



# Chattanooga Regional ITS Architecture Update

## Stakeholder Kickoff Meeting

Kimley»Horn

October 18, 2016

# Outline

## Overview of ITS

- What is ITS?
- ITS Benefits
- ITS Applications

## Overview of Regional ITS Architectures

- What is a Regional ITS Architecture?
- Benefits of the Regional ITS Architecture
- Other Federal FHWA Programs and Initiatives

## Discussion

- Regional ITS Architecture Update Process
- Existing and Planned Projects in the Region
- ITS Needs in the Region
- Interagency Connections in the Region

# What is ITS?

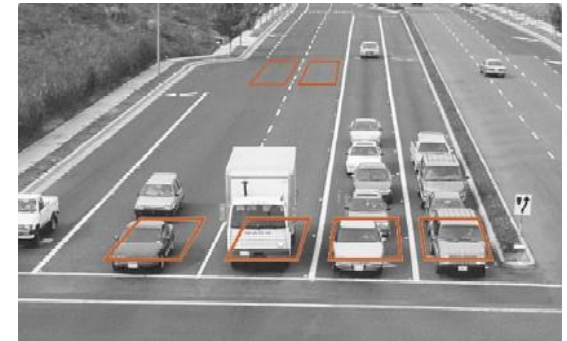
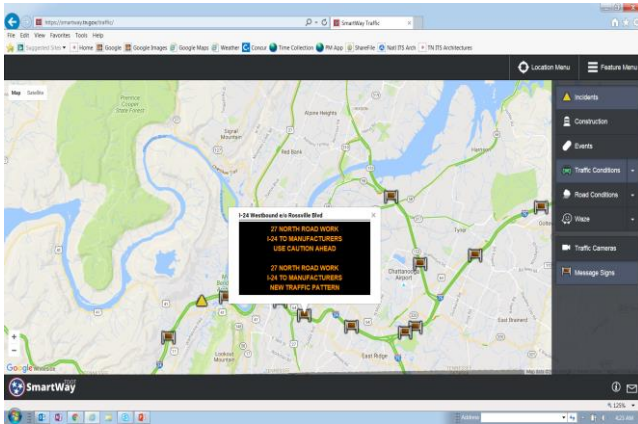
## *ITS:*

An acronym that stands for Intelligent Transportation Systems.

## *One definition of ITS:*

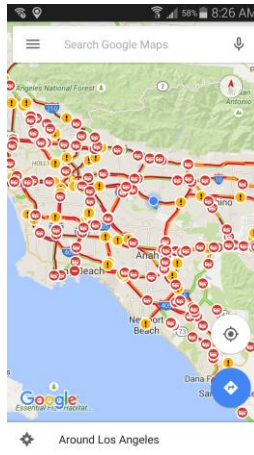
The application of data processing and data communications to surface transportation to increase safety and efficiency.

# What is ITS?



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# Why Deploy ITS?



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# Why Deploy ITS?



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**

Annual delay for the average traveler was **42 hours**, wasting **19 gallons** of fuel at a value of about **\$960** per traveler

Some of the most common causes of congestion included incidents, special events, and weather

*\*from the 2015 Urban Mobility Scorecard*

# ITS Benefits

Increased roadway and transit efficiency

Enhanced incident and special event management

Improved safety for travelers, public safety, and maintenance personnel

Accurate and timely traveler information

# ITS Applications

Traffic Management

Traveler Information

Emergency Management

Maintenance & Construction Management

Public Transportation

Commercial Vehicle Operations

Archived Data Management

Vehicle Safety (Connected & Autonomous Vehicles)

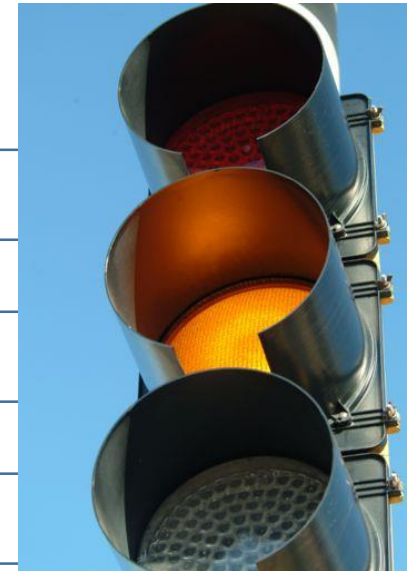


# Traffic Management

Data Collection

Control

Roadside Traveler Information



# Traveler Information

Traveler Information Website

511 Traveler Information Phone Number



https://smartway.tn.gov/traffic/

SmartWay Traffic

Location Menu Feature Menu

Map Satellite

Prentice Cooper State Forest

Signal Mountain

Alpine Heights

Red Bank

Harrison

Chattanooga Airport

East Ridge

SmartWay TDOT

27 NORTH ROAD WORK  
I-24 TO MANUFACTURERS  
USE CAUTION AHEAD

27 NORTH ROAD WORK  
I-24 TO MANUFACTURERS  
NEW TRAFFIC PATTERN

- Incidents
- Construction
- Events
- Traffic Conditions
- Road Conditions
- Waze
- Traffic Cameras
- Message Signs

