

Austin Regional Intelligent Transportation Systems

Architecture and Deployment Plan

STAKEHOLDER WORKSHOP



Outline

Welcome and Introductions

Overview of the Regional ITS Architecture

Review of Regional ITS Needs and Level of ITS Deployment

Use and Maintenance of the Regional ITS Architecture

Regional ITS Architecture Website

Next Steps



Overview of the Regional Architecture

What is ITS?

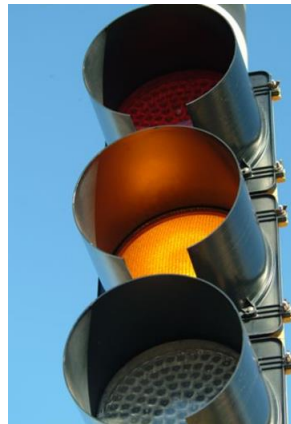
ITS

An acronym that stands for Intelligent Transportation Systems.

One Definition of ITS

The application of data processing and data communications to surface transportation to increase safety and efficiency.

What is ITS?



Why Deploy ITS?

REDUCE CONGESTION

Congestion caused urban Americans to travel **6.9 billion hours** longer and use an extra **3.1 billion gallons** of fuel for an estimated congestion cost of **\$160 billion**.*

INCREASE SAFETY

In 2017, Texas had 3,721 traffic fatalities and 14,299 serious injury crashes.

IMPROVE RELIABILITY and DECREASE TRAVELER FRUSTRATION

Travelers report variability in travel times to be one of their greatest sources of frustration.

**from the 2015 Urban Mobility Scorecard*

What is the Regional ITS Architecture?

A long-range plan for the deployment, integration, and operation of ITS.

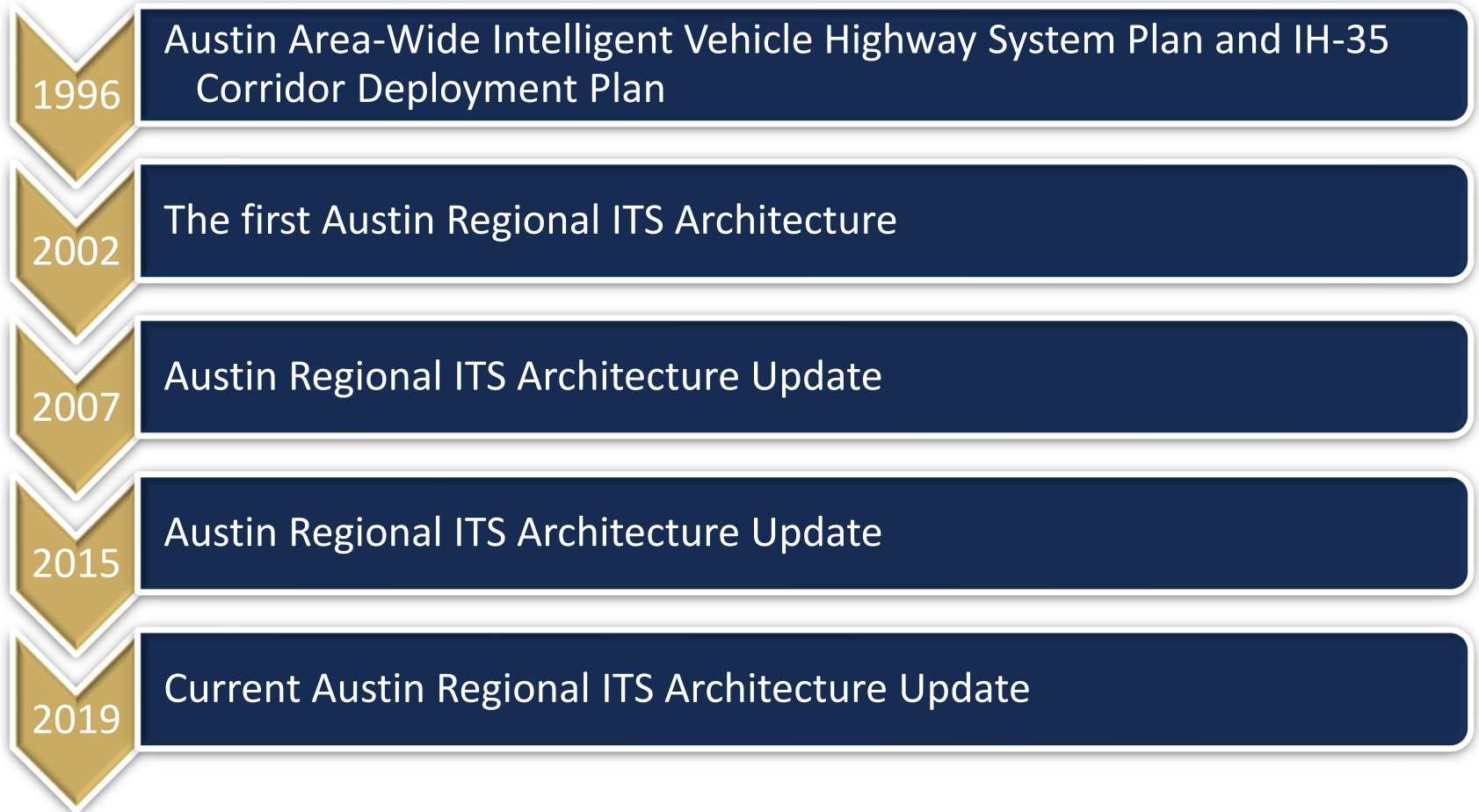
The architecture acts as a framework for ensuring institutional agreement and technical integration among **stakeholders** for the implementation of ITS projects in a particular region.

