



ARC-IT v8 Workshop

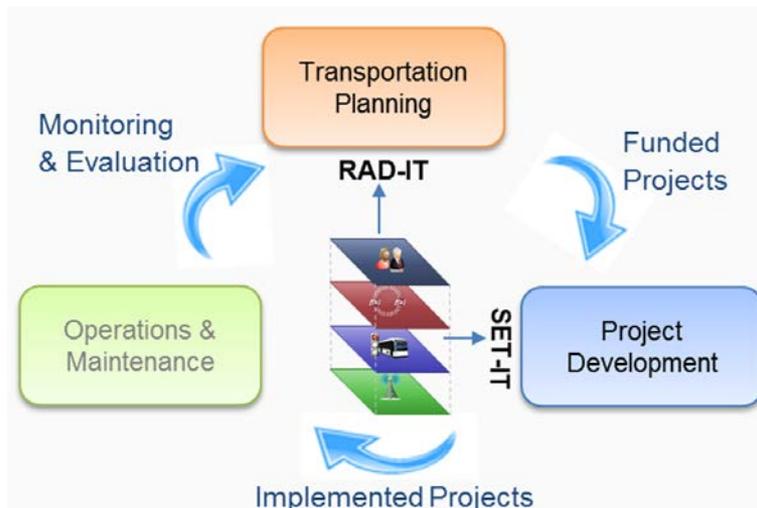
# ARC-IT TOOL SET

# ARC-IT Tool Suite

- Two free downloadable software tools available to apply ARC-IT to regions and projects
  - Regional Architecture Development for Intelligent Transportation (RAD-IT)
  - Systems Engineering Tool for Intelligent Transportation (SET-IT)

*RAD-IT* ✓

*SET-IT* 🚦



# What is *RAD-IT*?

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- Formerly known as *Turbo Architecture*
- Supports ARC-IT
- To create and maintain ITS architectures
- Includes conversion utilities for current regional architectures
- Free tool available at [www.arc-it.net](http://www.arc-it.net) (select Resources / Tools)
- Training available under Resources / Training



# What is SET-IT?

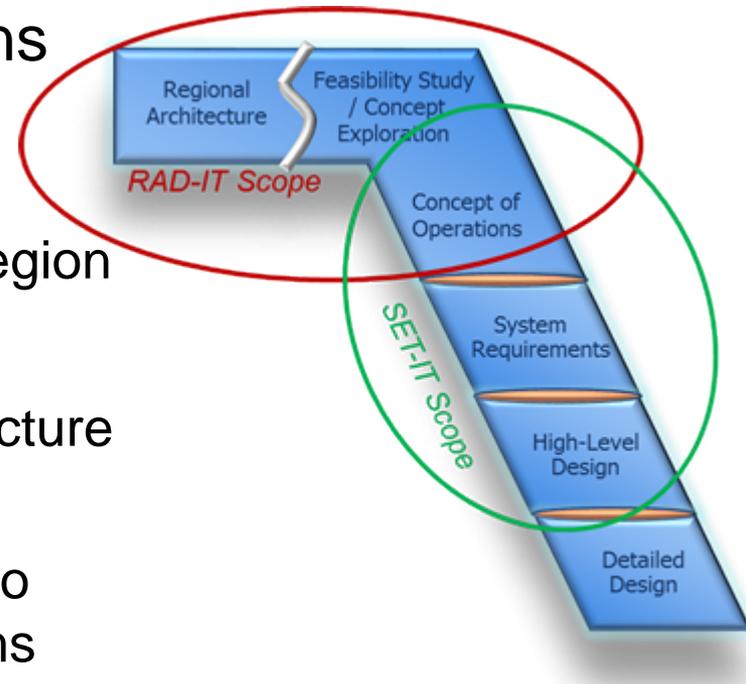
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- Systems Engineering Tool for Intelligent Transportation (SET-IT)
- Originally to support tailored CV project architecture development (using CVRIA)
- Expanded to include all ITS
- Creation of diagram based project architectures covering the Physical, Enterprise and Communications Viewpoints
- SET-IT Training at [www.arc-it.net](http://www.arc-it.net) (select Resources / Training).



# Scope of Tools

- RAD-IT focuses on regional planning and the development of Operations Concepts,
  - Stakeholders, Physical Objects, Service Packages, Interfaces for the region
- SET-IT is project-focused
  - Scope specified in the regional architecture
  - Graphical tool,
    - providing visual feedback and tools to manipulate service package diagrams
    - develop communications stack templates, specify standards at all protocol layers,
  - Outputs – documents, diagrams, tables



# RAD-IT's Updated Look-and-Feel

The screenshot displays the RAD-IT software interface for 'Marinara County'. The window title is 'RAD-IT - New - Marinara County'. The interface includes a ribbon menu with 'File', 'Home', and 'Output' tabs. The 'Home' tab is active, showing groups for 'Clipboard' (Copy, Cut, Paste), 'Tools' (Synchronize Elements, Update Status, Add Physical Objects, Add Flows), and 'Review' (Request Flows, Spelling, Architecture). Below the ribbon is a navigation bar with tabs for 'Start', 'Planning', 'Stakeholders', 'Inventory', 'Services', 'R & R', 'Requirements', 'Interfaces', 'Standards', and 'Agreements'. The 'Current Region: Marinara County' is displayed in a search bar.

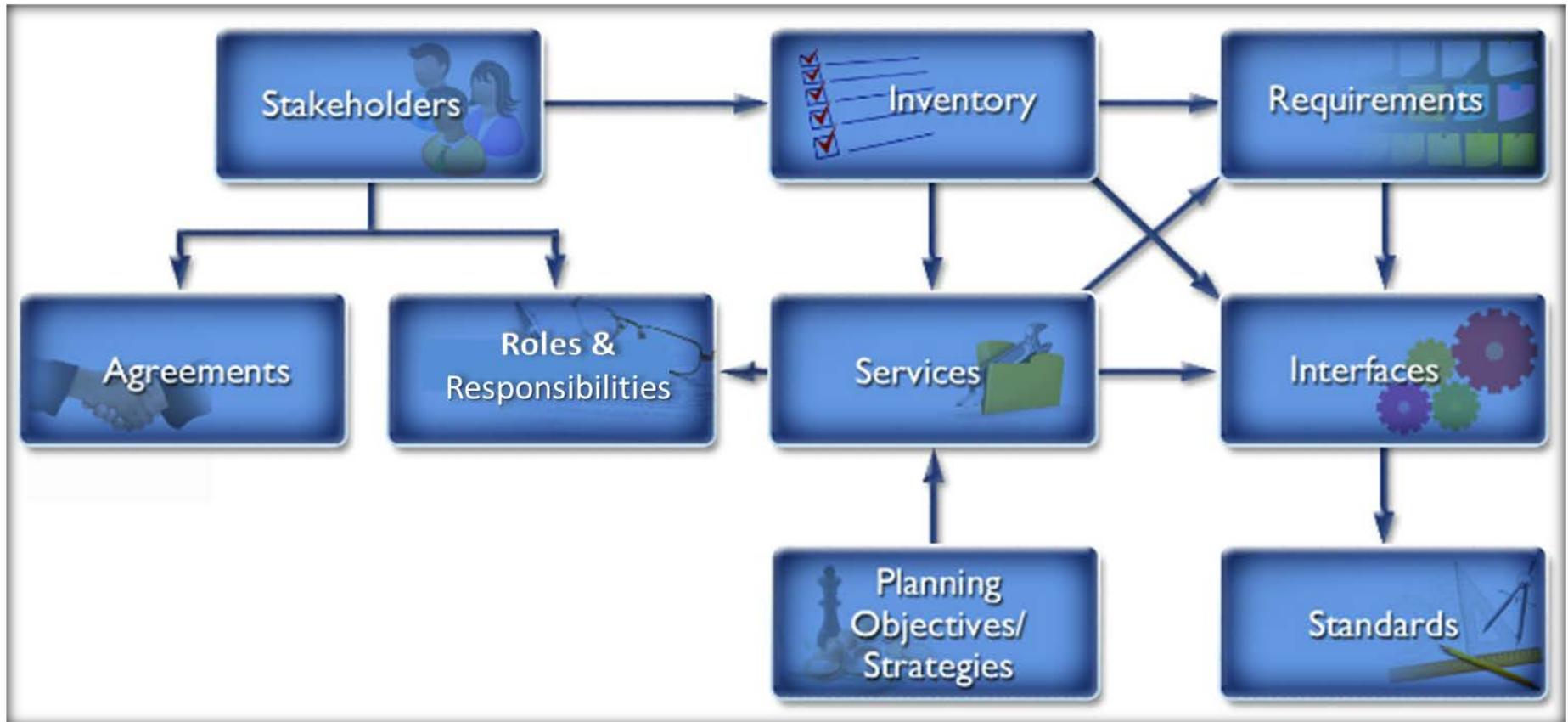
The main content area is divided into three sections:

