



**Virginia ITS Architecture Stakeholder Needs
Workshop – Updating the Northwestern
Regional Architecture**

May 20, 2011

WELCOME AND INTRODUCTIONS

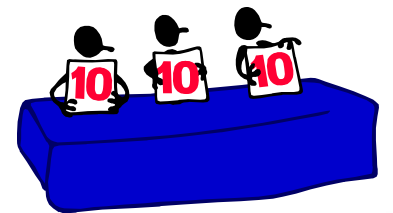
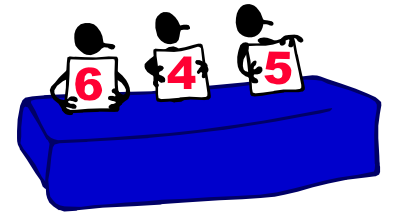
Introductions

- **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



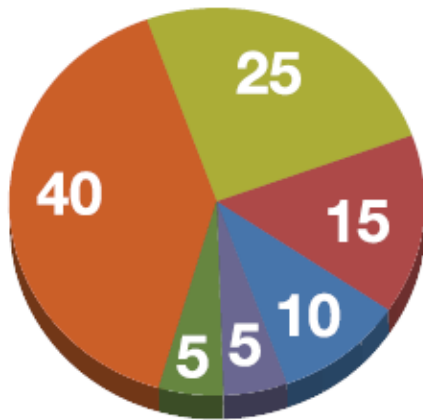
Virginia ITS Architectures
Stakeholder Needs Workshop
Updating Northwest Region Architecture
May 20, 2011

Chris Francis
ITS Program Development Manager
Operations and Security Division

**“
.....more congestion, longer commutes, and
missed economic opportunities.....That trend must
be reversed and this is the time to do it.”**

Governor Bob McDonnell

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

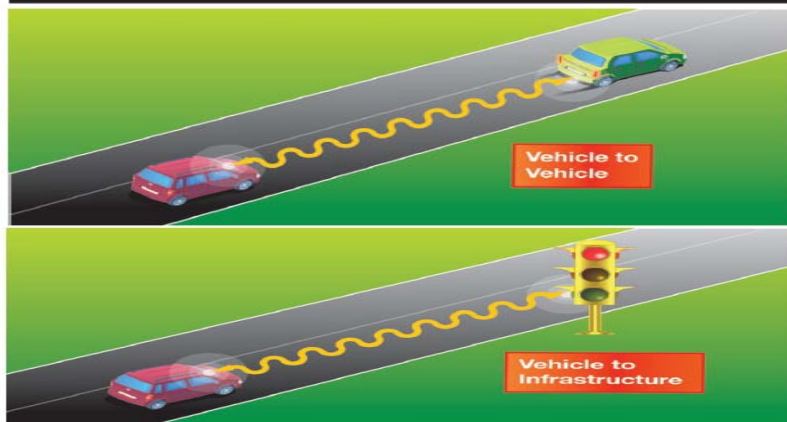
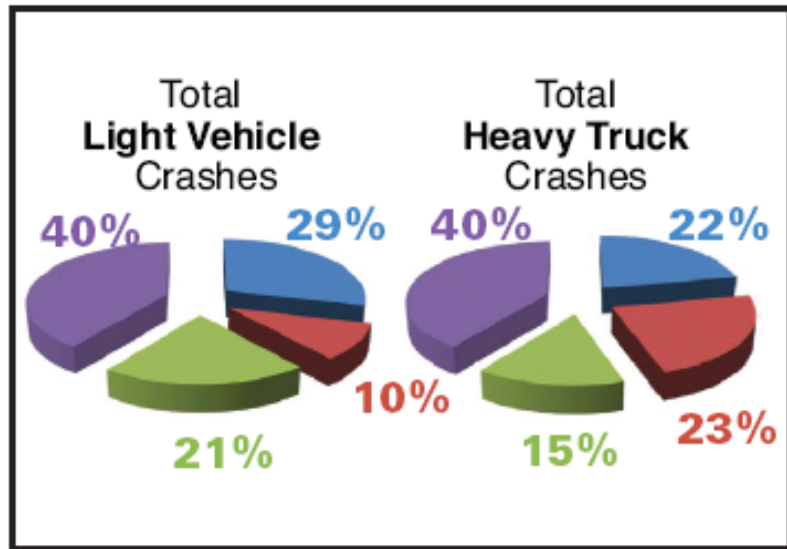


Roadside Technology



In-Vehicle Technology

Integrated Vehicle Based Safety Systems (IVBSS)



Awareness Provided

These illustrations show three types of prevalent crashes and the awareness provided to the driver by each safety system.