Purpose of the Architecture

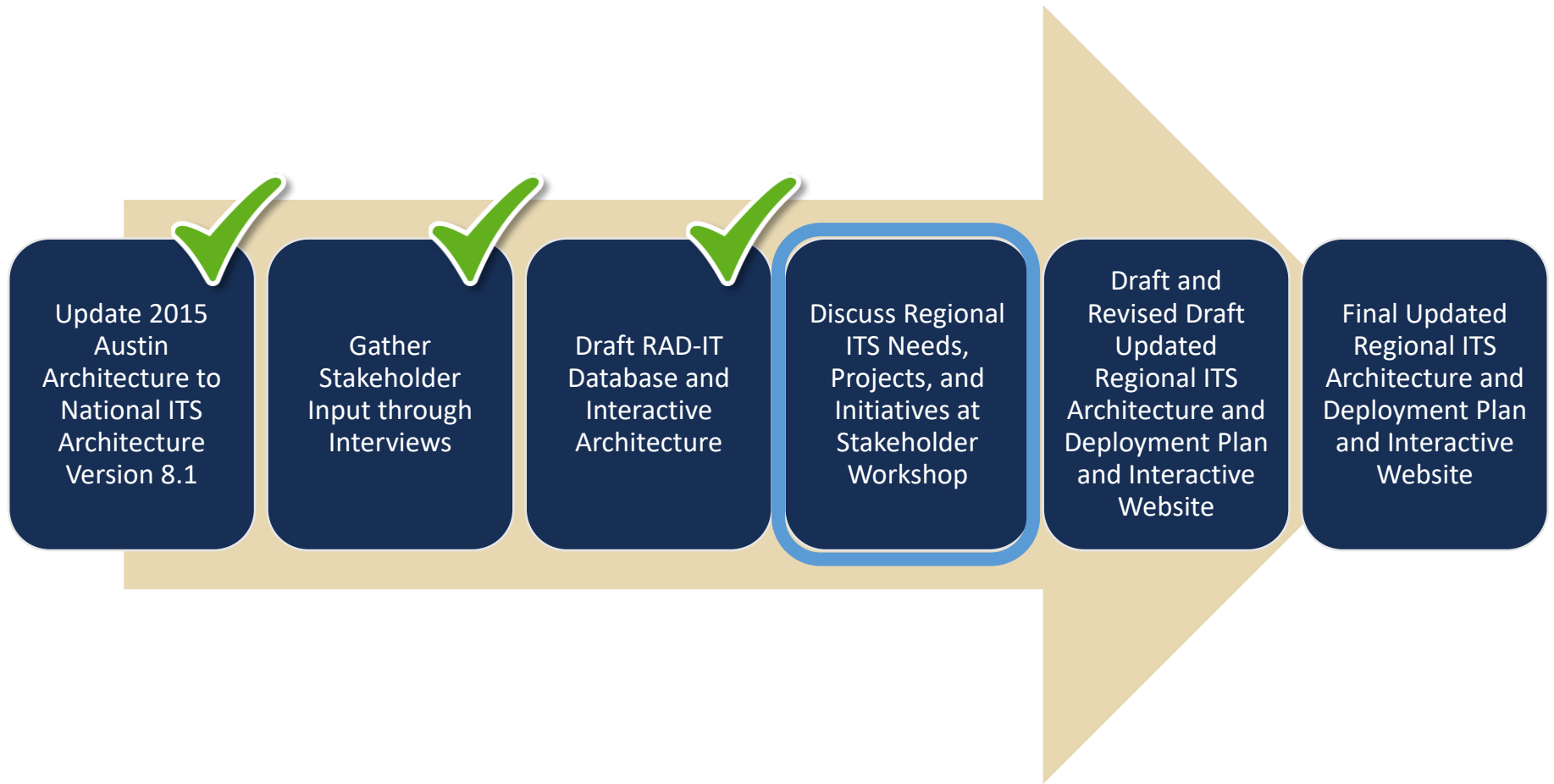
- To provide a vision for ITS in the region
- To identify key stakeholders and interagency relationships
- To develop a blueprint for the integration of systems
- To provide a framework for more detailed project design
- To help identify project-level requirements
- To demonstrate conformity for ITS projects using federal funding



History in the Austin Region



Architecture Update Process



National ITS Architecture Structure

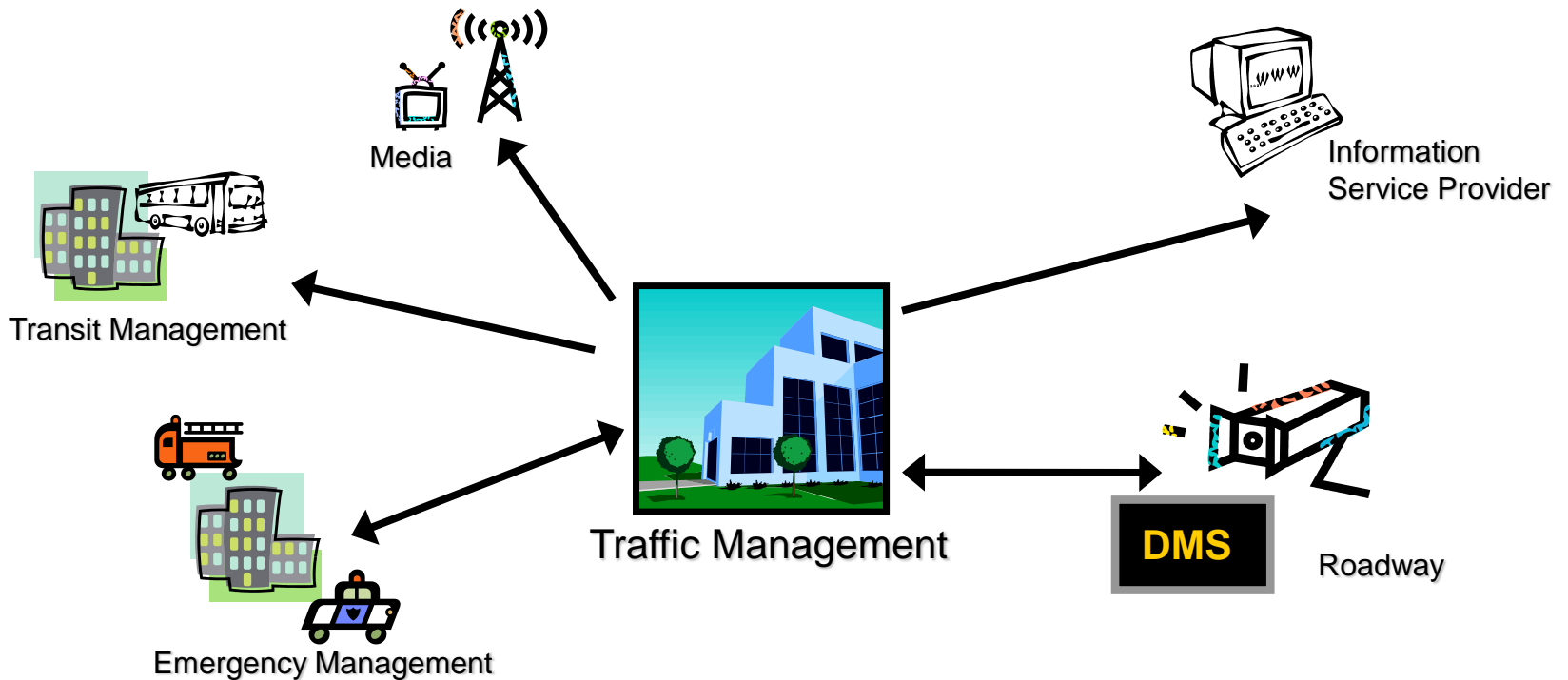
Twelve Service Areas for ITS

- Traffic Management
- Traveler Information
- Public Safety
- Maintenance and Construction
- Commercial Vehicle Operations
- Sustainable Travel
- Public Transportation
- Weather
- Data Management
- Support
- Parking Management
- Vehicle Safety

