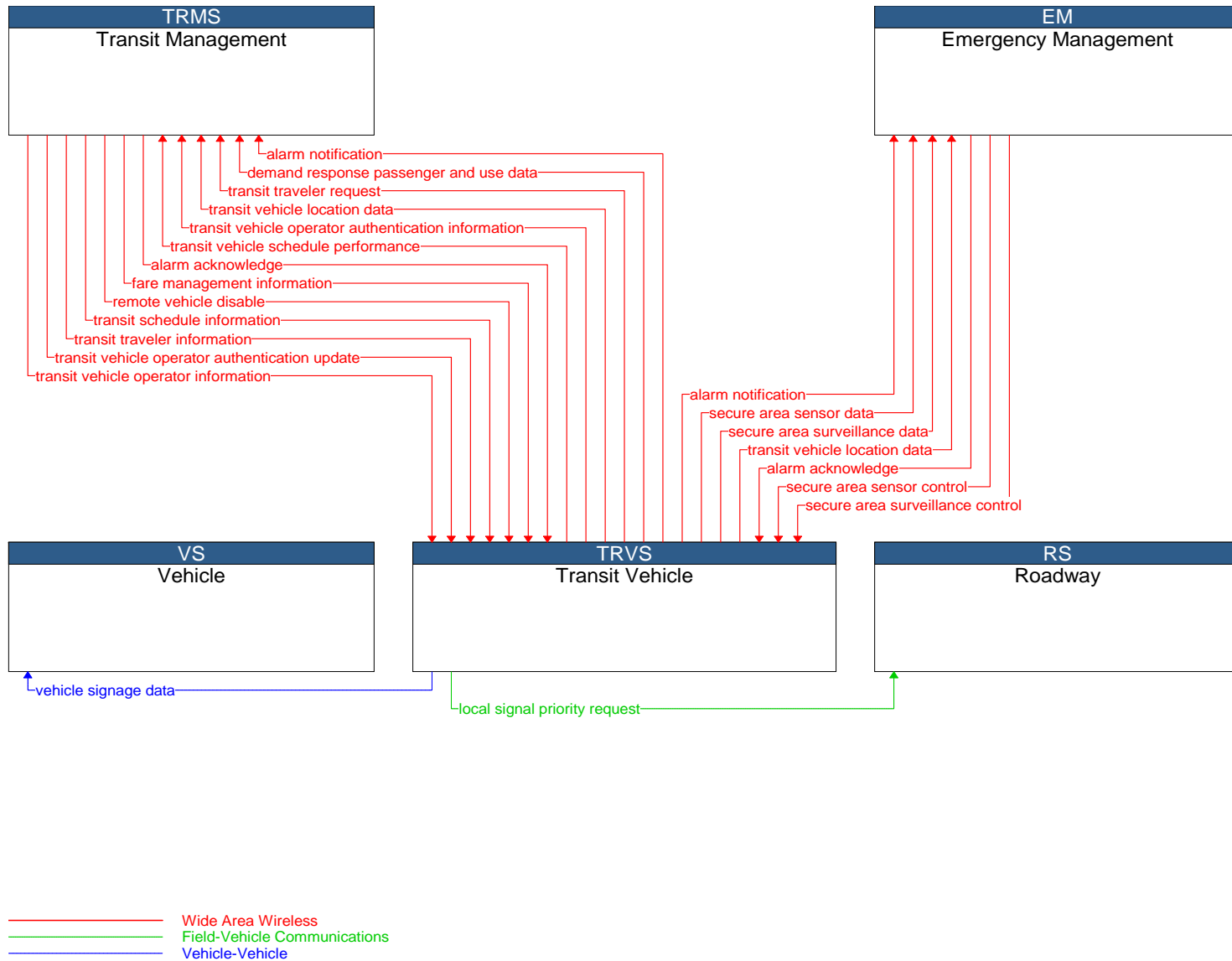


Figure 42: TRVS Subsystem Interfaces

Transit Vehicle

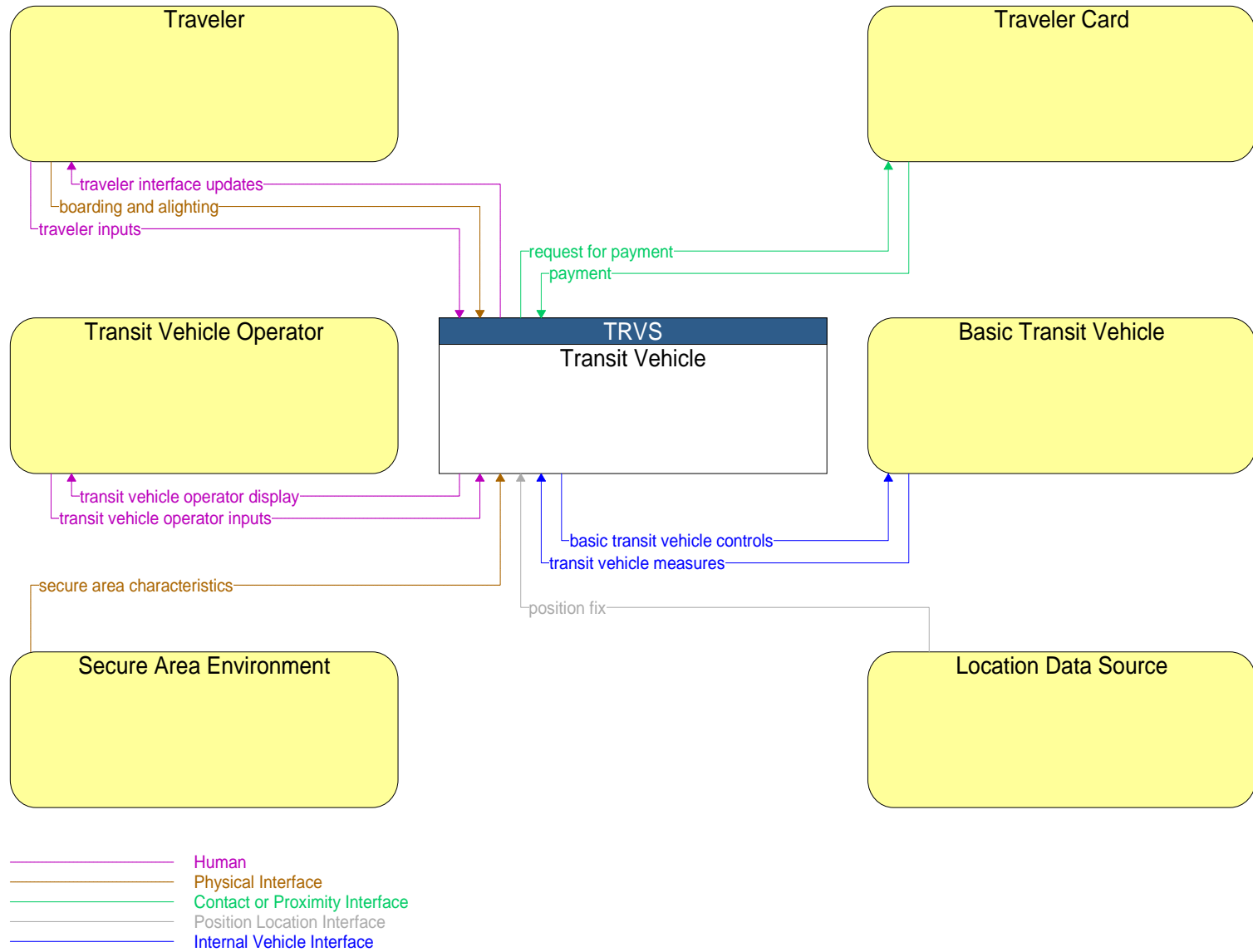


Figure 43: TRVS Terminator Interfaces

## 2.24 Vehicle

The Vehicle Subsystem (VS) provides the sensory, processing, storage, and communications functions necessary to support efficient, safe, and convenient travel. These functions reside in general vehicles including personal automobiles, commercial vehicles, emergency vehicles, transit vehicles, or other vehicle types. Information services provide the driver with current travel conditions and the availability of services along the route and at the destination. Both one-way and two-way communications options support a spectrum of information services from low-cost broadcast services to advanced, pay for use personalized information services. Route guidance capabilities assist in formulation of an optimal route and step by step guidance along the travel route. Advanced sensors, processors, enhanced driver interfaces, and actuators complement the driver information services so that, in addition to making informed mode and route selections, the driver travels these routes in a safer and more consistent manner. Initial collision avoidance functions provide 'vigilant co-pilot' driver warning capabilities. More advanced functions assume limited control of the vehicle to maintain safe headway. Ultimately, this subsystem supports completely automated vehicle operation through advanced communications with other vehicles in the vicinity and in coordination with supporting infrastructure subsystems. Pre-crash safety systems are deployed and emergency notification messages are issued when unavoidable collisions do occur.

### 2.24.1 Equipment Packages and Process Specifications for VS

#### **Equipment Package: Basic Vehicle Reception**

This equipment package provides the capability for drivers to receive basic transportation information including traffic and road conditions, incident information, maintenance and construction information, event information, transit information, parking information, weather information, and broadcast alerts.

##### **Process Specifications**

**6.7.3.2 Provide Driver with Personal Travel Information**

**6.7.3.3 Provide Driver Information Interface**

#### **Equipment Package: Driver Safety Monitoring System**

This equipment package monitors the driver's condition and warns the driver of potential dangers. This equipment package includes driver sensors to assess the suitability of the driver (e.g., fitness and alertness) to assume manual control of the vehicle.

##### **Process Specifications**

**3.1.2 Carry-out Safety Analysis**

**3.1.3 Process Vehicle On-board Data**

**6.7.3.3 Provide Driver Information Interface**

#### **Equipment Package: Driver Visibility Improvement System**

The equipment package augments the driver's ability to see objects in the vehicle path in conditions where visibility is poor (e.g., bad weather, night driving, etc.). These capabilities are provided using on-board sensors (e.g., an infrared sensor system) to create images that are displayed to the driver (e.g., using a heads up display).

##### **Process Specifications**

**3.4 Enhance Driver's Vision**

**6.7.3.3 Provide Driver Information Interface**

#### **Equipment Package: Interactive Vehicle Reception**

This equipment package provides drivers with personalized traveler information including traffic and road conditions, transit information, maintenance and construction information, multimodal information, event information, and weather information. The provided information is tailored based on driver requests. Both one-time requests for information and on-going information streams based on a submitted traveler profile and preferences are supported.

##### **Process Specifications**

**6.7.3.1 Get Driver Personal Request**

**6.7.3.2 Provide Driver with Personal Travel Information**

**6.7.3.3 Provide Driver Information Interface**

**6.7.3.4 Update Driver Display Map Data**

**Equipment Package: Vehicle Automated Operations**

This equipment package provides the capability for "hands-off" and "feet off" operation of an equipped vehicle on the automated portion of the highway system including the longitudinal control, lateral control for lane change/merge and roadway departure, regulating the vehicle speed and steering control, and sensing impending hazards and responding appropriately. These capabilities are provided by systems on board the vehicle to regulate longitudinal and lateral control maneuvers, including acceleration, braking, and steering functions. The capability to control access to the automated highway system is provided through an automated check-in procedure in which the vehicle and driver are checked for their fitness.

**Process Specifications**

- 3.1.3 Process Vehicle On-board Data**
- 3.2.1 Provide Driver Interface**
- 3.2.2 Provide Automatic Vehicle Operations Control**
- 3.2.3.2 Manage Platoon Following**
- 3.2.3.3 Process data for Vehicle Actuators**
- 3.2.4 Process Sensor Data for Automatic Vehicle Operations**
- 6.7.3.3 Provide Driver Information Interface**

**Equipment Package: Vehicle Autonomous Route Guidance**

This equipment package provides route planning and turn by turn route guidance to a driver using an on-board digital map. The equipment package includes autonomous systems that are not configured to receive or process real-time information. In advanced implementations, this equipment package receives real-time traffic and road conditions information from the infrastructure and factors this real-time information into its route selection and guidance algorithms.

**Process Specifications**

- 6.7.1.1.3 Provide Autonomous In-Vehicle Guidance**
- 6.7.1.2 Provide Driver Guidance Interface**
- 6.7.1.4 Update Vehicle Navigable Map Database**

**Equipment Package: Vehicle Environmental Probe Support**

This equipment package includes the vehicle sensors and communications systems that sense and send road conditions and surface weather information as the vehicle travels. The same vehicle equipment that improves stability and provides driver information in adverse conditions is a potential source for this information.

**Process Specifications**

- 3.1.3 Process Vehicle On-board Data**

**Equipment Package: Vehicle Intersection Control**

This equipment package detects potentially hazardous situations in an intersection and takes control of the vehicle to avoid a potential collision. This equipment package includes the on-board sensors that detect potential hazards, the actuator systems that provide automated control of the vehicle, and equipment that communicates with the infrastructure to identify intersection safety issues identified by field equipment at the intersection.

**Process Specifications**

- 3.1.1 Produce Collision and Crash Avoidance Data**
- 3.1.3 Process Vehicle On-board Data**
- 3.2.3.3 Process data for Vehicle Actuators**
- 6.7.3.3 Provide Driver Information Interface**

**Equipment Package: Vehicle Intersection Safety Warning**

This equipment package detects and notifies the driver of potentially hazardous situations in an intersection.

The equipment package monitors intersection status and vehicle speed on the approach to the intersection and warns the driver if necessary. It shares vehicle status with field equipment at the intersection and uses intersection status provided by this field equipment to warn the driver of impending violations or potential

## Vehicle

conflicts with other vehicles approaching the intersection. This equipment package includes the on-board sensors that detect potential hazards, equipment that communicates with the infrastructure to identify safety issues identified by field equipment at the intersection, and equipment that provides visual and/or audible warnings to the driver.

### **Process Specifications**

- 3.1.1 Produce Collision and Crash Avoidance Data**
- 3.1.3 Process Vehicle On-board Data**
- 3.2.3.3 Process data for Vehicle Actuators**
- 3.2.3.5 Process Vehicle Sensor Data**
- 6.7.3.2 Provide Driver with Personal Travel Information**
- 6.7.3.3 Provide Driver Information Interface**

### **Equipment Package: Vehicle Lateral Control**

This equipment package provides lateral control of a vehicle to allow "hands off" driving, automating the steering control function. It includes on-board systems that detect lanes and obstacles or vehicles to the sides of the vehicle. This sensor information is processed on board the vehicle, and appropriate steering control actions are maintained using steering actuators.

### **Process Specifications**

- 3.1.3 Process Vehicle On-board Data**
- 3.2.1 Provide Driver Interface**
- 3.2.3.1 Provide Command Interface**
- 3.2.3.3 Process data for Vehicle Actuators**
- 3.2.3.4.3 Provide Lane Servo Control**
- 3.2.3.4.4 Provide Change Lane Servo Control**
- 3.2.3.4.5 Provide Vehicle Control Data Interface**
- 6.7.3.3 Provide Driver Information Interface**

### **Equipment Package: Vehicle Lateral Warning System**

This equipment package monitors areas to the sides of a vehicle and provides warnings to a driver so the driver can take action to recover and maintain safe control of the vehicle. It includes on-board sensors that detect lanes and obstacles or vehicles to the sides of the vehicle and the driver information system that provides the warning.

### **Process Specifications**

- 3.1.1 Produce Collision and Crash Avoidance Data**
- 3.1.3 Process Vehicle On-board Data**
- 3.2.3.5 Process Vehicle Sensor Data**
- 6.7.3.3 Provide Driver Information Interface**

### **Equipment Package: Vehicle Location Determination**

This equipment package receives current location of the vehicle from the Location Data Source terminator and provides this information to other equipment packages that use the location information to provide various ITS services.

### **Process Specifications**

- 6.7.1.3 Process Vehicle Location Data**
- 6.7.1.4 Update Vehicle Navigable Map Database**

### **Equipment Package: Vehicle Longitudinal Control**

This equipment package provides longitudinal control of a vehicle to allow "feet off" driving, automating the function of speed control, acceleration, and braking to maintain safe following distances. It includes on-board systems that detect obstacles or vehicles in the longitudinal path of the vehicle. This sensor information is processed on board the vehicle, and appropriate control actions (acceleration, braking, or maintaining speed) are initiated using accelerator and/or brake actuators.

