



**Virginia ITS Architecture Stakeholder Needs  
Workshop – Updating the Eastern Region  
Architecture**

May 11, 2011

# WELCOME AND INTRODUCTIONS

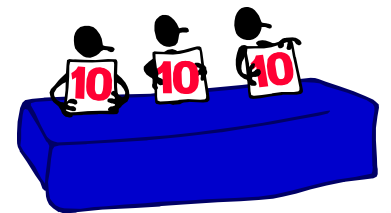
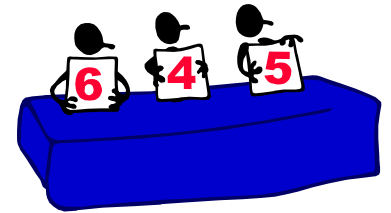
# Introductions

- **Name**
- **Organization/Role(s)**
- **Previous ITS architecture experience**
- **Workshop expectations**



# Workshop Outcomes

1. Better understand VA ITS Planning and Development
2. Review stakeholder needs survey results
3. Capture region's transportation/ITS needs
4. Review your ITS architecture and identify gaps



# Workshop Agenda

- **Welcome and Introductions**
- **ITS Planning and Development**
- **Stakeholder Needs Survey Result**
- **Transportation/ITS Needs Breakout Groups**
- **Lunch**
- **Needs Breakout Groups Recap**
- **Using ITS Architecture Presentation**
- **Identify Gaps and Suggested Architecture Changes**
- **Wrap-Up**

## Announcements

**Sign-in sheet  
Workbook  
Administrative and safety  
announcements**



# ITS PLANNING AND DEVELOPMENT

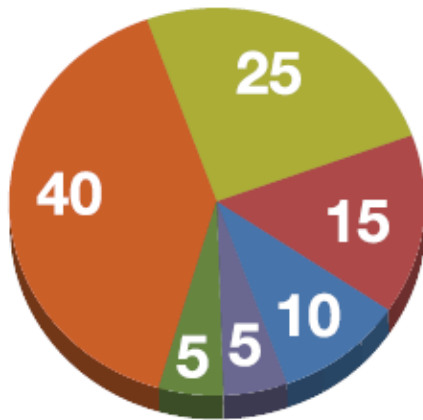


**Virginia ITS Architectures**  
**Stakeholder Needs Workshop**  
**Updating Eastern Region Architecture**  
May 11, 2011

**Chris Francis**  
**ITS Program Development Manager**  
**Operations and Security Division**



# Congestion Costs and Issues



## The Sources of Congestion:

**40% Bottlenecks**

**25% Traffic Incidents**

**15% Bad Weather**

**10% Work Zones**

**5% Poor Signal Timing**

**5% Special Events/Other**

## Congestion Costs and Issues

- About \$200 billion in freight bottlenecks
- Depending on the product carried, congestion adds between \$25 and \$200 per hour to freight costs
- Average annual cost of congestion per traveler: \$794
- 4 billion hours wasted waiting in traffic jams
- 2 billion gallons of fuel wasted in traffic jams
- Greatest concentration of congestion is along critical urban transportation corridors that link residential and commercial/-business nodes
- Between 1980 and 1999, highway-route miles in the US increased 1.5% while vehicle miles traveled increased 76%
- Incident lane blockage:
  - Each minute of lane blockage creates 4 minutes of congestion
  - Blockage of one of three freeway lanes reduces capacity by 50%
  - Blockage of two of three freeway lanes reduces capacity by 80%
- Work Zones:
  - Average of one work zone every 100 highway miles
  - Average of one work zone lane closure every 200 highway miles
  - Average of 1,000+ fatalities and 40,000 injuries in work zone crashes

# Weather Management Transportation Operations



## Annual Transportation Impacts from Severe Weather

- 1.5 million motor vehicle crashes
- 800,000 injuries
- 7,400 fatalities
- \$42 billion in costs (injuries, loss of life, property damage) from weather-related crashes
- 500 million hours of delay from fog, snow, and ice
- 24% of all crashes occur in adverse weather conditions
- Weather delays add up to \$3.4 billion to freight costs annually



## Annual Emergency Challenges in the United States

- 400+ tropical storms, hurricanes, tornadoes, and highway hazmat incidents, requiring evacuations
- An extensive number of localized incidents in the form of winter weather, wildfires, multi-vehicle crashes, and security activities
- 72-hour warning for hurricane evacuations

# In-Motion Adverse Weather Warning



Roadside Technology



In-Vehicle Technology

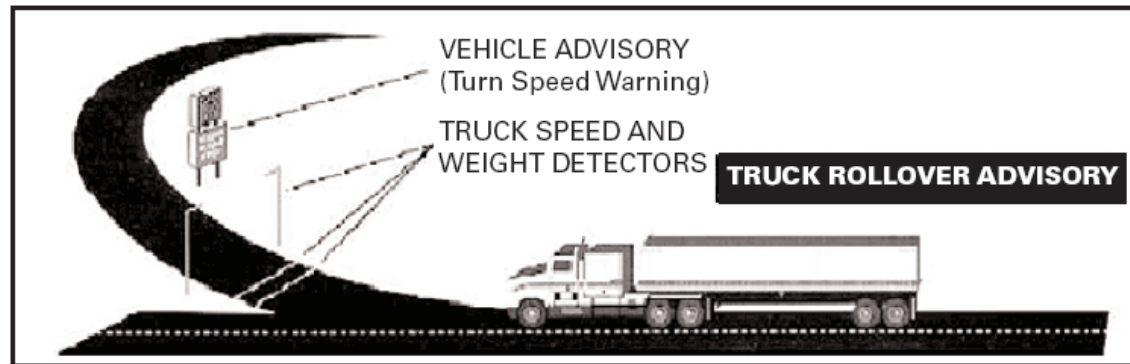
# Electronic Freight Management (EFM)



## Electronic Freight Management

Based on replication of initial tests, results include:

- 12% reduction in total shipment travel time
- 75% reduction in paper-work-entry labor per shipment
- 12% improvement in data accuracy
- 15% reduction in data-entry errors
- 10% improvement in customs-clearance processing



## International Trade Facts

- U.S. foreign trade rose from \$1.2 to \$2.6 trillion between 1990 and 2003
- In 2007, over \$3 billion in goods moved into and out of the country via freight transport
- The volume of trade moved on the U.S. transportation system in 2020 is expected to increase up to 70% from 1998 levels



# Commercial Vehicle Information System and Network (CVISN)



Weigh-in-motion Sensors



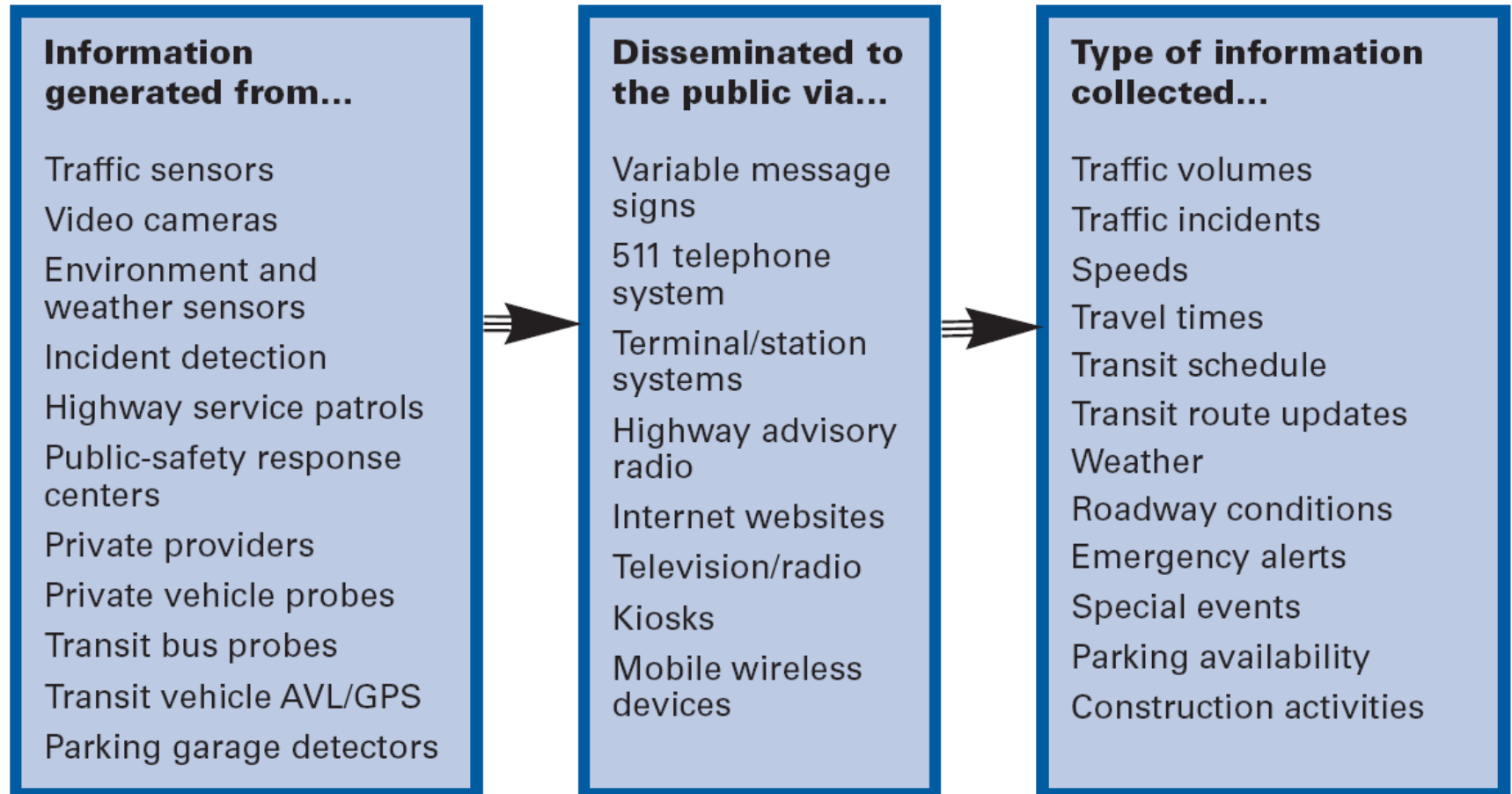
Electronic Toll Payment/  
Vehicle tracking transponder

# Real Time Traveler Information Signage



# Advanced Traveler Information System (ATIS)

## Dissemination of Traveler Information



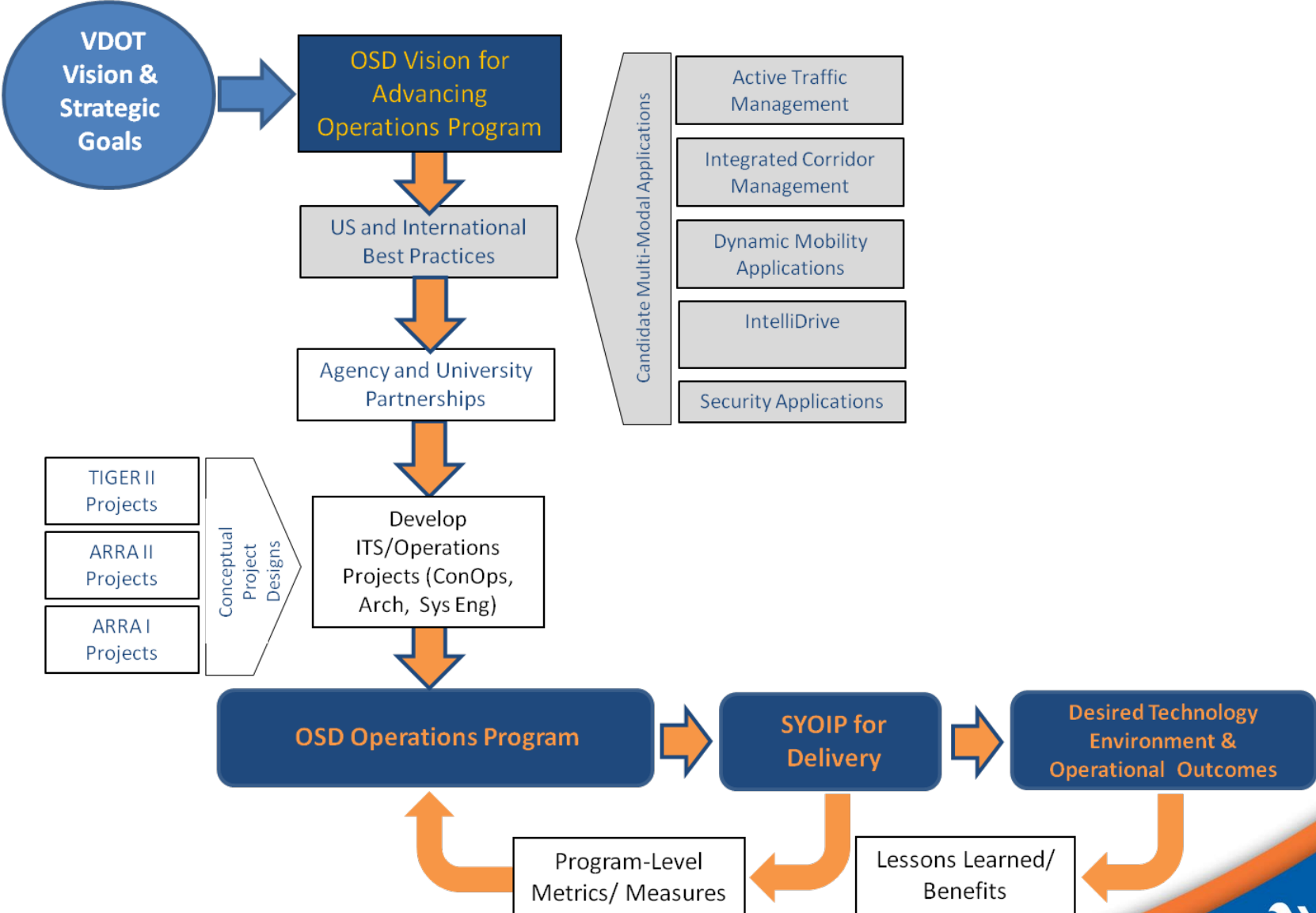
# Strategic Approach to New Technology Deployments



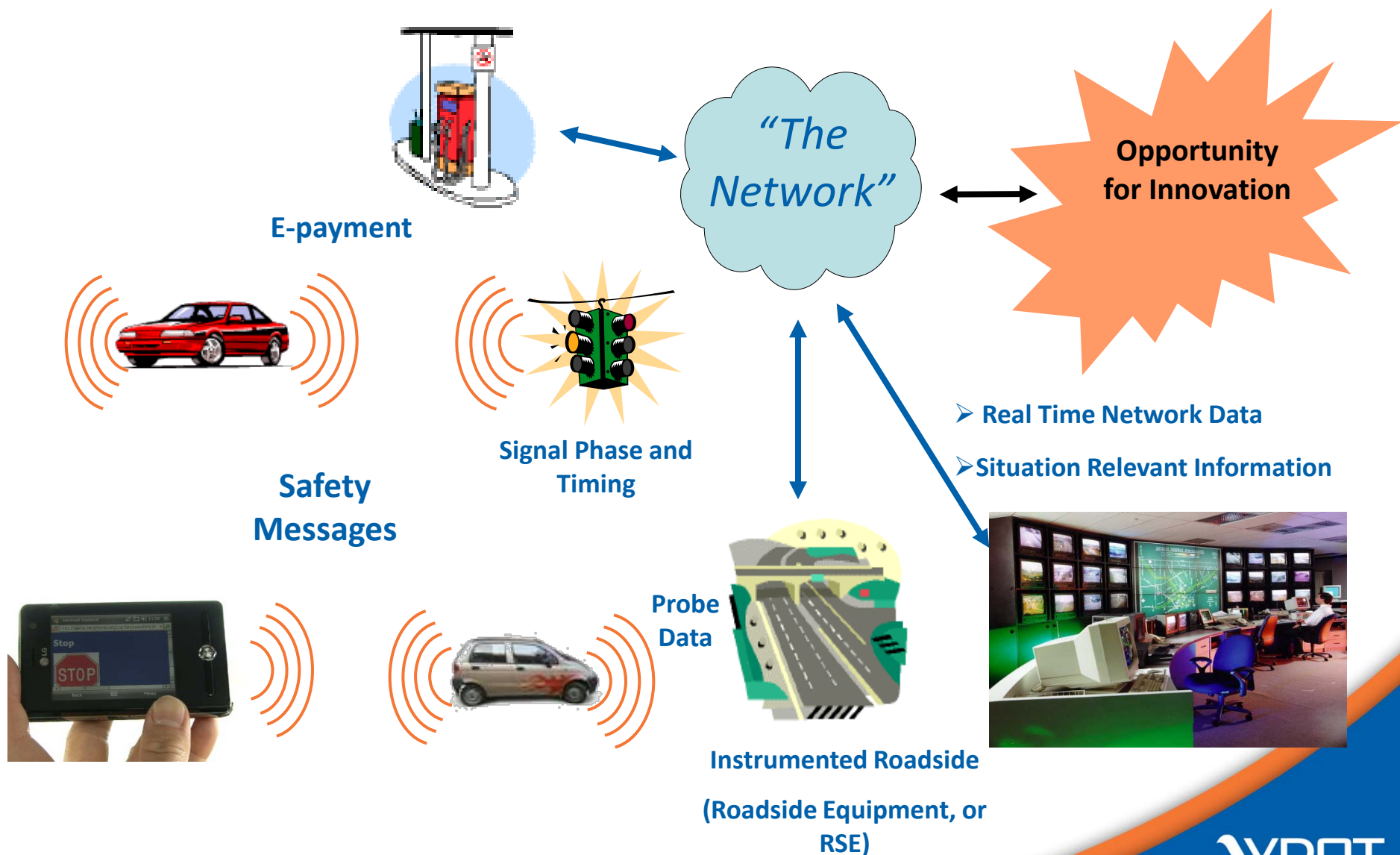
# Advancing VDOT's Operations Program

- **Address Recurring and Non-Recurring Congestion**
- **Approaches – Non-Pricing, Pricing, Context Sensitive**
- **Suite of Solutions - ATM, ICM, DMA, CV, Hybrid**
- **Candidate Multimodal Technology Applications**
- **Organizing Strategy: Network/Corridor Based**
- **SYOIP – Framework for Development & Delivery**

# New Technology Deployment Framework



# Preparing Virginia roads for Dynamic Mobility



# OSD Initiatives

- **TOC Operations Integration**
- **HR Bridge and Tunnel Operations Integration**
- **Travel Time Postings**
- **Commercial Vehicle Operations**

## I-64: Denbigh Blvd to I-264



# I-64: Denbigh Blvd to I-264

**Project Location** - critical link in transportation network in Hampton Roads area connecting largest ports on the east coast, large military installations, and numerous recreational attractions

**Context** - Heavy vehicular traffic traveling in and out of the region via the Hampton Roads Bridge Tunnel (HRBT) connecting Southside (Norfolk, Virginia Beach, Chesapeake) to the peninsula (Hampton, Newport News, Williamsburg) resulting in congestion and long queues at the approaches to the HRBT

**Technology Applications** - The project will deploy technologies to address two common contributors to congestion - **over-height vehicles** and **sudden onset of queuing**, primary cause of congestion and often evident on the approaches to the HRBT