National ITS Architecture Structure

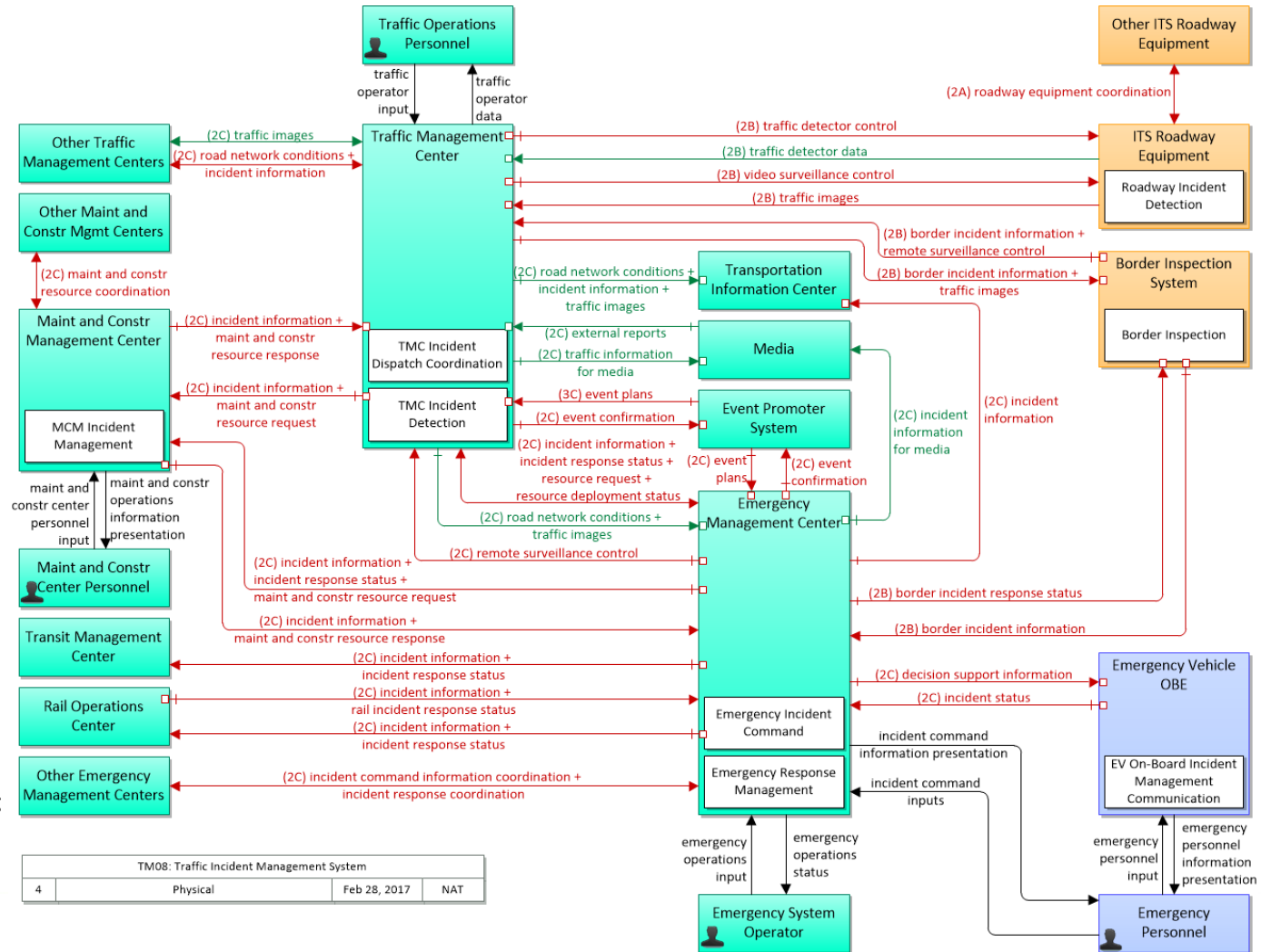
- Each service area includes multiple ITS service packages
- ITS service packages provide a visual representation of how ITS services are deployed and how information is shared
- Total of 139 ITS service packages in the National ITS Architecture (compared to 97 in previous version)
- 89 Service packages selected for Austin (compared to 59 in previous version)

National ITS Architecture Structure



**TM08 – Traffic Incident Management
Example ITS Service Package**

National ITS Architecture Structure

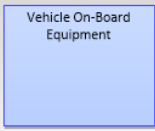


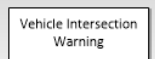
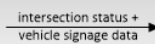