- Architectures:**
  - Regional:** A list containing 'Marinara County' (highlighted). Below the list are 'Region to Project', 'New', and 'Delete' buttons.
  - Project:** A list containing 'MCDOT Saucelito Traffic Coordination', 'MCDOT Traffic Monitoring Expansion Project', 'MCDOT V2I Safety Initiative', and 'TOMATO'. Below the list are 'Project to Region', 'New', and 'Delete' buttons.
  - Related:** A list containing 'Alfredo County'. Below the list are 'New' and 'Delete' buttons.
- Regional Architecture Attributes:**
  - Name:** 'Marinara County'
  - Description:** 'This sample architecture originated as an exercise in the National ITS Architecture Public Sector Training Course. It illustrates how many of the Turbo Architecture, Regional Architecture Development for Intelligent Transportation (RAD-IT), features can be used to highlight features of the tool as well as part of the Architecture Reference for Cooperative & Intelligent Transportation (ARC-IT) that merges traditional ITS concepts with connected vehicle technologies and supporting services. To this end, several minor extensions have been made to the basic Marinara County scenario so that features like user defined Physical Objects, Flows, and connected vehicle service packages can also be illustrated.'
  - Timeframe:** 'Through 2030 (Next 10 to 15 years)'
  - Geographic Scope:** 'The Marinara County transportation region encompasses rural and urban areas, including the rapidly expanding city of Saucelito. The total regional population of 675,000 is demographically diverse: 5% continue the traditional regional farming activities, 62% are Saucelito residents, and over 50% of the region's workers are in technology industries. Marinara's largest employer is Parma-John, a pharmaceuticals firm with a payroll of over 11,000 workers.'
  - Service Scope:** 'The intelligent transportation system for the Marinara region consists of freeway management, surface street systems, and transit services that are managed by the county and local agencies. There is now a growing interest in traveler information systems that use new technologies to collect traffic data and develop traveler information concerning traffic as well as parking and event data for the region.'
  - Developer:** 'Bob Olley (MCDOT)'
  - Maintainer:** 'Will N Able (MCTPB)'
  - Version:** 'v2017-a'
  - Date/Time:** '5/22/2017 10:48:56 AM'

At the bottom of the interface are 'Change Log', 'Apply', and 'Cancel' buttons.



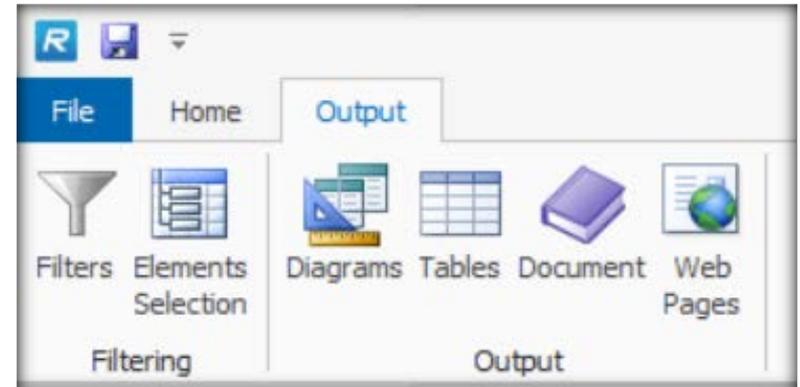
# Relationships of Architecture Components in RAD-IT