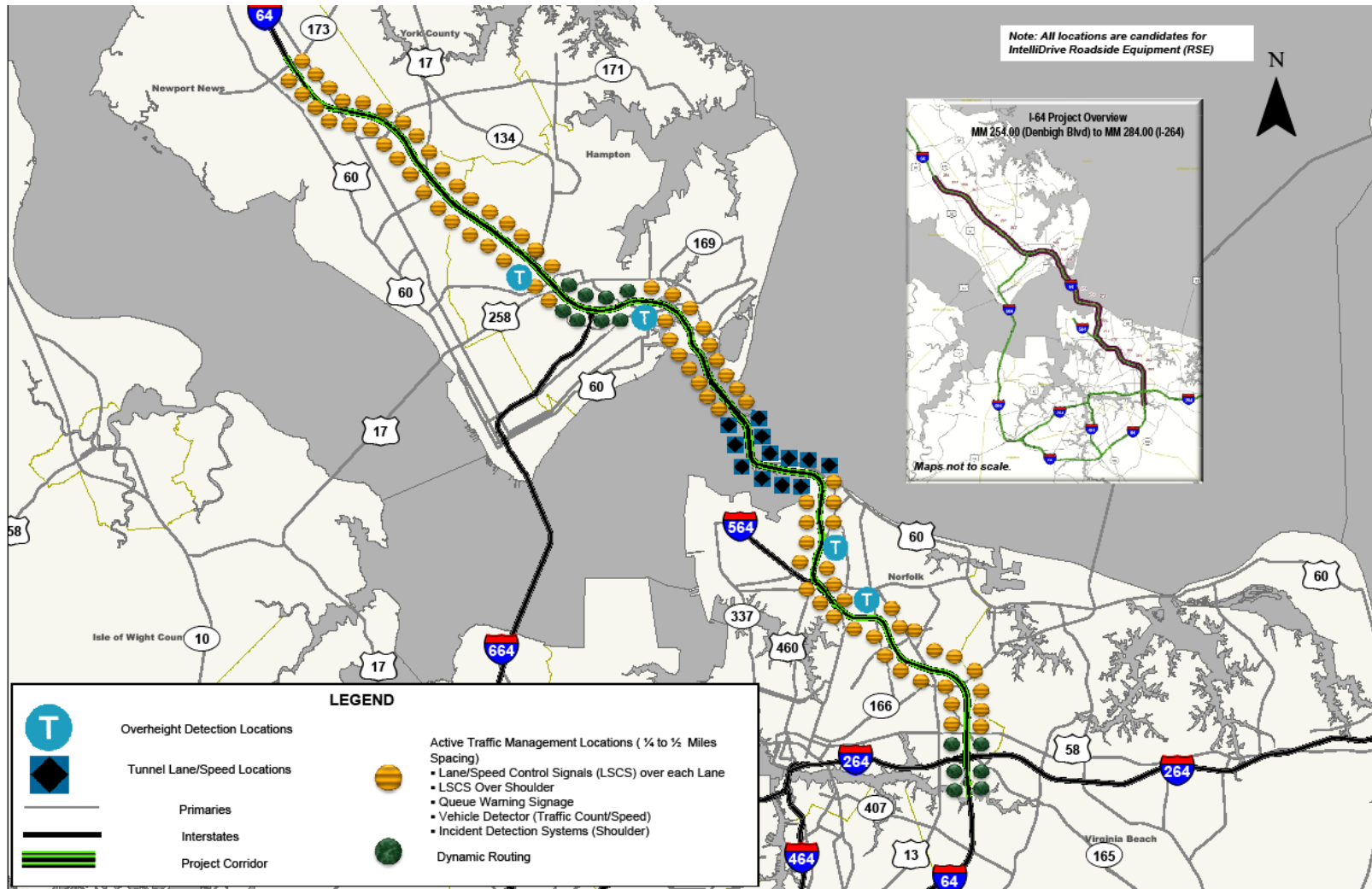
**Over Height Detection System** – Deployment of CB override transmitters upstream of the approach to the westbound tube of the HRBT to alert trucks of the height restriction at HRBT at a sufficient distance so that they can divert to another route

**Active Queue Warning System** will be installed to alert motorists of stopped or slow moving traffic ahead so that they can reduce speed and avoid making abrupt stop when the end of queue is reached by providing real-time information at points where they can divert to other routes

**Route Guidance** at decision points to allow drivers particularly non-local who are not familiar with the road network on potential diversion routes to act on information provided



## I-64: Denbigh Blvd to I-264



# Regional Concept for Transportation Operations (RCTO) – FHWA-FTA Initiative

## **Goal:**

To make transportation planning and transportation operations work together better for the benefit of transportation users and the community.

## **Serves three important purposes:**

- Operations vision and direction for the future of transportation systems management and operations
- Garner commitment from agencies and jurisdictions for a common regional approach to transportation systems management and operations
- Strengthen linkage between regional planners and operations managers - develop a coherent operations strategy to be part of the planning process

## **Common Operations Vision**

- ❖ Real-time information on transportation system performance is shared across agencies.
- ❖ Road users to have the ability to adjust their routes based on timely weather and traffic reports delivered seamlessly across jurisdictions, agencies, and modes.
- ❖ Hazardous materials moving through an urban area electronically identified and monitored by traffic management and public safety agencies to ensure their safe, secure, and efficient intermodal movement.



# Functional Scope of RCTO - Services of Regional Significance

- ❖ Congestion management
- ❖ Traffic incident management
- ❖ Traveler information
- ❖ Electronic payment services (e.g., transit, parking, tolls)
- ❖ Emergency response and homeland security
- ❖ Traffic signal coordination
- ❖ Road weather management
- ❖ Freight management
- ❖ Work zone traffic management
- ❖ Freeway management

# RCTO Regional Architecture and Focus Areas

## RCTO and Regional Architectures

Regional ITS Architectures enable Relationships and Information Sharing by providing key components such as:

- ☐ Operations concepts
- ☐ Agreements
- ☐ Inventories
- ☐ Architecture flow
- ☐ Standards

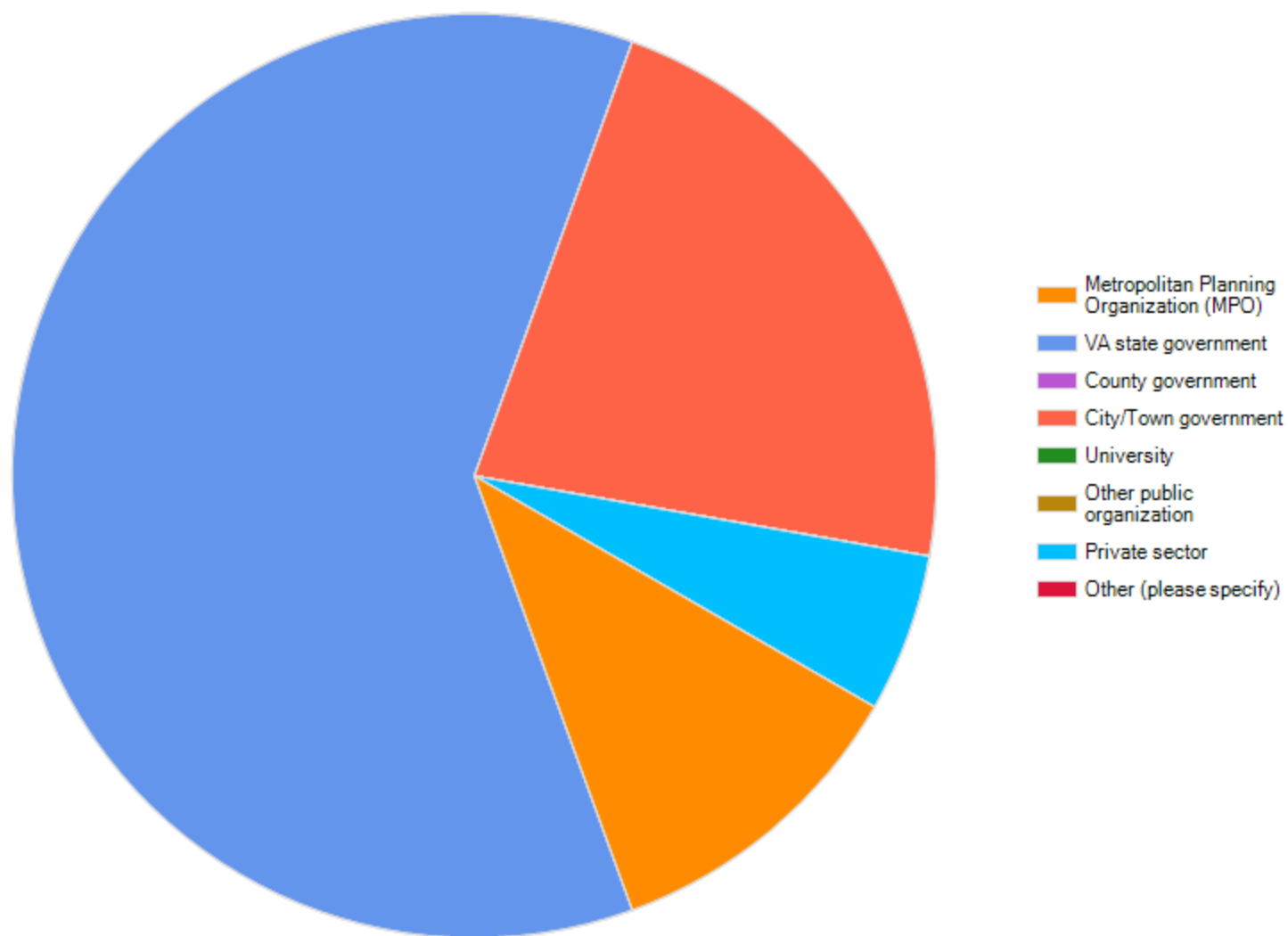
## RCTO Focus Areas

- ☐ Congestion Management
- ☐ Integrated Communication Network
- ☐ Incident Management
- ☐ Real-time Traveler Information

# STAKEHOLDER NEEDS SURVEY RESULTS

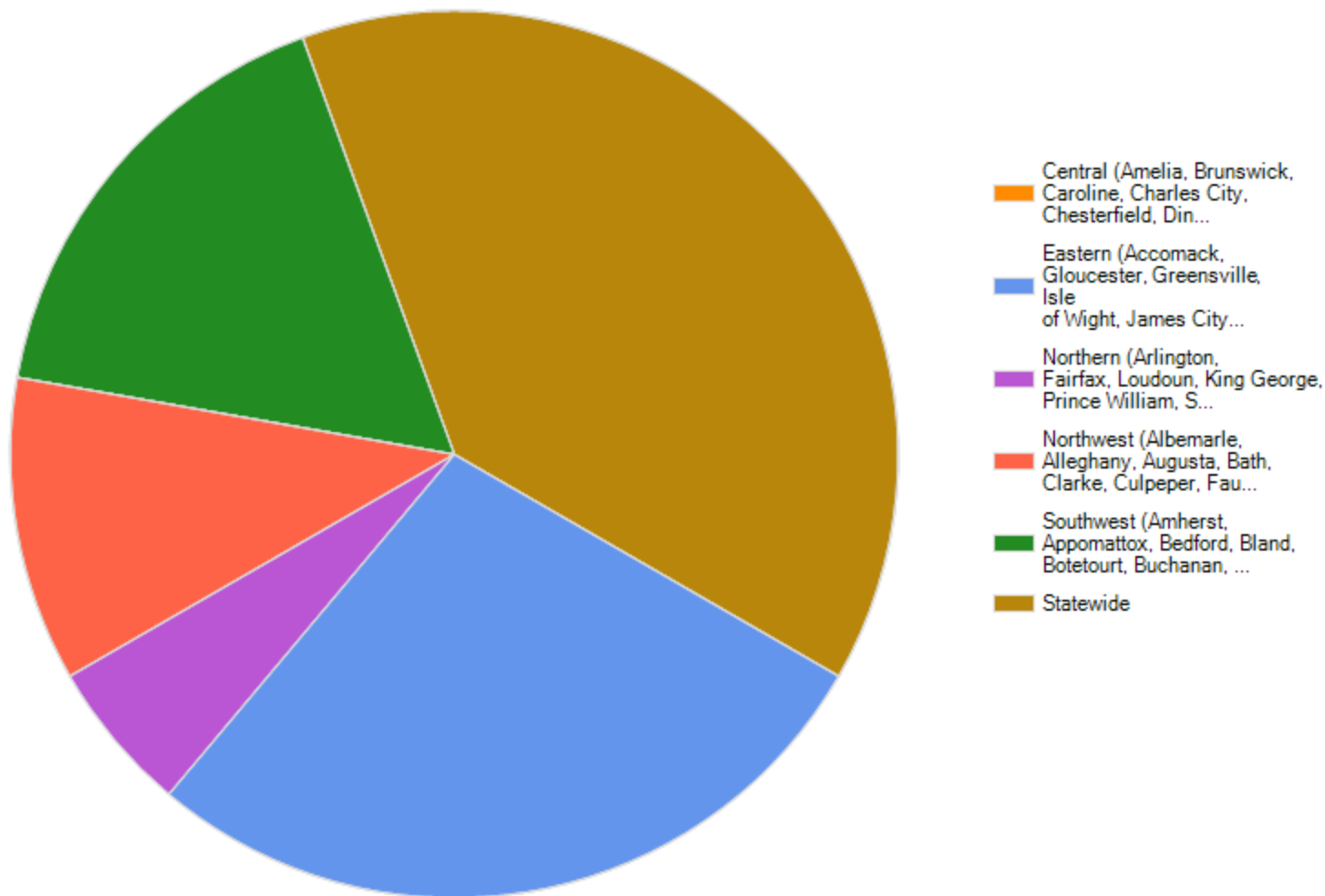
# Organizations responding

Is your organization represented as:



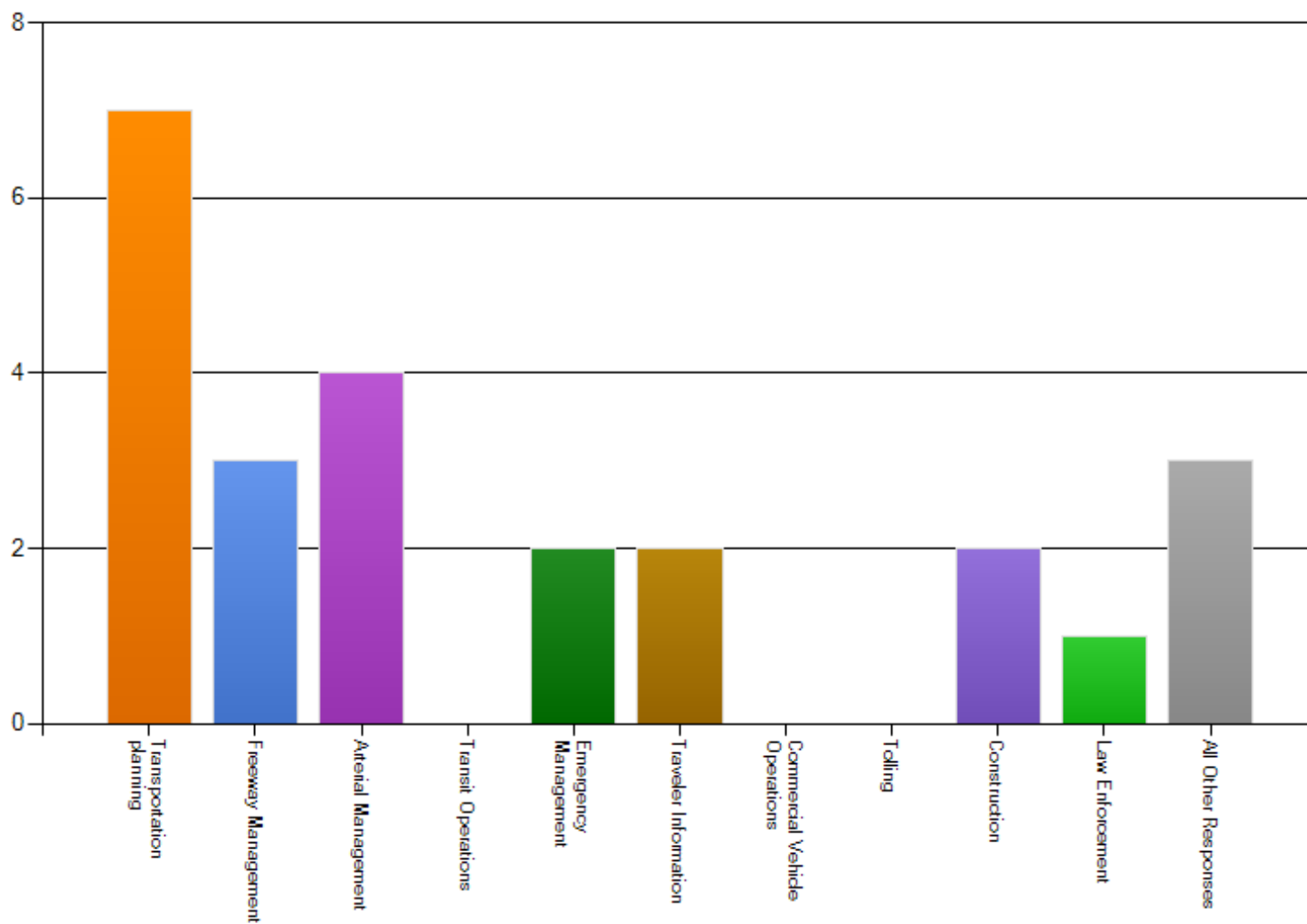
# Regions responding

Select the region of Virginia to which your organization's responsibilities or interests apply (Counties identified with regions below):



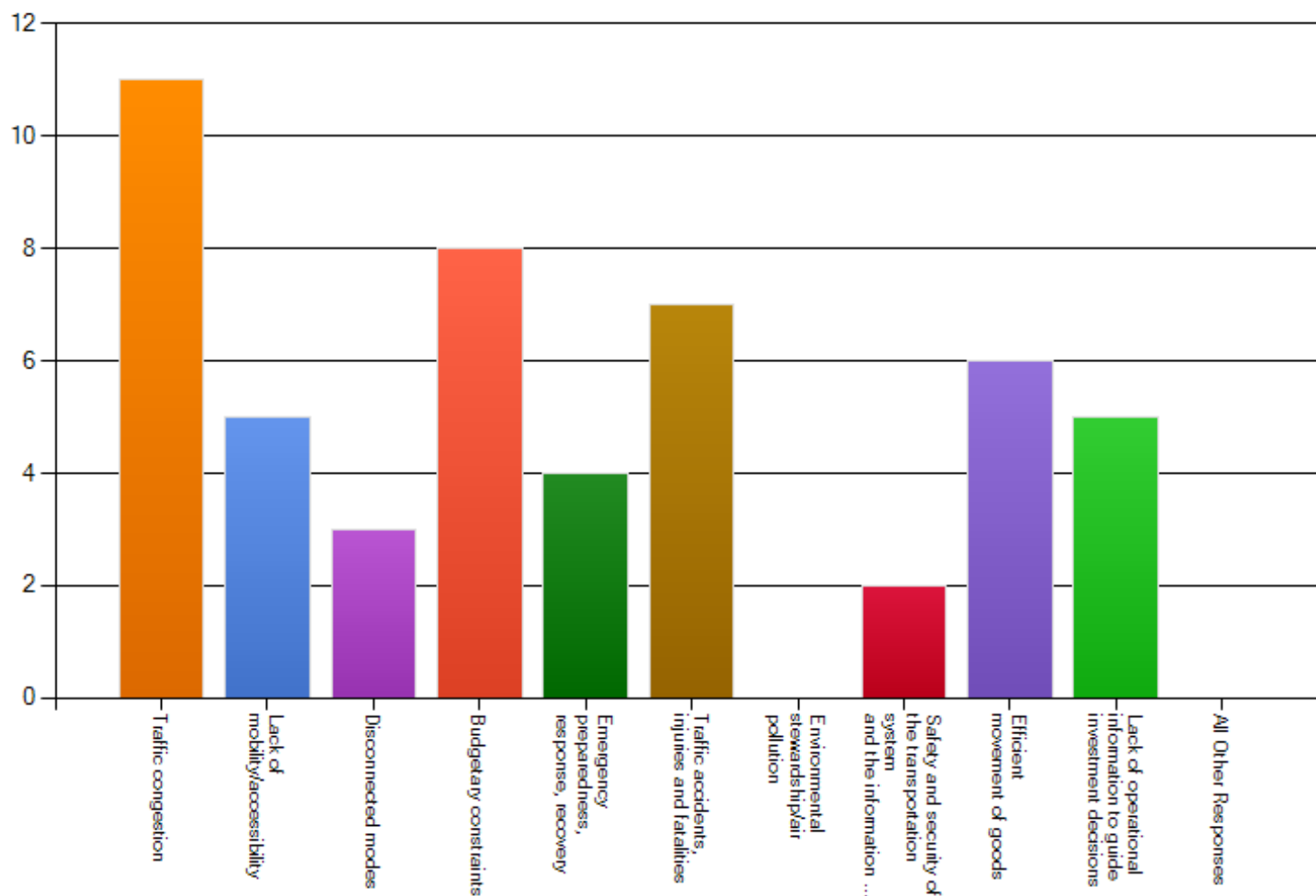
# Primary focus of organization

What is the primary focus of your organization? (Select all that apply.)