TM08 – Traffic Incident Management Example ITS Service Package

TM08: Traffic Incident Management System			
4	Physical	Feb 28, 2017	NAT

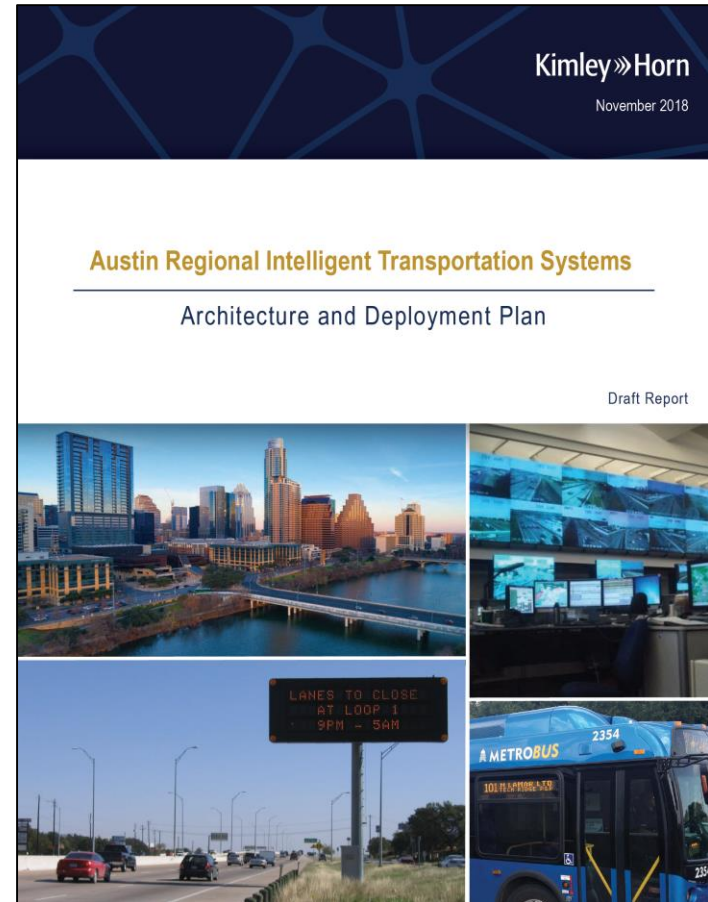
National ITS Architecture Structure

ITS Service Package Legend

<p>The Physical View Service Package Diagrams show the subset of the ARC-IT Physical View that supports each service package. These diagrams identify the physical objects, functional objects, and information flows that support each service package.</p>	
	<p>Physical objects are shown as colored rectangles. They represent the operational centers, field equipment, vehicle on-board equipment, traveler devices, and support systems in the Intelligent Transportation Systems environment. They are color coded to identify which of these classes they belong to. Since they correspond closely with the physical transportation system, the interfaces between physical objects tend to be prime candidates for standardization.</p> <div style="display: flex; justify-content: space-around; align-items: center;"> <div style="border: 1px solid black; background-color: #00FFCC; width: 40px; height: 20px; margin: 2px;"></div> <div style="border: 1px solid black; background-color: #FFA500; width: 40px; height: 20px; margin: 2px;"></div> <div style="border: 1px solid black; background-color: #ADD8E6; width: 40px; height: 20px; margin: 2px;"></div> <div style="border: 1px solid black; background-color: #FFFF00; width: 40px; height: 20px; margin: 2px;"></div> <div style="border: 1px solid black; background-color: #90EE90; width: 40px; height: 20px; margin: 2px;"></div> </div>
	<p>People also have an operational role in ITS. People are shown in the physical view as colored rectangles that include a human silhouette that distinguishes them from the other physical objects that represent man-made parts of the Connected Vehicle environment. Like the other physical objects, they are color coded to represent the environment where they primarily operate.</p>
	<p>Some of the physical objects defined in ARC-IT primarily provide a communications capability that enables other physical objects to share information. These communications objects are not shown on every interface where they apply to keep the service package diagrams manageable, but when they are included, they are shown as physical objects with the support class color and rounded corners to distinguish them from other physical objects.</p>
	<p>Functional objects are shown as smaller white rectangles that are contained within a physical object. Functional objects define the functionality that is required for each physical object to support one or more service packages. The functional objects serve as service-oriented containers for the functionality defined in the Functional View. Not all physical objects include functional objects since functionality that is peripheral to a particular service may not be shown on the service package diagram. Physical objects that are peripheral to ITS (e.g., a Financial Center or Weather Service Center) may not include functional objects in any of the service packages. The interfaces to these physical objects are important to ITS, but ITS will not add functionality to these broader systems.</p>
	<p>Information flows between physical objects are shown as solid lines that include arrowheads to indicate the direction the information is flowing. The flow is labeled with one or more flow names that identify the information that is transferred. The source physical object, destination physical object, and information flow together identify a "triple". The relationship between functional objects and information flows are not shown on the diagram. Consult the website or the database to view the specific functional objects that are associated with each information flow.</p>
<p>Flow Time Context</p> <p>1 - Now 3 - Historical 2 - Recent 4 - Static</p>	<p>Flow Time Context is represented as a number to the left of the flow name. This indicates the time sensitivity of the data contained within the information flow. The values are "Now", "Recent", "Historical", or "Static" for data that never or rarely ever changes.</p>
<p>Flow Spatial Context</p> <p>A - Adjacent D - National B - Local E - Continental C - Regional</p>	<p>Flow Spatial Context is represented by a letter to the left of the flow name. This indicates the spatial relevance of the data contained within the information flow. The values are "Adjacent", "Local", "Regional", "National", or "Continental".</p>
<p>Flow Cardinality</p> <p>Unicast → Multicast →→ Broadcast →→→</p>	<p>Flow Cardinality shows whether a flow is unicast (sent to one destination), multicast (sent to multiple addressees), or broadcast (sent to anyone with the right equipment). It is represented by the arrowhead – single, closed; single, open; or double, closed.</p>
<p>Flow Control</p> <p>→ Receipt acknowledged → Transaction initiated by left-hand party</p>	<p>A crossing line at the flow source indicates whether an information flow is acknowledged. Flows that are part of a transaction initiated by one side or the other are shown with a white box on the side that initiates the transaction. <i>(Note: the initiator boxes are only available in PNG format, the SVG drawings do not show the initiator boxes.)</i></p>
<p>Flow Security</p> <p>→ Clear text, No Authn → Encrypted, No Authn → Clear text, Authenticated → Encrypted, Authenticated</p>	<p>Flow Security is used to indicate what mechanisms should be in place in order for the information to get to its destination securely and in support of the overall security and privacy requirements for the system and its users. Black indicates 'clear' or no security specified; Blue indicates it should be encrypted but the sender does not have to be authenticated as the source of the message; Green indicates the information can be sent without encryption but the sender should be authenticated; Red indicates flows that require both encryption of the information and authentication of the source. These characteristics are based on a FIPS-199 analysis that evaluates confidentiality, integrity, and availability requirements for each triple.</p>

Key Content of the Regional ITS Architecture and Deployment Plan

- Stakeholder Agencies
- Regional ITS Needs
- Inventory of Existing and Planned Components
- ITS Service Packages
- Standards
- Deployment Plan
- Use and Maintenance





What Have We Heard So Far?

Regional ITS Needs

Improved coordination and data sharing between agencies, including computer-aided dispatch (CAD) and incident status

Opportunities for consolidated regional traffic management

Increased interagency access to ITS resources (e.g., CCTV cameras and Dynamic Message Signs)

Ability to pay a single fare for a transit trip involving multiple transit providers

Readiness for industry advancements in Connected and Automated Vehicles

Expansion of emergency vehicle preemption and freeway safety service patrol



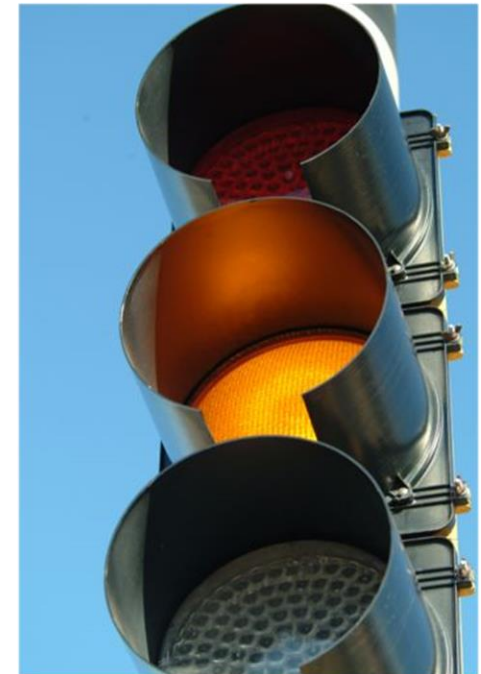
What are our Regional Needs
and Level of ITS Deployment?