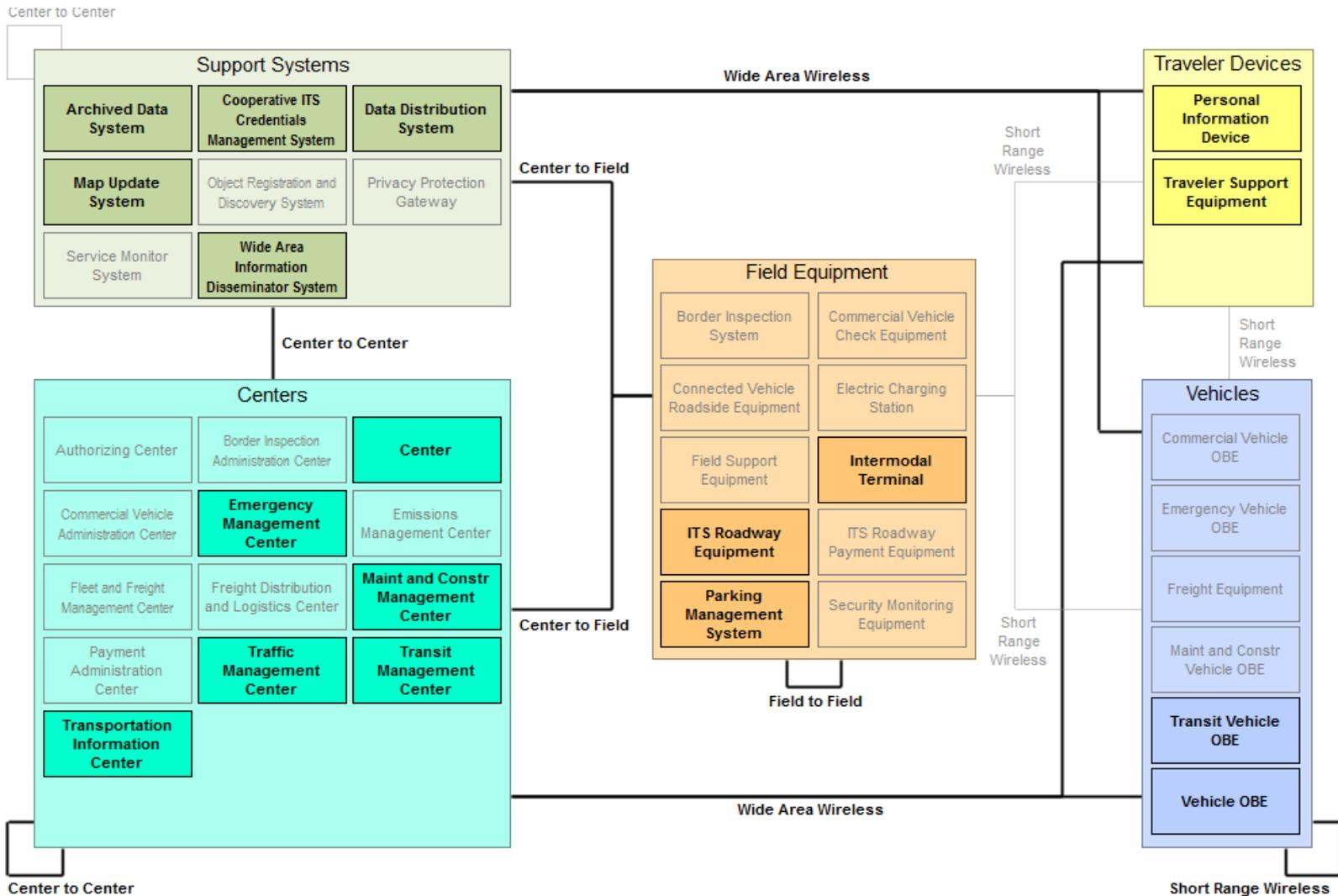
# RAD-IT Outputs

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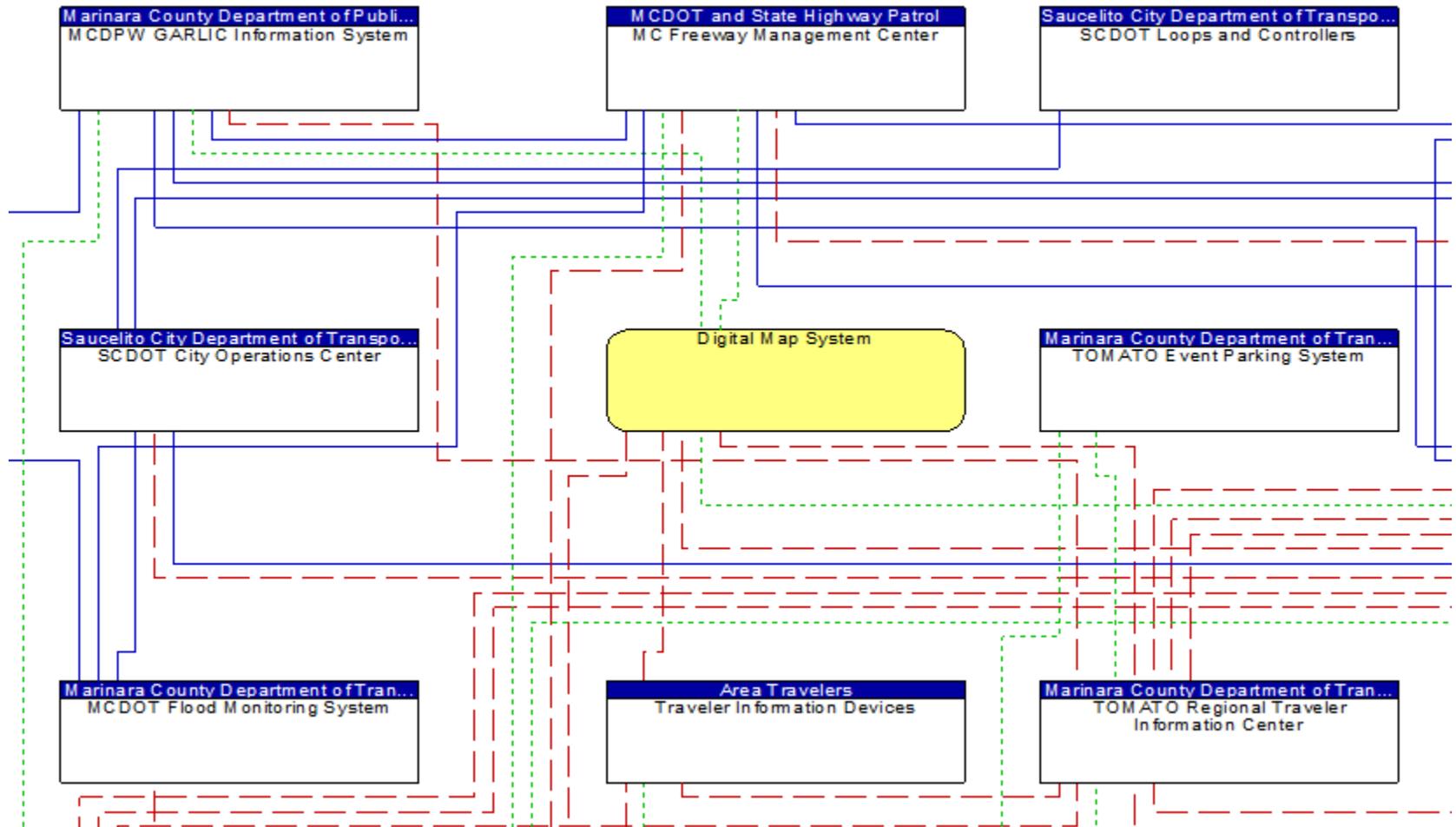
- Diagrams
  - Subsystem Summary
  - Interconnect
  - Flow
  - Plus - Batch capability
- Tables
- Documents – regional and project
- Customized website