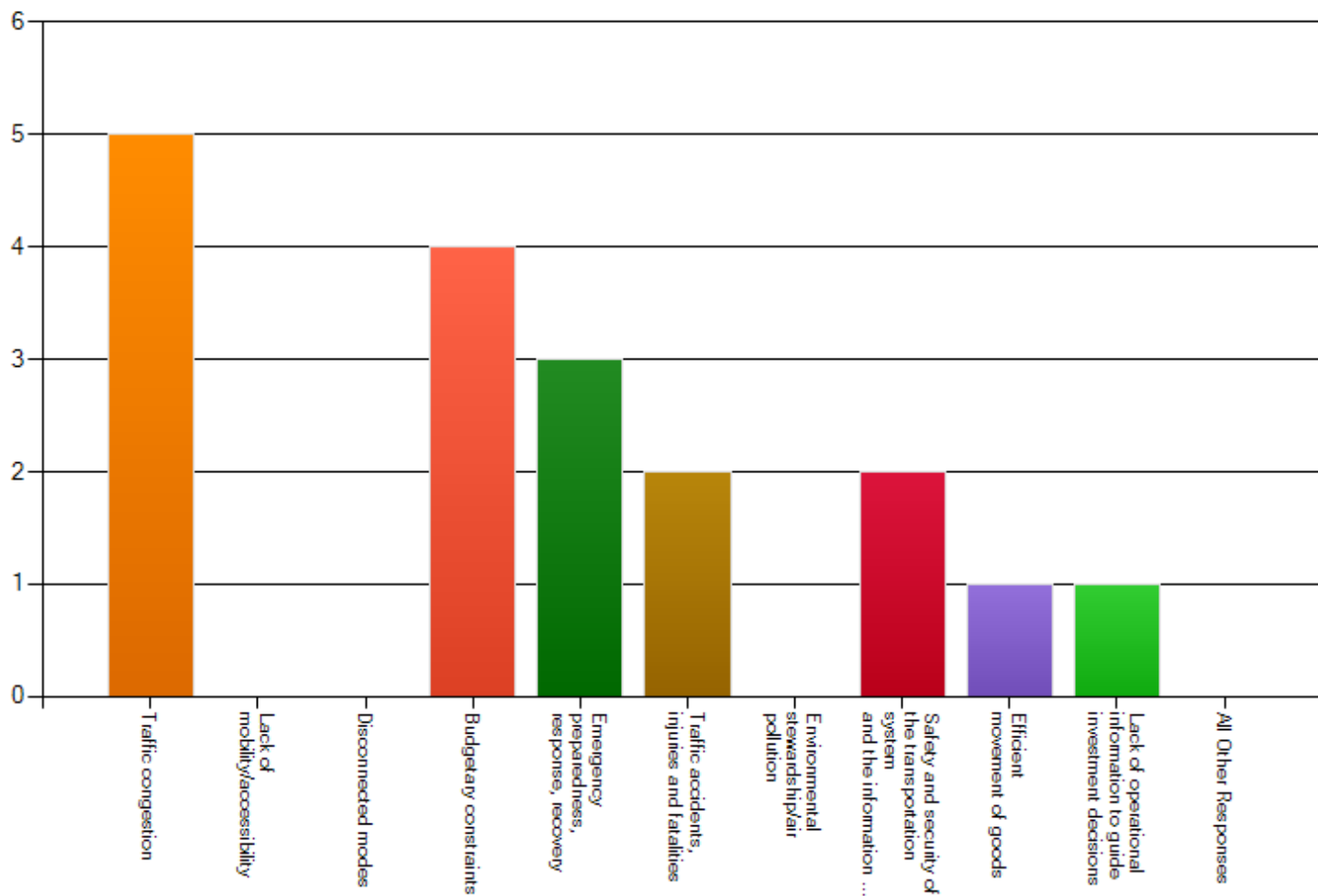
# Statewide transportation problems

What transportation related problems are you most challenged with? (Select all that apply.)



# Hampton Roads transportation problems

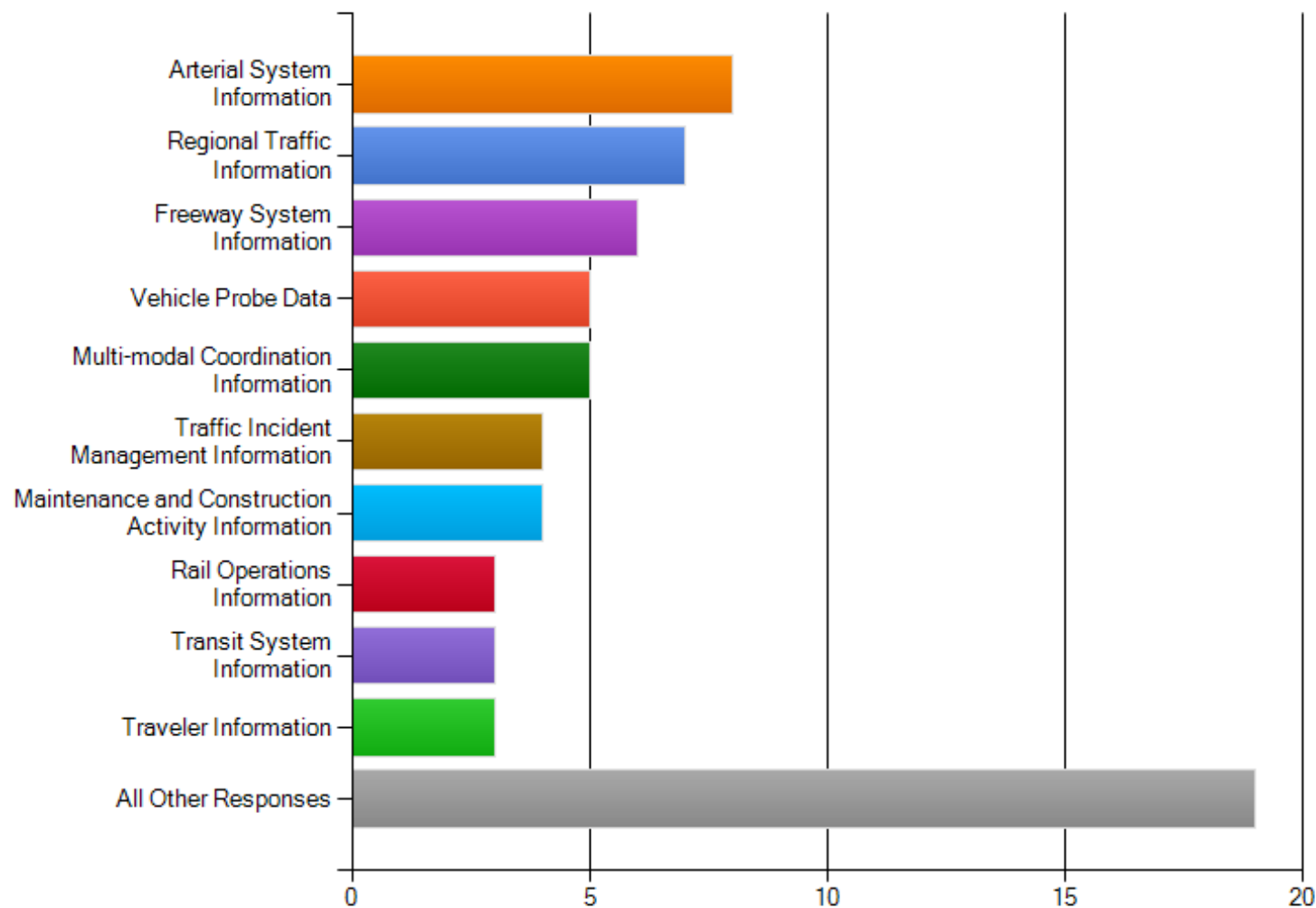
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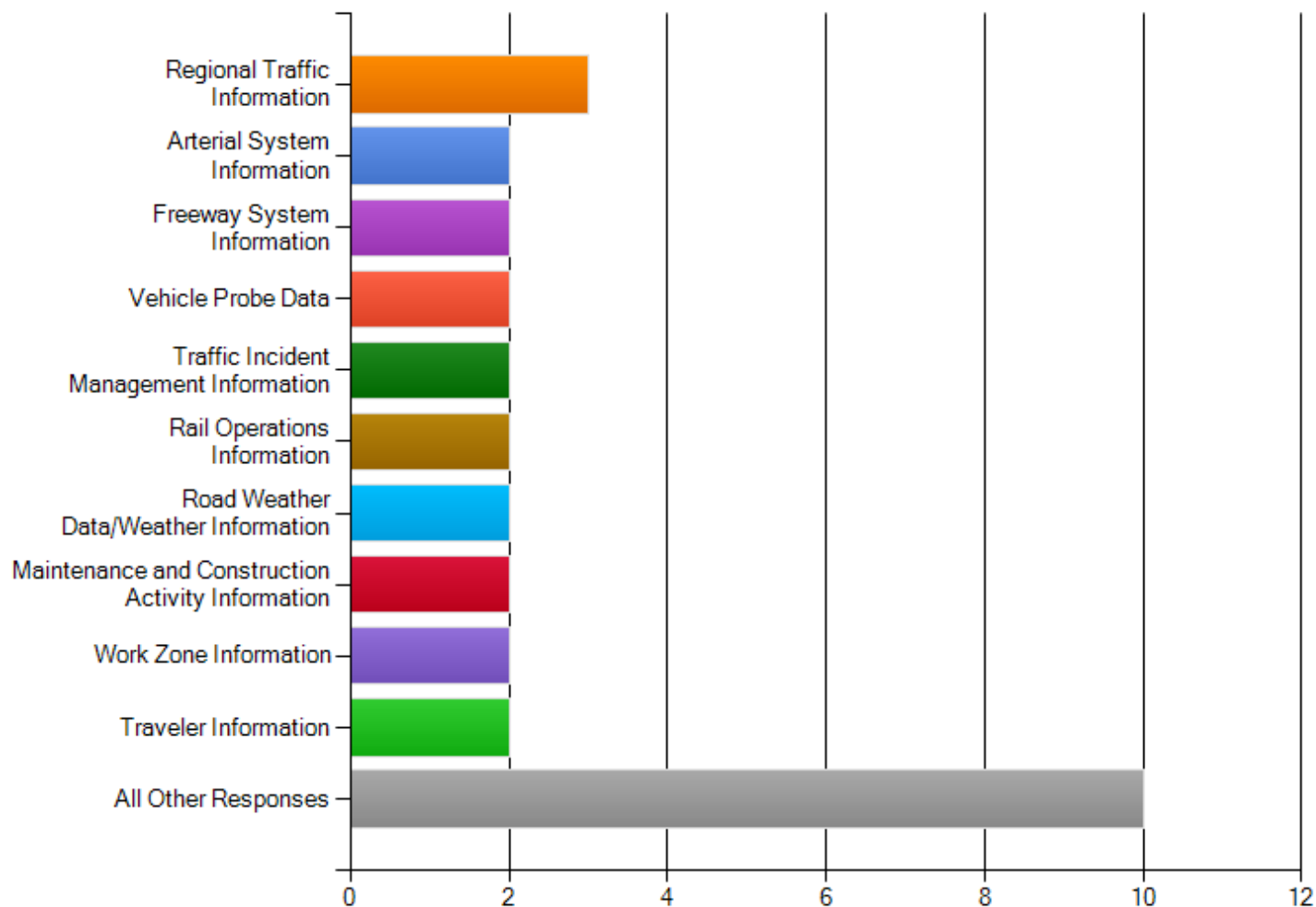
# Statewide information needs

What kinds of information do you need to address your transportation related problems but don't currently have access to? (Select all that apply.)



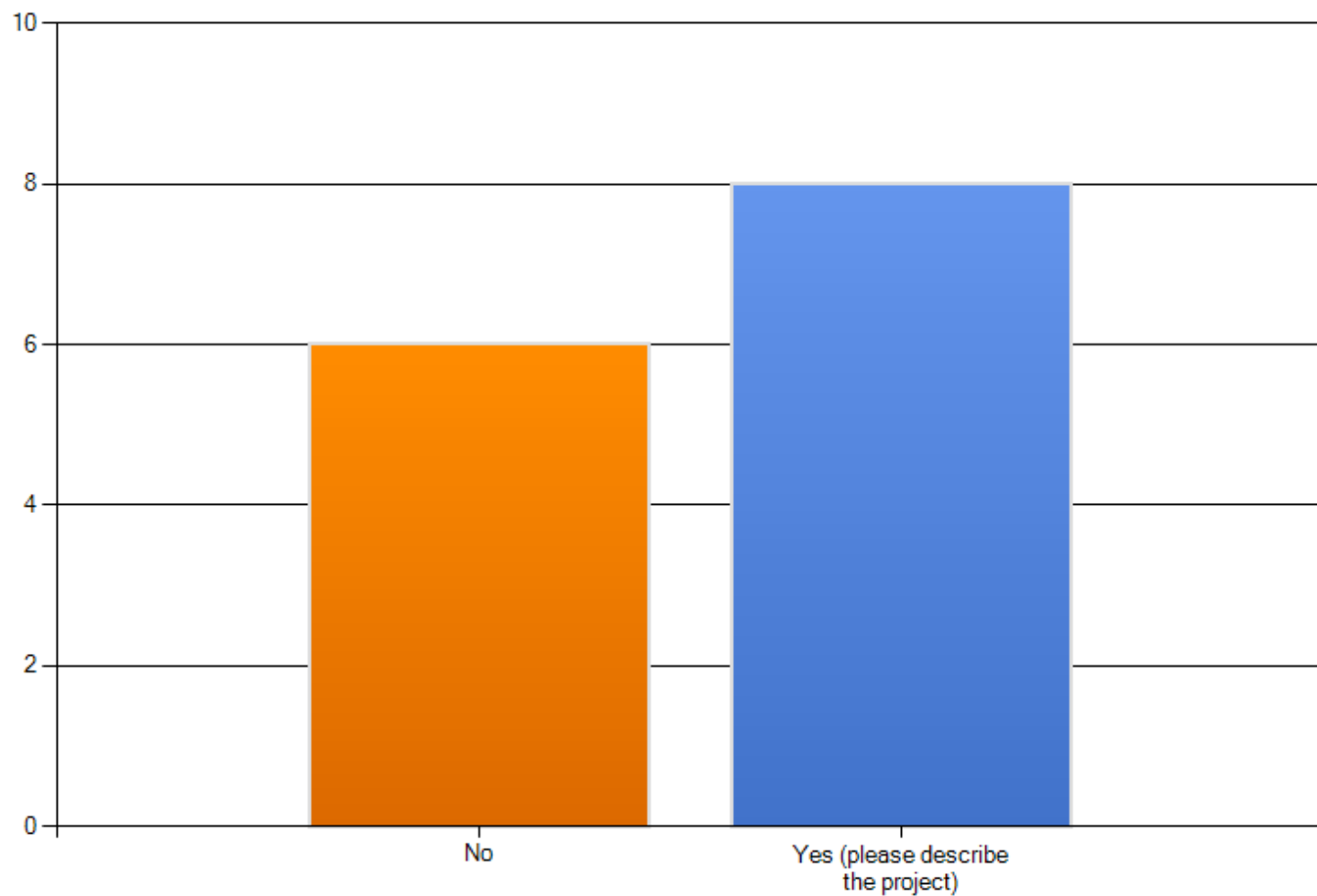
# Hampton Roads information needs

What kinds of information do you need to address your transportation related problems but don't currently have access to? (Select all that apply.)



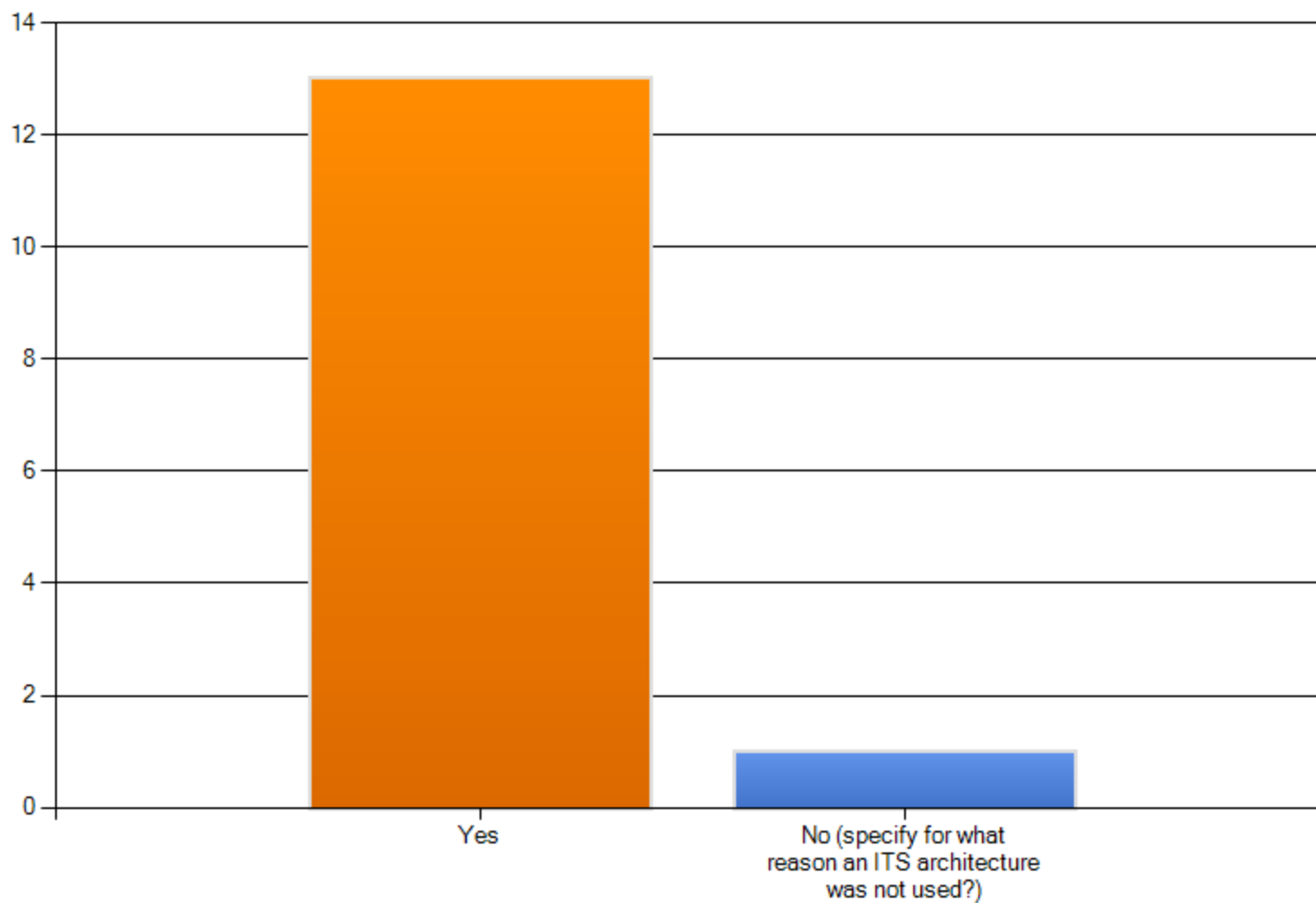
## New ITS projects

Has your organization deployed any new ITS projects within the past twelve (12) months?