Service Area 1 Traffic Management

Level of Deployment	High
Level of Interest	High

Example service packages include:

- Traffic Signal Control
- Traffic Incident Management System
- Variable Speed Limit Signs
- Ramp Metering



Service Area 2 Traveler Information

Level of Deployment	Medium
Level of Interest	High

Example service packages include:

- Broadcast Traveler Information
- Dynamic Route Guidance
- In-vehicle Signage



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Service Area 3 Public Safety

Example service packages include:

- Emergency Vehicle Preemption
- Roadway Service Patrols
- Disaster Response and Recovery

Level of Deployment	Medium
Level of Interest	High



Service Area 4 Maintenance and Construction

Example service packages include:

- Maintenance Vehicle and Equipment Tracking
- Infrastructure Monitoring
- Roadway Automated Treatment

Level of Deployment	Medium
Level of Interest	High



Service Area 5 Commercial Vehicle Operations

Level of Deployment	Medium
Level of Interest	High

Example service packages include:

- Electronic Clearance
- HAZMAT Management
- Roadside and Virtual Weigh-in-Motion



Service Area 6

Sustainable Travel

Example service packages include:

- Emissions Monitoring
- Electric Charging Stations Management
- HOV/HOT Lane Management

Level of Deployment	Low
Level of Interest	Medium

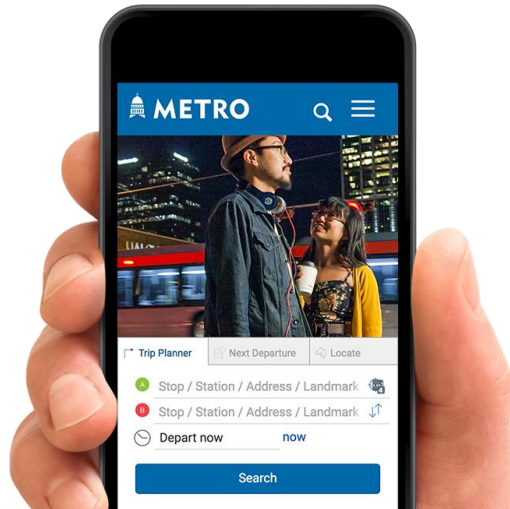


Service Area 7 Public Transportation

Level of Deployment	Medium
Level of Interest	High

Example service packages include:

- Transit Vehicle Tracking
- Transit Traveler Information
- Transit Signal Priority



Service Area 8 Weather

Level of Deployment	Medium
Level of Interest	Medium

Example service packages include:

- Weather Data Collection
- Weather Information Processing and Distribution
- Spot Weather Impact Warning



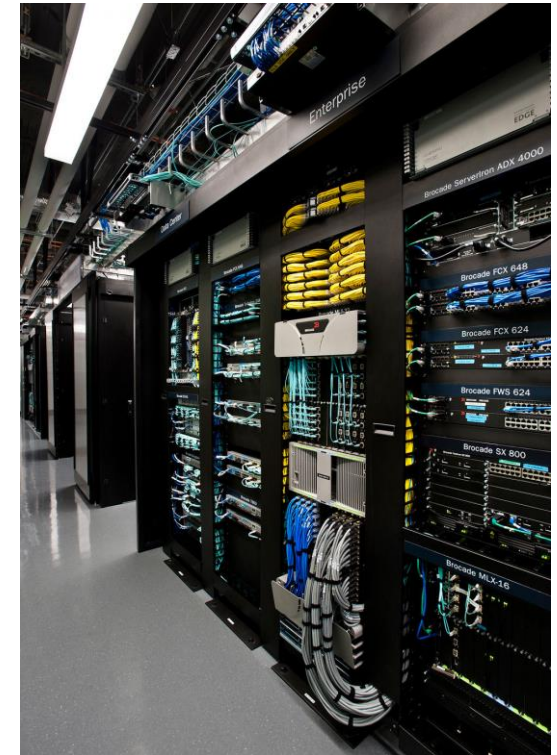
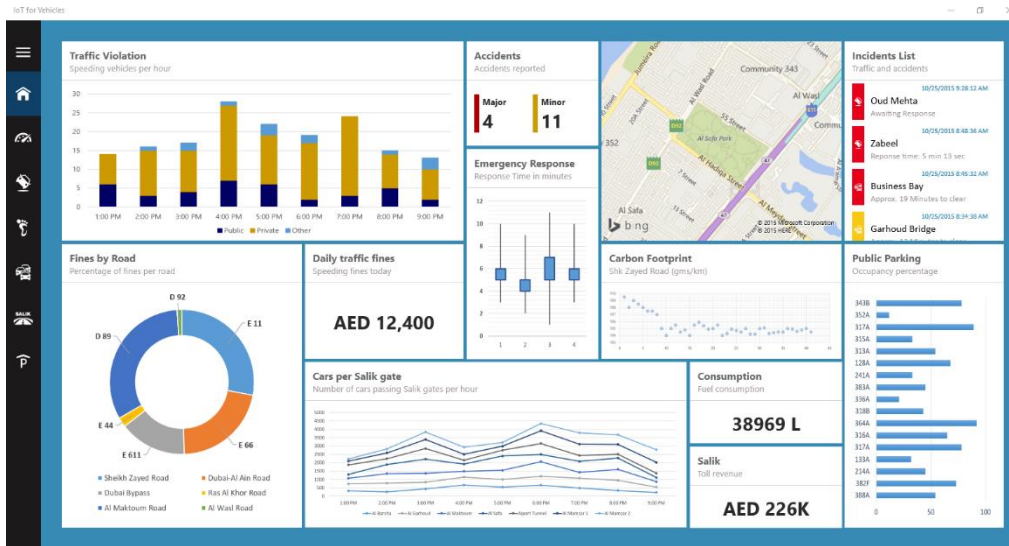
Service Area 9

Data Management

Example service packages include:

- ITS Data Warehouse
- Performance Monitoring

Level of Deployment	Low
Level of Interest	High



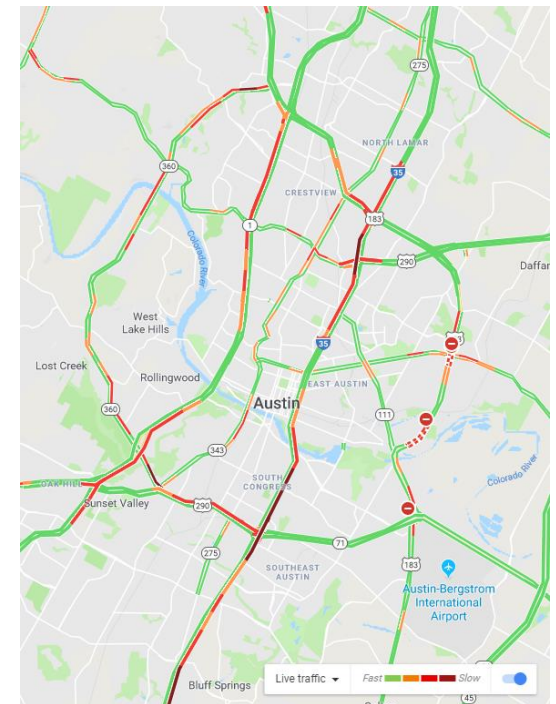
Service Area 10 Support

Catch-all category for systems supporting transportation operations.