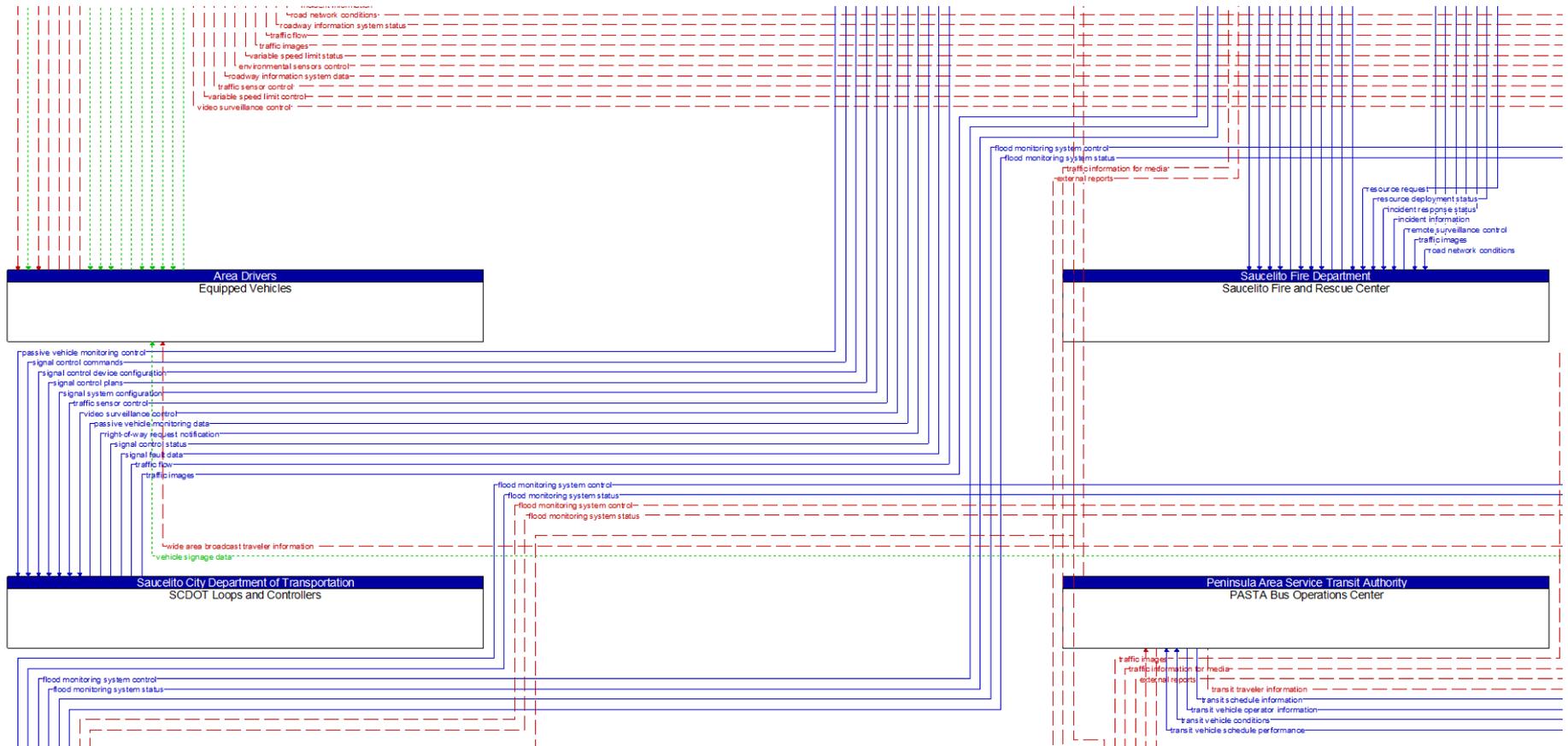
# RAD-IT Outputs: Subsystem Diagram



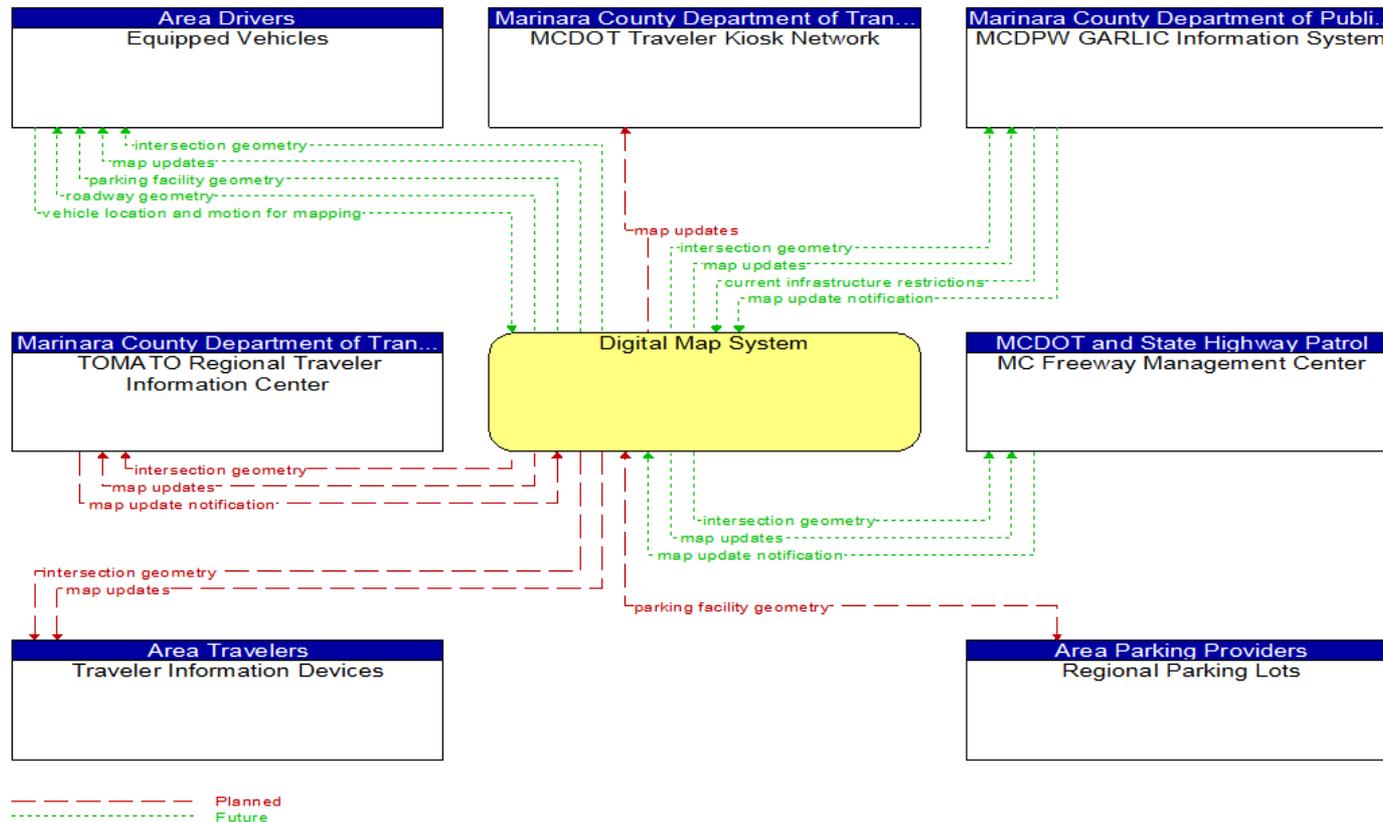
# RAD-IT Outputs: Interconnect Diagram



# RAD-IT Outputs: Flow Diagram



# RAD-IT Outputs: Context Diagrams



# RAD-IT Outputs: Tables

## Services

Service Package	Service Package Name	Service Package Description	Service Package Status	Service Package Instance	Included Elements	Comment
DM01	ITS Data Warehouse	This service package provides the same broad access to multimodal, multidimensional data from varied data sources as in the ITS Data Warehouse service package, but provides this access using enhanced interoperability between physically distributed ITS archives that are each locally managed. Requests for data that are satisfied by access to a single repository in the ITS Data Warehouse service package are parsed by the local archive and dynamically translated to requests to remote archives which relay the data necessary to satisfy the request.	Planned	No	MC Planning Data Warehouse	
PM04	Regional Parking Management	This service package supports communication and coordination between equipped parking facilities and also supports regional coordination between parking facilities and traffic and transit management systems. This service package also shares information with transit management systems and information service providers to support multimodal travel planning, including parking reservation capabilities. Information including current parking availability, system status, and operating strategies are shared to enable local parking facility management that supports regional transportation strategies.	Future	No	Regional Parking Lots	
PM04	Regional Parking Management	This service package supports communication and coordination between equipped parking facilities and also supports regional coordination between parking facilities and traffic and transit management systems. This service package also shares information with transit management systems and information service providers to support multimodal travel planning, including parking reservation capabilities. Information including current parking availability, system status, and operating strategies are shared to enable local parking facility management that supports regional transportation strategies.	Future	No	TOMATO Event Parking System	
PM04	Regional Parking Management	This service package supports communication and coordination between equipped parking facilities and also supports regional coordination between parking facilities and traffic and transit management systems. This service package also shares information with transit management systems and information service providers to support multimodal travel planning, including parking reservation capabilities. Information including current parking availability, system status, and operating strategies are shared to enable local parking facility management that supports regional transportation strategies.	Future	No	TOMATO Regional Traveler Information Center	



# RAD-IT Outputs: Documents

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# RAD-IT Outputs: Website



The screenshot shows the website interface for RAD-IT Marinara. The top navigation bar is blue and contains the RAD-IT logo on the left and the word "Marinara" in white text on the right. Below the navigation bar is a grey sidebar on the left with a list of menu items: Home (highlighted in yellow), Scope, Planning, Stakeholders, Inventory (with sub-items "By Physical Object" and "By Stakeholder"), Services, Roles and Resp, Requirements, Interfaces, Standards, Agreements, and Projects. The main content area on the right has a white background and features a "Welcome" heading followed by a paragraph of text describing the Regional ITS Architecture as a roadmap for transportation systems integration.