## Vehicle

### Process Specifications

- 3.1.3 Process Vehicle On-board Data
- 3.2.1 Provide Driver Interface
- 3.2.3.1 Provide Command Interface
- 3.2.3.3 Process data for Vehicle Actuators
- 3.2.3.4.1 Provide Speed Servo Control
- 3.2.3.4.2 Provide Headway Servo Control
- 3.2.3.4.5 Provide Vehicle Control Data Interface
- 6.7.3.3 Provide Driver Information Interface

### Equipment Package: Vehicle Longitudinal Warning System

This equipment package monitors areas in front of and behind the vehicle and provides warnings to the driver so the driver can take action to recover and maintain safe control of the vehicle. It includes on-board sensors that detect objects in front of or behind the vehicle and the driver information system that provides provides the warning.

### Process Specifications

- 3.1.1 Produce Collision and Crash Avoidance Data
- 3.1.3 Process Vehicle On-board Data
- 3.2.3.5 Process Vehicle Sensor Data
- 6.7.3.3 Provide Driver Information Interface

### Equipment Package: Vehicle Mayday I/F

This equipment package provides the capability for drivers or collision detection sensors to report an emergency and summon assistance. This equipment package includes the on-board collision detection sensors, a mechanism for the driver to summon assistance, and two-way communications with a service provider.

### Process Specifications

- 3.3.1 Provide Communications Function
- 3.3.2 Build Automatic Collision Notification Message
- 6.7.1.2 Provide Driver Guidance Interface
- 6.7.2.1 Build Driver Personal Security Message
- 6.7.2.2 Provide Driver In-vehicle Communications Function
- 6.7.3.3 Provide Driver Information Interface

### Equipment Package: Vehicle On-board Diagnostics System

This equipment package monitors engine-related components, including the emissions control system, to make sure they are operating properly. Detected problems are reported to the driver and additional diagnostics data is stored for the service technician. Vehicle diagnostics data is made available via short range communications to support vehicle performance monitoring, service, and repair.

### Process Specifications

- 3.1.3 Process Vehicle On-board Data
- 6.7.3.2 Provide Driver with Personal Travel Information
- 6.7.3.3 Provide Driver Information Interface

### Equipment Package: Vehicle Pre-Crash Safety Systems

This equipment package monitors the vehicle's local environment, determines collision probability, and deploys a pre-crash safety system when a crash is imminent. It includes on-board communications equipment and sensors to determine the proximity and closing rates of neighboring vehicles or other roadway obstacles.

These detection systems are supplemented by additional sensors that monitor existing weather and roadway conditions and roadway geometry. The equipment package assimilates this information and determines the probability of a collision with the other vehicle or obstacle. If the collision probability is high, it deploys a pre-crash safety system either to avoid the accident or to reduce the accident severity.

## Vehicle

### **Process Specifications**

- 3.1.1 Produce Collision and Crash Avoidance Data**
- 3.1.3 Process Vehicle On-board Data**
- 3.2.3.5 Process Vehicle Sensor Data**

### **Equipment Package: Vehicle Safety Monitoring System**

This equipment package monitors critical components of the vehicle and warns the driver of potential dangers. These capabilities are provided by on-board sensors to monitor the vehicle condition and performance, including steering, braking, acceleration, emissions, fuel economy, engine performance, etc. Problems with any of these systems are identified and reported to the driver. Warnings are provided in the event of a serious condition (e.g., likely failure or damage).

### **Process Specifications**

- 3.1.2 Carry-out Safety Analysis**
- 3.1.3 Process Vehicle On-board Data**
- 6.7.3.3 Provide Driver Information Interface**

### **Equipment Package: Vehicle Secure Area Access System**

This equipment package provides access to secure areas such as shipping yards, warehouses, airports, transit-only ramps, parking gates and other areas. It accepts inputs from the vehicle driver that include the necessary identity information and uses this information to generate the request to activate a barrier to gain access to the area.

### **Process Specifications**

- 3.5 Generate Vehicle Access Requests**
- 6.7.3.3 Provide Driver Information Interface**

### **Equipment Package: Vehicle Short Range Traveler Information Reception**

This equipment package receives advisories, vehicle signage data, and other driver information via short range communications and presents this information to the driver using in-vehicle equipment. Information presented may include fixed sign information, traffic control device status (e.g., signal phase and timing data), advisory and detour information, warnings of adverse road and weather conditions, travel times, and other driver information.

### **Process Specifications**

- 6.7.3.2 Provide Driver with Personal Travel Information**
- 6.7.3.3 Provide Driver Information Interface**

### **Equipment Package: Vehicle Toll/Parking Interface**

This equipment package includes the on-board systems that pay for tolls and parking electronically. It includes in-vehicle equipment that communicates with the toll/parking plaza (e.g., a tag) and an optional interface to a traveler card to allow use of a common payment medium for all transportation services.

### **Process Specifications**

- 7.1.4 Provide Driver Toll Payment Interface**
- 7.1.7 Provide Traveler Card Interface for Tolls**
- 7.2.4 Provide Driver Parking Lot Payment Interface**
- 7.2.7 Provide Traveler Card Interface for Parking**
- 7.5.1 Provide Vehicle Traveler Card Interface**

### **Equipment Package: Vehicle Traffic Probe Support**

This equipment package includes capabilities for the probe vehicle to identify its location, measure traffic conditions such as link travel time and speed, and transmit these data to a center or roadside equipment.

### **Process Specifications**

- 3.1.3 Process Vehicle On-board Data**
- 6.7.1.1.2 Provide Dynamic In-Vehicle Guidance**
- 6.7.3.3 Provide Driver Information Interface**



## Vehicle

### **Equipment Package: Vehicle Trip Planning and Route Guidance**

This equipment package includes the in-vehicle system that coordinates with a traveler information center to provide a personalized trip plan to the driver. The trip plan is calculated by the Information Service Provider based on preferences and constraints supplied by the driver and provided to the driver for confirmation. Reservations and advanced payment may also be processed by this equipment package to confirm the trip plan. Coordination with the Information Service Provider may continue during the trip so that the route plan can be modified to account for new information. Many equipment configurations are possible including in-vehicle systems that provide a basic trip plan to the driver as well as more sophisticated systems that can provide turn by turn guidance to the driver along the route.

#### **Process Specifications**

- 6.7.1.1.1 Determine In-Vehicle Guidance Method**
- 6.7.1.1.2 Provide Dynamic In-Vehicle Guidance**
- 6.7.1.2 Provide Driver Guidance Interface**
- 6.7.1.4 Update Vehicle Navigable Map Database**
- 6.7.3.1 Get Driver Personal Request**

### **Equipment Package: Vehicle VMT Payment Collection**

This equipment package tracks the location of the vehicle at specific times and reports this VMT data along with the vehicles VIN either periodically to the Payment Administration subsystem that the vehicle was registered with or to the Roadway Payment subsystem on request. This EP will also report VMT equipment status to roadside or mobile payment subsystems. If the vehicle owner has selected the option to pay with an in-vehicle payment instrument, then that information is sent on request. The EP can receive VMT cost data to present to the vehicle operator as either the actual cost of roadways used or the estimated cost of roadways that might be used by the vehicle operator.

#### **Process Specifications**

- 3.1.3 Process Vehicle On-board Data**
- 6.7.3.3 Provide Driver Information Interface**
- 7.6.3 Provide Driver VMT Payment Interface**
- 7.6.4 Provide Traveler Card Interface for VMT**

### **Equipment Package: Vehicle Warning System**

This equipment package receives location information from nearby vehicles and uses the received information to determine if there is a possibility of collision and warn the driver. This equipment package also provides information to surrounding vehicles about its own location, speed, and other information to allow other similarly equipped vehicles to warn their drivers if necessary. The same equipment also receives alerts from responding emergency vehicles in the vicinity so the driver can be warned of the approaching emergency vehicle, increasing the safety of the driver and the emergency responder. It includes on-board equipment (OBE) that sends and receives the messages and determines if there is a need to warn the driver, and the driver information system that provides the warnings.

#### **Process Specifications**

- 3.1.1 Produce Collision and Crash Avoidance Data**
- 3.1.3 Process Vehicle On-board Data**
- 6.7.3.3 Provide Driver Information Interface**

## *2.24.2 Interfaces for VS*

### **Basic Vehicle**

=> **Vehicle**

**Physical Architecture Flow Name:** basic vehicle measures

Information provided to on-board ITS equipment from the vehicle platform indicating current vehicle status.

**Logical Architecture Data Flow(s):**

## Vehicle

fbv-driver\_safety\_status  
fbv-vehicle\_speed  
fbv-vehicle\_security\_status  
fbv-vehicle\_safety\_status  
fbv-vehicle\_proximity\_data  
fbv-vehicle\_motion\_data  
fbv-vehicle\_lane\_position  
fbv-vehicle\_identity  
fbv-vehicle\_headway  
fbv-vehicle\_condition  
fbv-vehicle\_attitude\_data  
fbv-steering\_servo\_response  
fbv-diagnostics\_data  
fbv-crash\_sensor\_data  
fbv-brake\_servo\_response  
fbv-vehicle\_on\_avo\_lane  
fbv-vehicle\_occupants  
fbv-throttle\_servo\_response

### **Commercial Vehicle** => **Vehicle**

**Physical Architecture Flow Name:** commercial vehicle data

Information about the commercial vehicles cargo, credentials, and payments.

**Logical Architecture Data Flow(s):**

cv\_driver\_enrollment\_cost  
processed\_cargo\_data

### **Driver** => **Vehicle**

**Physical Architecture Flow Name:** driver inputs

Driver input to the vehicle including configuration data, settings and preferences, interactive requests, and control commands.

**Logical Architecture Data Flow(s):**

fd-vehicle\_display\_configuration\_setting  
fd-guidance\_route\_accepted  
fd-request\_advisory\_information  
fd-guidance\_map\_update\_request  
fd-vehicle\_display\_configuration\_override  
fd-activate\_vehicle\_control  
fd-guidance\_data

**Physical Architecture Flow Name:** request for service

Driver inputs that summon an emergency response, request a financial transaction, or initiate other services.

**Logical Architecture Data Flow(s):**

fd-emergency\_request  
fd-guidance\_request  
fd-other\_services\_parking\_request  
fd-other\_services\_toll\_request  
fd-driver\_vehicle\_access\_request

### **Emergency Management** => **Vehicle**

**Physical Architecture Flow Name:** emergency acknowledge

Acknowledge request for emergency assistance and provide additional details regarding actions and verification requirements.

**Logical Architecture Data Flow(s):**

## Vehicle

emergency\_request\_driver\_acknowledge  
emergency\_request\_vehicle\_acknowledge

**Physical Architecture Flow Name:** emergency data request

A request for additional information or a control command issued by the emergency response agency in response to an emergency request for assistance from a traveler.

**Logical Architecture Data Flow(s):**

vehicle\_security\_system\_commands  
emergency\_data\_request

**Emergency Vehicle** => **Vehicle**

**Physical Architecture Flow Name:** emergency vehicle alert

Notification to vehicles in the area that an emergency vehicle is in the vicinity. The number of responding vehicles, their status, location, speed, and direction are provided.

**Logical Architecture Data Flow(s):**

emergency\_vehicle\_proximity

**Physical Architecture Flow Name:** vehicle signage data

In-vehicle signing data that augments regulatory, warning, and informational road signs and signals. The information provided would include static sign information (e.g., stop, curve warning, guide signs, service signs, and directional signs) and dynamic information (e.g., current signal states, grade crossing information, local traffic and road conditions, advisories, and detours).

**Logical Architecture Data Flow(s):**

em\_to\_vehicle\_incident\_scene\_information

**Information Service Provider** => **Vehicle**

**Physical Architecture Flow Name:** broadcast traveler information

General traveler information that contains traffic and road conditions, link travel times, incidents, advisories, restrictions, transit service information, weather information, parking information, and other related traveler information.

**Logical Architecture Data Flow(s):**

vehicle\_broadcast\_transit\_data  
vehicle\_broadcast\_traffic\_data  
vehicle\_broadcast\_multimodal\_data  
vehicle\_broadcast\_border\_data  
vehicle\_broadcast\_parking\_data  
vehicle\_broadcast\_weather\_data  
vehicle\_broadcast\_event\_information  
link\_and\_queue\_data  
vehicle\_broadcast\_incident\_information  
vehicle\_broadcast\_price\_data

**Physical Architecture Flow Name:** emergency traveler information

Public notification of an emergency such as a natural or man-made disaster, civil emergency, or child abduction. This flow also includes evacuation information including evacuation instructions, evacuation zones, recommended evacuation times, tailored evacuation routes and destinations, traffic and road conditions along the evacuation routes, traveler services and shelter information, and reentry times and instructions.

**Logical Architecture Data Flow(s):**

vehicle\_wide\_area\_alert\_information  
vehicle\_emergency\_traveler\_information  
vehicle\_evacuation\_traveler\_information  
vehicle\_transportation\_system\_status

**Physical Architecture Flow Name:** interactive traveler information

## Vehicle

Traveler information provided in response to a traveler request. The provided information includes traffic and road conditions, advisories, incidents, payment information, transit services, parking information, weather information, and other travel-related data updates and confirmations.

### Logical Architecture Data Flow(s):

- vehicle\_interactive\_multimodal\_data
- driver\_map\_update\_payment\_response
- vehicle\_interactive\_weather\_data
- driver\_display\_update\_payment\_response
- advanced\_tolls\_and\_fares\_response
- vehicle\_interactive\_transit\_data
- vehicle\_interactive\_traffic\_data
- vehicle\_interactive\_parking\_data
- vehicle\_interactive\_incident\_information
- vehicle\_interactive\_event\_information
- vehicle\_interactive\_border\_data
- advanced\_fares\_and\_charges\_response
- vehicle\_interactive\_price\_data

### Physical Architecture Flow Name: traffic probe reporting management

Data used to manage probe data reporting by vehicles. This flow indicates to the vehicle when to report probe data, the type of probe data to send, and thresholds for nominal conditions when sending data can be skipped.

### Logical Architecture Data Flow(s):

- traffic\_probe\_configuration

### Physical Architecture Flow Name: travel services information

Travel service information and reservations for tourist attractions, lodging, dining, service stations, emergency services, and other services and businesses of interest to the traveler.

### Logical Architecture Data Flow(s):

- vehicle\_transaction\_confirmation
- vehicle\_travel\_services\_provider\_data

### Physical Architecture Flow Name: traveler alerts

Traveler information alerts reporting congestion, incidents, adverse road or weather conditions, parking availability, transit service delays or interruptions, and other information that may impact the traveler. Relevant alerts are provided based on traveler-supplied profile information including trip characteristics and preferences.

### Logical Architecture Data Flow(s):

- vehicle\_transit\_alert
- vehicle\_border\_alert
- vehicle\_event\_alert
- vehicle\_weather\_alert
- vehicle\_multimodal\_alert
- vehicle\_parking\_alert
- vehicle\_incident\_alert
- vehicle\_traffic\_alert

### Physical Architecture Flow Name: trip plan

A travel itinerary identifying a route and associated traveler information and instructions identifying recommended modes and transfer information, ride sharing options, and transit and parking reservation information.

### Logical Architecture Data Flow(s):

- vehicle\_payment\_confirmation
- vehicle\_trip\_information
- vehicle\_guidance\_route

Location Data Source

=>

Vehicle

## Vehicle

**Physical Architecture Flow Name:** position fix

Information which provides a traveler's or vehicle's geographical position.

**Logical Architecture Data Flow(s):**

From\_Location\_Data\_Source

**Maintenance and Construction Vehicle** ==> **Vehicle**

**Physical Architecture Flow Name:** vehicle signage data

In-vehicle signing data that augments regulatory, warning, and informational road signs and signals. The information provided would include static sign information (e.g., stop, curve warning, guide signs, service signs, and directional signs) and dynamic information (e.g., current signal states, grade crossing information, local traffic and road conditions, advisories, and detours).

**Logical Architecture Data Flow(s):**

work\_zone\_intrusion\_alert\_on\_board\_for\_in\_vehicle\_signing

**Map Update Provider** ==> **Vehicle**

**Physical Architecture Flow Name:** map updates

Map update which could include a new underlying static or real-time map or map layer(s) update.