Level of Deployment	Medium
Level of Interest	Medium

Example service packages include:

- Map Management
- Data Distribution
- Security and Credentials Management

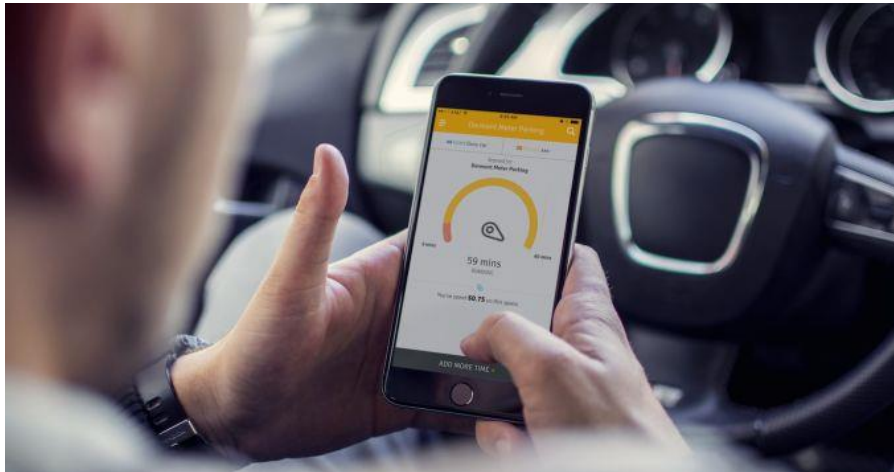


Service Area 11 Parking Management

Example service packages include:

- Parking Space Management
- Parking Electronic Payment
- Smart Park and Ride System

Level of Deployment	Medium
Level of Interest	Medium



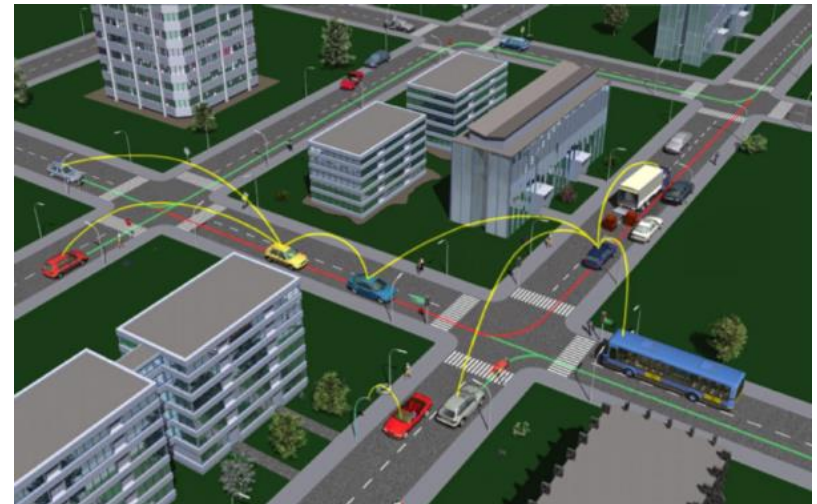
Service Area 12

Vehicle Safety

Level of Deployment	Low
Level of Interest	High

Example service packages include:

- Connected Vehicle Curve Speed Warning
- Connected Vehicle Queue Warning
- Automated Vehicle Operations





Potential Regional ITS Projects and Operations Initiatives

Potential Regional ITS Projects and Operations Initiatives

- Regional Platform for Camera and DMS Sharing
- Regional Platform for Incident Information Sharing
- Integrated Corridor Management
- Regional Traffic Management Center Concepts
 - Travis County
 - Williamson County
- Regional Transit Fare System
- Data Management
- **Other Regional Projects?**