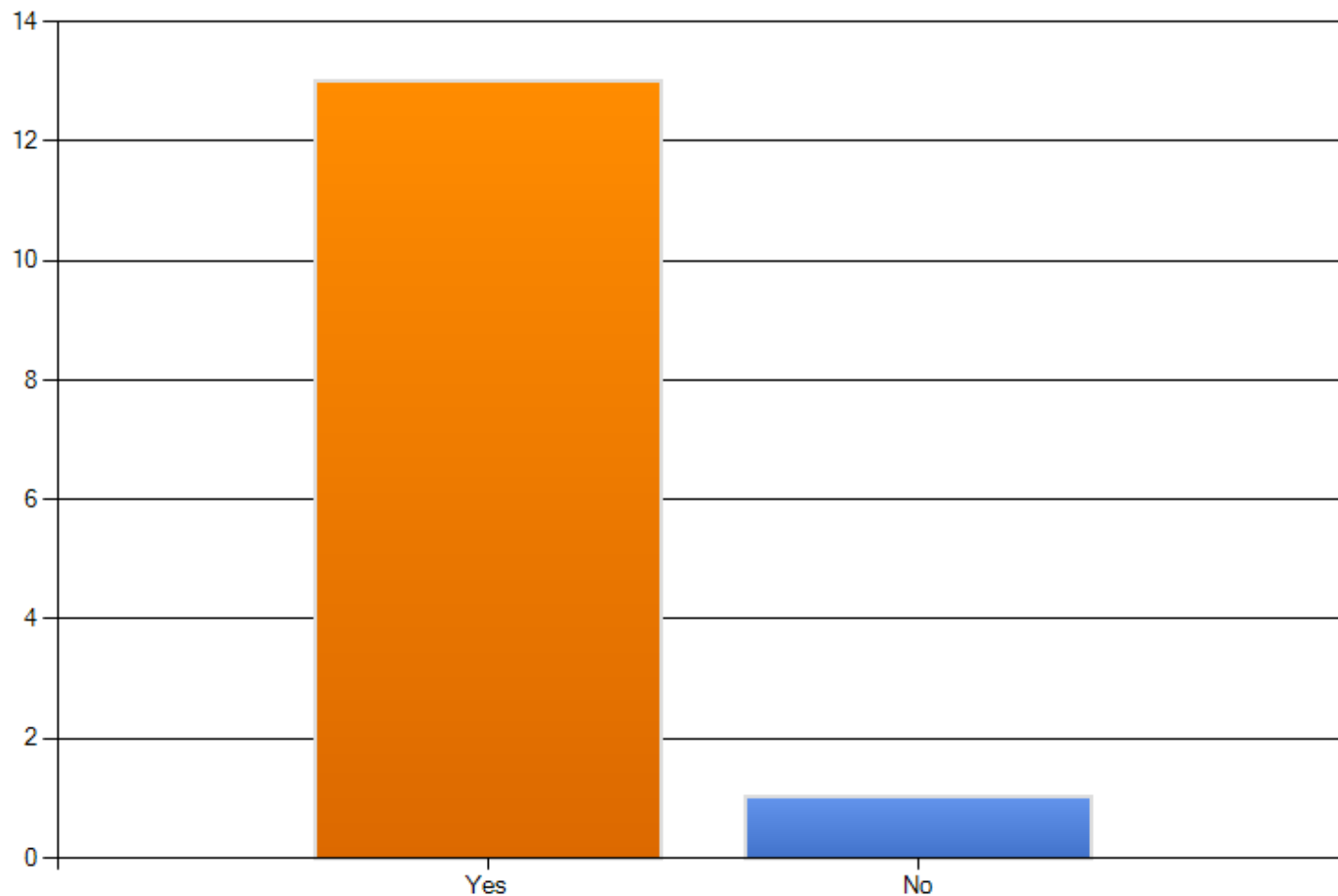
# Use of VA ITS Architectures

Have you used any of the Virginia ITS Architectures to plan, define, or develop your projects?



# Accuracy of VA ITS Architectures

Are your organization's Intelligent Transportation Systems (ITS) capabilities accurately represented in the Virginia suite of ITS Architectures ? If you would like to review your regional ITS architecture for your organization's interests, please go to the following site: <http://local.iteris.com/viriniaitsarchitecture/>.



# TRANSPORTATION/ITS NEEDS BREAKOUT GROUPS

# ITS

**Use of information and communications technologies to *meet* transportation needs**

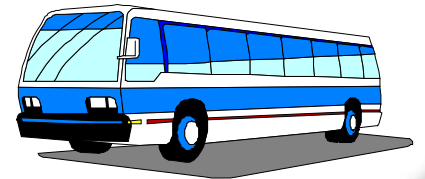
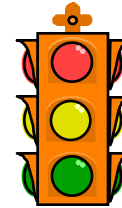


# ITS Architecture

## Framework for Developing Integrated Transportation Systems

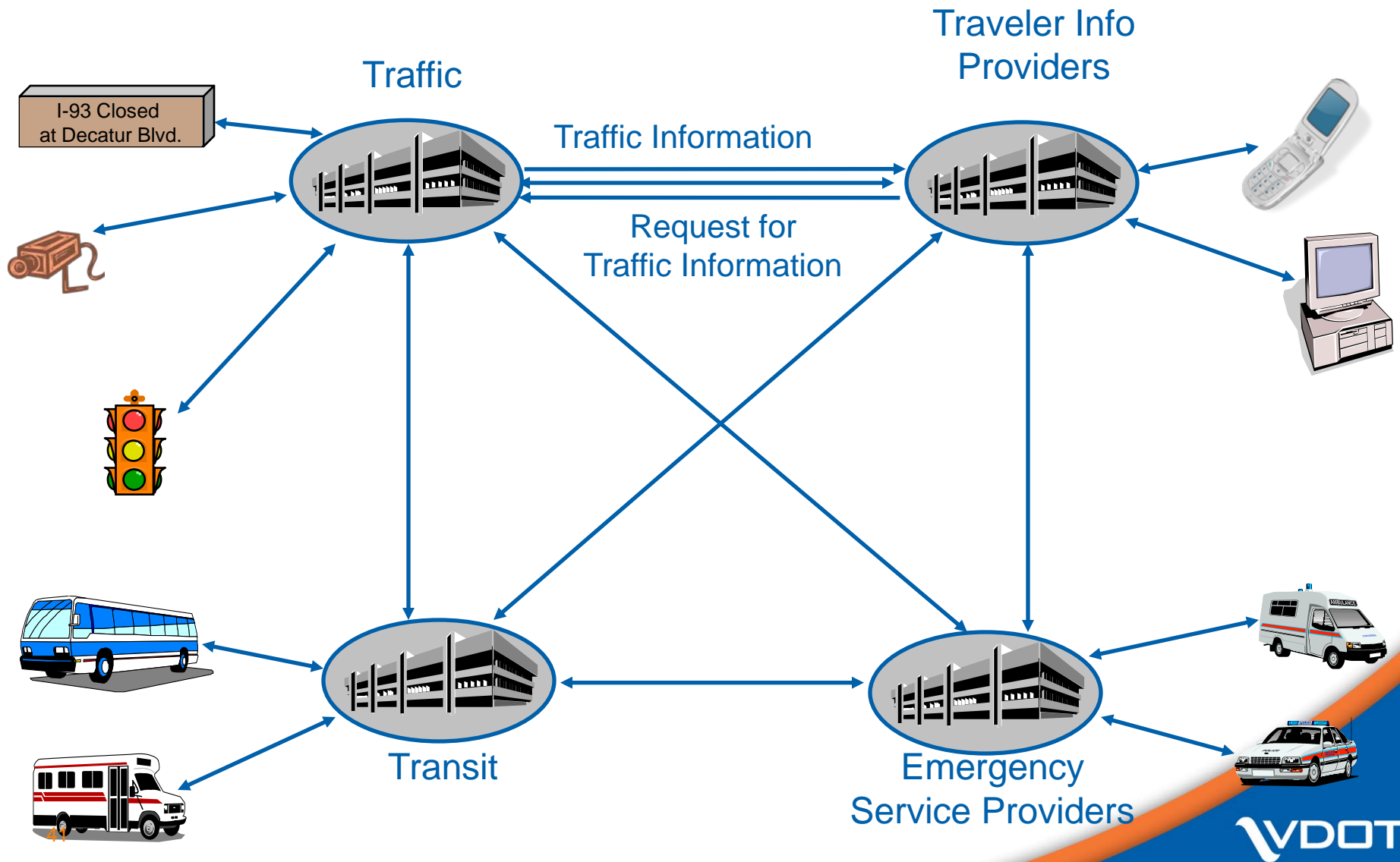
### Identifies:

- Organizations
- Systems operated
- Functions performed
- Communications
- Information exchanged





# ITS Architectures Provide a Framework for Integration



# An ITS Architecture Produces Real Benefits

**Reduce design costs and development time**

**Orderly and efficient deployments over time**

**Improve communications**

**Between people**

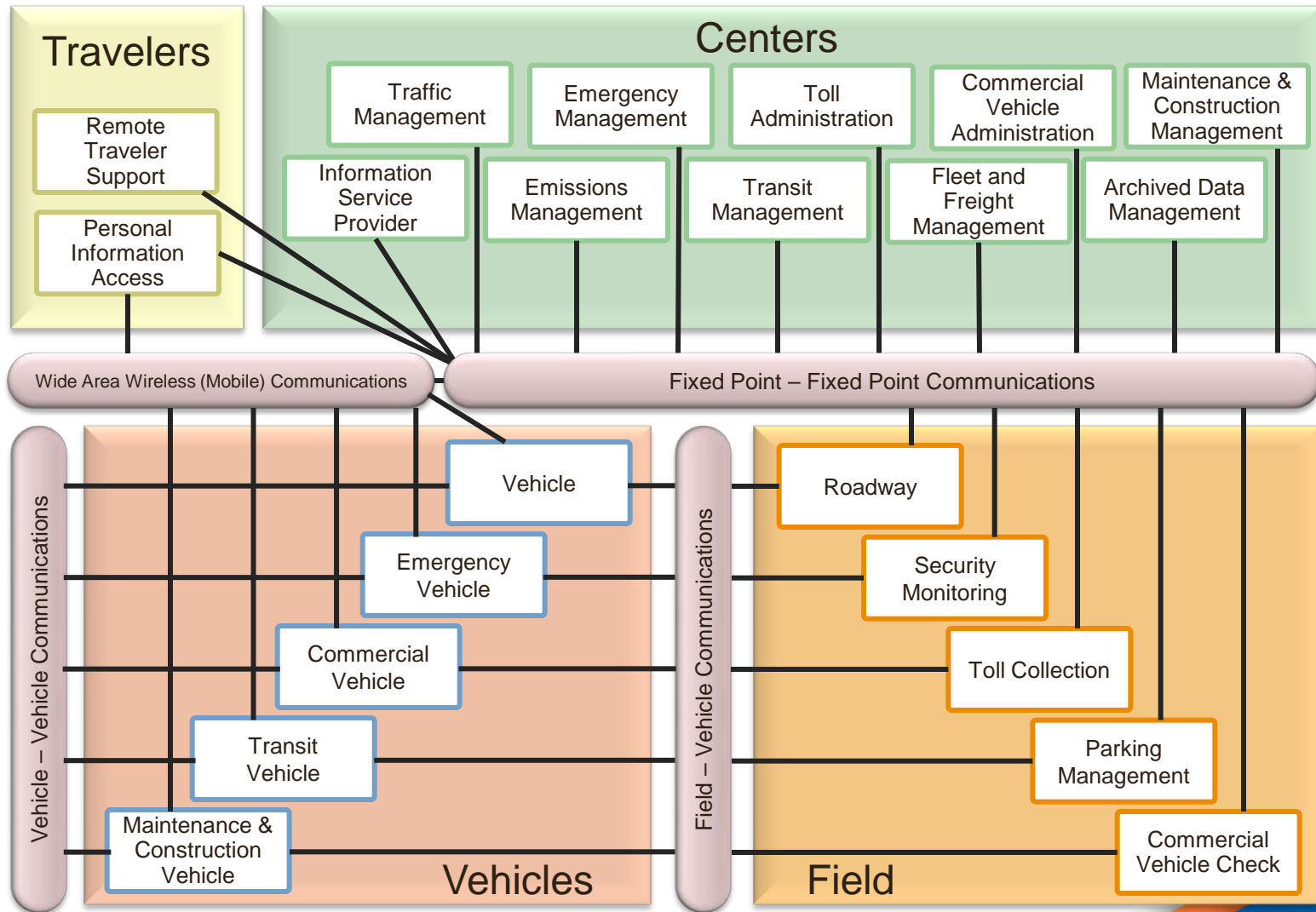
**Between systems**

**Reduce risk**

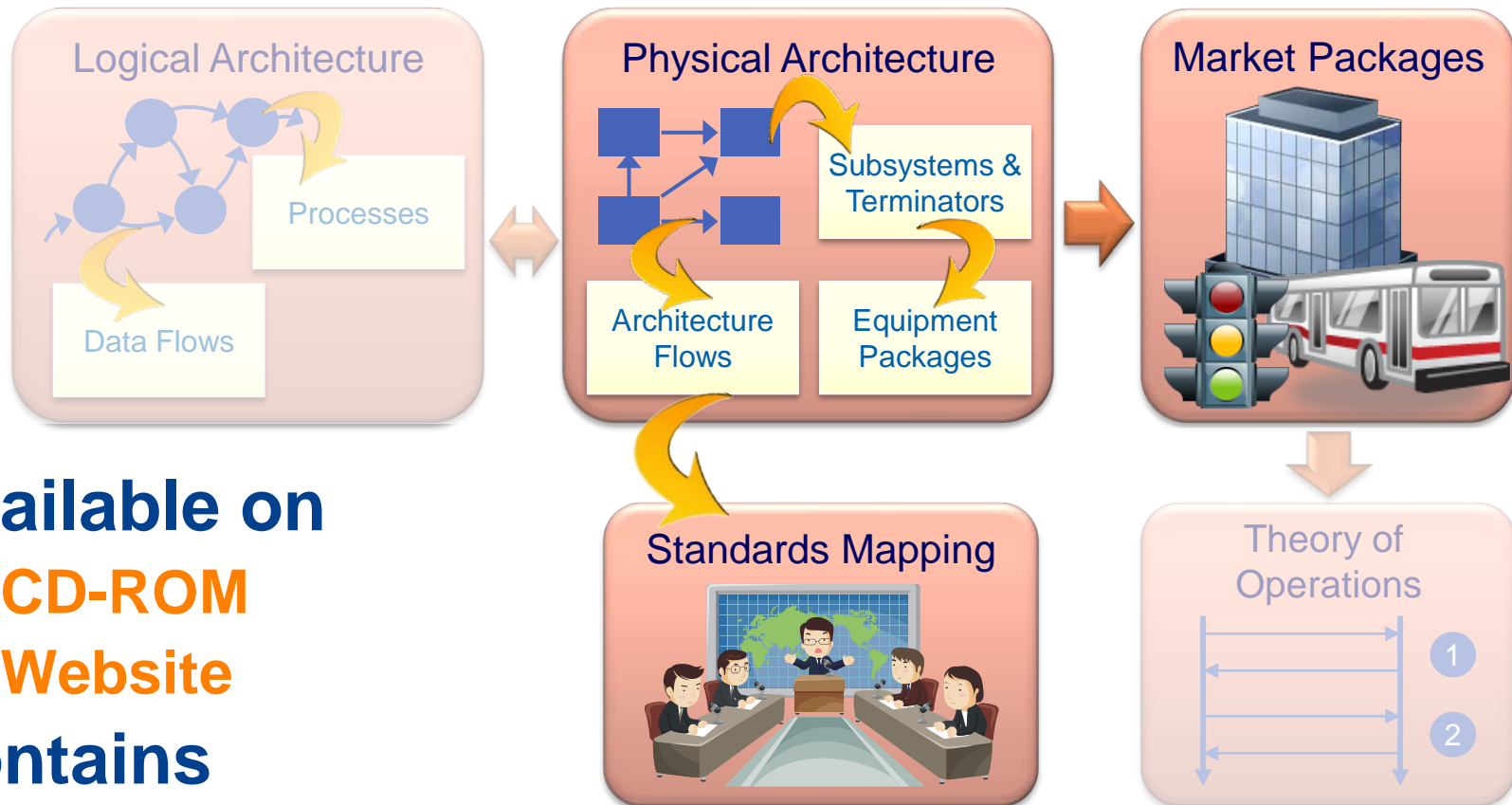
**Support compliance with ITS Architecture &  
Standards Rule/Policy**



# National ITS Architecture is a Framework and a Template



# National ITS Architecture Products



**Available on**

**CD-ROM**

**Website**

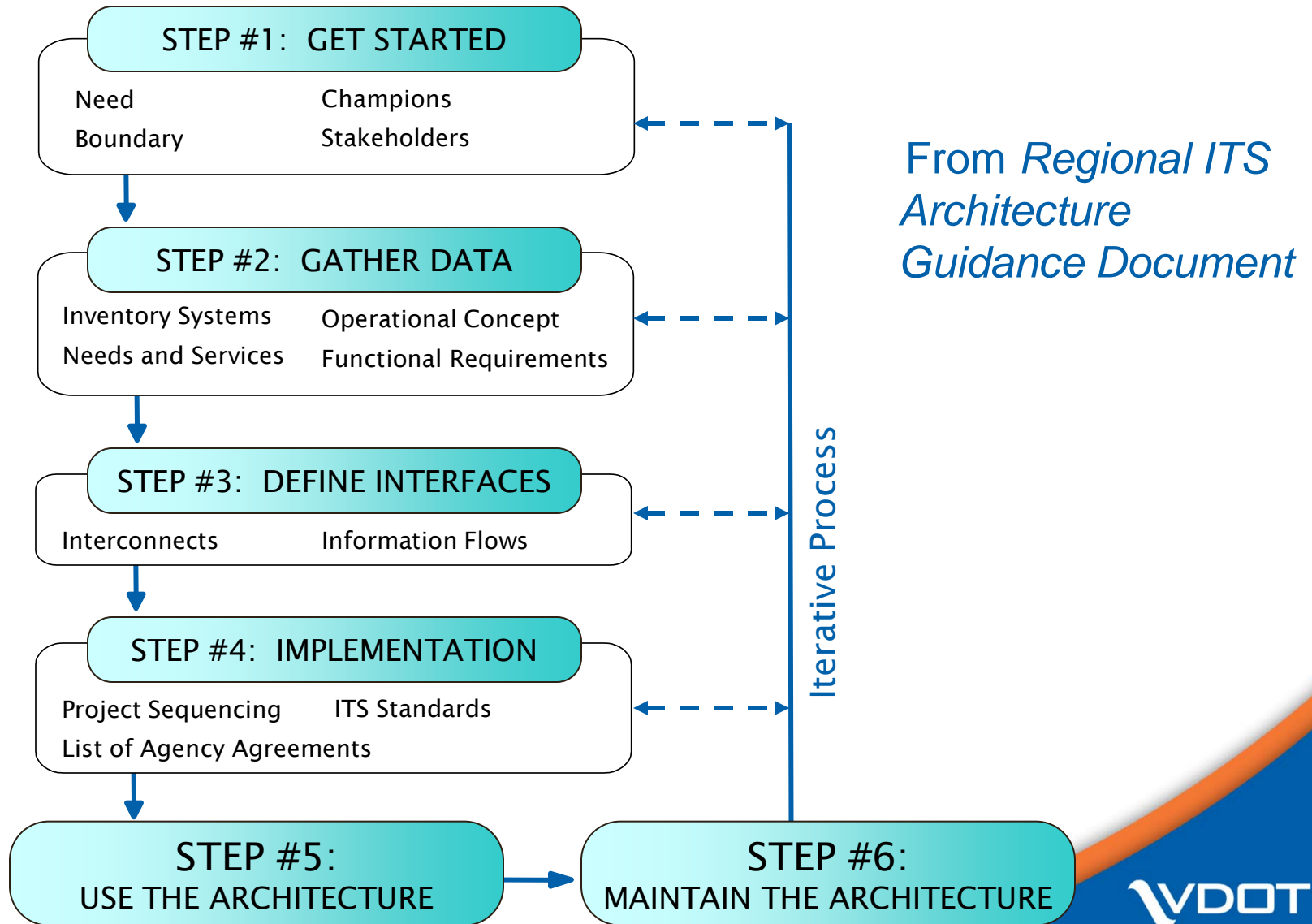
**Contains**

**Hypertext**

**PDF documents**

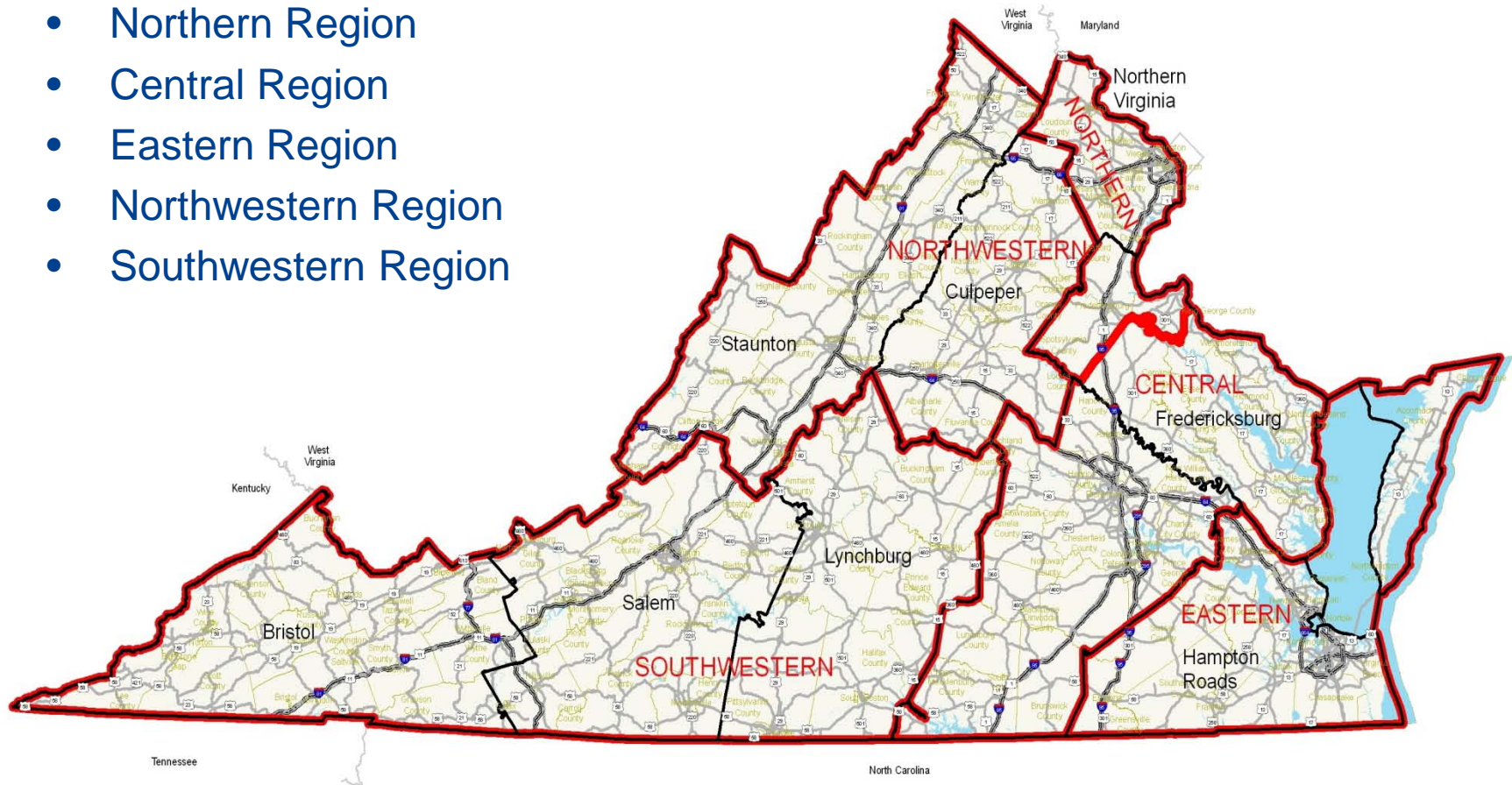
**Databases**

# Regional ITS Architecture Development Process



# VA ITS Architectures

- Statewide
- Northern Region
- Central Region
- Eastern Region
- Northwestern Region
- Southwestern Region