SmartWay TDOT

125%

10:46 PM

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# Emergency Management

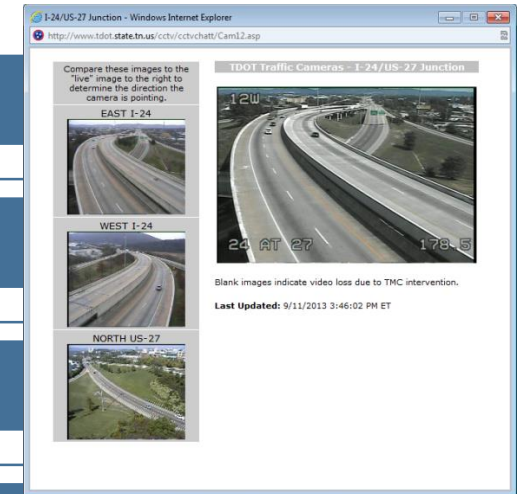
Computer-aided Dispatch Systems

AMBER Alerts

Traffic Signal Preemption

Video/Information Sharing

Coordinated Incident Management



# Public Transportation

Smart Fare Payment Systems

Automated Vehicle Location

Video Security Systems

Real-time Bus Arrival Information

Transit Signal Priority

Automated Passenger Counters



## Commercial Vehicle Operations

Freight Administration

Weigh-In-Motion

HAZMAT Management

Freight Assignment Management



***\*Not a large component of regional ITS planning because CVO are mostly determined at a state level.***

## Maintenance & Construction Management

Flood Detection and Closure Systems

Smart Work Zones

Anti-icing Systems

Vehicle Tracking Systems

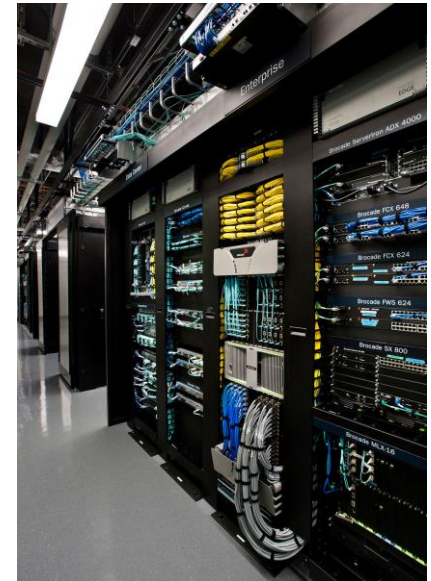
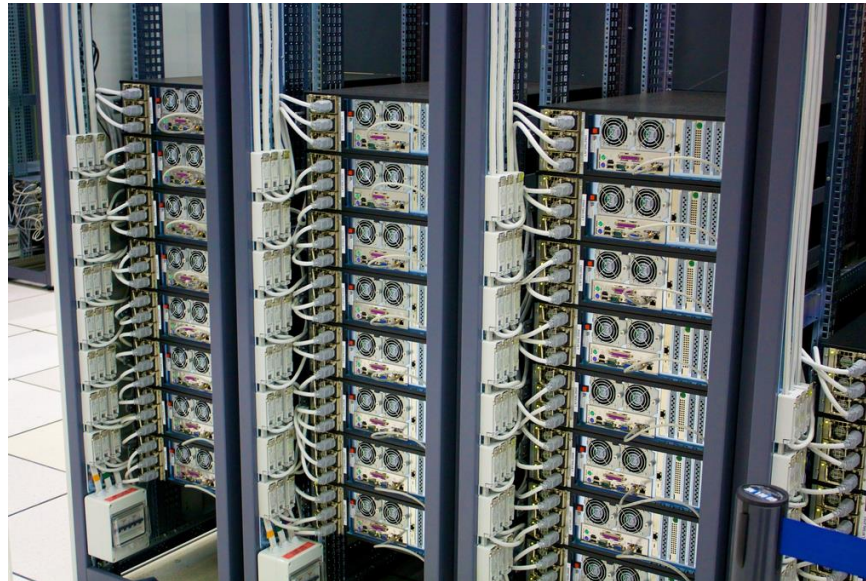


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# Archived Data Management

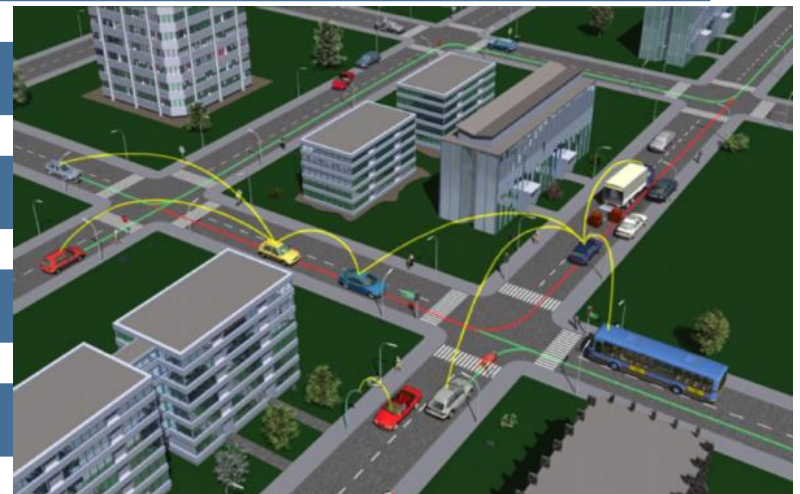
Archived Data User Service at Traffic Management Centers

ITS Virtual Data Warehouse



# Emerging ITS Technologies

- Automated Vehicles
- Connected Vehicles
- Active Traffic Management
- Integrated Corridor Management
- Decision Support Systems
- Vehicle Detection System (Bluetooth)
- Privatized Traffic Data





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# Regional ITS Architectures – an overview

Nick Renna

Operations Program Manager  
Federal Highway Administration  
Tennessee Division Office



# Discussion Topics

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Skyscape over Autumn Colors on the Cherokee Skyway

1. Regional ITS Architectures
2. Planning for “TSM&O”
3. Connected Vehicles – V2I
4. Real-time traveler information
5. Opportunities for Chattanooga RITSA update

# Regional ITS what?

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## *Regional Intelligent Transportation System Architecture*

...or **“RITSA”**

Put simply, it is a vision for how transportation should work in a metropolitan area given all the technologies that are reasonably expected to be available.



# Key pieces of a RITSA:

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Skyscape over Autumn Colors on the Cherokee Skyway

- Regional description
- Stakeholders
- Operational concept, including roles and responsibilities
- Operational agreements (such as MOUs)
- Functional requirements
- Information exchanges: existing and planned
- Applicable ITS standards
- Project sequence (a.k.a. deployment plan)

# Why should you care?

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- All Highway Trust Fund ITS projects must conform with a RITSA

...yes, but RITSAs also:

- Help scope projects appropriately
- Ensure regional interoperability
- Offer a focused perspective for long-range planning
- Ensure preparedness for un-deployed technologies

# What could happen when you don't have a good, up-to-date RITSA:

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- The **traveler experience is inconsistent**, traveler information doesn't achieve its potential, and public satisfaction worsens
- Across jurisdictions **systems are incompatible**, and opportunities to enhance safety and mobility are missed
- Project **life-cycle is reduced** as obsolescence becomes commonplace
- Agency **costs rise** as ITS deployments become segregated from other project deliveries