**Logical Architecture Data Flow(s):**

fmup-vehicle\_map\_update  
fmup-vehicle\_map\_update\_cost  
fmup-driver\_display\_update  
fmup-driver\_display\_update\_cost

**Other Vehicle** ==> **Vehicle**

**Physical Architecture Flow Name:** vehicle control coordination

Coordination of control commands between leader and follower vehicles allowing vehicles to join and separate from groups of cooperative vehicles, sharing performance capabilities, and coordinating maneuvers between lead and following vehicles.

**Logical Architecture Data Flow(s):**

fov-platoon\_data\_from\_other\_vehicle

**Physical Architecture Flow Name:** vehicle intersection safety data

Vehicle path and acceleration data provided by vehicles approaching or occupying an intersection. It identifies the intersection, vehicle position and motion, the anticipated lane and movement that will be used in the intersection, and notification of potential violations or other detected safety hazards.

**Logical Architecture Data Flow(s):**

fov-safety\_status\_from\_other\_vehicle

**Physical Architecture Flow Name:** vehicle safety data

Vehicle safety data indicating vehicle location, vehicle motion (speed, heading, acceleration), vehicle control (brakes, steering, throttle, exterior lights), basic vehicle characteristics (length, width). May also include additional vehicle status (e.g., anti-lock brake activation, stability control system activation).

**Logical Architecture Data Flow(s):**

fov-safety\_msg\_data\_from\_other\_vehicles

**Parking Management** ==> **Vehicle**

**Physical Architecture Flow Name:** vehicle parking information

## Vehicle

Parking information for in-vehicle display that is provided to vehicles approaching or in parking facilities. The information provided would include static sign information (e.g., guide signs, service signs, height, width, and weight restrictions, and directional signs) and dynamic information (e.g., current parking availability and locations).

### Logical Architecture Data Flow(s):

parking\_to\_vehicle\_local\_parking\_data

**Physical Architecture Flow Name:** vehicle payment request

Request for information supporting toll and parking payments.

### Logical Architecture Data Flow(s):

parking\_lot\_vehicle\_payment\_data\_request

parking\_lot\_payment\_request

**Physical Architecture Flow Name:** vehicle payment update

Data written to vehicle equipment to support electronic toll collection or parking payment.

### Logical Architecture Data Flow(s):

parking\_lot\_vehicle\_payment\_data\_update

parking\_lot\_payment\_debited

parking\_lot\_vehicle\_payment\_data\_clear

**Payment Administration** ==> **Vehicle**

**Physical Architecture Flow Name:** vehicle payment request

Request for information supporting toll and parking payments.

### Logical Architecture Data Flow(s):

vmt\_vehicle\_payment\_data\_clear\_from\_admin

vmt\_payment\_request\_from\_admin

**Physical Architecture Flow Name:** VMT cost data

VMT charges per link.

### Logical Architecture Data Flow(s):

vmt\_cost\_data

**Potential Obstacles** ==> **Vehicle**

**Physical Architecture Flow Name:** physical presence

Detection of an obstacle. Obstacle could include animals, vehicles, pedestrians, rocks in roadway etc.

### Logical Architecture Data Flow(s):

From\_Potential\_Obstacles

**Roadway** ==> **Vehicle**

**Physical Architecture Flow Name:** access permission

Information returned indicating whether permission for access is granted and instructions for proceeding.

### Logical Architecture Data Flow(s):

vehicle\_barrier\_access\_status

**Physical Architecture Flow Name:** automated vehicle control data

Instructions and control parameters for automated vehicle operation including current system conditions and advisories, control parameters (e.g., speed and performance profiles, headways), maneuver coordination, and check in/checkout instructions.

## Vehicle

### **Logical Architecture Data Flow(s):**

- avo\_check\_response
- lane\_change\_details
- lane\_change\_strategy

**Physical Architecture Flow Name:** broadcast traveler information

General traveler information that contains traffic and road conditions, link travel times, incidents, advisories, restrictions, transit service information, weather information, parking information, and other related traveler information.

### **Logical Architecture Data Flow(s):**

- field\_to\_vehicle\_broadcast\_incident\_information
- field\_to\_vehicle\_broadcast\_weather\_data
- field\_to\_vehicle\_broadcast\_transit\_data
- field\_to\_vehicle\_broadcast\_traffic\_data
- field\_to\_vehicle\_broadcast\_price\_data
- field\_to\_vehicle\_broadcast\_parking\_data
- field\_to\_vehicle\_broadcast\_multimodal\_data
- field\_to\_vehicle\_broadcast\_event\_information
- field\_to\_vehicle\_broadcast\_border\_data

**Physical Architecture Flow Name:** emergency traveler information

Public notification of an emergency such as a natural or man-made disaster, civil emergency, or child abduction. This flow also includes evacuation information including evacuation instructions, evacuation zones, recommended evacuation times, tailored evacuation routes and destinations, traffic and road conditions along the evacuation routes, traveler services and shelter information, and reentry times and instructions.

### **Logical Architecture Data Flow(s):**

- field\_to\_vehicle\_evacuation\_traveler\_information
- field\_to\_vehicle\_transportation\_system\_status
- field\_to\_vehicle\_wide\_area\_alert\_information
- field\_to\_vehicle\_emergency\_traveler\_information

**Physical Architecture Flow Name:** intersection status

Intersection status including current operational status, signal phase and timing information, intersection geometry, surface conditions, warnings of potential violations or hazardous conditions, and approaching vehicle information. This may include information about the position, velocity, acceleration, and turning status of approaching vehicles.

### **Logical Architecture Data Flow(s):**

- intersection\_status\_data\_for\_vehicle
- intersection\_collision\_avoidance\_data

**Physical Architecture Flow Name:** roadway safety data

Information about potential safety hazards in the vehicle path such as stalled vehicles, wrong way drivers, debris, or standing water.

### **Logical Architecture Data Flow(s):**

- roadside\_safety\_data\_to\_vehicle

**Physical Architecture Flow Name:** traffic probe reporting management

Data used to manage probe data reporting by vehicles. This flow indicates to the vehicle when to report probe data, the type of probe data to send, and thresholds for nominal conditions when sending data can be skipped.

### **Logical Architecture Data Flow(s):**

- vehicle\_traffic\_probe\_configuration

**Physical Architecture Flow Name:** vehicle signage data

In-vehicle signing data that augments regulatory, warning, and informational road signs and signals. The information provided would include static sign information (e.g., stop, curve

## Vehicle

warning, guide signs, service signs, and directional signs) and dynamic information (e.g., current signal states, grade crossing information, local traffic and road conditions, advisories, and detours).

### Logical Architecture Data Flow(s):

vehicle\_signage\_emissions\_testing\_results  
vehicle\_env\_probe\_data\_output  
vehicle\_signage\_data  
intrusion\_alert\_for\_in\_vehicle\_signing

## Roadway Environment => Vehicle

### Physical Architecture Flow Name: environmental conditions

Current road conditions (e.g., surface temperature, subsurface temperature, moisture, icing, treatment status) and surface weather conditions (e.g., air temperature, wind speed, precipitation, visibility) that are measured by environmental sensors.

### Logical Architecture Data Flow(s):

fre-environmental\_conditions

### Physical Architecture Flow Name: roadway characteristics

Detectable or measurable road characteristics such as friction coefficient and general surface conditions, road geometry and markings, etc. These characteristics are monitored or measured by ITS sensors and used to support advanced vehicle safety and control and road maintenance capabilities.

### Logical Architecture Data Flow(s):

fre-roadside\_data  
fre-roadway\_characteristics

## Roadway Payment => Vehicle

### Physical Architecture Flow Name: vehicle payment request

Request for information supporting toll and parking payments.

### Logical Architecture Data Flow(s):

toll\_vehicle\_payment\_data\_request  
toll\_payment\_request  
vmt\_payment\_request

### Physical Architecture Flow Name: vehicle payment update

Data written to vehicle equipment to support electronic toll collection or parking payment.

### Logical Architecture Data Flow(s):

vmt\_vehicle\_payment\_data\_clear  
toll\_payment\_debited  
toll\_vehicle\_payment\_data\_update  
toll\_vehicle\_payment\_data\_clear

## Transit Vehicle => Vehicle

### Physical Architecture Flow Name: vehicle signage data

In-vehicle signing data that augments regulatory, warning, and informational road signs and signals. The information provided would include static sign information (e.g., stop, curve warning, guide signs, service signs, and directional signs) and dynamic information (e.g., current signal states, grade crossing information, local traffic and road conditions, advisories, and detours).

### Logical Architecture Data Flow(s):

transit\_vehicle\_status\_for\_signing

## Traveler Card => Vehicle



## Vehicle

**Physical Architecture Flow Name:** payment

Payment of some kind (e.g., toll, parking, fare) by traveler which, in most cases, can be related to a credit account.

**Logical Architecture Data Flow(s):**

- ftc-vmt\_vehicle\_payment\_data
- ftc-confirm\_vmt\_payment
- ftc-toll\_vehicle\_payment\_data
- ftc-confirm\_payment\_at\_parking\_lot
- ftc-confirm\_payment\_at\_toll\_plaza
- ftc-parking\_vehicle\_payment\_data
- ftc-driver\_vehicle\_input\_credit\_identity

**Vehicle** => **Basic Vehicle**

**Physical Architecture Flow Name:** vehicle control

Vehicular control commands

**Logical Architecture Data Flow(s):**

- tbv-steer\_straight
- tbv-vehicle\_security\_system\_commands
- tbv-steer\_right
- tbv-steer\_left
- tbv-deploy\_crash\_restraints
- tbv-change\_direction
- tbv-change\_brake\_setting
- tbv-change\_throttle\_setting

**Vehicle** => **Commercial Vehicle**

**Physical Architecture Flow Name:** commercial vehicle data request

Requests from the vehicle for information about the commercial vehicle's cargo, credentials, and payments.

**Logical Architecture Data Flow(s):**

- cv\_driver\_credit\_identity
- cargo\_data\_request

**Vehicle** => **Driver**

**Physical Architecture Flow Name:** driver updates

Information displayed or otherwise conveyed by the vehicle to the driver.

**Logical Architecture Data Flow(s):**

- td-guidance\_route\_details
- td-advisory\_information
- td-driving\_guidance
- td-guidance\_map\_update\_response
- td-vehicle\_occupants\_detected
- td-guidance\_input\_request
- td-driver\_vehicle\_access\_status
- td-broadcast\_information

**Physical Architecture Flow Name:** in-vehicle transaction status

The status of an electronic payment transaction presented to the driver by in-vehicle equipment.

**Logical Architecture Data Flow(s):**

- td-other\_services\_parking\_response
- td-vmt\_payment\_confirmation

## Vehicle

td-vmt\_cost\_data  
td-other\_services\_toll\_response

### Vehicle => Emergency Management

**Physical Architecture Flow Name:** emergency notification

An emergency request for assistance automatically initiated by a vehicle or originated by a traveler using an in-vehicle or personal device.

**Logical Architecture Data Flow(s):**

emergency\_request\_driver\_details  
vehicle\_status\_update  
driver\_status\_update  
emergency\_request\_vehicle\_details  
vehicle\_security\_system\_commands\_request

### Vehicle => Information Service Provider

**Physical Architecture Flow Name:** emergency traveler information request

Request for alerts, evacuation information, and other emergency information provided to the traveling public.

**Logical Architecture Data Flow(s):**

vehicle\_emergency\_information\_request

**Physical Architecture Flow Name:** environmental probe data

Data from vehicle safety and convenience systems that can be used to estimate environmental conditions, including measured air temperature, exterior light status, wiper status, sun sensor status, rain sensor status, traction control status, anti-lock brake status, and other collected vehicle system status and sensor information. The collected data is reported along with the location, heading, and time that the data was collected. Both current data and snapshots of recent events (e.g., traction control or anti-lock brake system activations) may be reported.

**Logical Architecture Data Flow(s):**

env\_probe\_data\_from\_vehicle

**Physical Architecture Flow Name:** traffic probe data

Vehicle data that is used to determine traffic conditions. In a basic implementation, the data could be limited to time stamped unique identifiers that can be used to measure a vehicle's progress through the network. In more advanced implementations, the vehicle may report current position, speed, and heading and snapshots of recent events including route information, starts and stops, speed changes, and other information that can be used to estimate traffic conditions.

**Logical Architecture Data Flow(s):**

guidance\_probe\_data\_from\_vehicle  
traffic\_probe\_data\_from\_vehicle

**Physical Architecture Flow Name:** travel services request

Request for travel service information including tourist attractions, lodging, restaurants, service stations, and emergency services. The request identifies the type of service, the area of interest, optional reservation request information, parameters that are used to prioritize or filter the returned information, and sorting preferences.

**Logical Architecture Data Flow(s):**

vehicle\_transaction\_request  
vehicle\_travel\_services\_data\_request

**Physical Architecture Flow Name:** traveler profile

Information about a traveler including equipment capabilities, personal preferences, and traveler alert subscriptions.

**Logical Architecture Data Flow(s):**

## Vehicle

vehicle\_alert\_subscriptions  
vehicle\_profile

**Physical Architecture Flow Name:** traveler request

A request for traveler information including traffic, transit, toll, parking, road weather conditions, event, and passenger rail information. The request identifies the type of information, the area of interest, parameters that are used to prioritize or filter the returned information, and sorting preferences.

**Logical Architecture Data Flow(s):**

driver\_display\_update\_payment\_request  
driver\_map\_update\_payment\_request  
advanced\_fares\_and\_charges\_request  
advanced\_tolls\_and\_fares\_request  
vehicle\_information\_request

**Physical Architecture Flow Name:** trip confirmation

Acknowledgement by the driver/traveler of acceptance of a trip plan with associated personal and payment information required to confirm reservations.

**Logical Architecture Data Flow(s):**

vehicle\_payment\_information\_for\_services  
vehicle\_guidance\_route\_accepted  
vehicle\_trip\_confirmation  
vehicle\_payment\_information

**Physical Architecture Flow Name:** trip request

Request for trip planning services that identifies the trip origin, destination(s), timing, preferences, and constraints. The request may also include a request for transit and parking reservations and ridesharing options associated with the trip.

**Logical Architecture Data Flow(s):**

vehicle\_route\_request  
vehicle\_trip\_request

## Vehicle

=> **Maintenance and  
Construction Vehicle**

**Physical Architecture Flow Name:** safety system status

Current vehicle safety system status indicating the operating condition of these systems and the safety status of the vehicle and driver.

**Logical Architecture Data Flow(s):**

safety\_data\_for\_mcv

## Vehicle

=> **Map Update Provider**

**Physical Architecture Flow Name:** map update request

Request for a map update which could include a new underlying map or map layer updates.

**Logical Architecture Data Flow(s):**

tmup-request\_driver\_display\_update  
tmup-request\_driver\_display\_update\_cost  
tmup-vehicle\_map\_update\_request  
tmup-vehicle\_map\_update\_cost\_request

## Vehicle

=> **Other Vehicle**

**Physical Architecture Flow Name:** vehicle control coordination

Coordination of control commands between leader and follower vehicles allowing vehicles to join

## Vehicle

and separate from groups of cooperative vehicles, sharing performance capabilities, and coordinating maneuvers between lead and following vehicles.

### Logical Architecture Data Flow(s):

tov-platoon\_data\_to\_other\_vehicle

**Physical Architecture Flow Name:** vehicle intersection safety data

Vehicle path and acceleration data provided by vehicles approaching or occupying an intersection. It identifies the intersection, vehicle position and motion, the anticipated lane and movement that will be used in the intersection, and notification of potential violations or other detected safety hazards.

### Logical Architecture Data Flow(s):

tov-safety\_status\_to\_other\_vehicle

**Physical Architecture Flow Name:** vehicle safety data

Vehicle safety data indicating vehicle location, vehicle motion (speed, heading, acceleration), vehicle control (brakes, steering, throttle, exterior lights), basic vehicle characteristics (length, width). May also include additional vehicle status (e.g., anti-lock brake activation, stability control system activation).