## Statewide vs Regional Scope

### **Statewide system functionality defined at statewide level in detail**

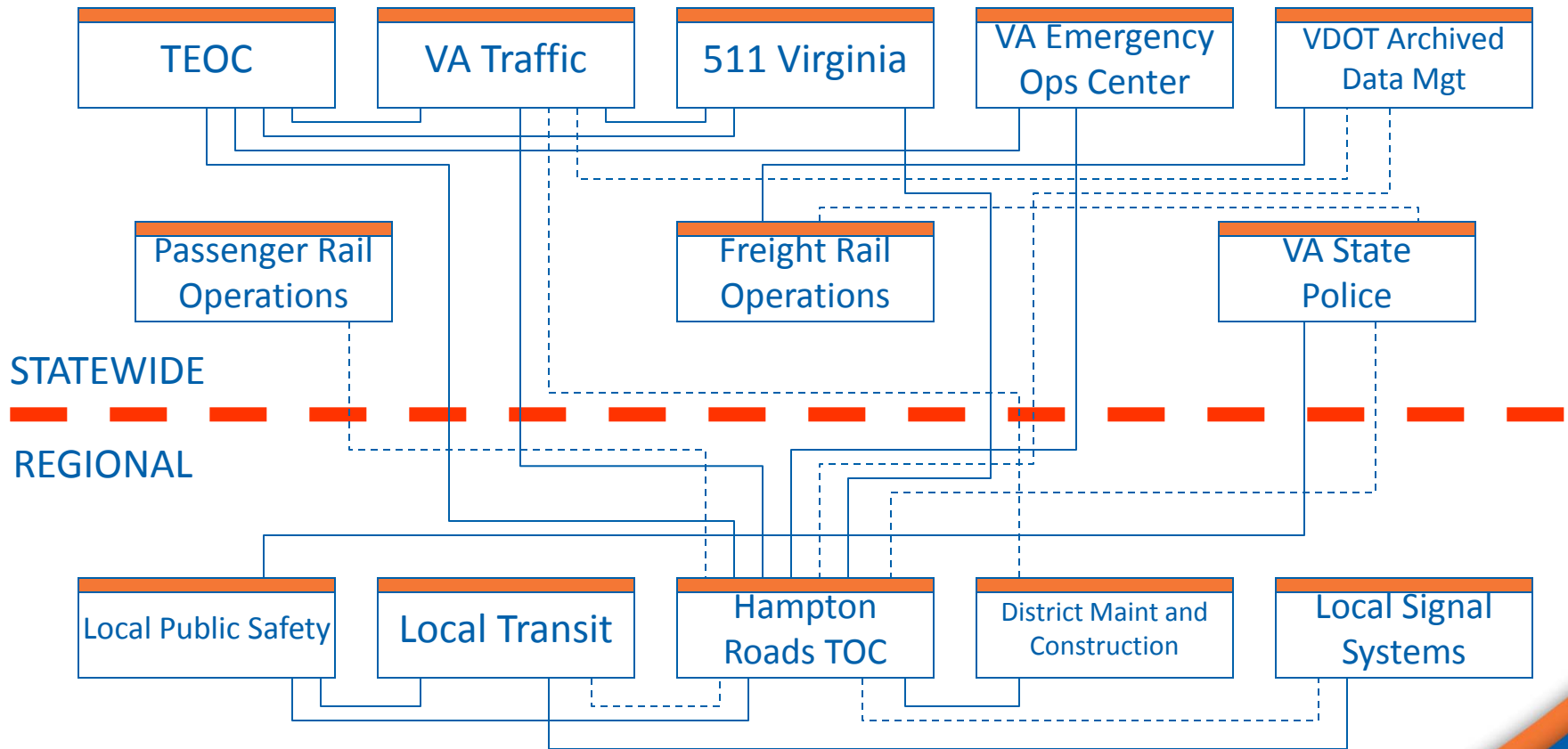
Statewide functionality definition not required at regional levels – interfaces to statewide systems is focus

### **Regional system functionality defined at regional levels in detail**

Relationships and information exchanges included in regional to statewide but regional is less complex regarding statewide systems

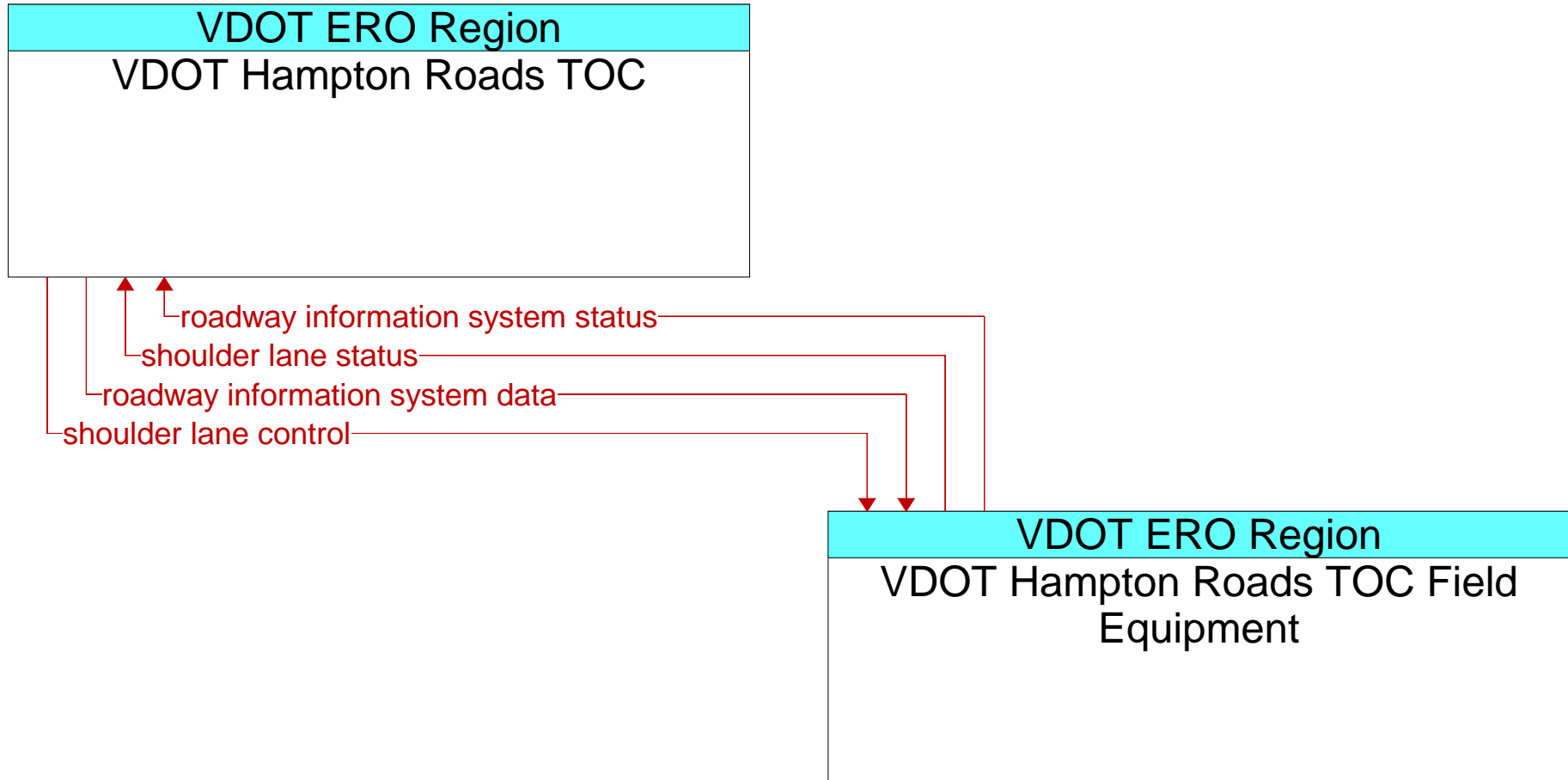


# Statewide vs. Regional Example



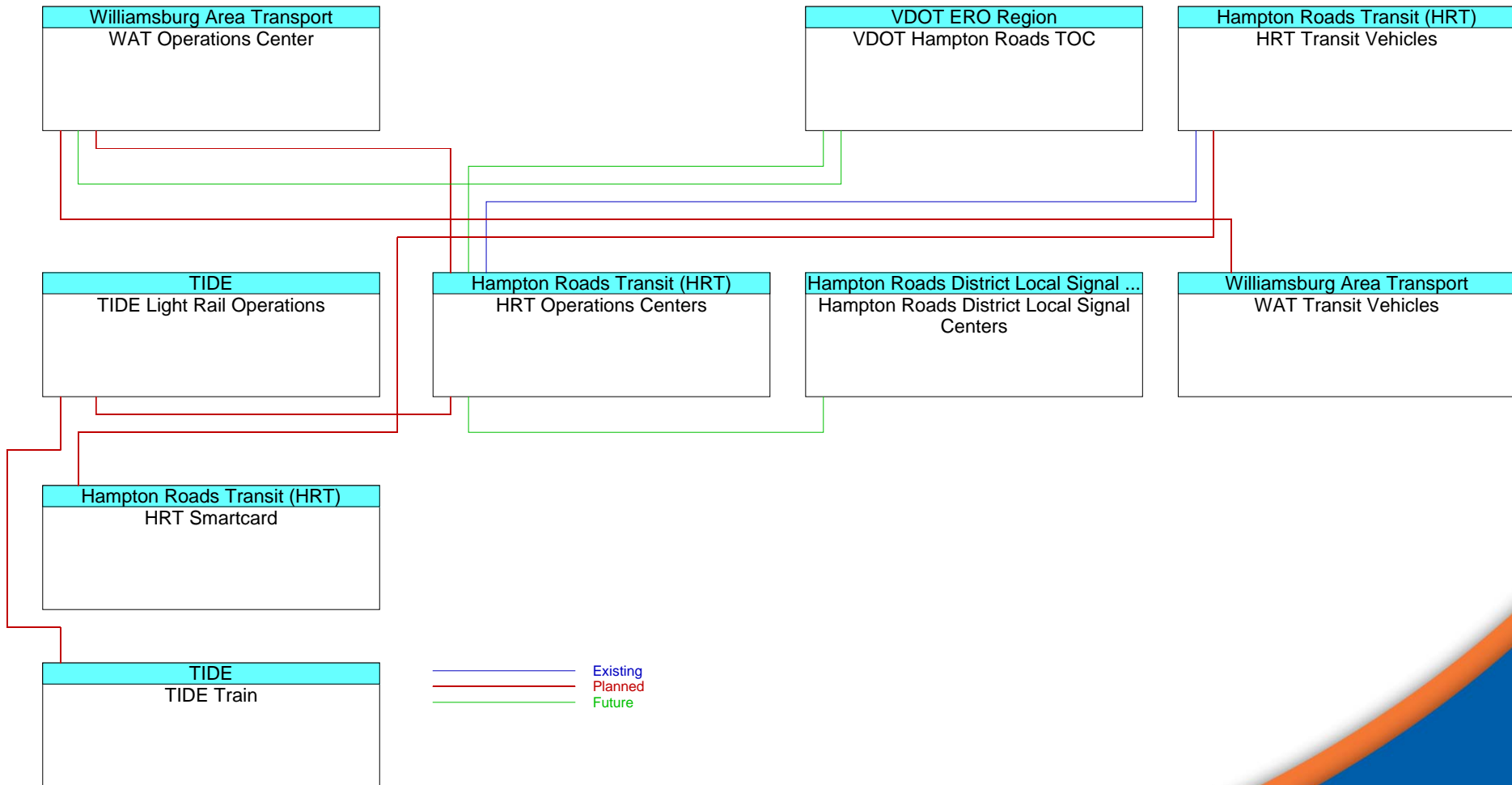


# Example Project: VDOT I-264 MM13-17 Changeable Message Sign (CMS)/Shoulder Lane Control System (SLCS) Project

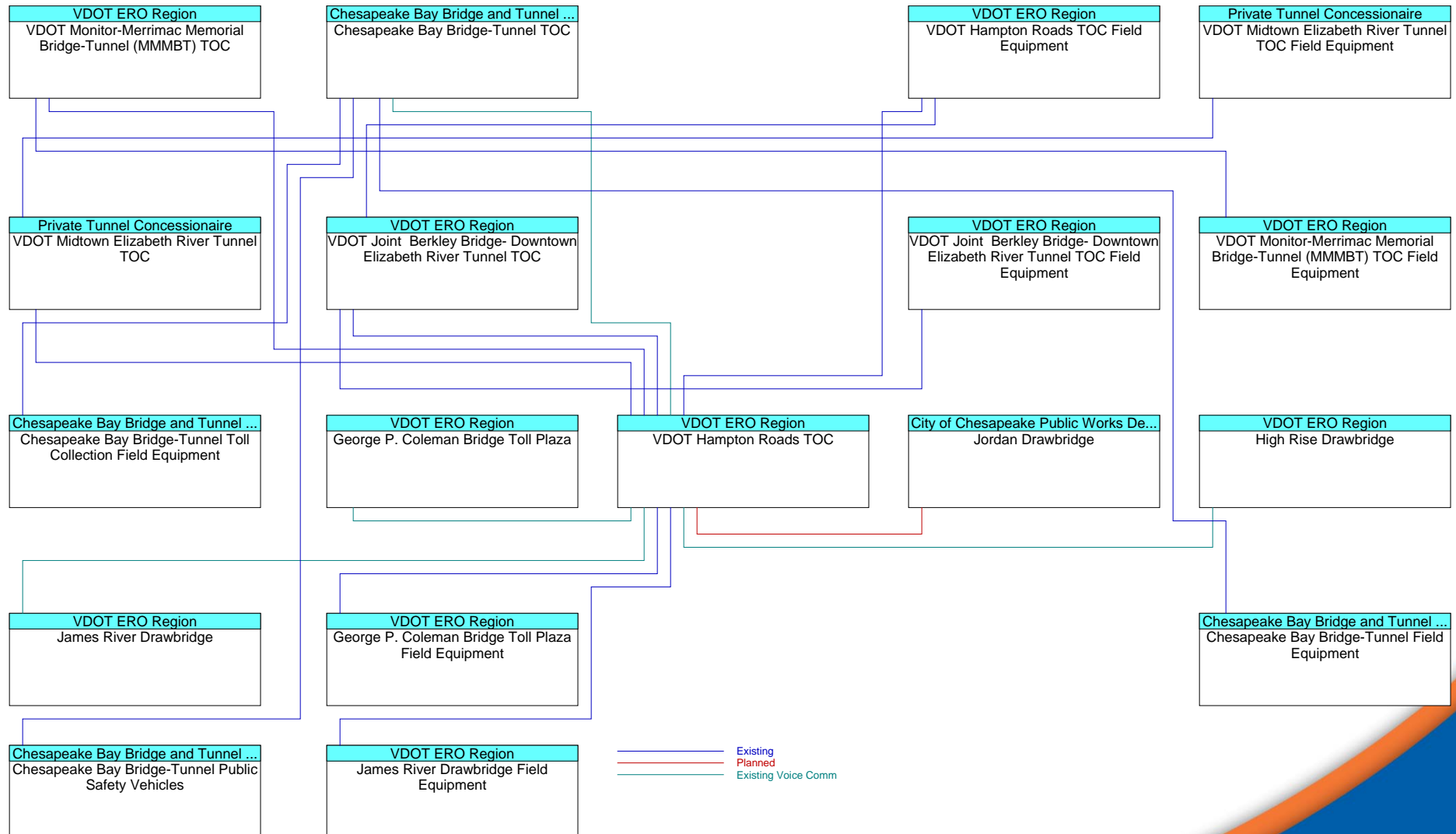


Planned

# HR Multimodal Coordination



# Example Project: HR Bridge-Tunnel Integration



## Break-Out Groups

- **Find Your Breakout Session**
- **Each group will discuss topics particular to that domain along with general findings across all domains**

## Break-Out Group Assignments (Sample)

### Breakout Group

Transit, Traveler mobility, Traveler information,

Traffic management, Maintenance & construction, Road weather, Critical infrastructure, Environment

Planning

Public Safety

# Breakout Group Introduction

## Objective

**Capture User Needs – problems/solutions/rationale**

## Breakout Group – Key Questions

- **Who are you?**
- **What is the problem?**
- **Why is this a problem?**
- **What do you need to solve the problem?**
- **Why should ITS solve this problem?**