Real Time Traveler Information Signage



Commercial Vehicle Information System and Network (CVISN)



Weigh-in-motion Sensors



Electronic Toll Payment/
Vehicle tracking transponder

Electronic Freight Management (EFM)



Electronic Freight Management

Based on replication of initial tests, results include:

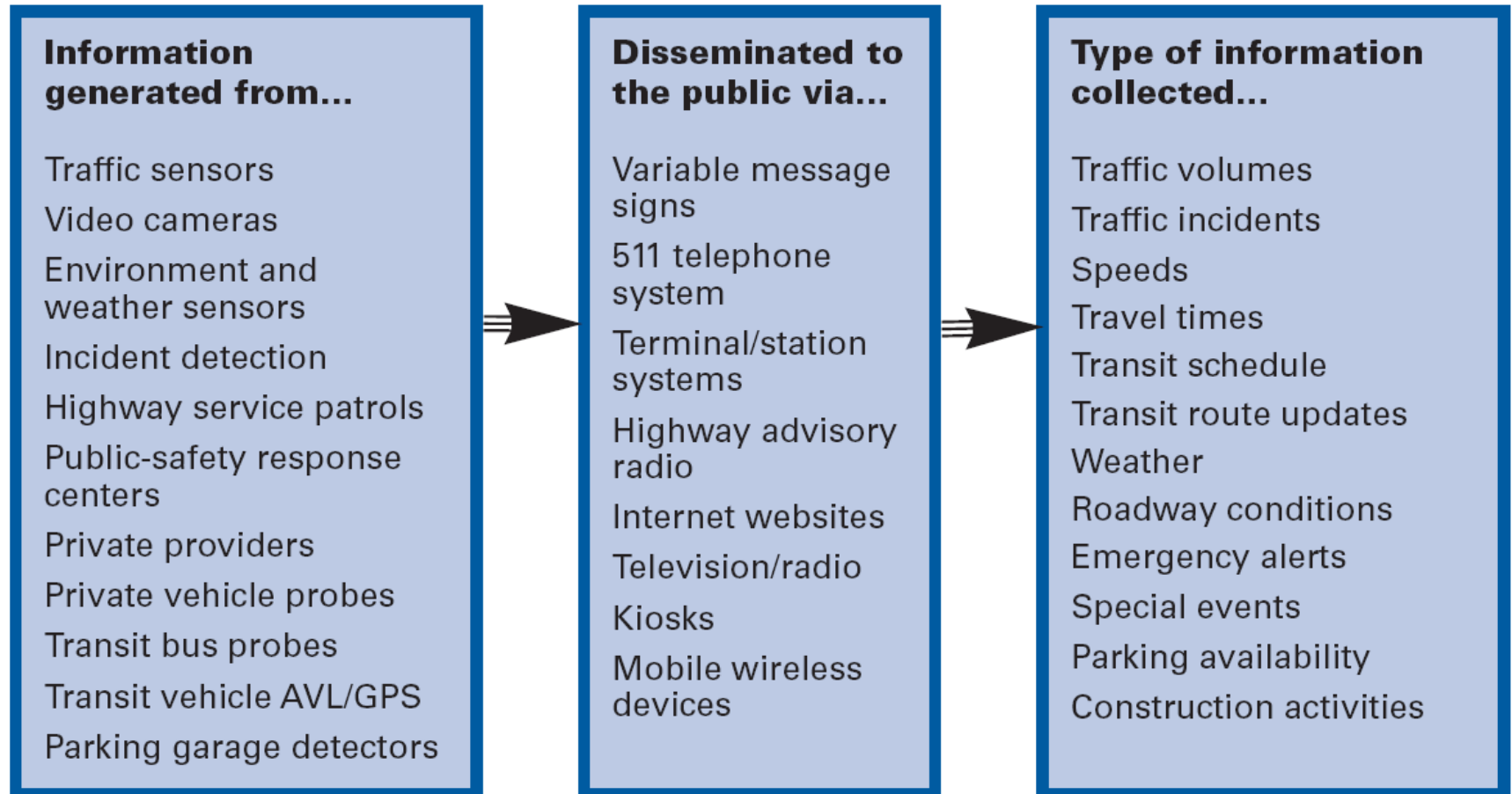
- 12% reduction in total shipment travel time
- 75% reduction in paper-work-entry labor per shipment
- 12% improvement in data accuracy
- 15% reduction in data-entry errors
- 10% improvement in customs-clearance processing

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

Advanced Traveler Information System (ATIS)