### Logical Architecture Data Flow(s):

tov-safety\_msg\_data\_to\_other\_vehicles

**Vehicle** => **Parking Management**

**Physical Architecture Flow Name:** vehicle payment information

Information provided for payment of tolls and parking fees including identification that can be used to identify the payment account or source and related vehicle and service information that are used to determine the type and price of service requested.

### Logical Architecture Data Flow(s):

parking\_lot\_vehicle\_payment\_data\_collect  
parking\_lot\_payment\_confirmation

**Vehicle** => **Payment Administration**

**Physical Architecture Flow Name:** vehicle payment information

Information provided for payment of tolls and parking fees including identification that can be used to identify the payment account or source and related vehicle and service information that are used to determine the type and price of service requested.

### Logical Architecture Data Flow(s):

vmt\_payment\_collected\_for\_admin  
vmt\_payment\_confirmation\_for\_admin

**Physical Architecture Flow Name:** VMT data

A vehicle's road use history that records where the vehicle has traveled over time. Optionally includes vehicle speeds as well as distance traveled for some applications. Information is accurate enough to distinguish between adjacent roads, adjacent lanes, and identify direction of travel on the roads.

### Logical Architecture Data Flow(s):

vehicle\_identity\_for\_vmt  
vehicle\_speed\_and\_distance\_for\_vmt  
vehicle\_location\_for\_vmt

**Vehicle** => **Roadway**

**Physical Architecture Flow Name:** access request

Request for access to an access-controlled transportation facility.

## Vehicle

### **Logical Architecture Data Flow(s):**

vehicle\_barrier\_access\_request

**Physical Architecture Flow Name:** automated vehicle status

Data provided by an automated vehicle identifying its current mode and operational status, current position and motion, preferred route, and information provided to support checking/checkout and coordinated maneuvers while on the automated facility.

### **Logical Architecture Data Flow(s):**

avo\_route\_data  
avo\_vehicle\_condition

**Physical Architecture Flow Name:** environmental probe data

Data from vehicle safety and convenience systems that can be used to estimate environmental conditions, including measured air temperature, exterior light status, wiper status, sun sensor status, rain sensor status, traction control status, anti-lock brake status, and other collected vehicle system status and sensor information. The collected data is reported along with the location, heading, and time that the data was collected. Both current data and snapshots of recent events (e.g., traction control or anti-lock brake system activations) may be reported.

### **Logical Architecture Data Flow(s):**

vehicle\_env\_probe\_data

**Physical Architecture Flow Name:** probe archive data

Probe data that allows calculation of travel times, volumes, and other measures that support transportation planning. Optionally, this flow also includes origin and destination information for vehicles that opt to provide this information.

### **Logical Architecture Data Flow(s):**

vehicle\_guidance\_probe\_data\_for\_archive  
vehicle\_traffic\_probe\_data\_for\_archive

**Physical Architecture Flow Name:** traffic probe data

Vehicle data that is used to determine traffic conditions. In a basic implementation, the data could be limited to time stamped unique identifiers that can be used to measure a vehicle's progress through the network. In more advanced implementations, the vehicle may report current position, speed, and heading and snapshots of recent events including route information, starts and stops, speed changes, and other information that can be used to estimate traffic conditions.

### **Logical Architecture Data Flow(s):**

vehicle\_traffic\_probe\_data  
vehicle\_guidance\_probe\_data

**Physical Architecture Flow Name:** vehicle diagnostics data

Information about the vehicle and its current operational status that supports vehicle performance monitoring, service, and repair. The flow identifies the vehicle and vehicle type and provides information about the vehicle's current operational status, the current performance of engine-related components, and notification of any identified malfunctions.

### **Logical Architecture Data Flow(s):**

vehicle\_status\_details\_for\_emissions

**Physical Architecture Flow Name:** vehicle intersection safety data

Vehicle path and acceleration data provided by vehicles approaching or occupying an intersection. It identifies the intersection, vehicle position and motion, the anticipated lane and movement that will be used in the intersection, and notification of potential violations or other detected safety hazards.

### **Logical Architecture Data Flow(s):**

vehicle\_status\_for\_intersection

**Physical Architecture Flow Name:** vehicle occupancy

The number of occupants detected by the vehicle.

## Vehicle

### Logical Architecture Data Flow(s):

vehicle\_occupants\_detected

### Physical Architecture Flow Name: vehicle profile

Information about a vehicle including vehicle type and equipment capabilities.

### Logical Architecture Data Flow(s):

vehicle\_characteristics\_for\_roadway

### Physical Architecture Flow Name: vehicle safety data

Vehicle safety data indicating vehicle location, vehicle motion (speed, heading, acceleration), vehicle control (brakes, steering, throttle, exterior lights), basic vehicle characteristics (length, width). May also include additional vehicle status (e.g., anti-lock brake activation, stability control system activation).

### Logical Architecture Data Flow(s):

vehicle\_roadside\_safety\_data

## Vehicle

=> **Roadway Payment**

### Physical Architecture Flow Name: vehicle payment information

Information provided for payment of tolls and parking fees including identification that can be used to identify the payment account or source and related vehicle and service information that are used to determine the type and price of service requested.

### Logical Architecture Data Flow(s):

toll\_payment\_confirmation  
toll\_vehicle\_payment\_data\_collect  
vmt\_payment\_confirmation  
vmt\_payment\_collected

### Physical Architecture Flow Name: VMT data

A vehicle's road use history that records where the vehicle has traveled over time. Optionally includes vehicle speeds as well as distance traveled for some applications. Information is accurate enough to distinguish between adjacent roads, adjacent lanes, and identify direction of travel on the roads.

### Logical Architecture Data Flow(s):

vehicle\_location\_for\_vmt\_roadway  
vehicle\_speed\_and\_distance\_for\_vmt\_roadway  
vehicle\_identity\_for\_vmt\_roadway

### Physical Architecture Flow Name: VMT equipment status

Provides an indication of the operational status of the VMT data collection equipment in a vehicle. Also indicates vehicle ID (VIN) so that the registration of the equipment to a specific vehicle can be verified and confirmed by comparison with vehicle characteristics.

### Logical Architecture Data Flow(s):

vmt\_equipment\_status

## Vehicle

=> **Traveler Card**

### Physical Architecture Flow Name: request for payment

Request to deduct cost of service from user's payment account.

### Logical Architecture Data Flow(s):

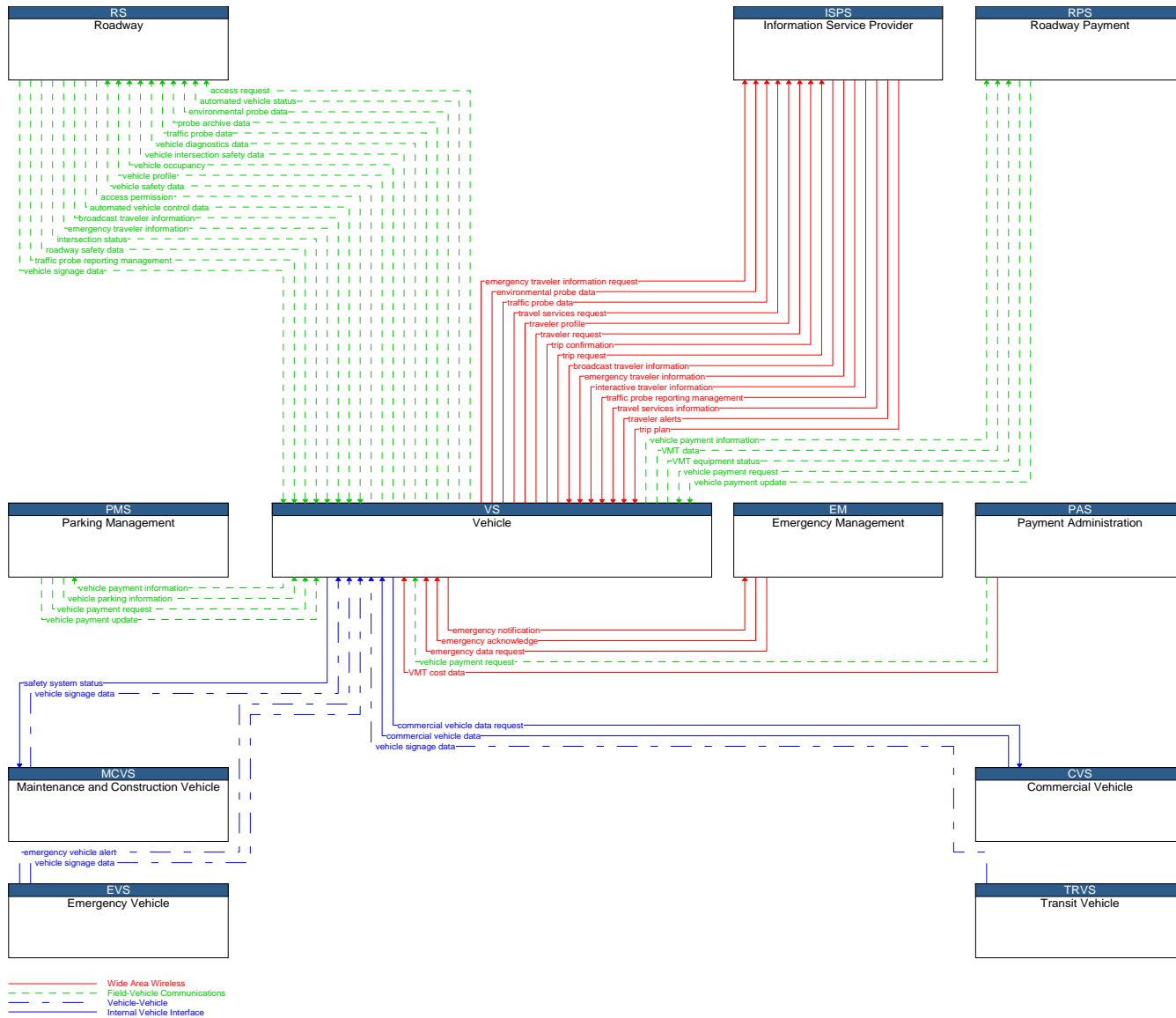
ttc-request\_vmt\_payment  
ttc-debited\_vmt\_payment  
ttc-debited\_driver\_payment\_at\_vehicle  
ttc-debited\_payment\_at\_toll\_plaza  
ttc-request\_payment\_at\_parking\_lot

Vehicle

ttc-request\_payment\_at\_toll\_plaza  
ttc-debited\_payment\_at\_parking\_lot

### *2.24.3 Architecture Flow Diagrams for VS*

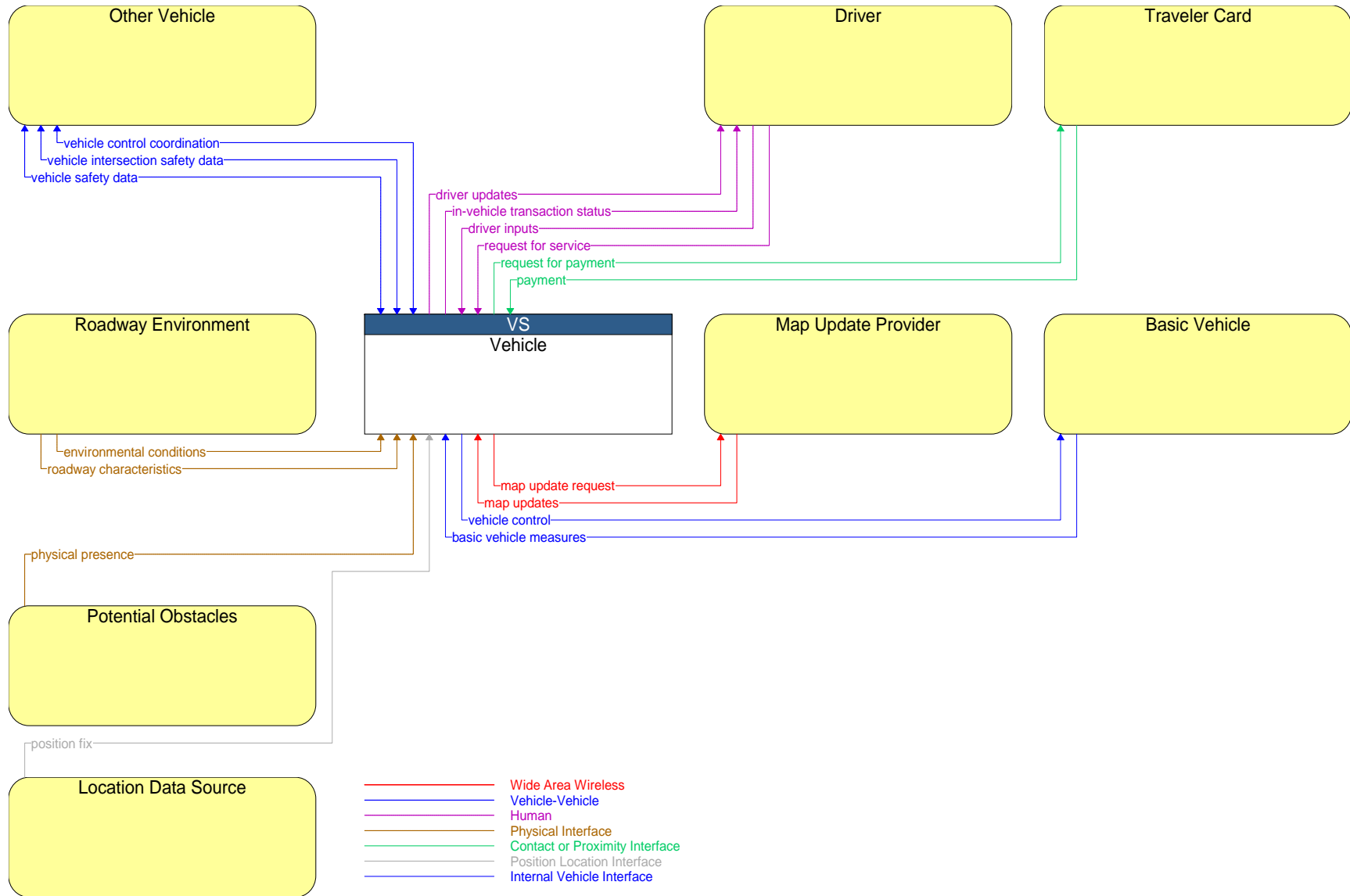
# Vehicle





**Figure 44: VS Subsystem Interfaces**

# Vehicle



**Figure 45: VS Terminator Interfaces**

### 3 PHYSICAL ARCHITECTURE FLOW SUPPORTING DATA

**Table 8: Physical Architecture Flows – Interconnects – Interoperability Requirements**

Source	Destination	Architecture Flow	Interconnects	Communication Service	Interoperability
Alerting and Advisory Systems	Commercial Vehicle Administration	alerts and advisories	W	Messaging data	national
Alerting and Advisory Systems	Commercial Vehicle Check	alerts and advisories	W	Messaging data	national
Alerting and Advisory Systems	Emergency Management	alerts and advisories	W	Messaging data	national
Alerting and Advisory Systems	Emergency Management	threat support data	W	Messaging data	national
Alerting and Advisory Systems	Maintenance and Construction Management	alerts and advisories	W	Messaging data	national
Alerting and Advisory Systems	Traffic Management	alerts and advisories	W	Messaging data	national
Alerting and Advisory Systems	Transit Management	alerts and advisories	W	Messaging data	national
Archived Data Administrator	Archived Data Management	archive management requests	H	Human Interface	product
Archived Data Management	Archived Data Administrator	archive management data	H	Human Interface	product
Archived Data Management	Archived Data User Systems	archive analysis results	W	Messaging data	national
Archived Data Management	Archived Data User Systems	archive request confirmation	W	Messaging data	national
Archived Data Management	Archived Data User Systems	archived data products	W	Messaging data	national
Archived Data Management	Asset Management	archive requests	W	Messaging data	regional
Archived Data Management	Asset Management	archive status	W	Messaging data	regional
Archived Data Management	Border Inspection Administration	archive requests	W	Messaging data	national
Archived Data Management	Border Inspection Administration	archive status	W	Messaging data	national
Archived Data Management	Commercial Vehicle Administration	archive requests	W	Messaging data	regional
Archived Data Management	Commercial Vehicle Administration	archive status	W	Messaging data	regional
Archived Data Management	Emergency Management	archive requests	W	Messaging data	regional