# A RITSA should be based on:

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- The requirements of 23 CFR 940 ([www.ecfr.gov](http://www.ecfr.gov))
- The National ITS Architecture (<http://www.iteris.com/itsarch/index.htm> )
- The respective state or states ITS architecture (<https://www.tn.gov/tdot/topic/its-statewide>)
- Ideally, the format of Turbo Architecture software
- Former RITSA's and adjacent area RITSA's
- **Regional needs and priorities using stakeholder input!**



# RITSA Resources

## ITS ARCHITECTURE IMPLEMENTATION PROGRAM



OFFICE OF OPERATIONS

21<sup>ST</sup> CENTURY OPERATIONS USING 21<sup>ST</sup> CENTURY TECHNOLOGIES

Search Operations:

Go

**Home**

**FHWA Rule/FTA  
Policy**

**Frequently Asked  
Questions**

**Guidance**

**Examples**

**Training**

**Resources**

**Links**

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## ITS Architecture Implementation Program

The ITS Architecture Implementation Program provides ITS practitioners with the guidance and resources necessary for implementing the Final Rule on Architecture and Standards Conformity issued on January 8, 2001. This program is part of the [Facilitating Integrated ITS Deployment Program](#) within the FHWA Office of Operations.

- [FHWA Rule/FTA Policy](#) presents the final text of both the FHWA Rule and the FTA policy, and several fact sheets and brochures.
- [Frequently Asked Questions](#) on the FHWA Final Rule/FTA Final Policy, regional ITS architectures, systems engineering and standards.
- [Guidance](#) contains several guidance documents on developing, using and maintaining a regional ITS architecture.
- [Examples](#) links to example sections of existing regional ITS architectures.
- [Training for ITS Architecture Development and Implementation](#) lists the available training and technical assistance on the development, use and maintenance of a regional ITS architecture including links for scheduling.
- [Resources](#) provides links to tools and information related to regional ITS architectures.
- [Links](#) to related sites.
- [Contact Us](#) for more information and assistance.

Now Available



[Applying a Regional ITS  
Architecture to Support  
Planning for Operations: A  
Primer](#)

[National ITS Architecture  
Version 7.0](#)





Skyscape over Autumn Colors on the Cherokee Skyway



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# Planning for TSM&O



U.S. Department of Transportation  
Federal Highway Administration

# Planning for TSM&O

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- TSM&O = transportation system management and operations
- Purpose of TSM&O = managing the existing capacity of transportation infrastructure with strategies that optimize reliability and safety



# Planning for TSM&O

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## Difference between TSM&O and ITS?

-TSM&O doesn't need to be ITS – for example, freeway service patrols, non-connected traffic signals, special event management, etc.

-Most, if not all, ITS is TSM&O, but not all TSM&O is ITS



# Planning for TSM&O at TDOT

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## Tennessee Division Office

- **Capability Maturity Model (CMM) Assessment** to organize for transportation reliability
- **TSM&O Coordinating Committee** and working groups
- **CMM Implementation Plan** (ITS Asset Management System, TSM&O Annual Report, etc.)
- Sent staff to **Operations Academy** <http://operationsacademy.org/>
- Draft **Traffic Operations Program Plan** and starting new Statewide ITS Architecture
- **Reliability measure** integration in long-range plan policies
- SHRP2 award to apply **regional operations forums (ROFs)**  
[http://www.fhwa.dot.gov/goshrp2/Solutions/Reliability/L36/Regional\\_Operations\\_Forum](http://www.fhwa.dot.gov/goshrp2/Solutions/Reliability/L36/Regional_Operations_Forum)

# Planning for TSM&O at MPOs?

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- Same tools are available

The role of the RITSA:

Applying a  
REGIONAL ITS ARCHITECTURE  
TO SUPPORT PLANNING FOR OPERATIONS  
A PRIMER



<http://www.ops.fhwa.dot.gov/publications/fhwahop12001/index.htm>



U.S. Department of Transportation  
Federal Highway Administration

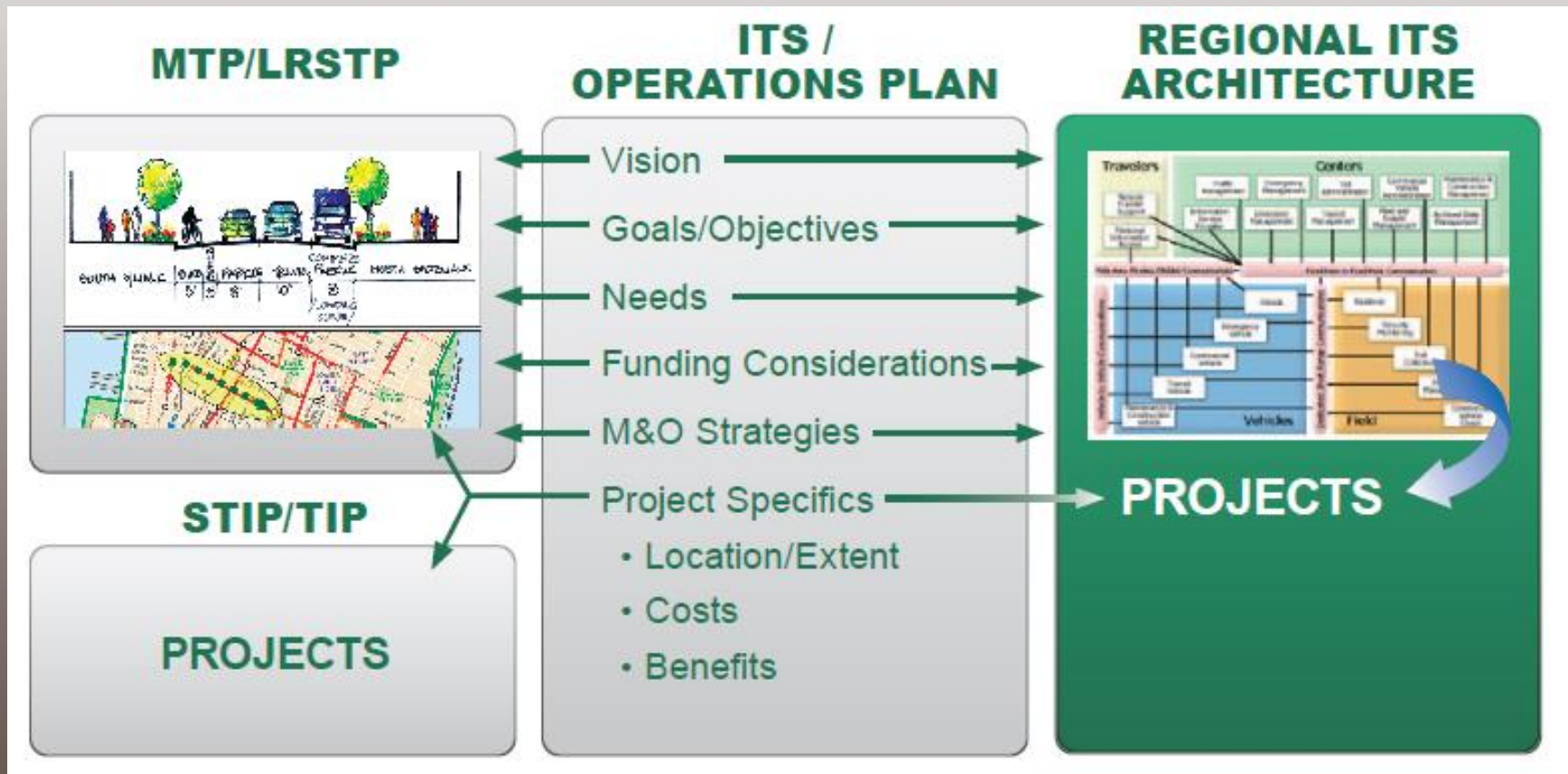


U.S. Department of Transportation  
Federal Highway Administration  
Federal Transit Administration  
Research and Innovative Technology Administration

# Before TSM&O plans:

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# FHWA Planning for Operations

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U.S. Department of Transportation  
Federal Highway Administration

FHWA Home | Feedback

### Planning for Operations

Home About Focus Areas Resources Glossary Links Sitemap Contact



Planning for Operations Workshops and Other Resources  
Links of a Model Transportation Plan  
Integrating Operations

VIEW

VIEW



<http://www.ops.fhwa.dot.gov/plan4ops/index.htm>

### Introduction

The U.S. Department of Transportation's Planning for Operations Program supports the integration of transportation systems management and operations strategies into the planning process for the purpose of improving transportation system efficiency, reliability, and options. This program is led by the Office of Operations and Office of Planning, Environment, & Realty of the Federal Highway Administration (FHWA) in coordination with the Federal Transit Administration (FTA), which work with metropolitan planning organizations, State and local departments of transportation, transit agencies, and other organizations to maximize the performance of existing infrastructure through multimodal and multi-agency programs and projects. [Learn more about planning for operations.](#)

### FOCUS AREAS

- Integrating Operations into Planning and Programming
- Analysis and Performance Measurement
- Regional Collaboration and Coordination
- Organizing for Operations
- Congestion Management Process (CMP)
- Regional Concept for Transportation Operations (RCTO)

Know what you're looking for?

**FIND IT FAST**

### NEWS

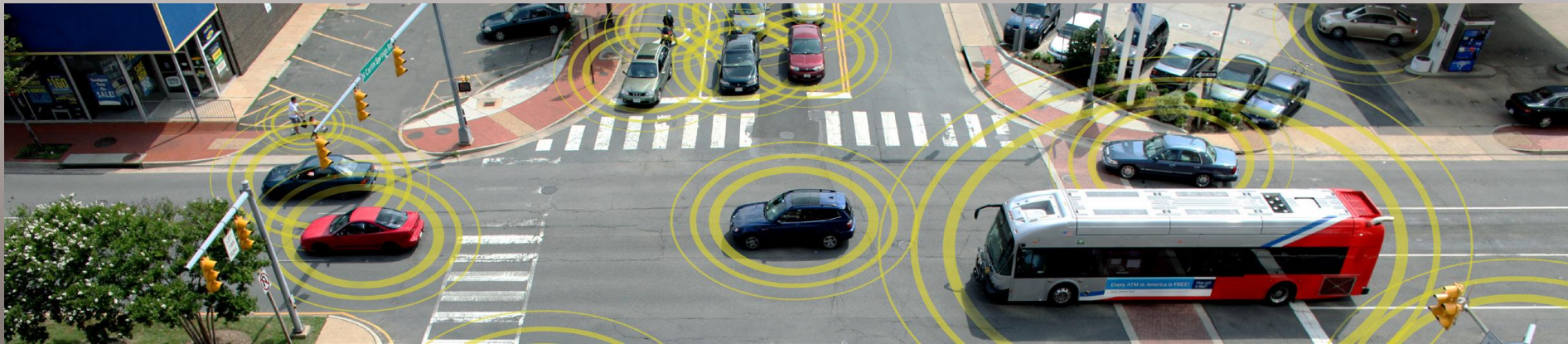
- Advancing Transportation Systems Management and Operations Through Scenario Planning
- The Use of Data in Planning for Operations: State-of-the-Practice Review
- Transportation Systems Management and Operations Benefit-Cost Analysis Compendium



U.S. Department of Transportation  
Federal Highway Administration



# So what about connected vehicles?



# Let's catch up:

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- Connected vehicles talk to each other (V2V) or talk with the road (V2I)
- Autonomous vehicles drive themselves
- CVs can use any sort of technology, but DSRC is the radio bandwidth currently reserved for CV communications

[http://its.dot.gov/cv\\_basics/index.htm](http://its.dot.gov/cv_basics/index.htm)



# What USDOT has been up to

Skyscape over Autumn Colors on the Cherokee Skyway

## Tennessee Division Office

- Systems engineering documents and standards

[http://its.dot.gov/pilots/cv\\_pilot\\_apps.htm](http://its.dot.gov/pilots/cv_pilot_apps.htm)