**RAD-IT** **Marinara**

**Home**  
Scope  
Planning  
Stakeholders  
Inventory  
    By Physical Object  
    By Stakeholder  
Services  
Roles and Resp  
Requirements  
Interfaces  
Standards  
Agreements  
Projects

## Welcome

This Regional ITS Architecture is a roadmap for transportation systems integration. The architecture was developed through a cooperative effort by the region's transportation agencies, covering all modes and all roads in the region. It represents a shared vision of how each agency's systems will work together in the future, sharing information and resources to provide a safer, more efficient, and more effective transportation system for travelers in the region. The architecture provides an overarching framework that spans all of the region's transportation organizations and individual transportation projects. Using the architecture, each transportation project can be viewed as an element of the overall transportation system, providing visibility into the relationship between individual transportation projects and ways to cost-effectively build an integrated transportation system over time. The purpose of this regional ITS architecture web site is to encourage use of the regional ITS architecture and gather feedback so that the architecture is used and continues to reflect the intelligent transportation system vision for the region. The menu bar at left provides access to the stakeholders, the transportation systems in the region (the Inventory), the transportation-related functions that are envisioned, and the existing and planned integration opportunities in the region.



# SET-IT Expanded Scope

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- SET-IT began with CVRIA applications
- Now includes all ITS service packages
- Supports tailored project architecture development based on ARC-IT
- SET-IT focuses on the Physical, Communications, and Enterprise Views
  - \* in version 8.0, the Enterprise View does not specify which relationships and roles are required to support service packages or information flow triples
  - However, SET-IT can still be used to generate enterprise diagram, context diagrams and other enterprise artifacts



# SET-IT

The screenshot displays the SET-IT software interface. At the top, the window title is "SET-IT - C:\SET-IT\Regional Unified Model Arch cv1\Regional Unified Model Arch cv1.setit". The interface includes a ribbon with tabs for "Project", "Home", "Review", and "Output". Below the ribbon are icons for "Diagram", "Enterprise", "Physical", "Comm", "Deployment", and "Synchronize". A left sidebar contains an "Overview" section with buttons for "Project", "Service Packages", "Dashboard", and "Change Log", and a navigation pane with "Overview", "Diagrams", and "Definitions". The main area is titled "Project Information" and contains the following fields:

- Name:** Unified Implementation of the Connected Vehicle Reference Implementation Architecture - Regional Scale (Sample version)
- Description:** The evolution of the concepts espoused in the Southeast Michigan 2014 project to one that can be applied anywhere and is larger (e.g., regional or statewide) in scope. The concept is to organize installations in a large region so that all parties have a common experience. This expectation of common experience goes a number of ways. Vehicle operators expect consistent data from infrastructure devices and center-based content providers. Center-based data analysts expect consistent data from
- Start Date:** 2/1/2015
- End Date:** 12/31/2015
- Geographical Scope:** Regional or statewide. No specific deployment (customize this to your needs if you use this sample)
- Service Scope:** Collection of vehicle situation data, Collection of field situation data, Provision of traveler information, Security credentials distribution and CRLs, Service Monitor of center-based and field infrastructure, Object Registration and
- Developer:** National ITS Architecture Team
- Maintainer:** National ITS Architecture Team
- Initials:** NAT
- Origin Location:** United States
- Version:** 7
- Timestamp:** 1/27/2015 9:22:21 AM

At the bottom left of the interface, the word "Physical" is displayed.

# SET-IT's Access to All ARC-IT Service Packages

SET-IT - C:\SET-IT\ITS Project CV1\ITS Project CV1.setit

Project Home Review Output

Diagram Enterprise Physical Comm Deployment Synchronize

Views Tools

**Overview**

Project Service Packages Dashboard Change Log

Combine Type(s)  Combine Group(s)

Include	In Project	SP	Service Package	Type(s)
<input type="checkbox"/>	<input type="checkbox"/>	0	TM01 Infrastructure-Based Traffic Surveillance	Informational, Management
<input type="checkbox"/>	<input type="checkbox"/>	0	TM02 Vehicle-Based Traffic Surveillance	Informational, Management, Mo
<input type="checkbox"/>	<input type="checkbox"/>	0	TM03 Traffic Signal Control	Management, Mobility, Safety
<input type="checkbox"/>	<input type="checkbox"/>	0	TM04 Connected Vehicle Traffic Signal System	Management, Mobility, Safety
<input type="checkbox"/>	<input type="checkbox"/>	0	TM05 Traffic Metering	Management, Mobility
<input type="checkbox"/>	<input type="checkbox"/>	0	TM06 Traffic Information Dissemination	Informational
<input type="checkbox"/>	<input type="checkbox"/>	0	TM07 Regional Traffic Management	Management
<input type="checkbox"/>	<input type="checkbox"/>	0	TM08 Traffic Incident Management System	Management, Mobility, Safety
<input type="checkbox"/>	<input type="checkbox"/>	0	TM09 Integrated Decision Support and Demand Management	Environmental, Management, Mc
<input type="checkbox"/>	<input type="checkbox"/>	0	TM10 Electronic Toll Collection	Management, Mobility, Regula
<input type="checkbox"/>	<input type="checkbox"/>	0	TM11 Road Use Charging	Management, Mobility, Regula
<input type="checkbox"/>	<input type="checkbox"/>	0	TM12 Dynamic Roadway Warning	Safety
<input type="checkbox"/>	<input type="checkbox"/>	0	TM13 Standard Railroad Grade Crossing	Mobility, Safety
<input type="checkbox"/>	<input type="checkbox"/>	0	TM14 Advanced Railroad Grade Crossing	Mobility, Safety
<input type="checkbox"/>	<input type="checkbox"/>	0	TM15 Railroad Operations Coordination	Management
<input type="checkbox"/>	<input type="checkbox"/>	0	TM16 Reversible Lane Management	Management, Regulatory, Safet
<input type="checkbox"/>	<input type="checkbox"/>	0	TM17 Speed Warning and Enforcement	Management, Regulatory, Safet
<input type="checkbox"/>	<input type="checkbox"/>	0	TM18 Drawbridge Management	Management
<input type="checkbox"/>	<input type="checkbox"/>	0	TM19 Roadway Closure Management	Management, Safety
<input type="checkbox"/>	<input type="checkbox"/>	0	TM20 Variable Speed Limits	Management, Mobility, Regula
<input type="checkbox"/>	<input type="checkbox"/>	0	TM21 Speed Harmonization	Management, Mobility
<input type="checkbox"/>	<input type="checkbox"/>	0	TM22 Dynamic Lane Management and Shoulder Use	Management, Mobility, Regula
<input type="checkbox"/>	<input type="checkbox"/>	0	TM23 Border Management Systems	Mobility, Regulatory
<input type="checkbox"/>	<input type="checkbox"/>	0	PT01 Transit Vehicle Tracking	Informational, Mobility
<input type="checkbox"/>	<input type="checkbox"/>	0	PT02 Transit Fixed-Route Operations	Management, Mobility
<input type="checkbox"/>	<input type="checkbox"/>	0	PT03 Dynamic Transit Operations	Informational, Management, Mo
<input type="checkbox"/>	<input type="checkbox"/>	0	PT04 Transit Fare Collection Management	Convenience, Mobility
<input type="checkbox"/>	<input type="checkbox"/>	0	PT05 Transit Security	Mobility, Safety
<input type="checkbox"/>	<input type="checkbox"/>	0	PT06 Transit Fleet Management	Management, Mobility
<input type="checkbox"/>	<input type="checkbox"/>	0	PT07 Transit Passenger Counting	Management, Mobility
<input type="checkbox"/>	<input type="checkbox"/>	0	PT08 Transit Traveler Information	Informational, Mobility
<input type="checkbox"/>	<input type="checkbox"/>	0	PT09 Transit Signal Priority	Mobility
<input type="checkbox"/>	<input type="checkbox"/>	0	PT10 Intermittent Bus Lanes	Management, Mobility, Regula
<input type="checkbox"/>	<input type="checkbox"/>	0	PT11 Transit Pedestrian Indication	Safety
<input type="checkbox"/>	<input type="checkbox"/>	0	PT12 Transit Vehicle at Station/Stop Warnings	Safety
<input type="checkbox"/>	<input type="checkbox"/>	0	PT13 Vehicle Turning Right in Front of a Transit Vehicle	Safety