Use and Maintenance

Systems Engineering

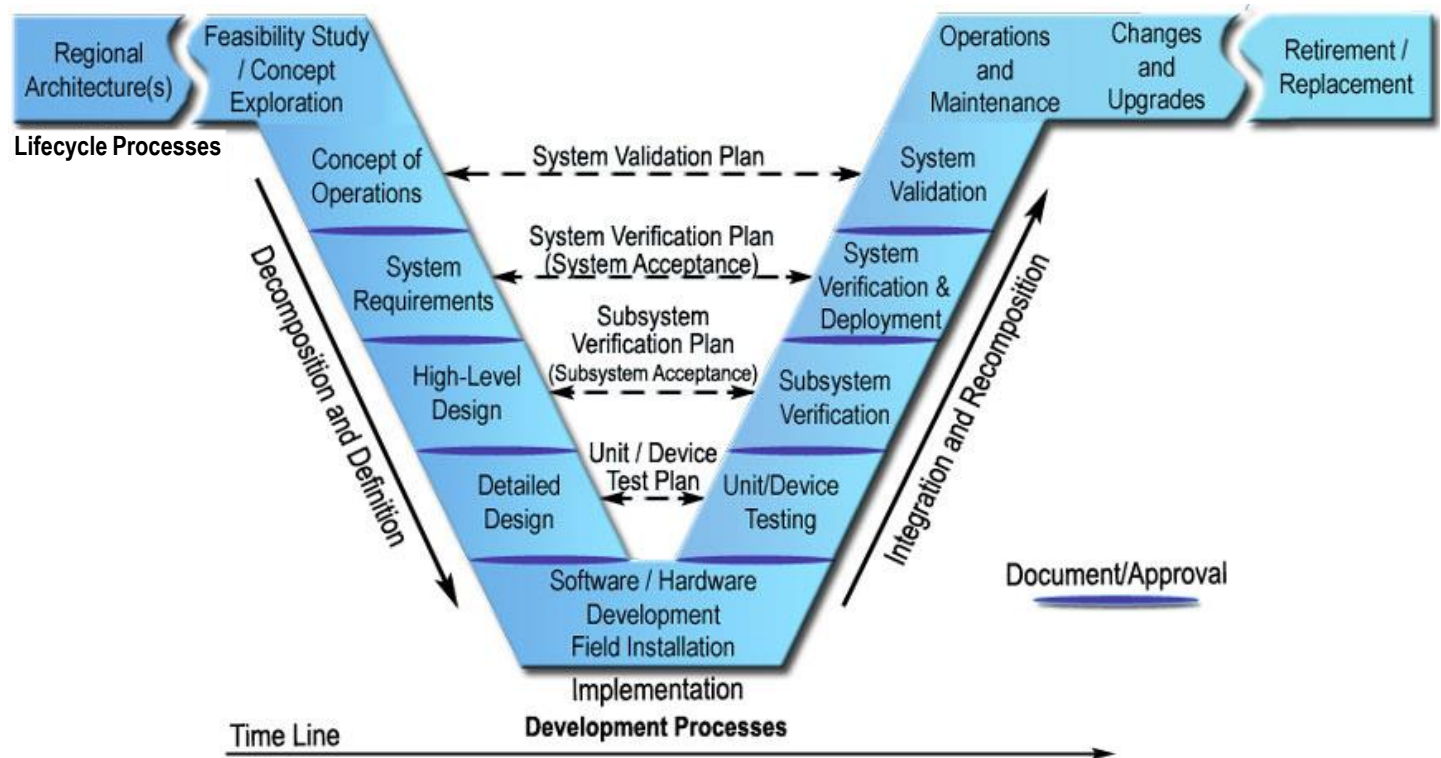
Definition

Systems engineering is an interdisciplinary approach to enable the realization of successful systems. It **focuses on defining customer needs and required functionality early** in the development cycle, documenting requirements, then proceeding with design synthesis and system validation while considering the complete problem.

Requirements

Using a systems engineering approach is required by the USDOT for ITS projects. The process includes demonstrating conformance to the Regional ITS Architecture.

Systems Engineering



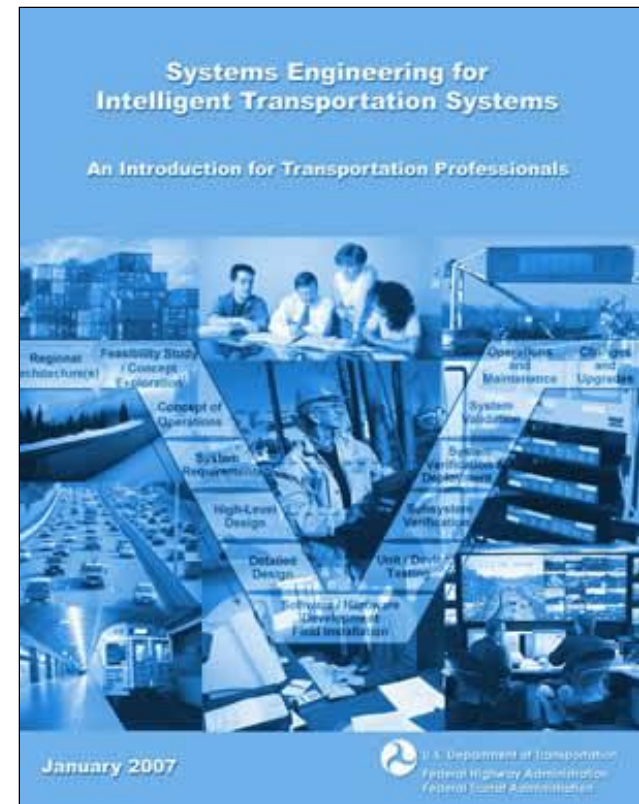
Systems Engineering Analysis

USDOT Systems Engineering Requirements

- Required for all ITS projects funded with highway trust funds
- Scale should be commensurate with the project scope
- Includes:
 - Identification of the part of the ITS architecture being implemented
 - Agencies roles and responsibilities
 - Alternatives analysis
 - Standards

Resources

FHWA Systems Engineering for Intelligent Transportation Systems An Introduction for Transportation Professionals



Resources

The screenshot shows a web browser displaying the ARC-IT website. The browser's address bar shows the URL <https://local.teris.com/arc-it/index.html>. The website header includes the United States Department of Transportation logo and the title "ARC-IT Version 8.1 The National ITS Reference Architecture". A navigation menu is visible with options like "Architecture", "Architecture Use", "Architecture Resources", "Architecture Terminology", and "Contact The Architecture Team".

The main content area features the title "Architecture Reference for Cooperative and Intelligent Transportation" and a brief introduction: "The Architecture Reference for Cooperative and Intelligent Transportation (ARC-IT) provides a common framework for planning, defining, and integrating intelligent transportation systems. It is a mature product that reflects the contributions of a broad cross-section of the ITS community (transportation practitioners, systems engineers, system developers, technology specialists, consultants, etc.)."

Below the introduction, there is a "Latest News" section with three entries:

- ARC-IT 8.1** is a major release of the National ITS Architecture that significantly enhances 8.0. ARC-IT merges, unifies, and enhances Version 7.1 of the National ITS Architecture and CVRIA Version 2.2. [Read more...](#)
- July 2018 – Both **RAD-IT** and **SET-IT** have been updated with new features and performance improvements. See below for details.
- RAD-IT 8.1** has been substantially upgraded to include support for network drives, file logging, and updated import from SET-IT. [Read more...](#)
- SET-IT 8.1** is a major new release of the systems engineering software tool that includes performance improvements, updated import from RAD-IT, and many new features. [Read more...](#)

To the right of the news section is a vertical stack of four diagrams representing different views of the architecture:

- Enterprise View**: Relationships between Organizations
- Functional View**: Logical Interactions between Functions
- Physical View**: Connections between Physical Objects
- Communications View**: Learned protocols facilitating data exchange between Physical Objects

At the bottom of the page, there is a list of links for further information:

- [Architecture](#) contains links to all of the content inside the architecture, and describes the structure of the architecture. In particular:
 - [Service Packages](#) provide the most straightforward entry into ARC-IT content. Similar in appearance to CVRIA applications, these include all of the services defined in both CVRIA and the National ITS Architecture 7.1.
 - [Views](#) and its sub-menus provide view-specific content; if for example you are looking for a particular [information flow](#), or a particular [communications profile](#), browse the relevant physical and communications sections here.
 - [Methodology](#) and its sub-menus describe the structure of the architecture: how it is built, how the artifacts within are inter-related.
 - The [Security](#) section describes how security is addressed throughout the architecture and provides links to cross-cutting security content.
- [Architecture Use](#) describes how to use ARC-IT, from the perspective of a regional architect or project systems engineer.
- [Architecture Resources](#) provides access to all ARC-IT content in user-downloadable forms. Notably this also includes access to our tools: RAD-IT and SET-IT, that provide you with means to manipulate the architecture according to models' rules, customizing the reference architecture to your regional or project needs.
- [Architecture Terminology](#) provides those definitions that permeate these pages.
- [Contact the Architecture Team](#) gives you a direct line to the source. We want to hear from you! If you have questions, concerns or find an error (say it isn't

National ITS Architecture Website

Architecture Website and Download for ARC-IT and SET-IT

Use and Maintenance Plan

ITS Architecture Maintenance Procedure Needs to Identify

1. Maintenance Process (Documentation Form)
2. Lead Maintenance Agency
3. Timeframe for Updates

Austin Regional ITS Architecture
Architecture Maintenance Documentation Form

Please complete the following questionnaire to document changes to the Austin Regional ITS Architecture. Modifications will be made during the next update of the Regional ITS Architecture.