### Connected Vehicle Applications

V2I Safety	Environment	Mobility
<p>Red Light Violation Warning</p> <p>Curve Speed Warning</p> <p>Stop Sign Gap Assist</p> <p>Spot Weather Impact Warning</p> <p>Reduced Speed/Work Zone Warning</p> <p>Pedestrian in Signalized Crosswalk Warning (Transit)</p>	<p>Eco-Approach and Departure at Signalized Intersections</p> <p>Eco-Traffic Signal Timing</p> <p>Eco-Traffic Signal Priority</p> <p>Connected Eco-Driving</p> <p>Wireless</p> <p>Inductive/Resonance Charging</p> <p>Eco-Lanes Management</p> <p>Eco-Speed Harmonization</p> <p>Eco-Cooperative Adaptive Cruise Control</p> <p>Eco-Traveler Information</p> <p>Eco-Ramp Metering</p> <p>Low Emissions Zone Management</p> <p>AFV Charging / Fueling Information</p> <p>Eco-Smart Parking</p> <p>Dynamic Eco-Routing (light vehicle, transit, freight)</p> <p>Eco-ICM Decision Support System</p>	<p>Advanced Traveler Information System</p> <p>Intelligent Traffic Signal System (I-SIG)</p> <p>Signal Priority (transit, freight)</p> <p>Mobile Accessible Pedestrian Signal System (PED-SIG)</p> <p>Emergency Vehicle Preemption (PREEMPT)</p> <p>Dynamic Speed Harmonization (SPD-HARM)</p> <p>Queue Warning (Q-WARN)</p> <p>Cooperative Adaptive Cruise Control (CACC)</p> <p>Incident Scene Pre-Arrival Staging Guidance for Emergency Responders (RESP-STG)</p> <p>Incident Scene Work Zone Alerts for Drivers and Workers (INC-ZONE)</p> <p>Emergency Communications and Evacuation (EVAC)</p> <p>Connection Protection (T-CONNECT)</p> <p>Dynamic Transit Operations (T-DISP)</p> <p>Dynamic Ridesharing (D-RIDE)</p> <p>Freight-Specific Dynamic Travel Planning and Performance</p> <p>Drayage Optimization</p>
V2V Safety	Road Weather	Smart Roadside
<p>Emergency Electronic Brake Lights (EEBL)</p> <p>Forward Collision Warning (FCW)</p> <p>Intersection Movement Assist (IMA)</p> <p>Left Turn Assist (LTA)</p> <p>Blind Spot/Lane Change Warning (BSW/LCW)</p> <p>Do Not Pass Warning (DNPW)</p> <p>Vehicle Turning Right in Front of Bus Warning (Transit)</p>	<p>Motorist Advisories and Warnings (MAW)</p> <p>Enhanced MDSS</p> <p>Vehicle Data Translator (VDT)</p> <p>Weather Response Traffic Information (WxTINFO)</p>	<p>Wireless Inspection</p> <p>Smart Truck Parking</p>
Agency Data		
<p>Probe-based Pavement Maintenance</p> <p>Probe-enabled Traffic Monitoring</p> <p>Vehicle Classification-based Traffic Studies</p> <p>CV-enabled Turning Movement &amp; Intersection Analysis</p>		



# What USDOT has been up to

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Skyscape over Autumn Colors on the Cherokee Skyway

- Pilot deployments:
  - <http://www.its.dot.gov/pilots/>
  - Wyoming, NYC, Tampa
  - Lessons and resources
- Connected Vehicle Affiliated Test Beds
  - <http://www.its.dot.gov/testbed.htm>
- Engineering and planning tools
  - RDE, OSADP, CVRIA, SET-IT, CO-PILOT, and upcoming guidance documents





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# A quick word about Every Day Counts



U.S. Department of Transportation  
Federal Highway Administration

# A quick word about Every Day Counts

Skyscape over Autumn Colors on the Cherokee Skyway

Tennessee Division Office

ITS-related initiatives part of Round 4:

- Using Data to Improve Traffic Incident Management
- Automated Traffic Signal Performance Measures (ATSPMs)
- Road Weather Management – Weather-Savvy Roads

See fact sheets handed out.



[http://www.fhwa.dot.gov/innovation/everydaycounts/edc\\_4/](http://www.fhwa.dot.gov/innovation/everydaycounts/edc_4/)



# Real-time traveler information



# Real-time traveler information

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## 23 CFR 511:

By November 8, 2014, state agencies needed to make available real-time information on the Interstate system:

- Lane blockages
- Road weather
- Construction
- Travel times or speeds





# Real-time traveler information

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23 CFR 511.311(d):

In short:

RITSAAs need to ensure all this happens, too.



# Real-time traveler information

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TDOT:

- Recently joined Waze's "Connected Citizens" program
- Recently overhauled its SmartWay website
- In process of upgrading its TMC software



Nick Renna

615-781-5769

[nicholas.renna@dot.gov](mailto:nicholas.renna@dot.gov)

Thank you!  
Questions?