Include Group Search all Service Packages... Search

This service package includes traffic detectors, other surveillance equipment, the supporting field equipment, and Center to Field communications to transmit the collected data back to the Traffic Management Center. The derived data can be used locally such as when traffic detectors are connected directly to a signal control system or remotely (e.g., when a CCTV system sends data back to the Traffic Management Center). The data generated by this service package enables traffic managers to monitor traffic and road conditions, identify and verify incidents, detect faults in indicator operations, and collect census data for traffic strategy development and long range planning. The collected data can also be analyzed and made available to users and the Traveler Information Center physical object.

This service package includes 1 physical diagram and 1 enterprise diagram.

TM01: Infrastructure-Based Traffic Surveillance

3	Physical	Sep 28, 2016	NAT
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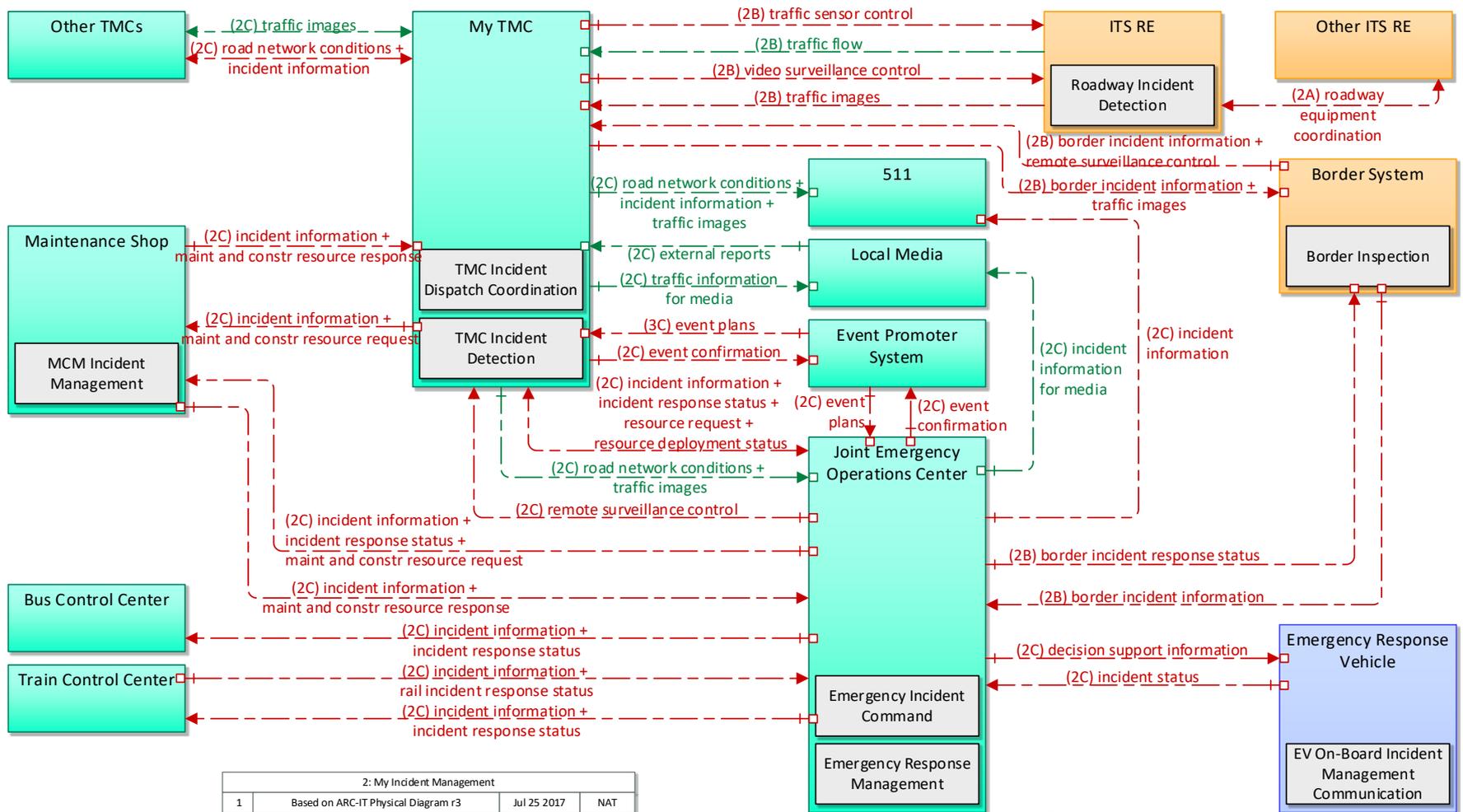


# SET-IT Outputs

- Tables
- Diagrams
- Documents

The screenshot displays the SET-IT software interface. On the left, a 'Diagrams' panel lists various project components, including '0: ITS Proj CV1 Top Layer Physical', '1: State DOT and Our Town ITS', '2: SU03: Data Distribution (Copy 1)', '2: PT09: Transit Signal Priority (Copy 1)', '2: TM21: Speed Harmonization (Copy 1)', and '2: TM20: Variable Speed Limits (Copy 1)'. The main workspace shows a diagram with several interconnected boxes: 'State DOT TMC', 'TMC Signal Control', 'TMC Multi-Mode Coordination', 'Our Town Trans Dispatch Center', 'Transit Center Prior Management', and 'Our Town Trans Sys Operator'. Arrows indicate data flow between these components, with labels like '(ZC) traffic control priority request' and '(ZC) prior'. An 'Output Tables' dialog box is open on the right, showing a tree view of project components under 'Project / File Info'. The 'Project Summary' component is selected. Below the tree, there are sections for 'Select Columns' (with 'Name' selected) and 'Select Action' (with 'Save to File' selected). At the bottom, there are icons for 'Word', 'Excel', and 'Text' output formats.