# Participant Notes



# Participant Notes

# Participant Notes

# Participant Notes

# **TRANSPORTATION/ITS NEEDS BREAKOUT GROUPS RECAP**

# Breakout Group – Reports

## What did we learn?

**Someone from each group summarize key points**

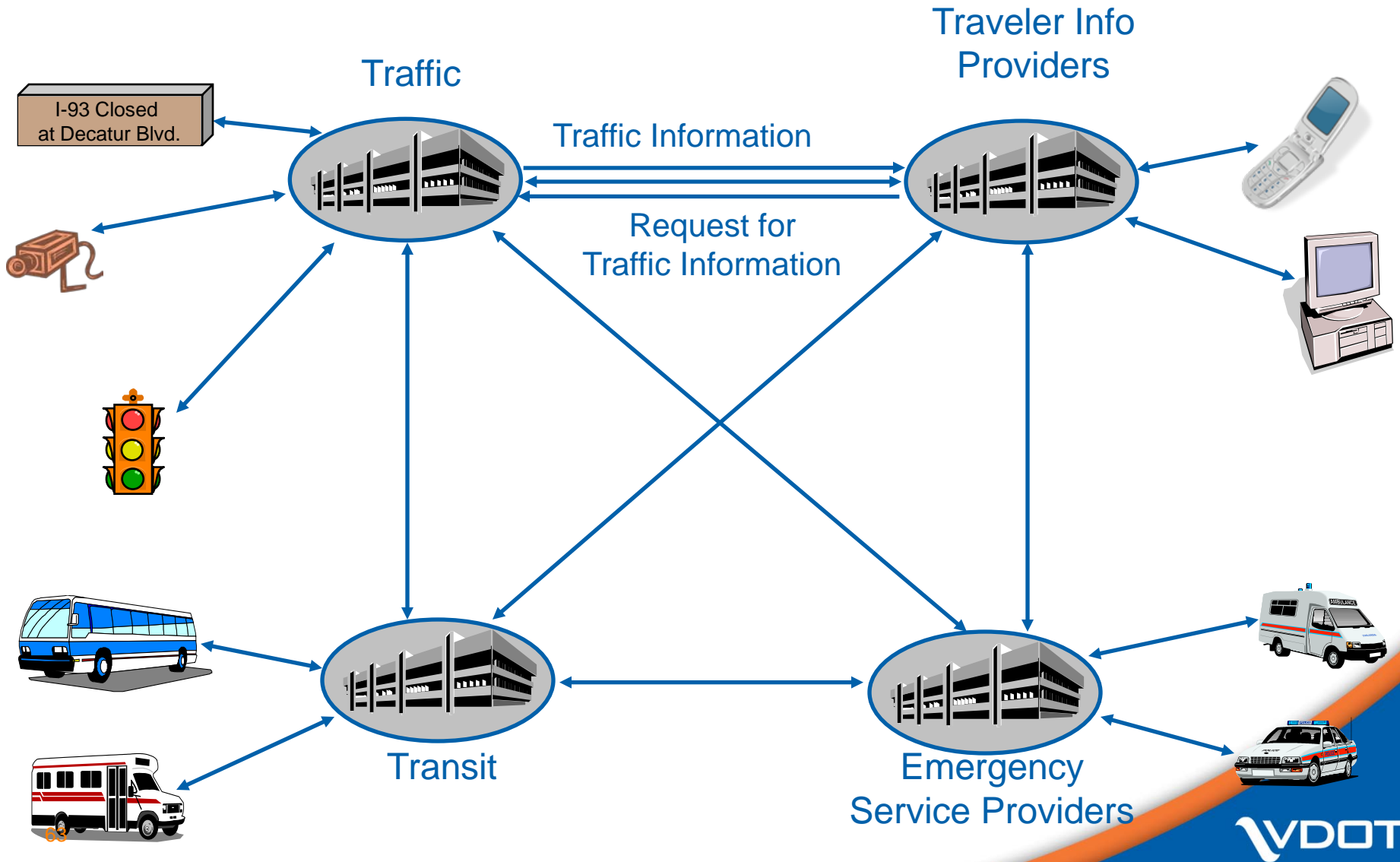
**Problems**

**Needs**

**Rationale**

# USING ITS ARCHITECTURE PRESENTATION

# Recall: ITS Architectures are a Framework for Integration



# Regional ITS Architecture

**A framework for ensuring institutional agreement and technical integration for the implementation of ITS projects in a particular region**





# Regional ITS Architecture Components

## ITS Architecture

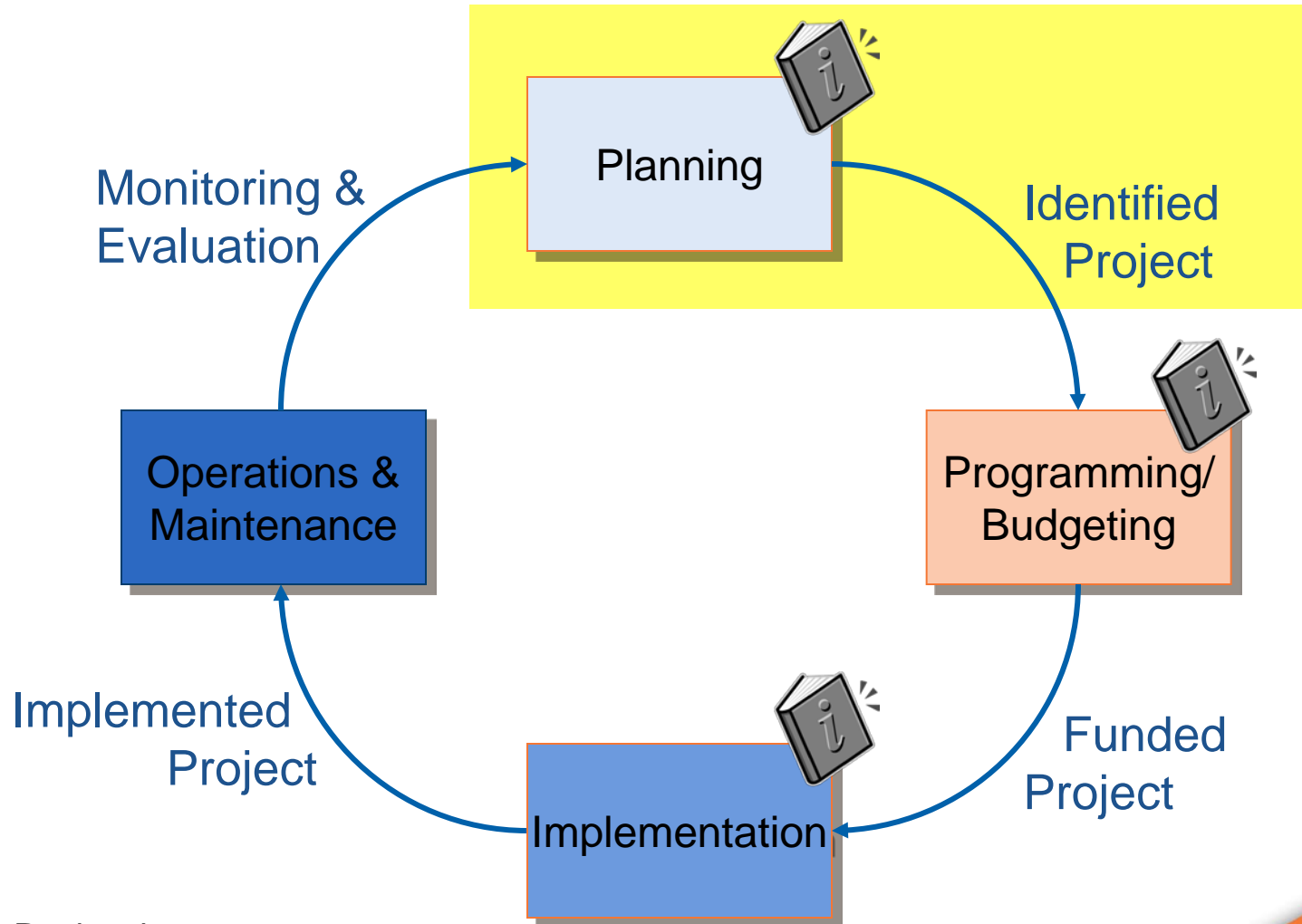
1. Region description
2. Stakeholder identification
3. ITS elements
4. ITS services
5. Operational concept
6. Functional requirements
7. Interfaces / Information flows
8. Standards identification
9. Project sequencing
10. Agreements
11. Maintenance plan

# Turbo Architecture

*Turbo Architecture* is a software tool that automates use of the National ITS Architecture



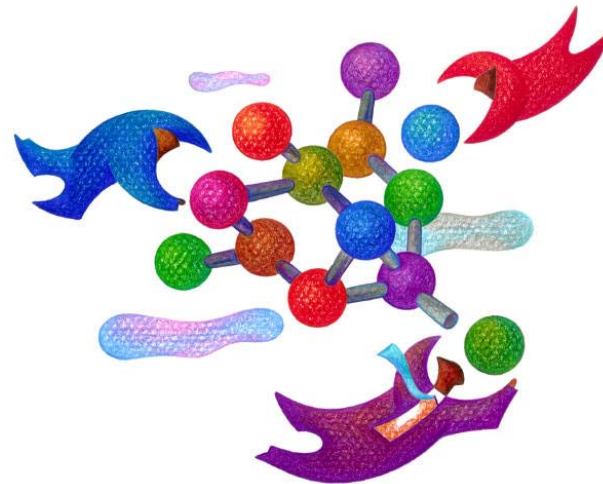
# Architecture Use in Project Life Cycle



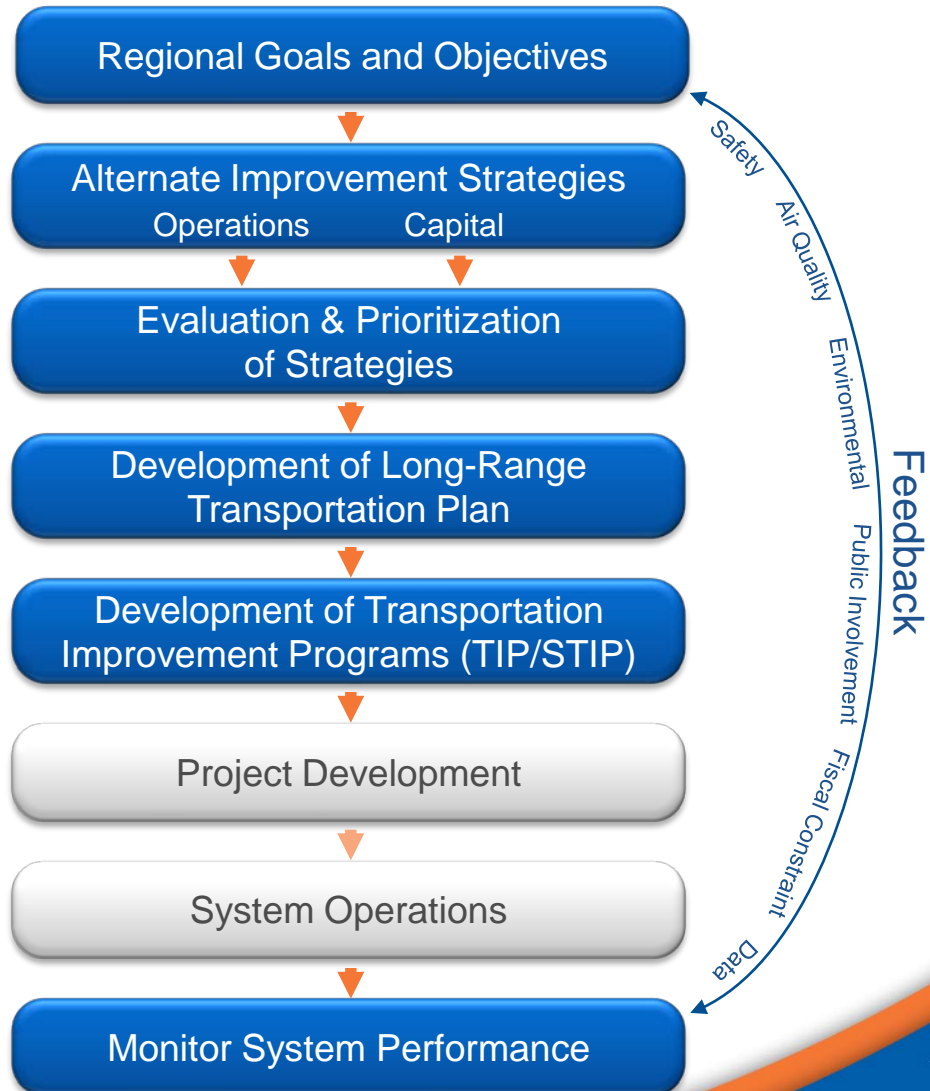
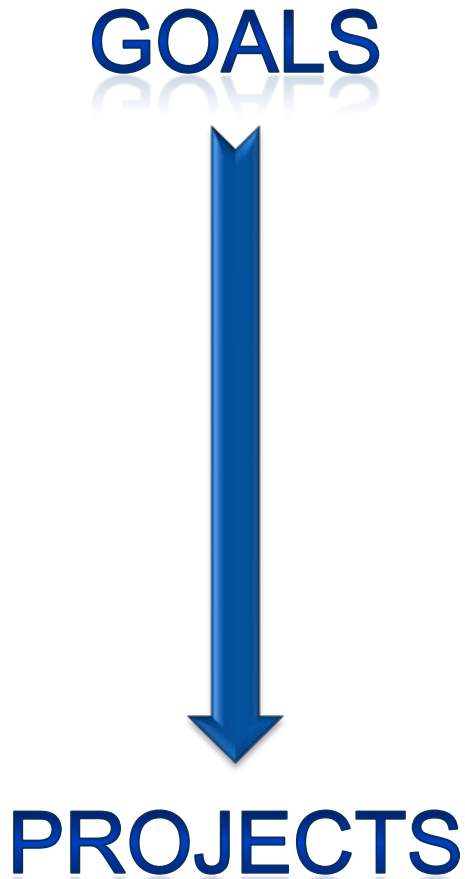
# Reasons for Architecture Use in Transportation Planning

**Architecture represents a consensus vision of Operations and Planning stakeholders for deployment of ITS systems**

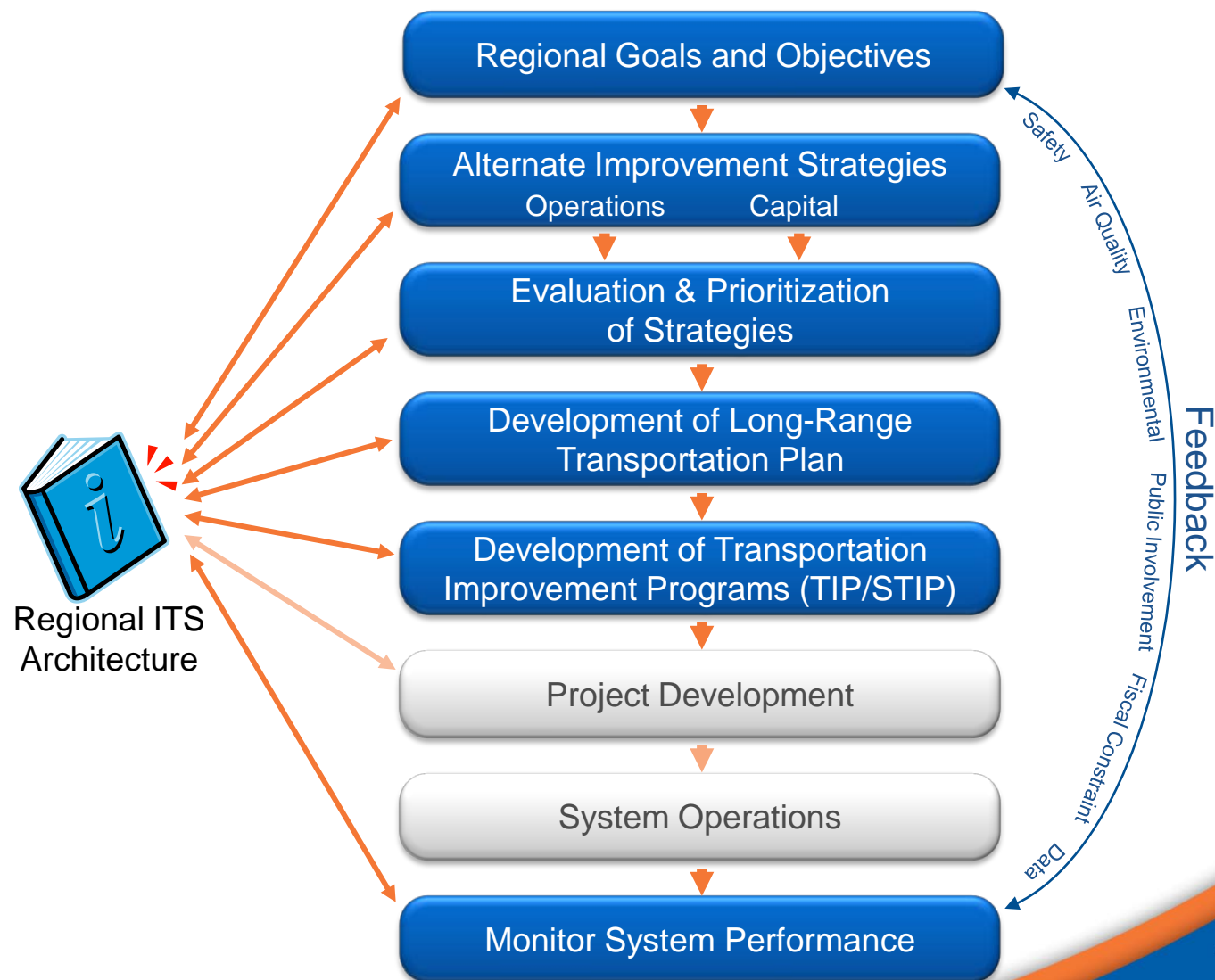
**Addresses both short range projects and long range strategies**