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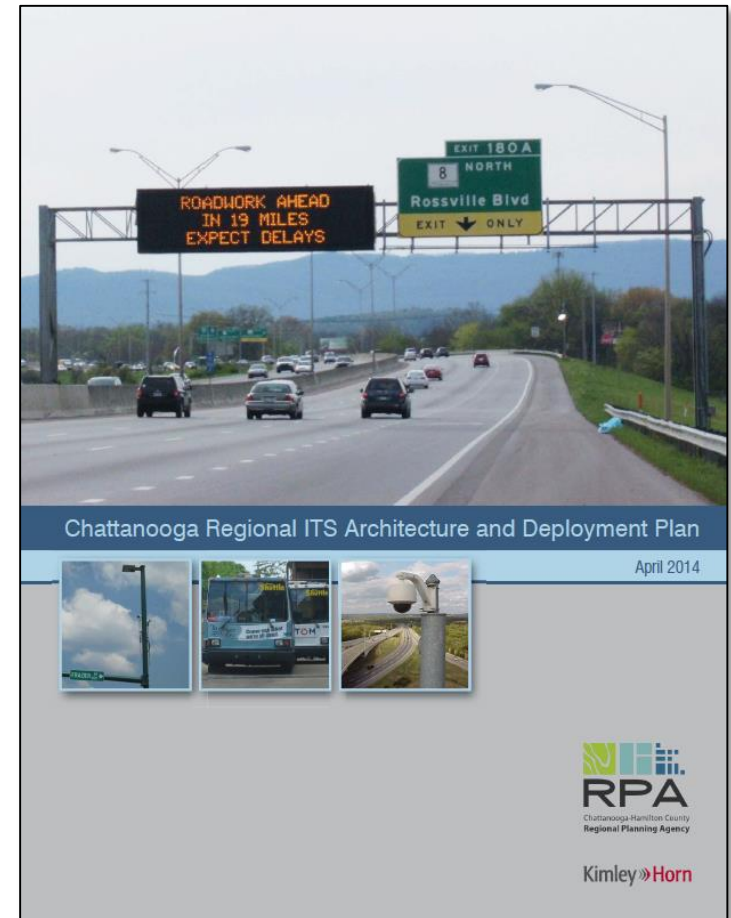
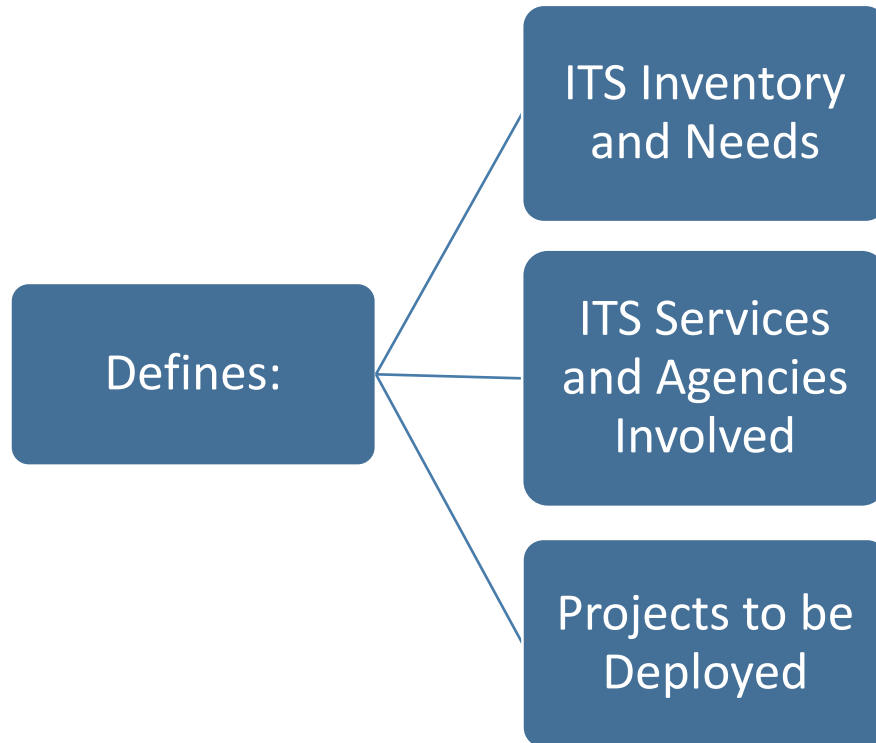
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# Chattanooga Regional ITS Architecture