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Source	Destination	Architecture Flow	Interconnects	Communication Service	Interoperability
Archived Data Management	Emergency Management	archive status	W	Messaging data	regional
Archived Data Management	Emissions Management	archive requests	W	Messaging data	regional
Archived Data Management	Emissions Management	archive status	W	Messaging data	regional
Archived Data Management	Financial Institution	payment request	W	Conversational data, Messaging data	national
Archived Data Management	Government Reporting Systems	government reporting system data	W	Messaging data	national
Archived Data Management	Intermodal Freight Depot	archive requests	W	Messaging data	regional
Archived Data Management	Intermodal Freight Depot	archive status	W	Messaging data	regional
Archived Data Management	Maintenance and Construction Management	archive requests	W	Messaging data	regional
Archived Data Management	Maintenance and Construction Management	archive status	W	Messaging data	regional
Archived Data Management	Map Update Provider	map update request	W	Messaging data	national
Archived Data Management	Multimodal Transportation Service Provider	archive requests	W	Messaging data	regional
Archived Data Management	Multimodal Transportation Service Provider	archive status	W	Messaging data	regional
Archived Data Management	Other Archives	archive coordination	W	Messaging data	national
Archived Data Management	Other Data Sources	archive requests	W	Messaging data	national
Archived Data Management	Other Data Sources	archive status	W	Messaging data	national
Archived Data Management	Parking Management	archive requests	W	Messaging data	regional
Archived Data Management	Parking Management	archive status	W	Messaging data	regional
Archived Data Management	Roadway	data collection and monitoring control	W	Messaging data	product
Archived Data Management	Surface Transportation Weather Service	archive requests	W	Messaging data	regional
Archived Data Management	Surface Transportation Weather Service	archive status	W	Messaging data	regional
Archived Data Management	Traffic Management	archive requests	W	Messaging data	regional
Archived Data Management	Traffic Management	archive status	W	Messaging data	regional
Archived Data Management	Traffic Management	archived data products	W	Messaging data	regional
Archived Data Management	Transit Management	archive requests	W	Messaging data	regional
Archived Data Management	Transit Management	archive status	W	Messaging data	regional
Archived Data Management	Transit Management	archived data products	W	Messaging data	regional
Archived Data Management	Weather Service	archive requests	W	Messaging data	regional

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Source	Destination	Architecture Flow	Interconnects	Communication Service	Interoperability
Archived Data Management	Weather Service	archive status	W	Messaging data	regional
Archived Data User Systems	Archived Data Management	archive analysis requests	W	Messaging data	national
Archived Data User Systems	Archived Data Management	archived data product requests	W	Messaging data	national
Asset Management	Archived Data Management	asset archive data	W	Messaging data	regional
Asset Management	Maintenance and Construction Management	asset damage assessment	W	Messaging data	regional
Asset Management	Maintenance and Construction Management	asset inventory	W	Messaging data	regional
Asset Management	Maintenance and Construction Management	asset restrictions	W	Messaging data	regional
Asset Management	Maintenance and Construction Management	maintenance and repair needs	W	Conversational data, Messaging data	regional
Basic Commercial Vehicle	Commercial Vehicle	commercial vehicle measures	V	Messaging data	product
Basic Commercial Vehicle	Commercial Vehicle Check	CVO weight and presence	P	Physical Interface	NA
Basic Commercial Vehicle	Commercial Vehicle Check	identification information	P	Physical Interface	NA
Basic Maintenance and Construction Vehicle	Maintenance and Construction Vehicle	maint and constr material information	V	Messaging data	regional
Basic Maintenance and Construction Vehicle	Maintenance and Construction Vehicle	maint and constr vehicle measures	V	Messaging data	regional
Basic Transit Vehicle	Transit Vehicle	transit vehicle measures	V	Messaging data	product
Basic Vehicle	Vehicle	basic vehicle measures	V	Messaging data	product
Border Inspection Administration	Archived Data Management	border information archive data	W	Messaging data	national
Border Inspection Administration	Commercial Vehicle Administration	client verification request	W	Messaging data	national
Border Inspection Administration	Commercial Vehicle Administration	pre-arrival notification	W	Messaging data	national
Border Inspection Systems	Commercial Vehicle	border pass/pull-in	W	Messaging data	national
Border Inspection Systems	Commercial Vehicle	clearance notification	W	Messaging data	national
Border Inspection Systems	Commercial Vehicle Administration	arrival notification	W	Messaging data	national
Border Inspection Systems	Commercial Vehicle Check	inspection results	W	Messaging data	national
Border Inspection Systems	Emergency Management	border incident information	W	Messaging data	national
Border Inspection Systems	Traffic Management	border incident information	W	Messaging data	national

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Source	Destination	Architecture Flow	Interconnects	Communication Service	Interoperability
Border Inspection Systems	Traffic Management	lane management inputs	W	Messaging data	national
Border Inspection Systems	Traffic Management	remote surveillance control	W	Messaging data	national
Care Facility	Emergency Management	care facility status	W	Conversational data, Messaging data	regional
Care Facility	Emergency Vehicle	care facility status	U1t	Conversational data, Messaging data	regional
Commercial Vehicle	Basic Commercial Vehicle	safe vehicle disable	V	Conversational data	product
Commercial Vehicle	Border Inspection Systems	tag data	U2	Messaging data	national
Commercial Vehicle	Commercial Vehicle Check	border clearance data	U2	Conversational data	national
Commercial Vehicle	Commercial Vehicle Check	commercial vehicle breach	U2	Conversational data, Messaging data	national
Commercial Vehicle	Commercial Vehicle Check	commercial vehicle disable status	U2	Conversational data, Messaging data	national
Commercial Vehicle	Commercial Vehicle Check	driver log	U2	Conversational data	national
Commercial Vehicle	Commercial Vehicle Check	electronic lock data	U2	Conversational Data	national
Commercial Vehicle	Commercial Vehicle Check	expected driver identity characteristics	U2	Conversational data, Messaging data	national
Commercial Vehicle	Commercial Vehicle Check	freight equipment information	U2	Conversational data, Messaging data	national
Commercial Vehicle	Commercial Vehicle Check	on-board safety data	U2	Conversational data	national
Commercial Vehicle	Commercial Vehicle Check	safety inspection record	U2	Conversational Data	national
Commercial Vehicle	Commercial Vehicle Check	screening event record	U2	Conversational data	national
Commercial Vehicle	Commercial Vehicle Check	tag data	U2	Conversational data	national
Commercial Vehicle	Commercial Vehicle Driver	alerts	H	Human Interface	product
Commercial Vehicle	Commercial Vehicle Driver	CVO pass/pull-in message	H	Human Interface	product
Commercial Vehicle	Commercial Vehicle Driver	trip log information	H	Human Interface	product
Commercial Vehicle	Emergency Management	hazmat spill notification	U1t	Messaging data	national
Commercial Vehicle	Vehicle	commercial vehicle data	V	Messaging data	product
Commercial Vehicle Administration	Archived Data Management	commercial vehicle archive data	W	Messaging data	regional
Commercial Vehicle Administration	Border Inspection Administration	client verification information	W	Messaging data	national
Commercial Vehicle Administration	Border Inspection Administration	screening results	W	Messaging data	national
Commercial Vehicle Administration	Commercial Vehicle Check	accident report	W,U1t	Messaging data	regional

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Source	Destination	Architecture Flow	Interconnects	Communication Service	Interoperability
Commercial Vehicle Administration	Commercial Vehicle Check	border agency clearance results	W,U1t	Conversational data, Messaging data	regional
Commercial Vehicle Administration	Commercial Vehicle Check	citation	W,U1t	Messaging data	regional
Commercial Vehicle Administration	Commercial Vehicle Check	credentials information	W,U1t	Conversational data, Messaging data	regional
Commercial Vehicle Administration	Commercial Vehicle Check	credentials status information	W,U1t	Conversational data, Messaging data	regional
Commercial Vehicle Administration	Commercial Vehicle Check	cv driver record	W,U1t	Conversational data, Messaging data	national
Commercial Vehicle Administration	Commercial Vehicle Check	safety inspection report	W,U1t	Conversational data, Messaging data	regional
Commercial Vehicle Administration	Commercial Vehicle Check	safety status information	W,U1t	Messaging data	regional
Commercial Vehicle Administration	Commercial Vehicle Check	transportation border clearance assessment	W,U1t	Conversational data, Messaging data	regional
Commercial Vehicle Administration	Commercial Vehicle Check	trip declaration identifiers	W,U1t	Messaging data	regional
Commercial Vehicle Administration	CVO Information Requestor	credentials information	W,U1t	Messaging data	national
Commercial Vehicle Administration	CVO Information Requestor	credentials status information	W,U1t	Messaging data	national
Commercial Vehicle Administration	CVO Information Requestor	cv driver record	W,U1t	Conversational data, Messaging data	national
Commercial Vehicle Administration	CVO Information Requestor	safety status information	W,U1t	Messaging data	national
Commercial Vehicle Administration	Enforcement Agency	accident report	W	Messaging data	national
Commercial Vehicle Administration	Enforcement Agency	citation	W	Conversational data, Messaging data	regional
Commercial Vehicle Administration	Enforcement Agency	violation notification	W	Messaging data	regional
Commercial Vehicle Administration	Financial Institution	payment request	W	Conversational data, Messaging data	national
Commercial Vehicle Administration	Intermodal Freight Shipper	border clearance status	W	Conversational data, Messaging data	national

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Source	Destination	Architecture Flow	Interconnects	Communication Service	Interoperability
Commercial Vehicle Administration	Map Update Provider	route restrictions	W	Messaging data	national
Commercial Vehicle Administration	Other CVAS	accident report	W	Conversational Data, Messaging data	national
Commercial Vehicle Administration	Other CVAS	border clearance status	W	Conversational data, Messaging data	national
Commercial Vehicle Administration	Other CVAS	citation	W	Conversational Data, Messaging data	national
Commercial Vehicle Administration	Other CVAS	credential fee coordination	W	Messaging data	national
Commercial Vehicle Administration	Other CVAS	credentials information	W	Messaging data	national
Commercial Vehicle Administration	Other CVAS	credentials status information	W	Messaging data	national
Commercial Vehicle Administration	Other CVAS	cv driver record	W	Conversational data, Messaging data	national
Commercial Vehicle Administration	Other CVAS	route restrictions	W	Messaging data	national
Commercial Vehicle Administration	Other CVAS	safety inspection report	W	Messaging data	national
Commercial Vehicle Administration	Other CVAS	safety status information	W	Messaging data	national
Commercial Vehicle Check	Commercial Vehicle	border clearance data request	U2	Conversational data	national
Commercial Vehicle Check	Commercial Vehicle	border clearance event	U2	Conversational Data	national
Commercial Vehicle Check	Commercial Vehicle	electronic lock data request	U2	Conversational Data	national
Commercial Vehicle Check	Commercial Vehicle	electronic screening request	U2	Conversational data	national
Commercial Vehicle Check	Commercial Vehicle	pass/pull-in	U2	Conversational data	national
Commercial Vehicle Check	Commercial Vehicle	request tag data	U2	Conversational data	national
Commercial Vehicle Check	Commercial Vehicle	safety inspection record	U2	Conversational Data	national
Commercial Vehicle Check	Commercial Vehicle	safety inspection request	U2	Conversational Data	regional
Commercial Vehicle Check	Commercial Vehicle	screening event record	U2	Conversational data	national
Commercial Vehicle Check	Commercial Vehicle Administration	accident report	W,U1t	Messaging data	regional



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Source	Destination	Architecture Flow	Interconnects	Communication Service	Interoperability
Commercial Vehicle Check	Commercial Vehicle Administration	border clearance event	W,U1t	Conversational data, Messaging data	regional
Commercial Vehicle Check	Commercial Vehicle Administration	citation	W,U1t	Conversational data, Messaging data	regional
Commercial Vehicle Check	Commercial Vehicle Administration	daily site activity data	W,U1t	Messaging data	regional
Commercial Vehicle Check	Commercial Vehicle Administration	safety inspection report	W,U1t	Messaging data	regional
Commercial Vehicle Check	Commercial Vehicle Administration	violation notification	W,U1t	Messaging data	regional
Commercial Vehicle Check	Commercial Vehicle Driver	CVO pass/pull-in message	H	Human Interface	regional
Commercial Vehicle Check	CVO Inspector	CVO inspector information	H	Human Interface	product
Commercial Vehicle Check	Emergency Management	alarm	W	Conversational data, Messaging data	national
Commercial Vehicle Driver	Commercial Vehicle	alert response	H	Human Interface	product
Commercial Vehicle Driver	Commercial Vehicle	CVO driver initialization	H	Human Interface	product
Commercial Vehicle Driver	Commercial Vehicle	driver identity characteristics	H	Human Interface	product
Commercial Vehicle Driver	Commercial Vehicle	trip identification number input	H	Human Interface	product
CVO Inspector	Commercial Vehicle Check	CVC override mode	H	Human Interface	product
CVO Inspector	Commercial Vehicle Check	CVO inspector input	H	Human Interface	product
DMV	Emissions Management	registration	W	Messaging data	national
DMV	Parking Management	registration	W	Messaging data	national
DMV	Traffic Management	registration	W	Messaging data	national
Driver	Vehicle	driver inputs	H	Human Interface	product
Driver	Vehicle	request for service	H	Human Interface	product
Driver Identification Card	Commercial Vehicle	cv driver credential	S	Conversational data	national
Driver Identification Card	Commercial Vehicle Check	cv driver credential	S	Conversational data	national
Emergency Management	Alerting and Advisory Systems	threat data for analysis	W	Messaging data	national
Emergency Management	Alerting and Advisory Systems	threat information	W	Messaging data	vational
Emergency Management	Archived Data Management	emergency archive data	W	Messaging data	regional
Emergency Management	Border Inspection Systems	border incident response status	W	Messaging data	national

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Source	Destination	Architecture Flow	Interconnects	Communication Service	Interoperability
Emergency Management	Care Facility	care facility status request	W	Conversational data, Messaging data	regional
Emergency Management	Emergency Personnel	incident command information presentation	H	Human Interface	product
Emergency Management	Emergency System Operator	emergency operations status	H	Human Interface	product
Emergency Management	Emergency Telecommunications System	incident information for public	W	Conversational Data, Messaging data	national
Emergency Management	Emergency Telecommunications System	incident notification response	W	Conversational data conversational speech	regional
Emergency Management	Emergency Vehicle	decision support information	U1t	Conversational speech, Messaging data	regional
Emergency Management	Emergency Vehicle	emergency dispatch requests	U1t	Conversational speech, Messaging data	regional
Emergency Management	Emergency Vehicle	suggested route	U1t	Conversational speech, Messaging data	regional
Emergency Management	Event Promoters	event confirmation	W	Messaging data	regional
Emergency Management	Maintenance and Construction Management	alert notification	W	Messaging data	regional
Emergency Management	Maintenance and Construction Management	emergency plan coordination	W	Messaging data	regional
Emergency Management	Maintenance and Construction Management	evacuation information	W	Messaging data	regional
Emergency Management	Maintenance and Construction Management	incident information	W	Conversational data, Messaging data	regional
Emergency Management	Maintenance and Construction Management	incident response status	W	Conversational data, Messaging data	regional
Emergency Management	Maintenance and Construction Management	maint and constr resource request	W	Conversational data, Messaging data	regional
Emergency Management	Maintenance and Construction Management	security field equipment status	W	Conversational data, Messaging data	regional
Emergency Management	Maintenance and Construction Management	threat information	W	Messaging data	regional
Emergency Management	Maintenance and Construction Management	transportation system status	W	Messaging data	regional