# Transportation Planning Process



# Regional Architecture and Transportation Planning



# Strategy Evaluation and Prioritization

Potential  
Strategies

Evaluation and  
prioritization

Selected  
Strategies

Included in

Long Range  
Plan

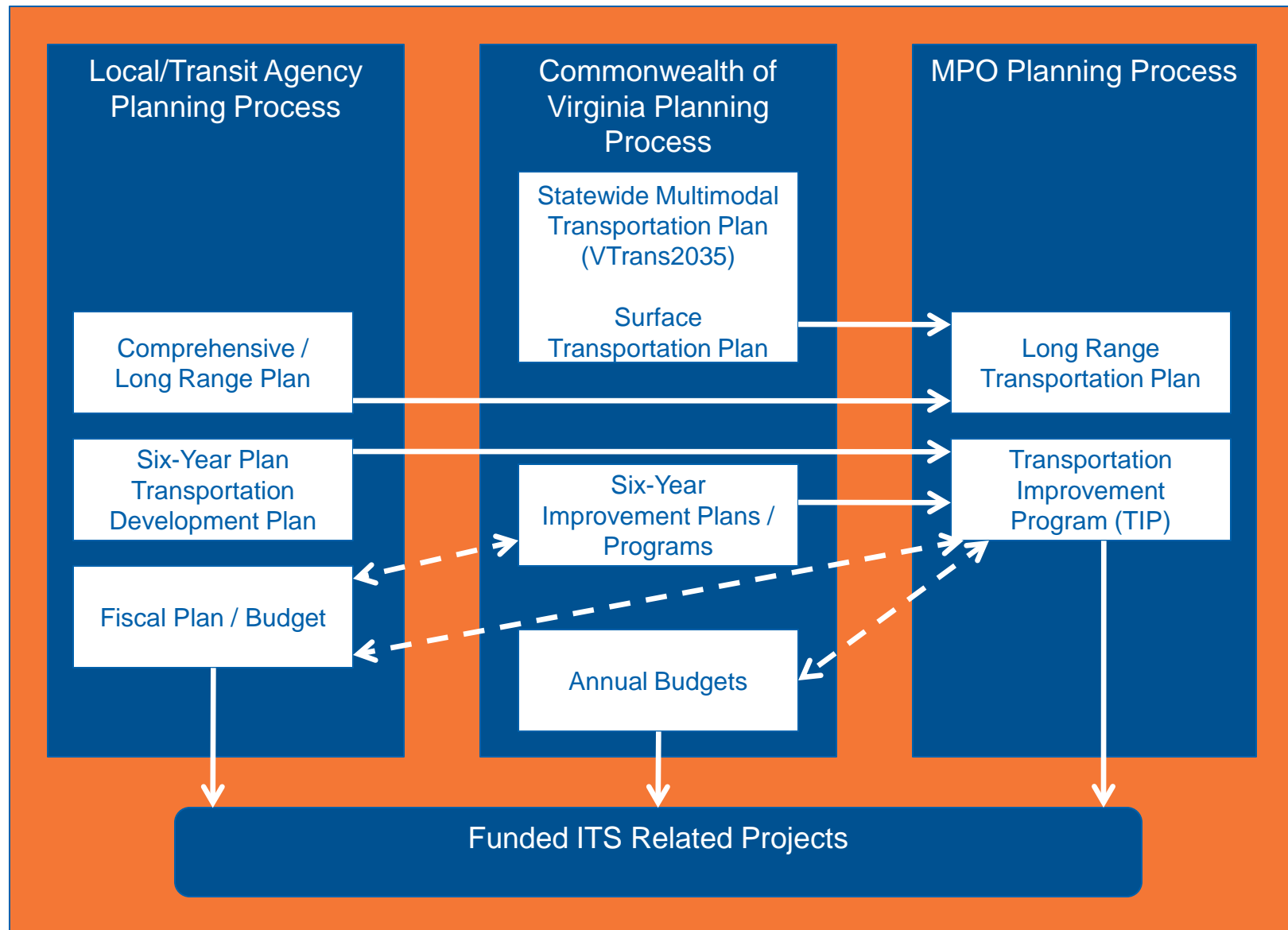
Regional Goals and Objectives

Alternate Improvement Strategies  
Operations Capital

Evaluation & Prioritization  
of Strategies

Evaluation and prioritization of  
strategies are key planning  
activities

# Using the Virginia Eastern Region ITS Architecture for Planning





# Architecture in Long Range Planning

## Services/Market Packages – insight to needs, relationships, project scope

Goals and Objectives

Transportation Needs Definition

Travel Conditions Forecasting

Candidate Strategies/Projects

Project/Strategy Costs and Benefits estimates

## Inventory – on-going operations and maintenance needs

Transportation Needs Definition

## Project Sequencing – project dependencies and project scope

Candidate Strategies/Projects

Project/Strategy Costs and Benefits estimates

# Architecture in Programming and Budgeting

## Use by Project Sponsors

**Services** – insight into project element relationships and institutional partnerships

**Interfaces/Information Flows** – project element relationships and issues

**Project Sequencing** – system and project dependencies

## Use by Transportation Planners

**Operational Concept** – Roles and Responsibilities related to project

**Services**

**Interfaces/Information Flows** – Regional system impacts

**Project Sequencing** – Project timelines and dependencies, evaluation and prioritization

# Promoting Architecture in Planning

## Monitor for architecture implementation in planning – VDOT and DRPT

- Identify architecture checkpoints in planning process

- Provide guidance on architecture in planning

- Evaluate project compliance with architecture during planning process

- Point of contact for questions on architecture application

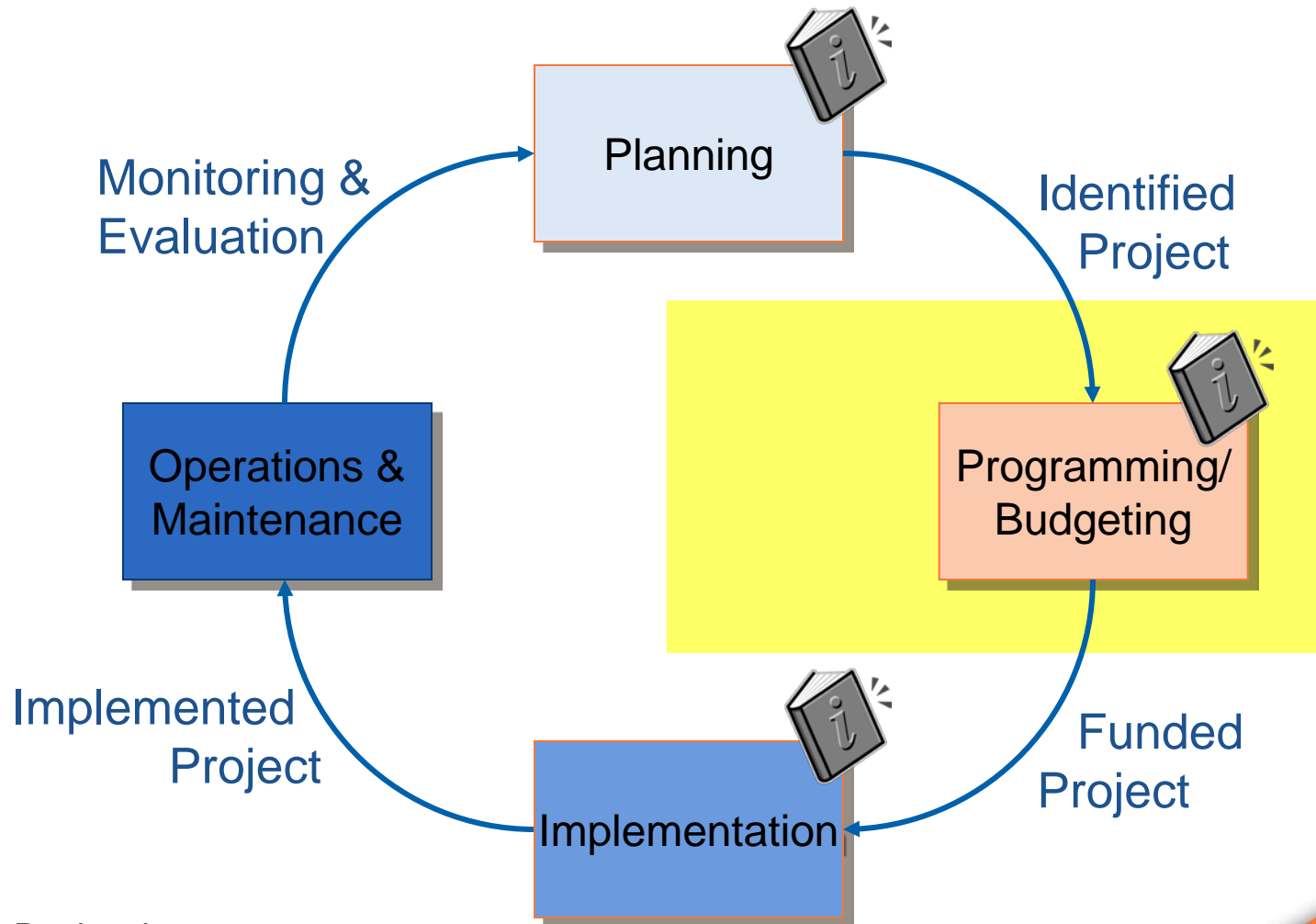
- Liaison between MPOs and other planning organizations

## MPOs and other Planning Organizations

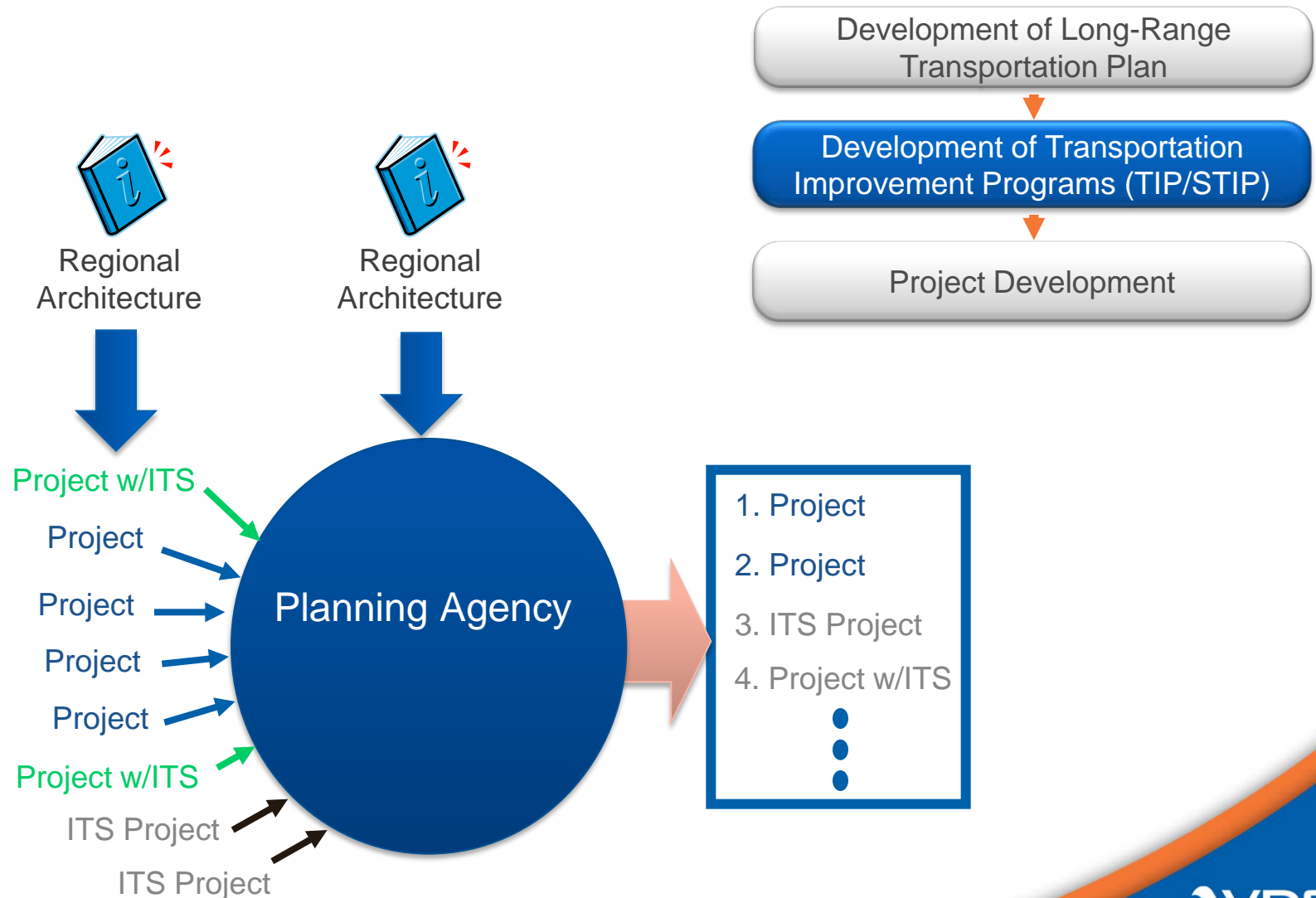
- Evaluate planning processes for inclusion of architecture

- Coordinate with VDOT

# Architecture Use in Project Life Cycle



# Architecture Use in Programming/Budgeting



# Benefits of Architecture Use in Programming/Budgeting

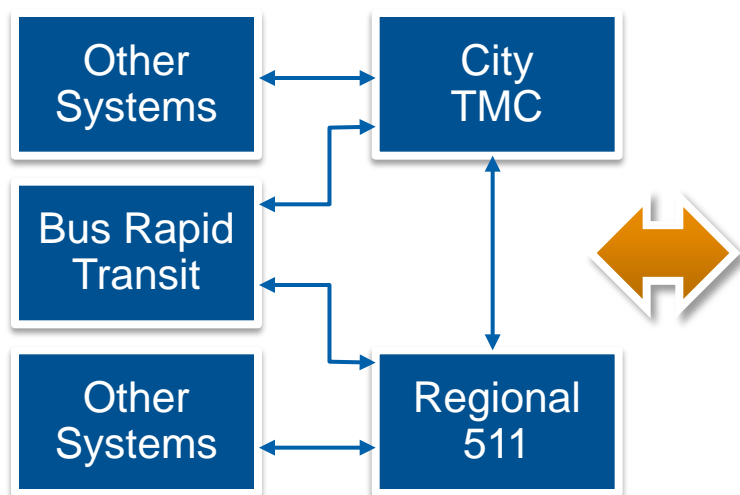
**Link objectives and needs of the region with ITS  
deployed in the field**

**Take a regional view**

**Begin coordination of projects of various organizations  
by defining from the same reference point**

# Architecture Provides a Regional Context for Planned Projects

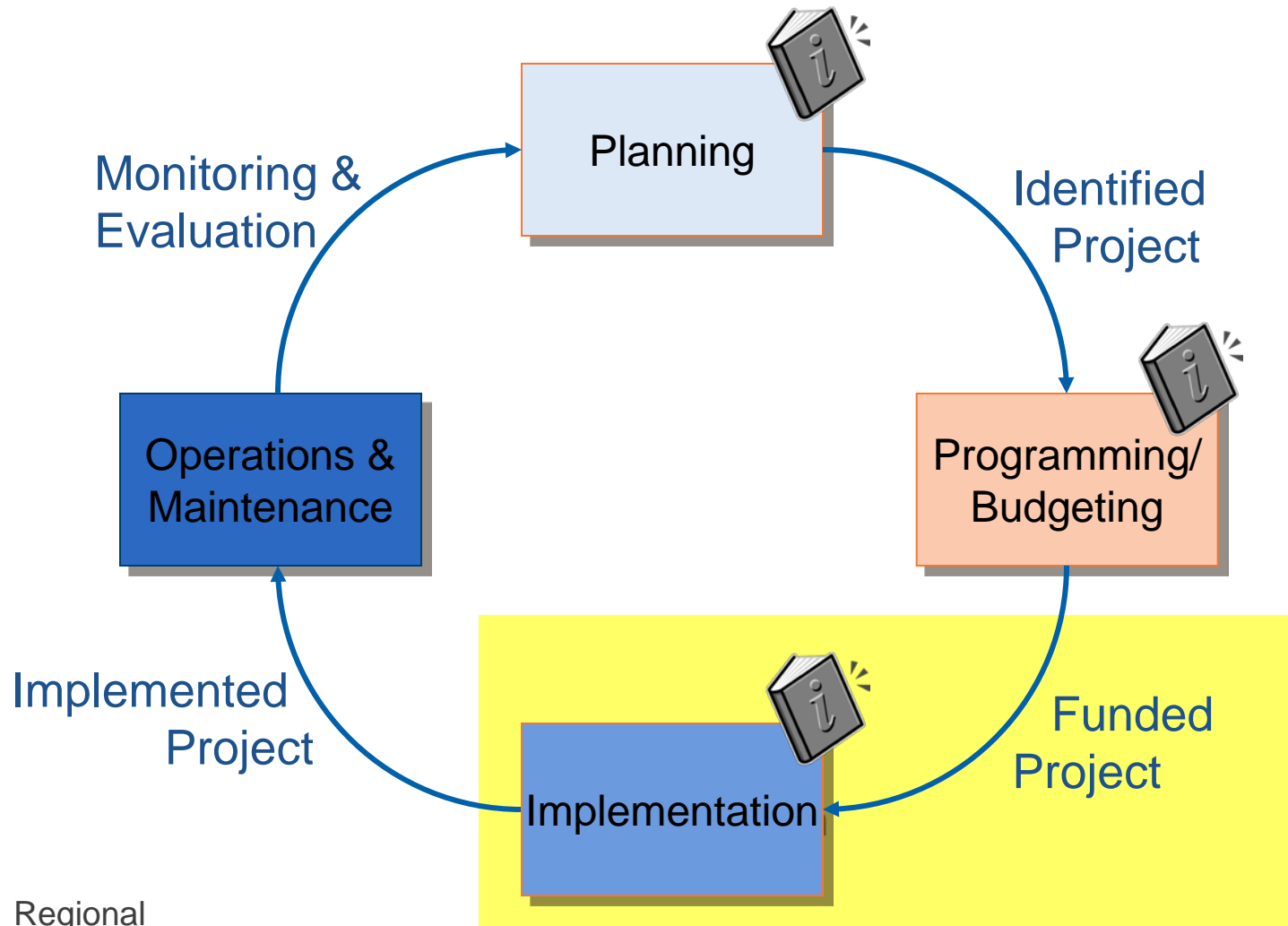
## Regional Architecture



## Transportation Improvement Program

| Agency | Number  | Project               | Funding |
|--------|---------|-----------------------|---------|
| City   | C11-321 | City TMC              | \$400K  |
| CTrans | T12-023 | Bus Rapid Transit Ph1 | \$1.4M  |
| DOT    | D11-843 | Regional 511 Ph2      | \$600K  |

# Architecture Use in Project Life Cycle

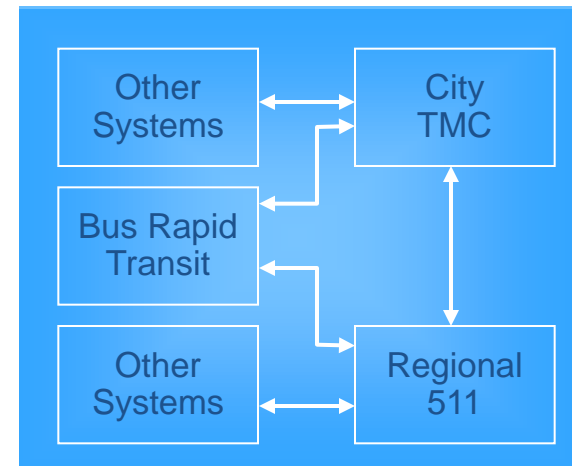
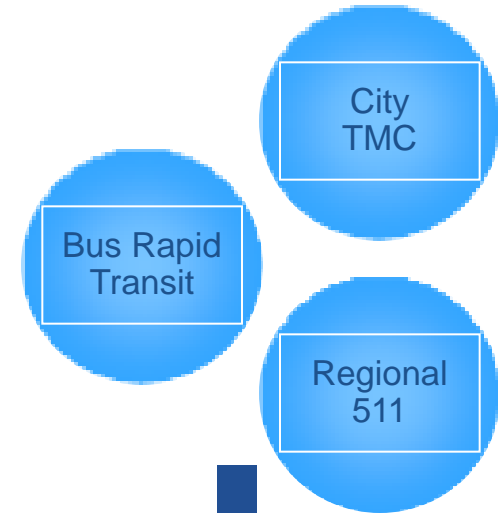




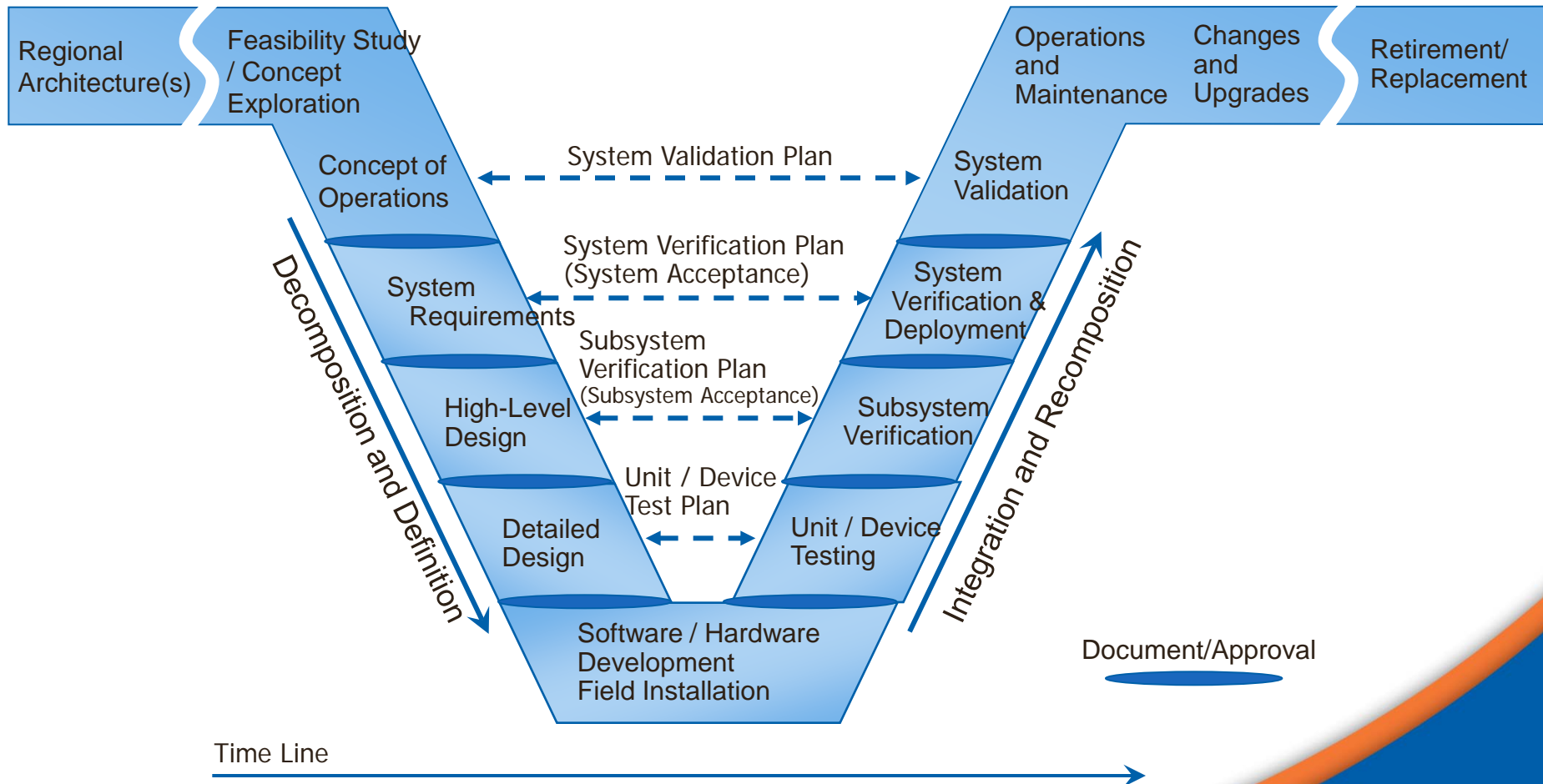
# Reasons for Architecture Use in Project Implementation