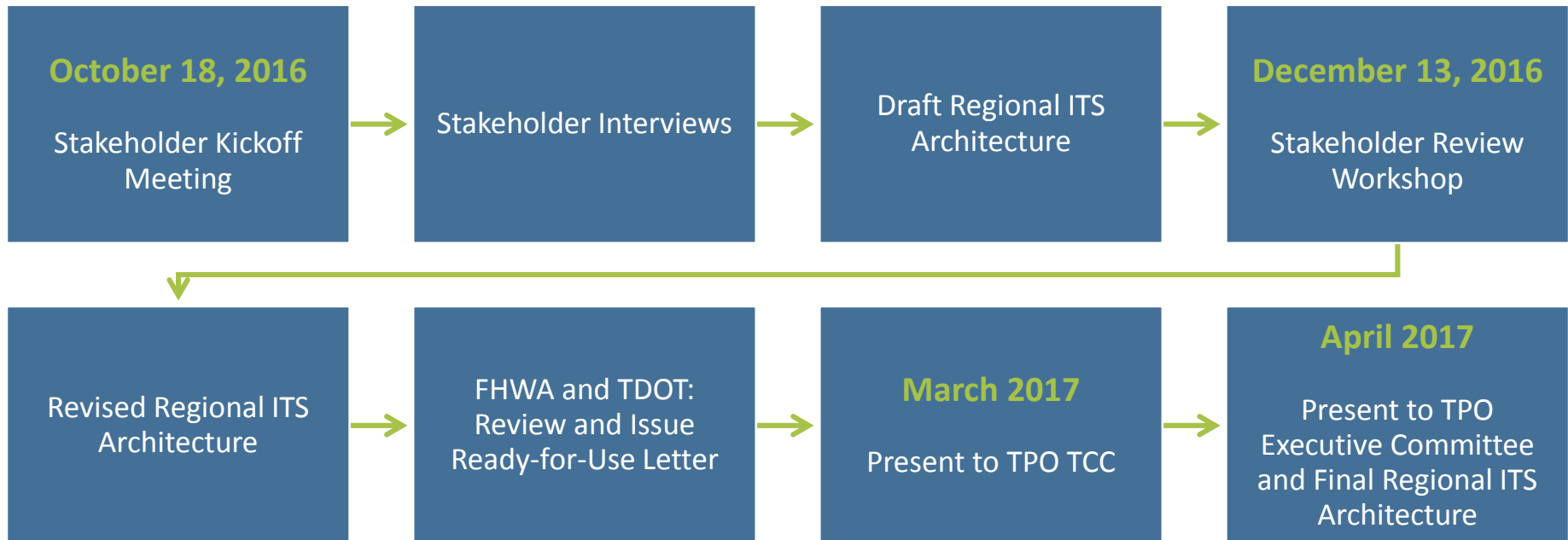


Last updated in 2014

Chattanooga Regional ITS Architecture Update Stakeholder Kickoff Meeting

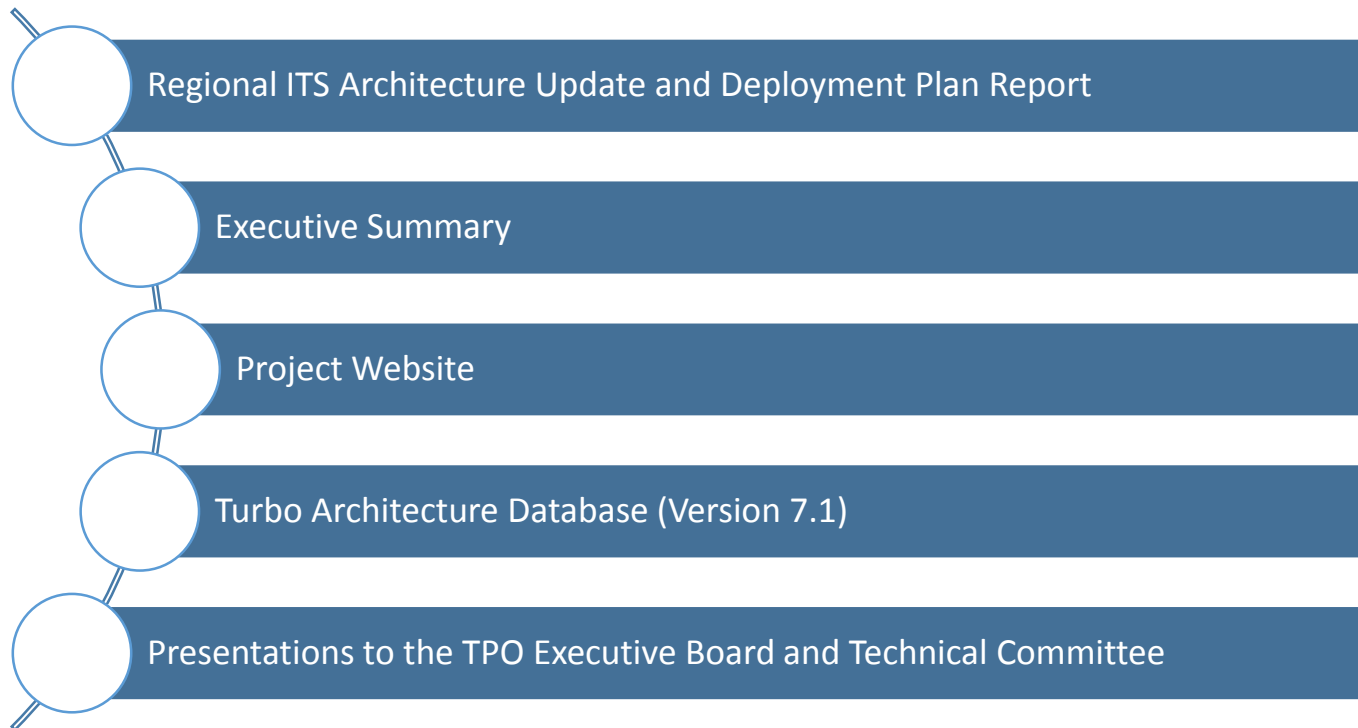
# Update Process

## Schedule



# Update Process

## Deliverables



# Update Process





# Update Process



## Inventory

- Identify all existing and planned ITS components
- Identify all existing and planned connections between components

## Needs

- Identify transportation needs in the Region
- Needs can be general or specific to ITS
- Continually update needs list throughout the project

# Update Process



ITS service packages are the services that ITS can provide in the Region

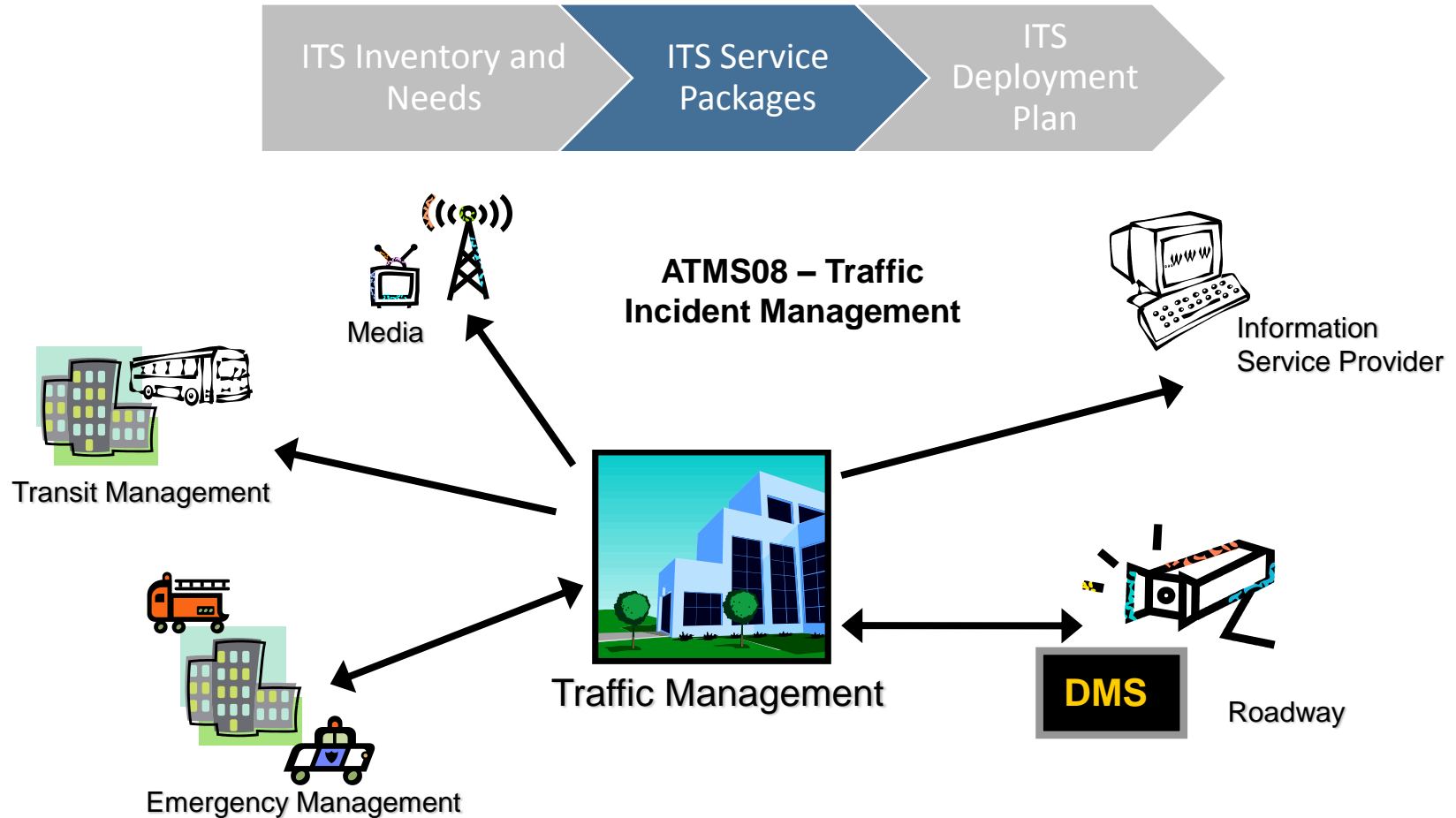
Common service packages:

Network Surveillance  
Traffic Signal Control  
Traffic Information Dissemination  
Incident Management

Road Weather Data Collection  
Transit Vehicle Tracking  
Transit Security  
Transit Signal Priority

A total of 97 service packages exist in the current version of the National ITS Architecture. 47 were selected for the current version of the Chattanooga Regional ITS Architecture.