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Source	Destination	Architecture Flow	Interconnects	Communication Service	Interoperability
Emergency Management	Maintenance and Construction Management	work plan feedback	W	Conversational data, Messaging data	regional
Emergency Management	Map Update Provider	map update request	W	Messaging data	national
Emergency Management	Media	incident information for media	W	Messaging data	product
Emergency Management	Other Emergency Management	alert notification coordination	W	Conversational data, Messaging data	national
Emergency Management	Other Emergency Management	emergency plan coordination	W	Messaging data	regional
Emergency Management	Other Emergency Management	evacuation coordination	W	Messaging data	regional
Emergency Management	Other Emergency Management	incident command information coordination	W	Conversational data, Messaging data	regional
Emergency Management	Other Emergency Management	incident report	W	Conversational data, Messaging data	regional
Emergency Management	Other Emergency Management	incident response coordination	W	Conversational data, Messaging data	regional
Emergency Management	Other Emergency Management	resource coordination	W	Messaging data	regional
Emergency Management	Other Emergency Management	threat information coordination	W	Conversational data, Messaging data	regional
Emergency Management	Other Emergency Management	transportation system status	W	Messaging data	national
Emergency Management	Personal Information Access	emergency acknowledge	W,U1t	Conversational data, Messaging data	national
Emergency Management	Public Health System	public health request	W	Conversational Data, Messaging data	national
Emergency Management	Rail Operations	emergency plan coordination	W	Conversational data, Messaging data	national
Emergency Management	Rail Operations	evacuation information	W	Messaging data	regional
Emergency Management	Rail Operations	incident information	W	Messaging data	regional
Emergency Management	Rail Operations	incident response status	W	Conversational data, Messaging data	national
Emergency Management	Rail Operations	threat information	W	Conversational data, Messaging data	national

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Source	Destination	Architecture Flow	Interconnects	Communication Service	Interoperability
Emergency Management	Rail Operations	transportation system status	W	Messaging data	regional
Emergency Management	Security Monitoring	infrastructure monitoring sensor control	W	Messaging data	product
Emergency Management	Security Monitoring	secure area sensor control	W	Messaging data	product
Emergency Management	Security Monitoring	secure area surveillance control	W	Messaging data	product
Emergency Management	Shelter Providers	evacuation information	W	Messaging data	regional
Emergency Management	Surface Transportation Weather Service	transportation weather information request	W	Conversational data, Messaging data	regional
Emergency Management	Traffic Management	alert notification	W	Messaging data	regional
Emergency Management	Traffic Management	emergency plan coordination	W	Messaging data	regional
Emergency Management	Traffic Management	emergency route request	W	Messaging data	regional
Emergency Management	Traffic Management	emergency traffic control request	W	Conversational data, conversational speech	regional
Emergency Management	Traffic Management	evacuation information	W	Messaging data	regional
Emergency Management	Traffic Management	incident information	W	Conversational data, Messaging data	regional
Emergency Management	Traffic Management	incident response status	W	Conversational data, Messaging data	regional
Emergency Management	Traffic Management	remote surveillance control	W	Conversational data, Messaging data	regional
Emergency Management	Traffic Management	resource deployment status	W	Conversational data, Messaging data	regional
Emergency Management	Traffic Management	resource request	W	Conversational data, Messaging data	regional
Emergency Management	Traffic Management	threat information	W	Messaging data	regional
Emergency Management	Traffic Management	transportation system status	W	Messaging data	regional
Emergency Management	Transit Management	alert notification	W	Messaging data	regional
Emergency Management	Transit Management	emergency plan coordination	W	Messaging data	regional
Emergency Management	Transit Management	emergency transit service request	W	Messaging data	regional
Emergency Management	Transit Management	evacuation information	W	Messaging data	regional

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Source	Destination	Architecture Flow	Interconnects	Communication Service	Interoperability
Emergency Management	Transit Management	incident information	W	Messaging data	regional
Emergency Management	Transit Management	incident response status	W	Conversational data, Messaging data	regional
Emergency Management	Transit Management	threat information	W	Messaging data	national
Emergency Management	Transit Management	transportation system status	W	Messaging data	regional
Emergency Management	Transit Vehicle	alarm acknowledge	U1t	Conversational speech, Messaging data	product
Emergency Management	Transit Vehicle	secure area sensor control	U1t	Messaging data	product
Emergency Management	Transit Vehicle	secure area surveillance control	U1t	Messaging Data	product
Emergency Management	Vehicle	emergency acknowledge	U1t	Conversational data conversational speech	national
Emergency Management	Vehicle	emergency data request	U1t	Conversational data conversational speech	national
Emergency Personnel	Emergency Management	incident command inputs	H	Human Interface	product
Emergency Personnel	Emergency Vehicle	emergency personnel inputs	H	Human Interface	product
Emergency System Operator	Emergency Management	emergency operations inputs	H	Human Interface	product
Emergency Telecommunications System	Emergency Management	incident notification	W	Conversational data, Conversational speech, Location data	regional
Emergency Vehicle	Care Facility	care facility status request	U1t	Conversational data, Messaging data	regional
Emergency Vehicle	Care Facility	patient status	U1t	Messaging data	regional
Emergency Vehicle	Emergency Management	emergency dispatch response	U1t	Conversational speech, Messaging data	regional
Emergency Vehicle	Emergency Management	emergency vehicle tracking data	U1t	Conversational speech, Messaging data	regional
Emergency Vehicle	Emergency Management	incident status	U1t	Conversational speech, Messaging data	regional
Emergency Vehicle	Emergency Personnel	emergency personnel information presentation	H	Human Interface	product
Emergency Vehicle	Roadway	barrier system control	U2	Conversational data, Messaging data	regional

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Source	Destination	Architecture Flow	Interconnects	Communication Service	Interoperability
Emergency Vehicle	Roadway	local signal preemption request	U2	Conversational data	regional
Emergency Vehicle	Vehicle	emergency vehicle alert	U3	Conversational data, Messaging data	national
Emergency Vehicle	Vehicle	vehicle signage data	U3	Messaging data	national
Emissions Management	Archived Data Management	emissions archive data	W	Messaging data	regional
Emissions Management	DMV	license request	W	Messaging data	national
Emissions Management	Emissions Management Operator	pollution data display	H	Human Interface	product
Emissions Management	Enforcement Agency	emissions violation notification	W	Messaging data	regional
Emissions Management	Map Update Provider	map update request	W	Messaging data	national
Emissions Management	Media	air quality information	W	Messaging data	product
Emissions Management	Roadway	emissions sensor control	W	Messaging data	product
Emissions Management	Roadway	pollution sensor control	W	Messaging data	product
Emissions Management	Traffic Management	widearea statistical pollution information	W	Messaging data	regional
Emissions Management Operator	Emissions Management	pollution data parameters	H	Human Interface	product
Enforcement Agency	Commercial Vehicle Administration	information on violators	W	Messaging data	regional
Enforcement Agency	Commercial Vehicle Check	information on violators	W	Messaging data	regional
Enforcement Agency	Roadway	speed monitoring control	W	Conversational data, Messaging data	product
Environment	Roadway	pollutant levels	P	Physical Interface	NA
Equipment Repair Facility	Maintenance and Construction Management	maint and constr equipment repair status	W	Messaging data	regional
Event Promoters	Emergency Management	event plans	W	Messaging data, Multicast data	regional
Event Promoters	Traffic Management	event plans	W	Messaging data, Multicast data	regional
Event Promoters	Transit Management	event plans	W	Messaging data, Multicast data	regional
Financial Institution	Archived Data Management	transaction status	W	Conversational data, Messaging data	national

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Source	Destination	Architecture Flow	Interconnects	Communication Service	Interoperability
Financial Institution	Commercial Vehicle Administration	transaction status	W	Conversational data, Messaging data	national
Financial Institution	Parking Management	transaction status	W	Conversational data, Messaging data	national
Financial Institution	Transit Management	transaction status	W	Conversational data, Messaging data	national
Freight Equipment	Commercial Vehicle	freight breach	V	Conversational data, Messaging data	national
Freight Equipment	Commercial Vehicle	freight equipment information	V	Conversational data, Messaging data	national
Freight Equipment	Commercial Vehicle Check	freight breach	U2	Conversational data, Messaging data	national
Freight Equipment	Commercial Vehicle Check	freight equipment information	U2	Conversational data, Messaging data	national
Freight Equipment	Commercial Vehicle Check	hazmat environmental factors	P	Physical Interface	NA
Government Reporting Systems	Archived Data Management	government reporting data receipt	W	Messaging data	national
Intermodal Freight Depot	Archived Data Management	intermodal freight archive data	W	Messaging data	regional
Intermodal Freight Depot	Traffic Management	intermodal freight event information	W	Messaging data	regional
Intermodal Freight Shipper	Commercial Vehicle	trip identification number	U1t,U2N	Conversational data, Messaging data	national
Location Data Source	Commercial Vehicle	position fix	L	Broadcast Data	product
Location Data Source	Emergency Vehicle	position fix	L	Broadcast Data	product
Location Data Source	Maintenance and Construction Vehicle	position fix	L	Broadcast Data	product
Location Data Source	Personal Information Access	position fix	L	Broadcast Data	product
Location Data Source	Transit Vehicle	position fix	L	Broadcast Data	product
Location Data Source	Vehicle	position fix	L	Broadcast Data	product
Maintenance and Construction Administrative Systems	Maintenance and Construction Management	maint and constr administrative information	W	Conversational data, Messaging data	regional

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Source	Destination	Architecture Flow	Interconnects	Communication Service	Interoperability
Maintenance and Construction Center Personnel	Maintenance and Construction Management	maint and constr center personnel inputs	H	Human Interface	product
Maintenance and Construction Field Personnel	Maintenance and Construction Vehicle	crew movements	P	Physical Interface	NA
Maintenance and Construction Field Personnel	Maintenance and Construction Vehicle	maint and constr field personnel inputs	H	Human Interface	product
Maintenance and Construction Field Personnel	Roadway	crew movements	P	Physical Interface	NA
Maintenance and Construction Field Personnel	Roadway	field device status request	H	Human Interface	product
Maintenance and Construction Management	Archived Data Management	maint and constr archive data	W	Messaging data	regional
Maintenance and Construction Management	Asset Management	asset status update	W	Conversational data, Messaging data	regional
Maintenance and Construction Management	Commercial Vehicle Administration	current asset restrictions	W	Messaging data	regional
Maintenance and Construction Management	Emergency Management	alert status	W	Messaging data	regional
Maintenance and Construction Management	Emergency Management	current asset restrictions	W	Messaging data	regional
Maintenance and Construction Management	Emergency Management	emergency plan coordination	W	Messaging data	regional
Maintenance and Construction Management	Emergency Management	incident information	W	Conversational data, Messaging data	regional
Maintenance and Construction Management	Emergency Management	maint and constr resource response	W	Conversational data, Messaging data	regional
Maintenance and Construction Management	Emergency Management	maint and constr work plans	W	Conversational data, Messaging data	regional
Maintenance and Construction Management	Emergency Management	road network status assessment	W	Messaging data	regional
Maintenance and Construction Management	Emergency Management	road weather information	W	Messaging data	regional
Maintenance and Construction Management	Emergency Management	roadway maintenance status	W	Messaging data	regional



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Source	Destination	Architecture Flow	Interconnects	Communication Service	Interoperability
Maintenance and Construction Management	Emergency Management	security equipment maintenance status	W	Messaging data	regional
Maintenance and Construction Management	Emergency Management	work zone information	W	Messaging data	regional
Maintenance and Construction Management	Enforcement Agency	request for enforcement	W	Conversational data, Messaging data	regional
Maintenance and Construction Management	Equipment Repair Facility	maint and constr fleet information	W	Conversational data, Messaging data	regional
Maintenance and Construction Management	Maintenance and Construction Administrative Systems	maint and constr administrative request	W	Conversational data, Messaging data	regional
Maintenance and Construction Management	Maintenance and Construction Administrative Systems	maint and constr work performance	W	Conversational data, Messaging data	regional
Maintenance and Construction Management	Maintenance and Construction Center Personnel	maint and constr operations information presentation	H	Human Interface	product
Maintenance and Construction Management	Maintenance and Construction Vehicle	environmental sensors control	U1t,U2N	Conversational data, Messaging data	product
Maintenance and Construction Management	Maintenance and Construction Vehicle	maint and constr dispatch information	U1t,U2N	Conversational data, Messaging data	product
Maintenance and Construction Management	Maintenance and Construction Vehicle	maint and constr vehicle system control	U1t,U2N	Conversational data, Messaging data	product
Maintenance and Construction Management	Map Update Provider	map update request	W	Messaging data	national
Maintenance and Construction Management	Media	maint and constr work plans	W	Conversational data, Messaging data	regional
Maintenance and Construction Management	Media	road weather information	W	Messaging data	product
Maintenance and Construction Management	Media	roadway maintenance status	W	Messaging data	regional
Maintenance and Construction Management	Media	work zone information	W	Messaging data	regional
Maintenance and Construction Management	Multimodal Transportation Service Provider	maint and constr work plans	W	Conversational data, Messaging data	regional

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Source	Destination	Architecture Flow	Interconnects	Communication Service	Interoperability
Maintenance and Construction Management	Other MCM	maint and constr resource coordination	W	Conversational data, Messaging data	regional
Maintenance and Construction Management	Other MCM	road weather information	W	Messaging data	regional
Maintenance and Construction Management	Other MCM	roadway maintenance status	W	Messaging data	regional
Maintenance and Construction Management	Other MCM	work plan coordination	W	Conversational data, Messaging data	regional
Maintenance and Construction Management	Other MCM	work zone information	W	Messaging data	regional
Maintenance and Construction Management	Rail Operations	maint and constr work plans	W	Conversational data, Messaging data	regional
Maintenance and Construction Management	Rail Operations	road weather information	W	Messaging data	national
Maintenance and Construction Management	Rail Operations	work plan feedback	W	Conversational data, Messaging data	regional
Maintenance and Construction Management	Roadway	barrier system control	W	Messaging data	regional
Maintenance and Construction Management	Roadway	environmental sensors control	W	Conversational data, Messaging data	product
Maintenance and Construction Management	Roadway	infrastructure monitoring sensor control	W	Messaging data	product
Maintenance and Construction Management	Roadway	roadway information system data	W	Messaging data	product
Maintenance and Construction Management	Roadway	roadway treatment system control	W	Conversational data, Messaging data	product
Maintenance and Construction Management	Roadway	speed monitoring control	W	Conversational data, Messaging data	product
Maintenance and Construction Management	Roadway	video surveillance control	W	Messaging data	product
Maintenance and Construction Management	Roadway	work zone warning device control	W	Conversational data, Messaging data	regional
Maintenance and Construction Management	Storage Facility	storage facility request	W	Conversational data, Messaging data	regional
Maintenance and Construction Management	Surface Transportation Weather Service	environmental conditions data	W	Messaging data	regional

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Source	Destination	Architecture Flow	Interconnects	Communication Service	Interoperability
Maintenance and Construction Management	Surface Transportation Weather Service	road data	W	Messaging data	regional
Maintenance and Construction Management	Surface Transportation Weather Service	road weather information	W	Messaging data	regional
Maintenance and Construction Management	Surface Transportation Weather Service	transportation weather information request	W	Conversational data, Messaging data	regional
Maintenance and Construction Management	Traffic Management	current asset restrictions	W	Messaging data	regional
Maintenance and Construction Management	Traffic Management	equipment maintenance status	W	Messaging data	regional
Maintenance and Construction Management	Traffic Management	incident information	W	Conversational data, Messaging data	regional
Maintenance and Construction Management	Traffic Management	maint and constr resource response	W	Conversational data, Messaging data	regional
Maintenance and Construction Management	Traffic Management	maint and constr work plans	W	Conversational data, Messaging data	regional
Maintenance and Construction Management	Traffic Management	road network status assessment	W	Messaging data	regional
Maintenance and Construction Management	Traffic Management	road weather information	W	Messaging data	regional
Maintenance and Construction Management	Traffic Management	roadway maintenance status	W	Messaging data	regional
Maintenance and Construction Management	Traffic Management	work zone information	W	Messaging data	regional
Maintenance and Construction Management	Transit Management	current asset restrictions	W	Messaging data	regional
Maintenance and Construction Management	Transit Management	maint and constr work plans	W	Conversational data, Messaging data	regional
Maintenance and Construction Management	Transit Management	road weather information	W	Messaging data	regional
Maintenance and Construction Management	Transit Management	roadway maintenance status	W	Messaging data	regional
Maintenance and Construction Management	Transit Management	work zone information	W	Messaging data	regional
Maintenance and Construction Management	Weather Service	environmental conditions data	W	Messaging data	national