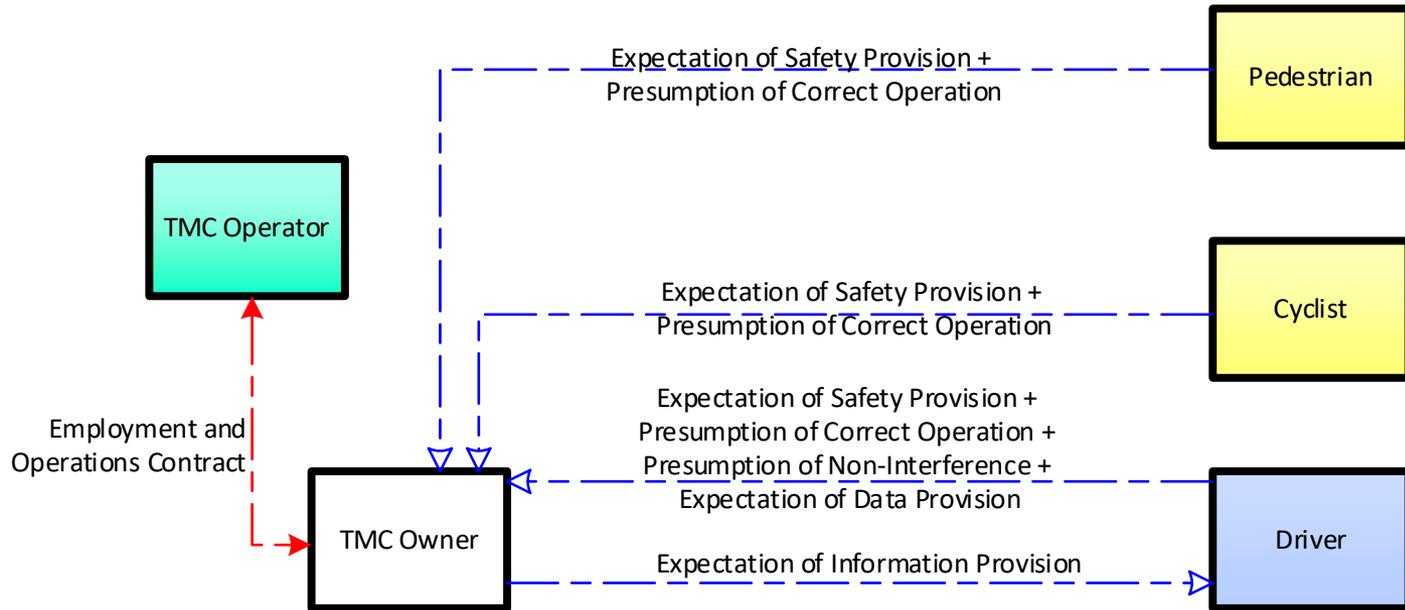
# SET-IT Outputs: Customized Physical Diagrams



2: My Incident Management			
1	Based on ARC-IT Physical Diagram r3	Jul 25 2017	NAT