# Update Process



# Update Process



Prioritizes projects into three time-frames (timeframes may be adjusted)

- Short-term (next 5 years)
- Mid-term (5 to 10 years)
- Long-term (beyond 10 years)

For each project the following information is included:

- Project description
- Responsible agency
- Estimate of probable cost
- Applicable service packages

Does not guarantee funding of the projects

# Regional Boundary

Chattanooga \ Hamilton County \ North Georgia  
TPO Area

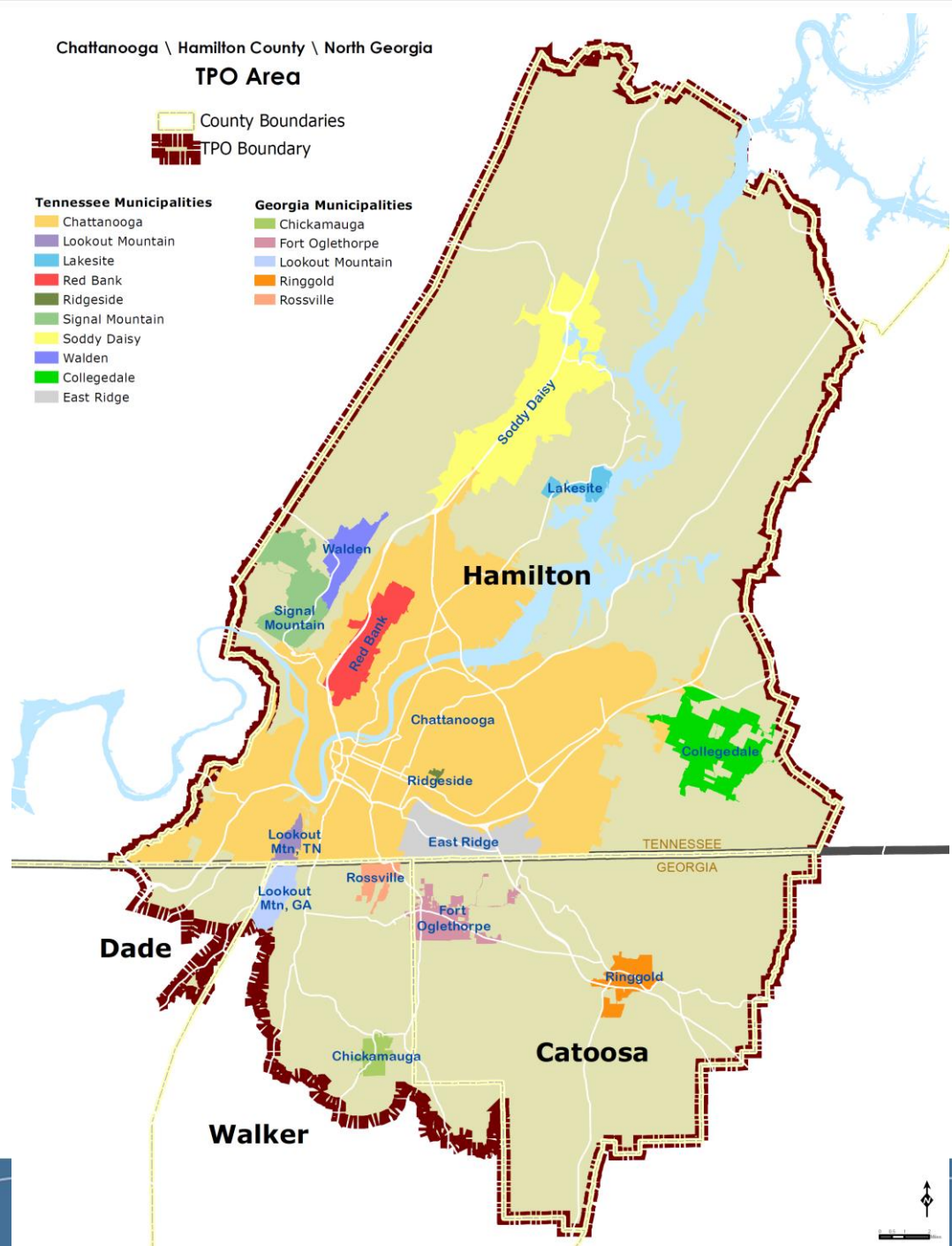
County Boundaries  
TPO Boundary

**Tennessee Municipalities**

- Chattanooga
- Lookout Mountain
- Lakesite
- Red Bank
- Ridgeside
- Signal Mountain
- Soddy Daisy
- Walden
- Collegedale
- East Ridge

**Georgia Municipalities**

- Chickamauga
- Fort Oglethorpe
- Lookout Mountain
- Ringgold
- Rossville



# Discussion Items

Additional Stakeholders to Include?

Existing and Planned ITS Projects in the Region?

Suggested ITS Projects?

Regional ITS Needs?

Regional Interagency Connections?

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## Regional ITS Needs?

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Traveler Information

Emergency Management

Maintenance & Construction Management

Public Transportation

Commercial Vehicle Operations

Archived Data Management

Vehicle Safety (Connected & Autonomous Vehicles)

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# Discussion Items

## Regional Interagency Connections?

Traffic Agency ↔ Traffic Agency

Traffic Agency ↔ Transit Agency

Traffic Agency ↔ Emergency Management

Transit Agency ↔ Emergency Management

Emergency Management ↔ Emergency Management



# Chattanooga Regional ITS Architecture Update

## Stakeholder Kickoff Meeting

Yuen Lee  
Chattanooga Hamilton County RPA  
ylee@chattanooga.gov

Tom Fowler  
Kimley-Horn  
thomas.fowler@kimley-horn.com

Terrance Hill  
Kimley-Horn  
terrance.hill@kimley-horn.com

**Kimley»Horn**

October 18, 2016