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Source	Destination	Architecture Flow	Interconnects	Communication Service	Interoperability
Maintenance and Construction Management	Weather Service	road weather information	W	Messaging data	national
Maintenance and Construction Vehicle	Basic Maintenance and Construction Vehicle	maint and constr vehicle control	V	Conversational data, Messaging data	product
Maintenance and Construction Vehicle	Driver	driver information	H	Human Interface	national
Maintenance and Construction Vehicle	Equipment Repair Facility	maint and constr vehicle conditions	U1t,U2N	Conversational data, Messaging data	product
Maintenance and Construction Vehicle	Maintenance and Construction Field Personnel	maint and constr field personnel information presentation	H	Human Interface	product
Maintenance and Construction Vehicle	Maintenance and Construction Field Personnel	maint and constr vehicle condition presentation	H	Human Interface	product
Maintenance and Construction Vehicle	Maintenance and Construction Field Personnel	work zone warning	H	Human Interface	product
Maintenance and Construction Vehicle	Maintenance and Construction Management	environmental sensor data	U1t,U2N	Messaging data	product
Maintenance and Construction Vehicle	Maintenance and Construction Management	infrastructure conditions data	U1t,U2N	Messaging data	product
Maintenance and Construction Vehicle	Maintenance and Construction Management	maint and constr dispatch status	U1t,U2N	Conversational data, Messaging data	product
Maintenance and Construction Vehicle	Maintenance and Construction Management	maint and constr vehicle conditions	U1t,U2N	Conversational data, Messaging data	product
Maintenance and Construction Vehicle	Maintenance and Construction Management	maint and constr vehicle location data	U1t,U2N	Conversational data, Messaging data	product
Maintenance and Construction Vehicle	Maintenance and Construction Management	maint and constr vehicle operational data	U1t,U2N	Conversational data, Messaging data	product
Maintenance and Construction Vehicle	Maintenance and Construction Management	work zone status	U1t,U2N	Conversational data, Messaging data	product
Maintenance and Construction Vehicle	Maintenance and Construction Management	work zone warning status	U1t,U2N	Conversational data, Messaging data	product
Maintenance and Construction Vehicle	Other MCV	maint and constr vehicle status coordination	U3	Conversational data, Messaging data	regional
Maintenance and Construction Vehicle	Other MCV	work zone warning notification	U3	Conversational data, Messaging data	regional

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Source	Destination	Architecture Flow	Interconnects	Communication Service	Interoperability
Maintenance and Construction Vehicle	Roadway	barrier system control	U2	Conversational data, Messaging data	regional
Maintenance and Construction Vehicle	Roadway	environmental sensor data	U2	Messaging data	regional
Maintenance and Construction Vehicle	Roadway	environmental sensors control	U2	Conversational data, Messaging data	regional
Maintenance and Construction Vehicle	Roadway	infrastructure monitoring sensor control	U2	Messaging data	regional
Maintenance and Construction Vehicle	Roadway	roadway information system data	U2	Messaging data	regional
Maintenance and Construction Vehicle	Vehicle	vehicle signage data	U3	Messaging data	national
Map Update Provider	Archived Data Management	map updates	W	Messaging data, Broadcast data, Multicast	national
Map Update Provider	Emergency Management	map updates	W	Messaging data, Multicast data	national
Map Update Provider	Emissions Management	map updates	W	Messaging data	national
Map Update Provider	Maintenance and Construction Management	map updates	W	Messaging data, Broadcast data, Multicast	national
Map Update Provider	Personal Information Access	map updates	W,U1t	Messaging data, Multicast data	national
Map Update Provider	Traffic Management	map updates	W	Messaging data, Multicast data	national
Map Update Provider	Transit Management	map updates	W	Messaging data, Multicast data	national
Map Update Provider	Vehicle	map updates	U1t	Messaging data, Multicast data	national
Media	Traffic Management	external reports	W	Messaging data, Multicast data	product
Multimodal Crossings	Roadway	multimodal crossing status	W	Conversational data, Messaging data	national
Multimodal Crossings	Traffic Management	multimodal crossing status	W	Conversational data, Messaging data	national
Multimodal Transportation Service Provider	Archived Data Management	multimodal archive data	W	Messaging data	regional

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Source	Destination	Architecture Flow	Interconnects	Communication Service	Interoperability
Multimodal Transportation Service Provider	Transit Management	multimodal service data	W	Messaging data	regional
Other Archives	Archived Data Management	archive coordination	W	Messaging data	national
Other CVAS	Commercial Vehicle Administration	accident report	W	Conversational Data, Messaging data	national
Other CVAS	Commercial Vehicle Administration	border clearance status	W	Conversational data, Messaging data	national
Other CVAS	Commercial Vehicle Administration	citation	W	Conversational Data, Messaging data	national
Other CVAS	Commercial Vehicle Administration	credential fee coordination	W	Messaging data	national
Other CVAS	Commercial Vehicle Administration	credentials information	W	Messaging data	national
Other CVAS	Commercial Vehicle Administration	credentials status information	W	Messaging data	national
Other CVAS	Commercial Vehicle Administration	cv driver record	W	Conversational data, Messaging data	national
Other CVAS	Commercial Vehicle Administration	route restrictions	W	Messaging data	national
Other CVAS	Commercial Vehicle Administration	safety inspection report	W	Messaging data	national
Other CVAS	Commercial Vehicle Administration	safety status information	W	Messaging data	national
Other Data Sources	Archived Data Management	other data source archive data	W	Messaging data	national
Other Emergency Management	Emergency Management	alert notification coordination	W	Conversational data, Messaging data	national
Other Emergency Management	Emergency Management	emergency plan coordination	W	Messaging data	regional
Other Emergency Management	Emergency Management	evacuation coordination	W	Messaging data	regional
Other Emergency Management	Emergency Management	incident command information coordination	W	Conversational data, Messaging data	regional
Other Emergency Management	Emergency Management	incident report	W	Conversational data, Messaging data	regional

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Source	Destination	Architecture Flow	Interconnects	Communication Service	Interoperability
Other Emergency Management	Emergency Management	incident response coordination	W	Conversational data, Messaging data	regional
Other Emergency Management	Emergency Management	resource coordination	W	Messaging data	regional
Other Emergency Management	Emergency Management	threat information coordination	W	Conversational data, Messaging data	regional
Other Emergency Management	Emergency Management	transportation system status	W	Messaging data	national
Other MCM	Maintenance and Construction Management	maint and constr resource coordination	W	Conversational data, Messaging data	regional
Other MCM	Maintenance and Construction Management	road weather information	W	Messaging data	regional
Other MCM	Maintenance and Construction Management	roadway maintenance status	W	Messaging data	regional
Other MCM	Maintenance and Construction Management	work plan coordination	W	Conversational data, Messaging data	regional
Other MCM	Maintenance and Construction Management	work zone information	W	Messaging data	regional
Other MCV	Maintenance and Construction Vehicle	maint and constr vehicle status coordination	U3	Conversational data, Messaging data	regional
Other MCV	Maintenance and Construction Vehicle	work zone warning notification	U3	Conversational data, Messaging data	regional
Other Parking	Parking Management	parking coordination	W	Messaging data	regional
Other Roadway	Roadway	roadway equipment coordination	W	Conversational data, Messaging data	product
Other Transit Management	Transit Management	transit fare coordination	W	Conversational data, Messaging data	regional
Other Transit Management	Transit Management	transit service coordination	W	Messaging data	regional
Other Transit Management	Transit Management	transit traveler information coordination	W	Conversational data, Messaging data	regional
Other Vehicle	Vehicle	vehicle control coordination	U3	Conversational data	national
Other Vehicle	Vehicle	vehicle intersection safety data	U3	Conversational data, Messaging data	national
Other Vehicle	Vehicle	vehicle safety data	U3	Conversational Data, Messaging data	national

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Source	Destination	Architecture Flow	Interconnects	Communication Service	Interoperability
Parking Management	Archived Data Management	parking archive data	W	Messaging data	regional
Parking Management	DMV	license request	W	Messaging data	national
Parking Management	Driver	driver parking information	H	Human Interface	product
Parking Management	Driver	roadside transaction status	H	Human Interface	product
Parking Management	Enforcement Agency	payment violation notification	W	Messaging data	regional
Parking Management	Financial Institution	payment request	W	Conversational data, Messaging data	national
Parking Management	Other Parking	parking coordination	W	Messaging data	regional
Parking Management	Parking Operator	parking status	H	Human Interface	product
Parking Management	Traffic Management	parking demand management response	W	Messaging data	regional
Parking Management	Traffic Management	parking information	W	Messaging data	regional
Parking Management	Transit Management	parking information	W	Messaging data	regional
Parking Management	Traveler Card	request for payment	S	Conversational data	national
Parking Management	Vehicle	vehicle parking information	U2	Messaging data	national
Parking Management	Vehicle	vehicle payment request	U2	Conversational data	national
Parking Management	Vehicle	vehicle payment update	U2	Conversational data	national
Parking Operator	Parking Management	parking operator inputs	H	Human Interface	product
Parking Operator	Parking Management	request for performance data	H	Human Interface	product
Pedestrians	Roadway	crossing call	H	Human Interface	national
Personal Information Access	Emergency Management	emergency notification	W,U1t	Conversational data, Messaging data	national
Personal Information Access	Map Update Provider	map update request	W,U1t	Messaging data	national
Personal Information Access	Transit Management	transit information user request	W,U1t	Messaging data	national
Personal Information Access	Traveler	traveler interface updates	H	Human Interface	product
Personal Information Access	Traveler Card	request for payment	S	Conversational Data	national
Personal Information Access	Traveler Card	traveler card update	S	Conversational data	national
Potential Obstacles	Vehicle	physical presence	P	Physical Interface	NA
Public Health System	Emergency Management	public health response	W	Conversational Data, Messaging data	national
Rail Operations	Emergency Management	emergency plan coordination	W	Conversational data, Messaging data	national



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Source	Destination	Architecture Flow	Interconnects	Communication Service	Interoperability
Rail Operations	Emergency Management	incident information	W	Messaging data	national
Rail Operations	Emergency Management	rail incident response status	W	Conversational data, Messaging data	national
Rail Operations	Emergency Management	rail system status assessment	W	Messaging data	national
Rail Operations	Maintenance and Construction Management	railroad schedules	W	Conversational data, Messaging data	national
Rail Operations	Maintenance and Construction Management	work plan feedback	W	Conversational data, Messaging data	national
Rail Operations	Traffic Management	railroad advisories	W	Conversational data, Messaging data	national
Rail Operations	Traffic Management	railroad schedules	W	Conversational data, Messaging data	national
Roadway	Archived Data Management	probe archive data	W	Conversational data, Messaging Data	regional
Roadway	Archived Data Management	roadside archive data	W	Messaging data	product
Roadway	Basic Vehicle	broadcast advisories	U1b	Conversational speech	national
Roadway	Driver	driver information	H	Human Interface	national
Roadway	Emergency Vehicle	barrier system status	U2	Conversational data, Messaging data	regional
Roadway	Emissions Management	area pollution data	W	Messaging data	product
Roadway	Emissions Management	vehicle emissions data	W	Messaging data	product
Roadway	Enforcement Agency	speed monitoring information	W	Conversational data, Messaging data	regional
Roadway	Enforcement Agency	traffic violation notification	W	Messaging data	regional
Roadway	Maintenance and Construction Field Personnel	field device status presentation	H	Human Interface	product
Roadway	Maintenance and Construction Field Personnel	work zone warning	H	Human Interface, Conversational data	product
Roadway	Maintenance and Construction Management	barrier system status	W	Messaging data	regional
Roadway	Maintenance and Construction Management	environmental probe data	W	Messaging data	national
Roadway	Maintenance and Construction Management	environmental sensor data	W	Messaging data	product

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Source	Destination	Architecture Flow	Interconnects	Communication Service	Interoperability
Roadway	Maintenance and Construction Management	field device status	W	Messaging data	product
Roadway	Maintenance and Construction Management	infrastructure monitoring sensor data	W	Messaging data	product
Roadway	Maintenance and Construction Management	roadway information system status	W	Messaging data	product
Roadway	Maintenance and Construction Management	roadway treatment system status	W	Conversational data, Messaging data	product
Roadway	Maintenance and Construction Management	speed monitoring information	W	Conversational data, Messaging data	product
Roadway	Maintenance and Construction Management	traffic images	W	Messaging data	product
Roadway	Maintenance and Construction Management	work zone warning status	W	Conversational data, Messaging data	product
Roadway	Maintenance and Construction Vehicle	barrier system status	U2	Conversational data, Messaging data	regional
Roadway	Maintenance and Construction Vehicle	environmental sensor data	U2	Messaging data	regional
Roadway	Maintenance and Construction Vehicle	infrastructure monitoring sensor data	U2	Messaging data	regional
Roadway	Maintenance and Construction Vehicle	roadway information system status	U2	Messaging data	regional
Roadway	Maintenance and Construction Vehicle	work zone warning notification	U2	Conversational data, Messaging data	regional
Roadway	Map Update Provider	traffic probe data	W	Messaging data	national
Roadway	Multimodal Crossings	highway control status	W	Conversational data, Messaging data	national
Roadway	Other Roadway	roadway equipment coordination	W	Conversational data, Messaging data	product
Roadway	Pedestrians	crossing permission	H	Human Interface	national
Roadway	Surface Transportation Weather Service	environmental probe data	W	Messaging data	national
Roadway	Surface Transportation Weather Service	environmental sensor data	W	Messaging data	product
Roadway	Traffic Management	automated roadway status	W	Messaging data	product
Roadway	Traffic Management	barrier system status	W	Messaging data	regional

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Source	Destination	Architecture Flow	Interconnects	Communication Service	Interoperability
Roadway	Traffic Management	environmental sensor data	W	Messaging data	product
Roadway	Traffic Management	hov data	W	Messaging data	product
Roadway	Traffic Management	hri status	W	Conversational data, Messaging data	product
Roadway	Traffic Management	intersection blockage notification	W	Messaging data	product
Roadway	Traffic Management	lighting system status	W	Conversational data, Messaging data	product
Roadway	Traffic Management	reversible lane status	W	Conversational data, Messaging data	product
Roadway	Traffic Management	roadway information system status	W	Conversational data, Messaging data	product
Roadway	Traffic Management	safeguard system status	W	Messaging data	regional
Roadway	Traffic Management	short range communications status	W	Conversational data, Messaging data	product
Roadway	Traffic Management	signal control status	W	Conversational data, Messaging data	product
Roadway	Traffic Management	speed monitoring information	W	Conversational data, Messaging data	product
Roadway	Traffic Management	traffic flow	W	Messaging data	product
Roadway	Traffic Management	traffic images	W	Messaging data	product
Roadway	Traffic Management	traffic probe data	W	Messaging data	product
Roadway	Vehicle	access permission	U2	Conversational Data	product
Roadway	Vehicle	automated vehicle control data	U2	Messaging data	national
Roadway	Vehicle	broadcast traveler information	U2	Messaging data,Broadcast data, Multicast	national
Roadway	Vehicle	emergency traveler information	U2	Messaging data,Broadcast data, Multicast	national
Roadway	Vehicle	intersection status	U2	Messaging data	national
Roadway	Vehicle	roadway safety data	U2	Conversational Data, Messaging data	national
Roadway	Vehicle	vehicle signage data	U2	Messaging data	national
Roadway	Wayside Equipment	hri operational status	W	Conversational data, Messaging data	product