**Blueprint**  
**Integration Opportunities**  
**Efficiency**  
**Rule/Policy**

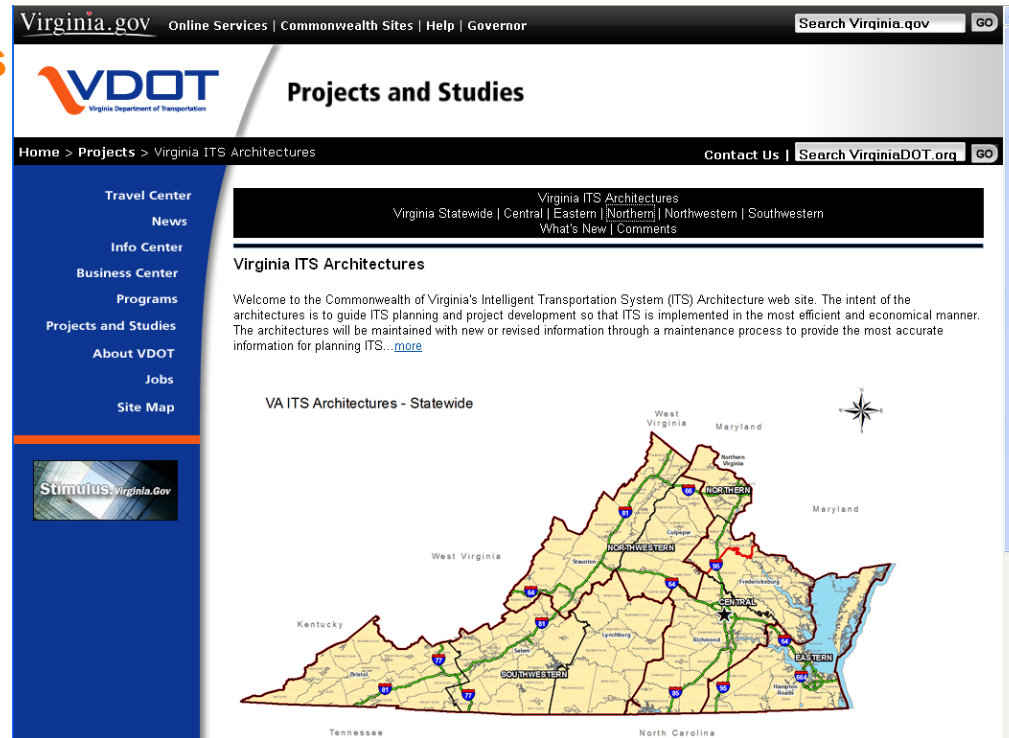


# Systems Engineering Process



# Architecture Tools

- **Common level of detail across all architectures**
  - ✓ **Tightly coupled - Facilitates inter- regional and corridor coordination**
- **CD / Website**
  - ✓ **All architectures on 1 site**
  - ✓ **No paper documents – all electronic products**
- **Nomenclature Guide**
  - ✓ **Captures common nomenclature**
- **Centerpiece of initiatives**
  - ✓ **Establishes functional framework**

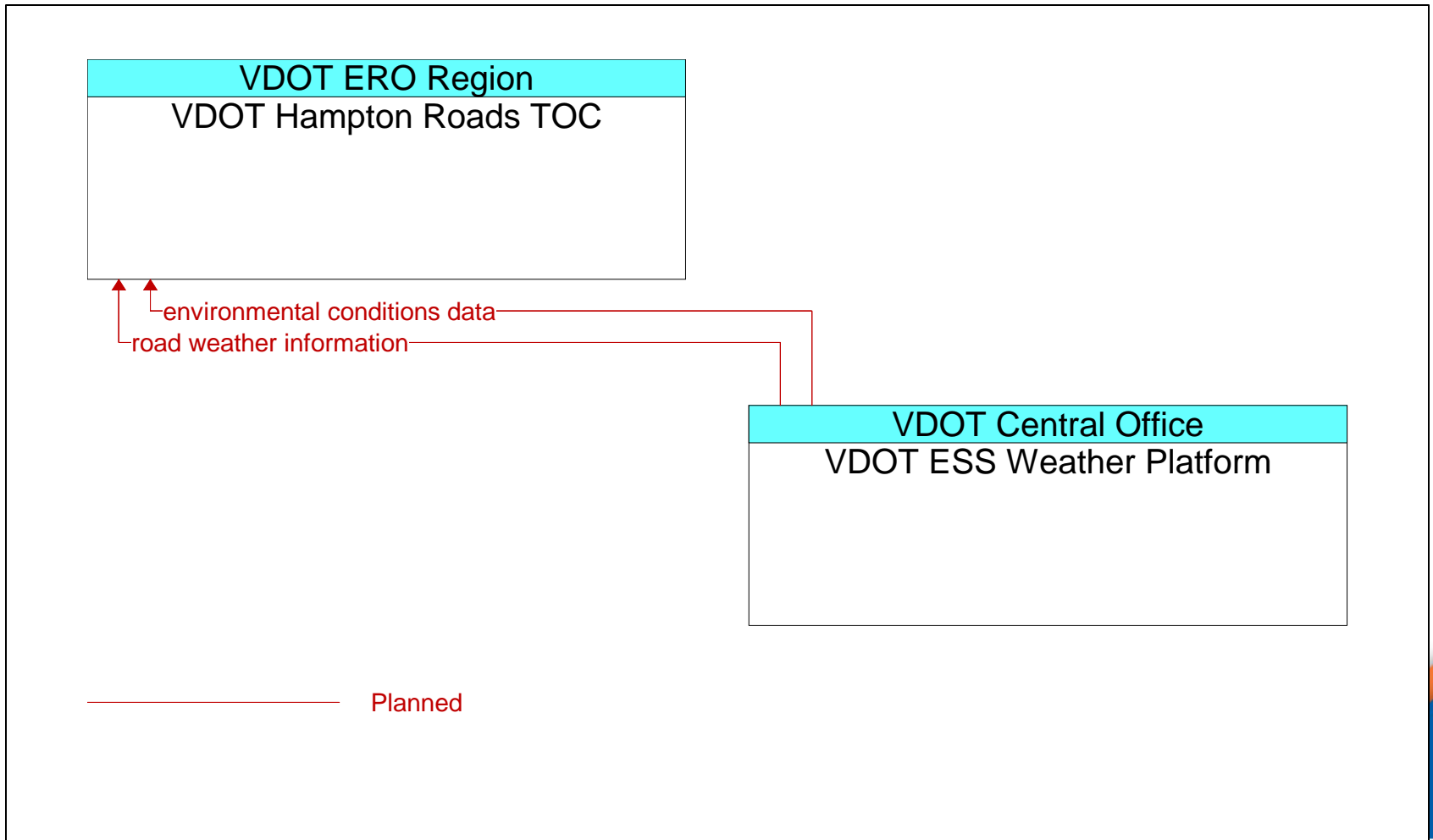


# Hampton Roads Road Weather Information System (RWIS) Project

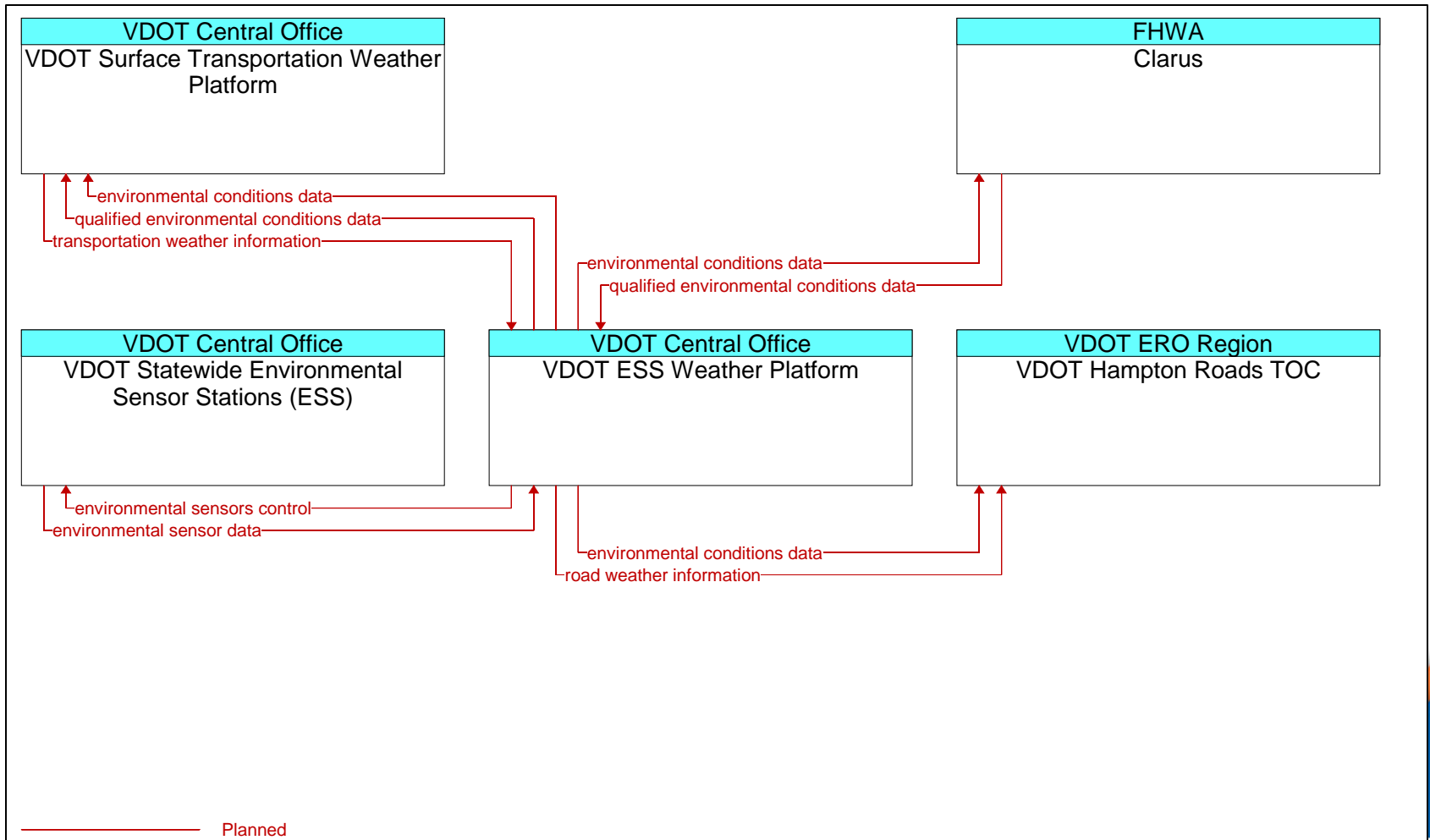
**Addresses Emergency and Traveler Information  
needs on I-64 between MM 242 and MM 255**

**2 RWIS**

# Project ITS architecture



# Project ITS architecture



# **Queue Warning and Speed Management Project for Eastbound I-66 / Dulles Connector**

**Addresses congestion resulting from merging traffic at the eastbound I-66 / Dulles Connector (Route 267) junction along with queue delays at the downstream exit ramps from I-66 to Westmoreland St and Washington Blvd.**

## **Project Equipment**

**10 Overhead Lane Management Systems (OLMS)**

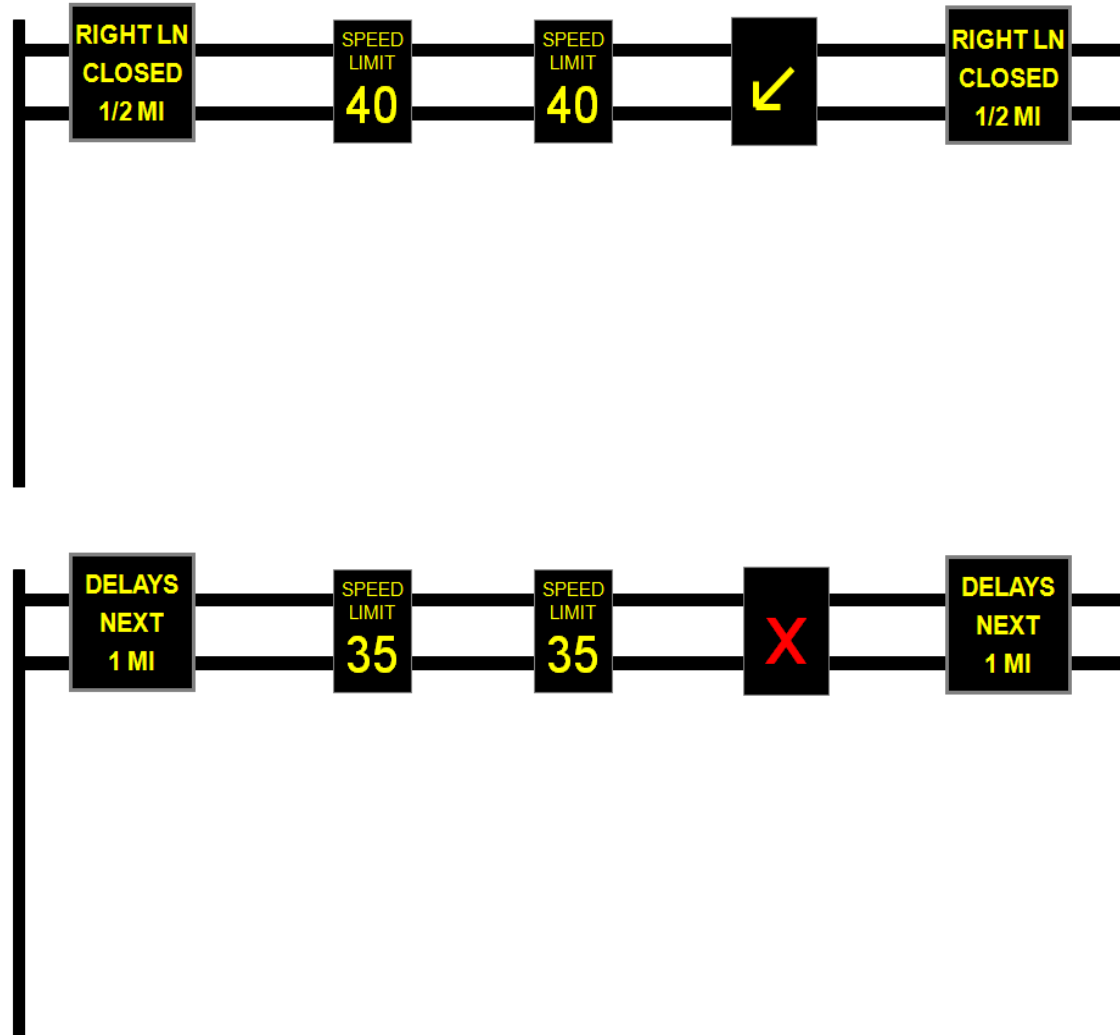
**13 VDS (Vehicle Detection Systems) (11 mainline, 2 off-ramp)**

**4 CCTV (Closed Circuit Television)**

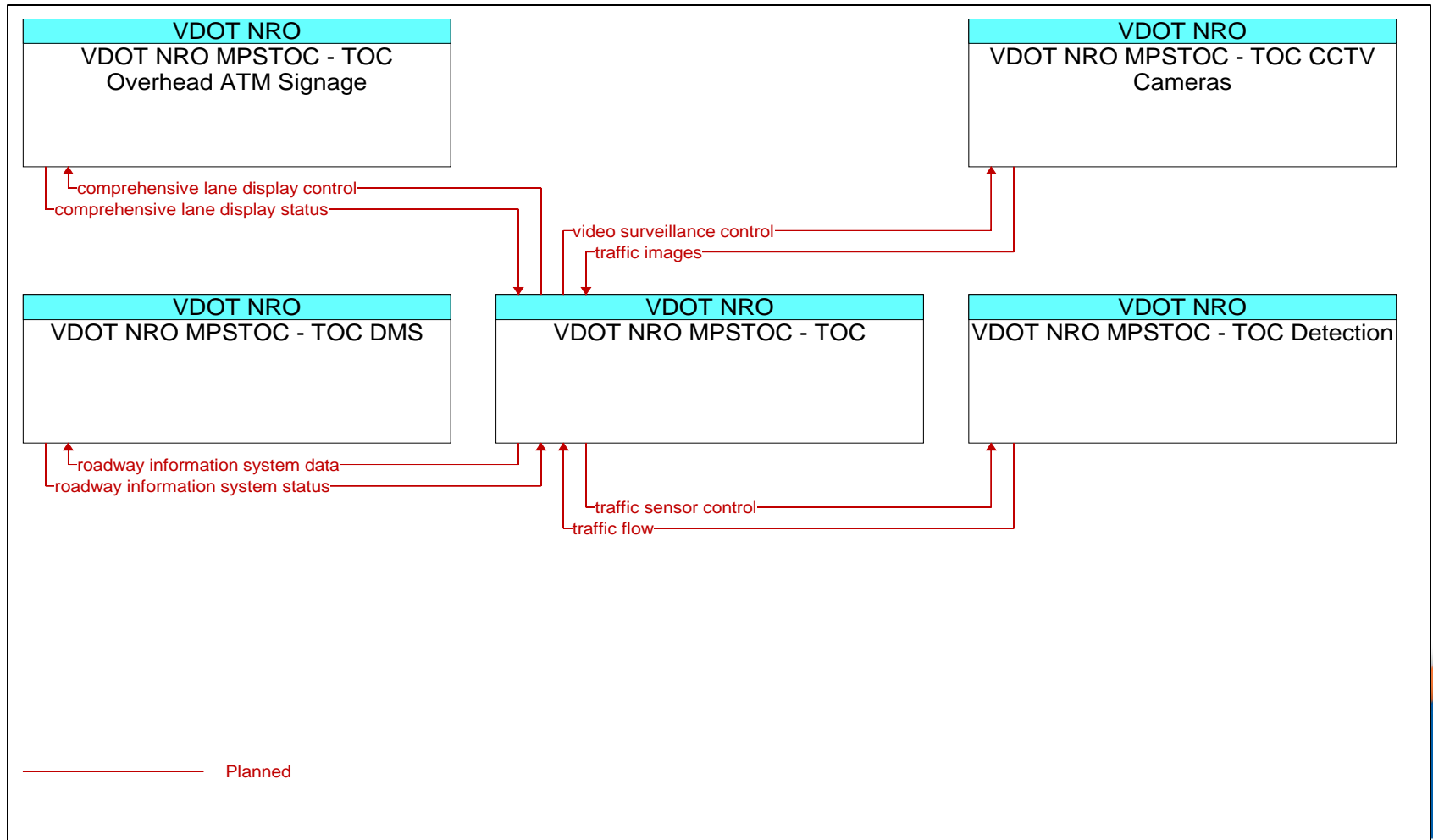
**2 DMS (Dynamic Message Signs)**



# Typical OLMS Display



# Project ITS architecture

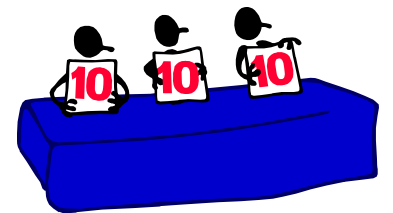
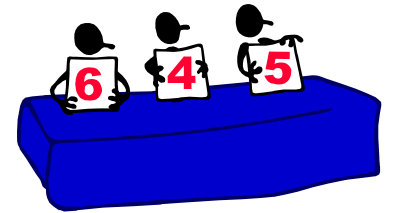


# IDENTIFY GAPS AND SUGGESTED ARCHITECTURE CHANGES

# WRAP-UP

# Workshop Outcomes

1. Better understand VA ITS Planning and Development
2. Review stakeholder needs survey results
3. Capture region's transportation/ITS needs
4. Review your ITS architecture and identify gaps



# THANK YOU!

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