Contact Information

Agency	
Agency Contact Person	
Street Address	
City	
State, Zip Code	
Telephone	
Fax	
E-Mail	

Change Information

Please indicate the type of change to the Regional ITS Architecture or Deployment Plan:

- Administrative Change:** Basic changes that do not affect the structure of the ITS service packages in the Regional ITS Architecture.
Examples include: Changes to stakeholder or element name, element status, or data flow status.
- Functional Change: Single Agency:** Structural changes to the ITS service packages that impact only one agency in the Regional ITS Architecture.
Examples include: Addition of a new ITS service package or changes to data flow connections of an existing ITS service package. The addition or changes would only impact a single agency.
- Functional Change: Multiple Agencies:** Structural changes to the ITS service packages that have the potential to impact multiple agencies in the Regional ITS Architecture.
Examples include: Addition of a new ITS service package or changes to data flow connections of an existing ITS service package. The addition or changes would impact multiple agencies and require coordination between the agencies.
- Project Change:** Addition, modification, or removal of a project in the Regional ITS Deployment Plan.
- Other:** _____

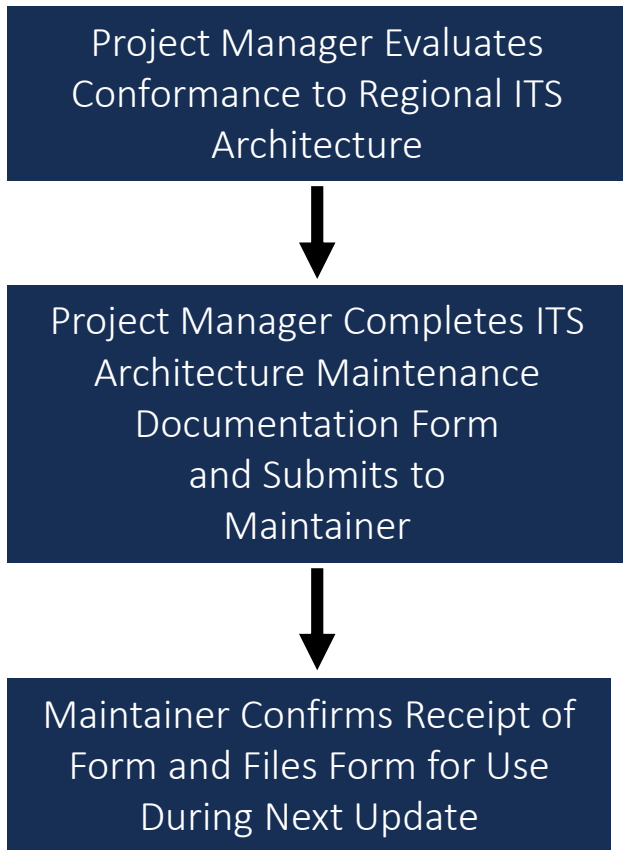
Submittal

Please submit ITS Architecture Maintenance Documentation form to one of the following agencies:
 CAMPO – Submit form to CAMPO for changes related to projects located in Bastrop, Burnet, Caldwell, Hays, Travis, and Williamson Counties
 TxDOT Austin District – Submit form to TxDOT Austin District for changes related to projects located in Blanco, Gillespie, Lee, Llano, and Mason Counties

Form Submittal Date: _____

Regional ITS Architecture Maintenance Form
Version 2.0 June 2015

Use and Maintenance Plan



Austin Regional ITS Architecture Architecture Maintenance Documentation Form															
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<p>Change Information</p> <p>Please indicate the type of change:</p> <ul style="list-style-type: none"> <input type="checkbox"/> Administrative Change: Based on the Regional ITS Architecture. Examples include: Changes to the Regional ITS Architecture. <input type="checkbox"/> Functional Change: Single agency in the Regional ITS Architecture. Examples include: Addition of a new agency, modification of an existing ITS service package. <input type="checkbox"/> Functional Change: Multiple agencies in the Regional ITS Architecture. Examples include: Addition of a new agency, modification of an existing ITS service package, coordination between the agencies. <input type="checkbox"/> Project Change: Addition, modification, or deletion of a project. <input type="checkbox"/> Other: _____ 															
<p>Submittal</p> <p>Please submit ITS Architecture Maintenance Documentation Form to:</p> <p>CAMPO – Submit form to CAMPO, 10000 N. Mopac Expressway, Suite 1000, Austin, TX 78758</p> <p>Travis, and Williamson Counties</p> <p>TxDOT Austin District – Submit form to: 10000 N. Mopac Expressway, Suite 1000, Austin, TX 78758</p> <p>Blanco, Gillespie, Lee, Llano, and Nueces Counties</p>															
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<p>Regional ITS Architecture Maintenance Form Version 2.0 June 2015</p>															

Regional ITS Architecture Maintenance Process

Maintenance Details	Regional ITS Architecture and Deployment Plan	
	Modification	Complete Update
Timeframe for Updates	As needed	Every 4 years
Scope of Update	Update service packages to satisfy architecture compliance requirements of projects or to document other changes that impact the ITS Architecture	Entire ITS Architecture and Deployment Plan
Lead Agency	TxDOT/CAMPO	TxDOT/CAMPO
Participants	Stakeholders impacted by service package modifications	Entire stakeholder group
Results	Service package or other change(s) documented for next complete update	Updated Austin Regional ITS Architecture document, Appendices, and RAD-IT database



Regional ITS Architecture Website

Regional ITS Architecture Website



Austin ITS Architecture

Overview Project Documents Interactive Architecture Use and Maintenance Agreements Resources Contacts

Austin Regional ITS Architecture

The Austin Regional Intelligent Transportation Systems (ITS) Architecture provides a long-range plan for the deployment, integration, and operation of ITS in the Austin Region. The plan is required by the Federal Highway Administration (FHWA) and Federal Transit Administration (FTA) in order to use federal transportation funds on ITS projects. Development of the plan also provides the Region with a framework for implementing ITS projects, encourages interoperability and resource sharing among agencies, identifies applicable standards to apply to projects, and allows for cohesive long-range planning among regional stakeholders in the Austin Region.

The Regional ITS Architecture update was led by the Texas Department of Transportation (TxDOT) in close coordination with stakeholders throughout the Austin Region. Stakeholders included local, regional, state, and federal agencies representing traffic, transit, public safety, emergency management, and rail in the Austin Region. A complete list of stakeholders that participated in the update can be found in the Austin Regional ITS Architecture and Deployment Plan document.

www.AustinITSArchitecture.com



Next Steps

Next Steps

Conduct additional outreach for input into the Regional ITS Architecture

Develop Draft Austin Regional ITS Architecture and Deployment Plan and Interactive Website over the next month

Finalize Architecture and Deployment Plan and Interactive Website following stakeholder review

Thank You!

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