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Source	Destination	Architecture Flow	Interconnects	Communication Service	Interoperability
Roadway	Wayside Equipment	intersection blockage notification	W	Messaging data	product
Roadway	Weather Service	environmental probe data	W	Messaging data	national
Roadway	Weather Service	environmental sensor data	W	Messaging data	product
Roadway Environment	Maintenance and Construction Vehicle	environmental conditions	P	Physical Interface	NA
Roadway Environment	Maintenance and Construction Vehicle	roadway characteristics	P	Physical Interface	NA
Roadway Environment	Roadway	environmental conditions	P	Physical Interface	NA
Roadway Environment	Vehicle	environmental conditions	P	Physical Interface	NA
Roadway Environment	Vehicle	roadway characteristics	P	Physical Interface	NA
Secure Area Environment	Security Monitoring	secure area characteristics	P	Physical Interface	NA
Secure Area Environment	Transit Vehicle	secure area characteristics	P	Physical Interface	NA
Security Monitoring	Emergency Management	infrastructure monitoring sensor data	W	Messaging data	regional
Security Monitoring	Emergency Management	secure area sensor data	W	Messaging data	regional
Security Monitoring	Emergency Management	secure area surveillance data	W	Messaging data	regional
Shelter Providers	Emergency Management	shelter information	W	Messaging data	regional
Storage Facility	Maintenance and Construction Management	equipment availability	W	Conversational data, Messaging data	regional
Storage Facility	Maintenance and Construction Management	maintenance materials storage status	W	Messaging data	regional
Surface Transportation Weather Service	Archived Data Management	transportation weather information	W	Messaging data, Broadcast data, Multicast	national
Surface Transportation Weather Service	Emergency Management	transportation weather information	W	Messaging data, Broadcast data, Multicast	national
Surface Transportation Weather Service	Maintenance and Construction Management	environmental conditions data	W	Messaging data	product
Surface Transportation Weather Service	Maintenance and Construction Management	transportation weather information	W	Messaging data, Broadcast data, Multicast	regional
Surface Transportation Weather Service	Roadway	environmental sensors control	W	Conversational data, Messaging data	regional
Surface Transportation Weather Service	Traffic Management	environmental conditions data	W	Messaging data	product

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Source	Destination	Architecture Flow	Interconnects	Communication Service	Interoperability
Surface Transportation Weather Service	Traffic Management	transportation weather information	W	Messaging data,Broadcast data, Multicast	national
Surface Transportation Weather Service	Transit Management	transportation weather information	W	Messaging data,Broadcast data, Multicast	national
Traffic	Maintenance and Construction Vehicle	traffic characteristics	P	Physical Interface	NA
Traffic	Roadway	traffic characteristics	P	Physical Interface	NA
Traffic Management	Archived Data Management	archived data product requests	W	Messaging data	regional
Traffic Management	Archived Data Management	traffic archive data	W	Messaging data	regional
Traffic Management	Border Inspection Systems	border incident information	W	Messaging data	national
Traffic Management	Border Inspection Systems	traffic images	W	Messaging data	national
Traffic Management	DMV	license request	W	Messaging data	national
Traffic Management	Emergency Management	alert status	W	Messaging data	regional
Traffic Management	Emergency Management	emergency plan coordination	W	Messaging data	regional
Traffic Management	Emergency Management	emergency routes	W	Messaging data	regional
Traffic Management	Emergency Management	emergency traffic control information	W	Conversational data, conversational speech	regional
Traffic Management	Emergency Management	incident information	W	Messaging data	regional
Traffic Management	Emergency Management	incident response status	W	Conversational data, Messaging data	regional
Traffic Management	Emergency Management	resource deployment status	W	Messaging data	regional
Traffic Management	Emergency Management	resource request	W	Conversational data, Messaging data	regional
Traffic Management	Emergency Management	road network conditions	W	Messaging data	regional
Traffic Management	Emergency Management	road network status assessment	W	Messaging data	regional
Traffic Management	Emergency Management	traffic images	W	Messaging data	regional
Traffic Management	Emissions Management	pollution state data request	W	Messaging data	product
Traffic Management	Enforcement Agency	request for enforcement	W	Conversational data, Messaging data	regional
Traffic Management	Enforcement Agency	traffic violation notification	W	Messaging data	regional
Traffic Management	Event Promoters	event confirmation	W	Messaging data	regional

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Source	Destination	Architecture Flow	Interconnects	Communication Service	Interoperability
Traffic Management	Intermodal Freight Depot	intermodal freight traffic confirmation	W	Messaging data	regional
Traffic Management	Maintenance and Construction Management	field equipment status	W	Conversational data, Messaging data	regional
Traffic Management	Maintenance and Construction Management	incident information	W	Conversational data, Messaging data	regional
Traffic Management	Maintenance and Construction Management	maint and constr resource request	W	Conversational data, Messaging data	regional
Traffic Management	Maintenance and Construction Management	road network conditions	W	Messaging data	regional
Traffic Management	Maintenance and Construction Management	road network status assessment	W	Conversational data, Messaging data	regional
Traffic Management	Maintenance and Construction Management	work plan feedback	W	Conversational data, Messaging data	regional
Traffic Management	Map Update Provider	map update request	W	Messaging data	national
Traffic Management	Parking Management	parking demand management request	W	Messaging data	regional
Traffic Management	Parking Management	parking lot data request	W	Conversational data, Messaging data	regional
Traffic Management	Parking Management	parking lot inputs	W	Messaging data	regional
Traffic Management	Rail Operations	hri advisories	W	Conversational Data, Messaging data	national
Traffic Management	Roadway	automated roadway control data	W	Conversational data, Messaging data	product
Traffic Management	Roadway	barrier system control	W	Conversational data, Messaging data	regional
Traffic Management	Roadway	environmental sensors control	W	Conversational data, Messaging data	product
Traffic Management	Roadway	hri control data	W	Conversational data, Messaging data	product
Traffic Management	Roadway	hri request	W	Conversational data, Messaging data	product
Traffic Management	Roadway	lighting system control data	W	Conversational data, Messaging data	product
Traffic Management	Roadway	reversible lane control	W	Conversational data, Messaging data	regional

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Source	Destination	Architecture Flow	Interconnects	Communication Service	Interoperability
Traffic Management	Roadway	roadway information system data	W	Conversational data, Messaging data	product
Traffic Management	Roadway	safeguard system control	W	Conversational data, Messaging data	regional
Traffic Management	Roadway	speed monitoring control	W	Conversational data, Messaging data	product
Traffic Management	Roadway	traffic sensor control	W	Conversational data, Messaging data	product
Traffic Management	Roadway	vehicle signage data	W	Conversational data, Messaging data	product
Traffic Management	Roadway	video surveillance control	W	Conversational data, Messaging data	product
Traffic Management	Surface Transportation Weather Service	environmental conditions data	W	Messaging data	regional
Traffic Management	Surface Transportation Weather Service	transportation weather information request	W	Conversational data, Messaging data	regional
Traffic Management	Traffic Operations Personnel	traffic operator data	H	Human Interface	product
Traffic Management	Transit Management	incident information	W	Messaging data	regional
Traffic Management	Transit Management	request transit information	W	Conversational data, Messaging data	regional
Traffic Management	Transit Management	road network conditions	W	Messaging data	regional
Traffic Management	Transit Management	traffic control priority status	W	Conversational data, Messaging data	regional
Traffic Management	Transit Management	transit demand management request	W	Messaging data	regional
Traffic Management	Weather Service	environmental conditions data	W	Messaging data	national
Traffic Operations Personnel	Traffic Management	traffic operator inputs	H	Human Interface	product
Transit Management	Archived Data Management	archived data product requests	W	Messaging data	regional
Transit Management	Archived Data Management	transit archive data	W	Messaging data	regional
Transit Management	Emergency Management	alert status	W	Messaging data	regional
Transit Management	Emergency Management	emergency plan coordination	W	Messaging data	regional
Transit Management	Emergency Management	emergency transit schedule information	W	Messaging data	regional

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Source	Destination	Architecture Flow	Interconnects	Communication Service	Interoperability
Transit Management	Emergency Management	emergency transit service response	W	Messaging data	regional
Transit Management	Emergency Management	transit emergency data	W	Conversational data, Messaging data	regional
Transit Management	Emergency Management	transit system status assessment	W	Messaging data	regional
Transit Management	Enforcement Agency	payment violation notification	W	Messaging data	regional
Transit Management	Event Promoters	event confirmation	W	Messaging data	regional
Transit Management	Financial Institution	payment request	W	Conversational data, Messaging data	national
Transit Management	Maintenance and Construction Management	work plan feedback	W	Conversational data, Messaging data	regional
Transit Management	Map Update Provider	map update request	W	Messaging data	national
Transit Management	Media	transit incidents for media	W	Messaging data	product
Transit Management	Media	transit information for media	W	Messaging data	product
Transit Management	Multimodal Transportation Service Provider	transit multimodal information	W	Messaging data	regional
Transit Management	Other Transit Management	transit fare coordination	W	Conversational data, Messaging data	regional
Transit Management	Other Transit Management	transit service coordination	W	Messaging data	regional
Transit Management	Other Transit Management	transit traveler information coordination	W	Conversational data, Messaging data	regional
Transit Management	Parking Management	parking lot data request	W	Messaging data, Broadcast data, Multicast	regional
Transit Management	Personal Information Access	personal transit information	W,U1t	Messaging data	national
Transit Management	Surface Transportation Weather Service	transportation weather information request	W	Conversational data, Messaging data	regional
Transit Management	Traffic Management	emergency transit schedule information	W	Messaging data	regional
Transit Management	Traffic Management	traffic control priority request	W	Conversational data, Messaging data	regional
Transit Management	Traffic Management	transit demand management response	W	Messaging data	regional



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Source	Destination	Architecture Flow	Interconnects	Communication Service	Interoperability
Transit Management	Traffic Management	transit probe data	W	Conversational data, Messaging data	regional
Transit Management	Traffic Management	transit system data	W	Messaging data	regional
Transit Management	Transit Operations Personnel	transit operations status	H	Human Interface	product
Transit Management	Transit Vehicle	alarm acknowledge	U1t	Conversational speech, Messaging data	product
Transit Management	Transit Vehicle	bad tag list	U1t,U2N	Messaging data	product
Transit Management	Transit Vehicle	fare management information	U1t	Messaging data	product
Transit Management	Transit Vehicle	remote vehicle disable	U1t	Messaging data	product
Transit Management	Transit Vehicle	request for vehicle measures	U1t,U2N	Messaging data	product
Transit Management	Transit Vehicle	transit schedule information	U1t	Messaging data	product
Transit Management	Transit Vehicle	transit traveler information	U1t	Messaging data	product
Transit Management	Transit Vehicle	transit vehicle operator authentication update	U1t	Conversational data, Messaging data	product
Transit Management	Transit Vehicle	transit vehicle operator information	U1t	Messaging data	product
Transit Management	Transit Vehicle Operator	route assignment	H	Human Interface	product
Transit Operations Personnel	Transit Management	transit operations personnel inputs	H	Human Interface	product
Transit Vehicle	Basic Transit Vehicle	basic transit vehicle controls	V	Conversational data	product
Transit Vehicle	Emergency Management	alarm notification	U1t	Conversational speech, Messaging data	product
Transit Vehicle	Emergency Management	secure area sensor data	U1t	Messaging data	product
Transit Vehicle	Emergency Management	secure area surveillance data	U1t	Messaging data	product
Transit Vehicle	Emergency Management	transit vehicle location data	U1t	Messaging data	product
Transit Vehicle	Roadway	local signal priority request	U2	Conversational data	regional
Transit Vehicle	Transit Management	alarm notification	U1t	Conversational speech, Messaging data	product
Transit Vehicle	Transit Management	demand response passenger and use data	U1t	Conversational Data, Messaging data	product

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Source	Destination	Architecture Flow	Interconnects	Communication Service	Interoperability
Transit Vehicle	Transit Management	fare collection data	U1t,U2N	Conversational data, Messaging data	product
Transit Vehicle	Transit Management	request for bad tag list	U1t,U2N	Conversational data, Messaging data	product
Transit Vehicle	Transit Management	transit traveler request	U1t	Conversational data, Messaging data	product
Transit Vehicle	Transit Management	transit vehicle conditions	U1t,U2N	Messaging data	product
Transit Vehicle	Transit Management	transit vehicle loading data	U1t,U2N	Messaging data	product
Transit Vehicle	Transit Management	transit vehicle location data	U1t	Conversational data, Messaging data, location data	product
Transit Vehicle	Transit Management	transit vehicle operator authentication information	U1t	Conversational data, Messaging data	product
Transit Vehicle	Transit Management	transit vehicle schedule performance	U1t	Conversational data, Messaging data	product
Transit Vehicle	Transit Vehicle Operator	transit vehicle operator display	H	Human Interface	product
Transit Vehicle	Traveler	traveler interface updates	H	Human Interface	product
Transit Vehicle	Traveler Card	request for payment	S	Conversational Data	national
Transit Vehicle	Vehicle	vehicle signage data	U3	Messaging data	national
Transit Vehicle Operator	Transit Management	transit vehicle operator availability	H	Human Interface	product
Transit Vehicle Operator	Transit Vehicle	transit vehicle operator inputs	H	Human Interface	product
Traveler	Personal Information Access	traveler inputs	H	Human Interface	product
Traveler	Transit Vehicle	boarding and alighting	P	Physical Interface	NA
Traveler	Transit Vehicle	traveler inputs	H	Human Interface	product
Traveler Card	Parking Management	payment	S	Conversational data	national
Traveler Card	Personal Information Access	payment	S	Conversational Data	national
Traveler Card	Personal Information Access	traveler card information	S	Conversational data	national
Traveler Card	Transit Vehicle	payment	S	Conversational Data	national
Traveler Card	Vehicle	payment	S	Conversational Data	national
Vehicle	Basic Vehicle	vehicle control	V	Conversational Data	product
Vehicle	Commercial Vehicle	commercial vehicle data request	V	Messaging data	product
Vehicle	Driver	driver updates	H	Human Interface	product

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Source	Destination	Architecture Flow	Interconnects	Communication Service	Interoperability
Vehicle	Driver	in-vehicle transaction status	H	Human Interface	product
Vehicle	Emergency Management	emergency notification	U1t	Conversational speech, Messaging data, location data	national
Vehicle	Maintenance and Construction Vehicle	safety system status	V	Conversational data, Messaging data	product
Vehicle	Map Update Provider	map update request	U1t	Messaging data	national
Vehicle	Other Vehicle	vehicle control coordination	U3	Conversational data	national
Vehicle	Other Vehicle	vehicle intersection safety data	U3	Conversational data, Messaging data	national
Vehicle	Other Vehicle	vehicle safety data	U3	Conversational Data, Messaging data	national
Vehicle	Parking Management	vehicle payment information	U2	Conversational data	national
Vehicle	Roadway	access request	U2	Conversational Data	product
Vehicle	Roadway	automated vehicle status	U2	Conversational data	national
Vehicle	Roadway	environmental probe data	U2	Messaging data	national
Vehicle	Roadway	probe archive data	U2	Conversational data, Messaging data	national
Vehicle	Roadway	traffic probe data	U2	Messaging data	national
Vehicle	Roadway	vehicle diagnostics data	U2	Messaging data	national
Vehicle	Roadway	vehicle intersection safety data	U2	Conversational Data, Messaging data	national
Vehicle	Roadway	vehicle occupancy	U2	Messaging data	national
Vehicle	Roadway	vehicle safety data	U2	Conversational Data, Messaging data	national
Vehicle	Traveler Card	request for payment	S	Conversational Data	national
Vehicle Characteristics	Parking Management	vehicle characteristics	P	Physical Interface	NA
Vehicle Characteristics	Roadway	vehicle characteristics	P	Physical Interface	NA
Wayside Equipment	Roadway	arriving train information	W	Messaging data	product
Wayside Equipment	Roadway	track status	W	Messaging data	product
Weather Service	Archived Data Management	weather archive data	W	Messaging data	national
Weather Service	Emergency Management	weather information	W	Messaging data, Broadcast data, Multicast	national

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Source	Destination	Architecture Flow	Interconnects	Communication Service	Interoperability
Weather Service	Emissions Management	weather information	W	Messaging data	national
Weather Service	Maintenance and Construction Management	environmental conditions data status	W	Messaging data	national
Weather Service	Maintenance and Construction Management	qualified environmental conditions data	W	Messaging data	national
Weather Service	Maintenance and Construction Management	weather information	W	Messaging data, Broadcast data, Multicast	national
Weather Service	Roadway	environmental sensors control	W	Conversational data, Messaging data	national
Weather Service	Traffic Management	environmental conditions data status	W	Messaging data	national
Weather Service	Traffic Management	qualified environmental conditions data	W	Messaging data	national
Weather Service	Traffic Management	weather information	W	Messaging data, Broadcast data, Multicast	national
Weather Service	Transit Management	weather information	W	Messaging data, Broadcast data, Multicast	national