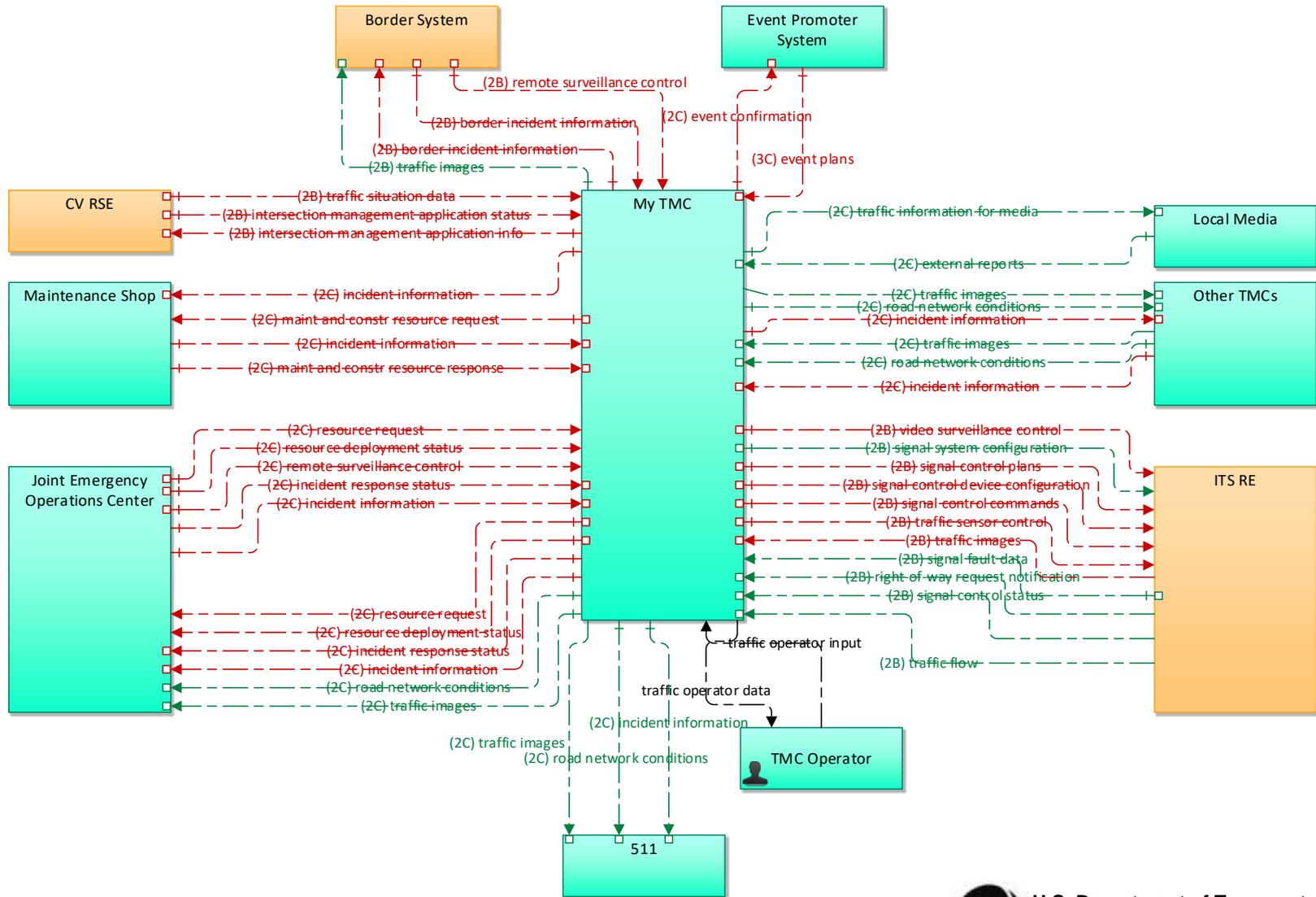
# SET-IT Outputs: Enterprise Diagrams



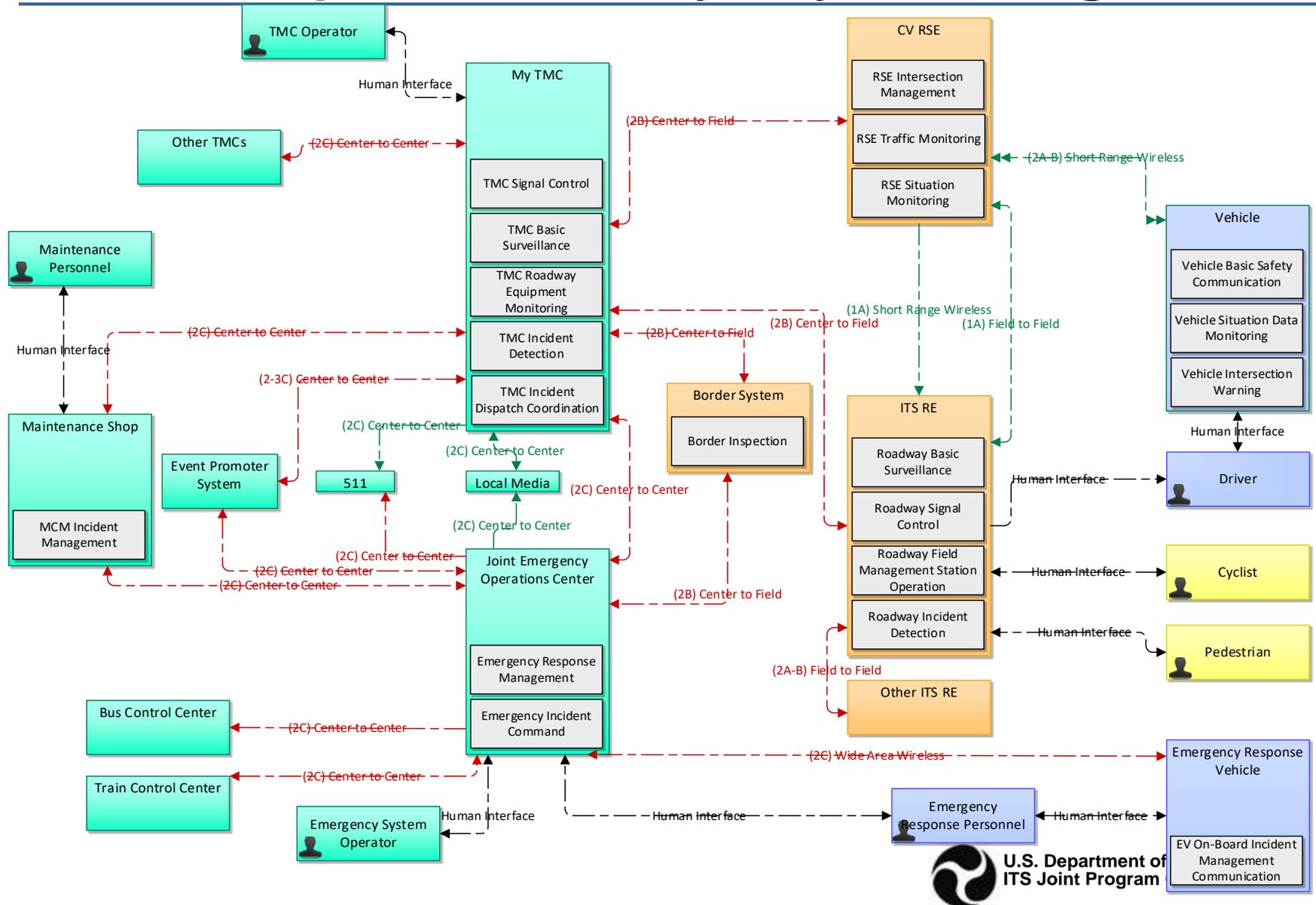
CV Traffic Signal System			
1	Enterprise View	DATE	NAT



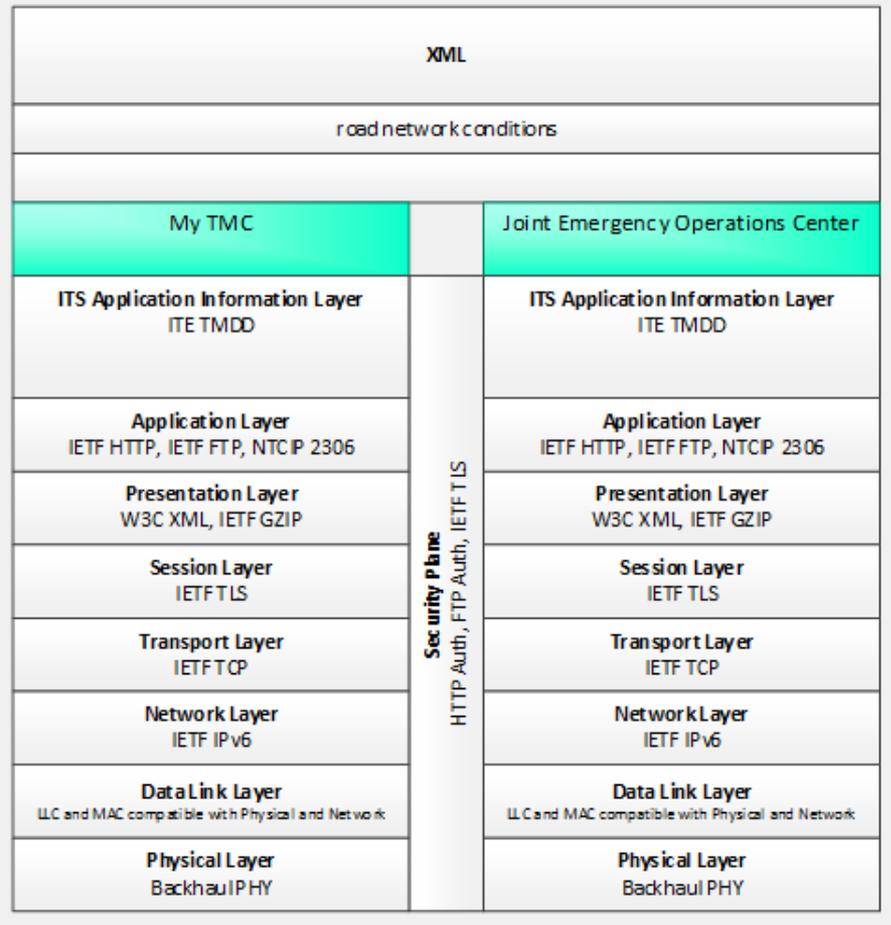
# SET-IT Outputs: Context Diagrams



# SET-IT Outputs: Summary Physical Diagrams



# SET-IT Output: Communications Diagrams



# SET-IT Outputs: Tables

## Elements

Name	Abbreviation	Description	Status	Class	Parent	Physical Object(s)	Stakeholder(s)	Role	Diagram
511	5		Project	Center	No	Center, Transportation Information Center	511 Contractor	Operates, Owns	High Level Summary, My Incident Management, System with Functionality
511 Contractor	5C		Project	Center	No	TIC Operator	511 Contractor		
Border System	BS		Project	Field	No	Border Inspection System	US Customs and Border Protection	Operates, Owns	High Level Summary, My Incident Management, System with Functionality
Bus Control Center	BCC		Project	Center	No	Center, Transit Management Center	Bus Company, Bus Control Operator	Owns, Operates	High Level Summary, My Incident Management, System with Functionality
Bus Control Operator	BCO		Project	Center	No	Transit Operations Personnel	Bus Control Operator		
CV RSE	CR		Project	Field	No	Connected Vehicle Roadside Equipment	TMC Operator, TMC Owner	Operates, Owns	High Level Summary, My Connected Vehicle-enabled Signal System, System with Functionality
Cyclist	C		Project	Traveler	No	Cyclist	Cyclist		High Level Summary, My Connected Vehicle-enabled Signal System, System with Functionality



# SET-IT Outputs: Documents

Concept of Operations

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# ARC-IT Tools Integration

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- FUTURE Capability
  - Take the Regional Architecture content as an input for a project in SET-IT
  - Drive more SE analysis using tools → Requirements, ICDs, regional standards

**RAD-IT** ✓



**SET-IT** ✓



# ARC-IT Tool Set Supports Application & Usage of Architecture