Dissemination of Traveler Information

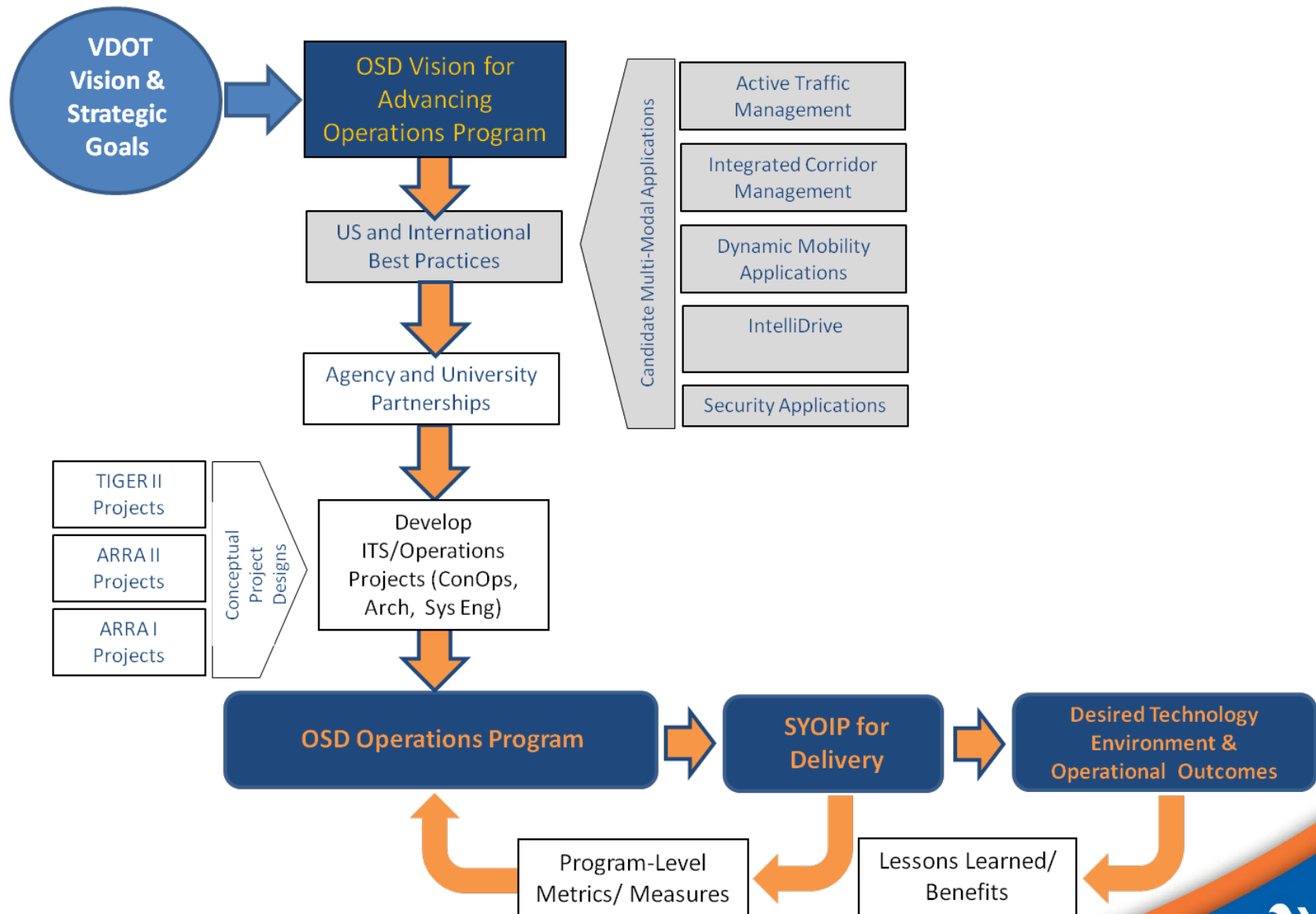


Strategic Approach to New Technology Deployments

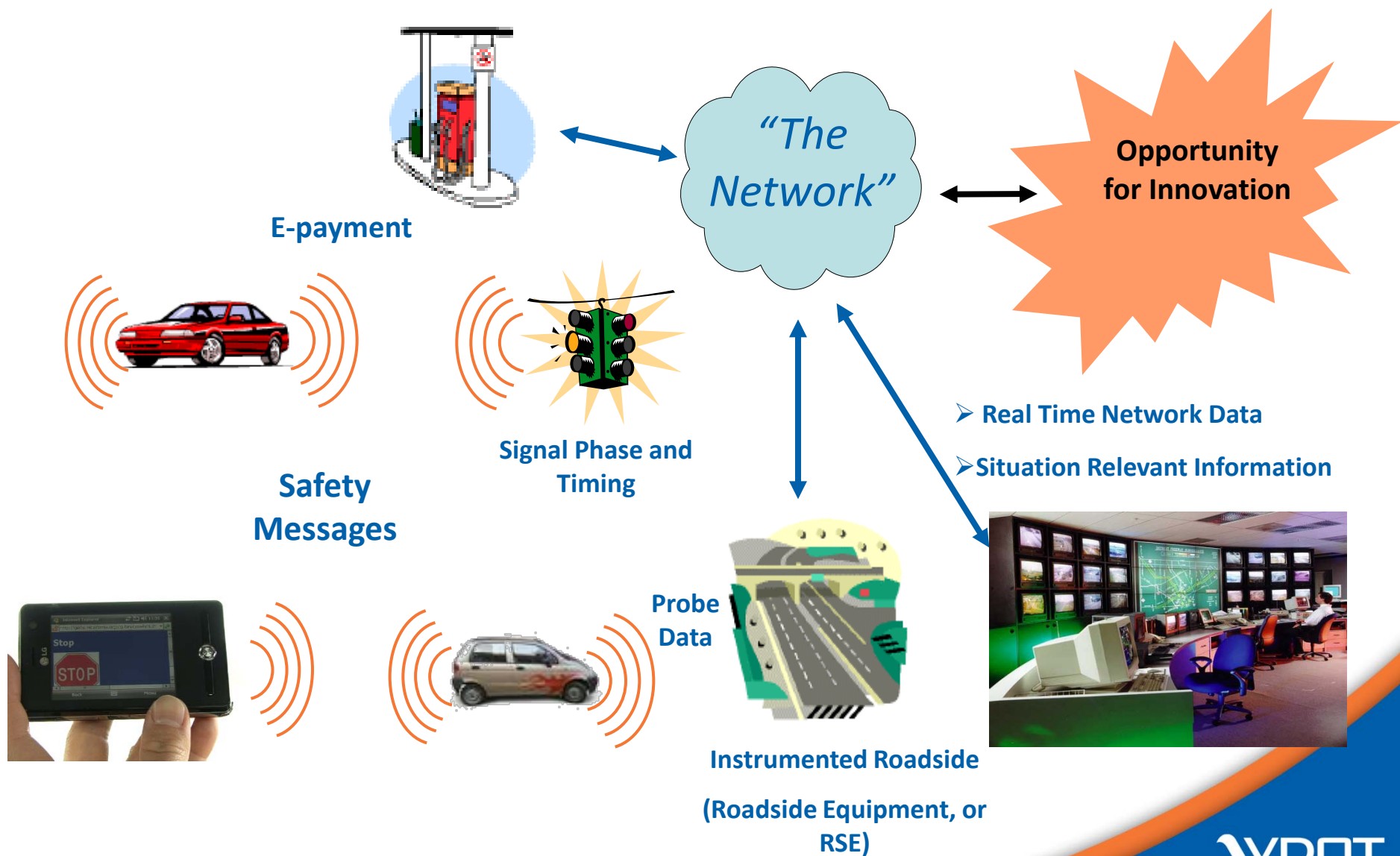
Advancing VDOT's Operations Program

- Address Recurring and Non-Recurring Congestion
- Approaches – Non-Pricing, Pricing, Context Sensitive
- Suite of Solutions - ATM, ICM, DMA, CV, Hybrid
- Candidate Multimodal Technology Applications
 - I-66 ATM, I-95 ICM, I-64 DMA
- Organizing Strategy: Network/Corridor Based
- SYOIP – Framework for Development & Delivery

New Technology Deployment Framework



Preparing Virginia roads for Dynamic Mobility



I-66: Haymarket to DC



I-66 Technology Corridor: Haymarket to DC

Project Objective – Application of ATM/ICM strategies to facilitate dynamic transportation network management based on prevailing traffic conditions

Context – Very heavy vehicular traffic both east and west bound during on and off-peak periods – rated as the 2nd highest congested network in the Nation (TTI Mobility Rep)

Technology Applications - Active Traffic Management (ATM) and Enhanced Traveler Information

- **Speed Harmonization:** speed limits are dynamically changed based on observed traffic conditions
- **Queue Warning:** dynamic message signs inform travelers of approaching queues/bottlenecks
- **Hard Shoulder Running:** lane control signs manage the use of shoulders as a travel lane

ICM Nodal Information - Enhanced corridor-specific traveler information, such as real-time transit and parking information, and travel times. Provide parking availability via dynamic message signs along I-66. Park-and-ride lots to be retrofitted with advanced parking management system (APMS) which would track parking space availability and communicate directly with the parking information signs

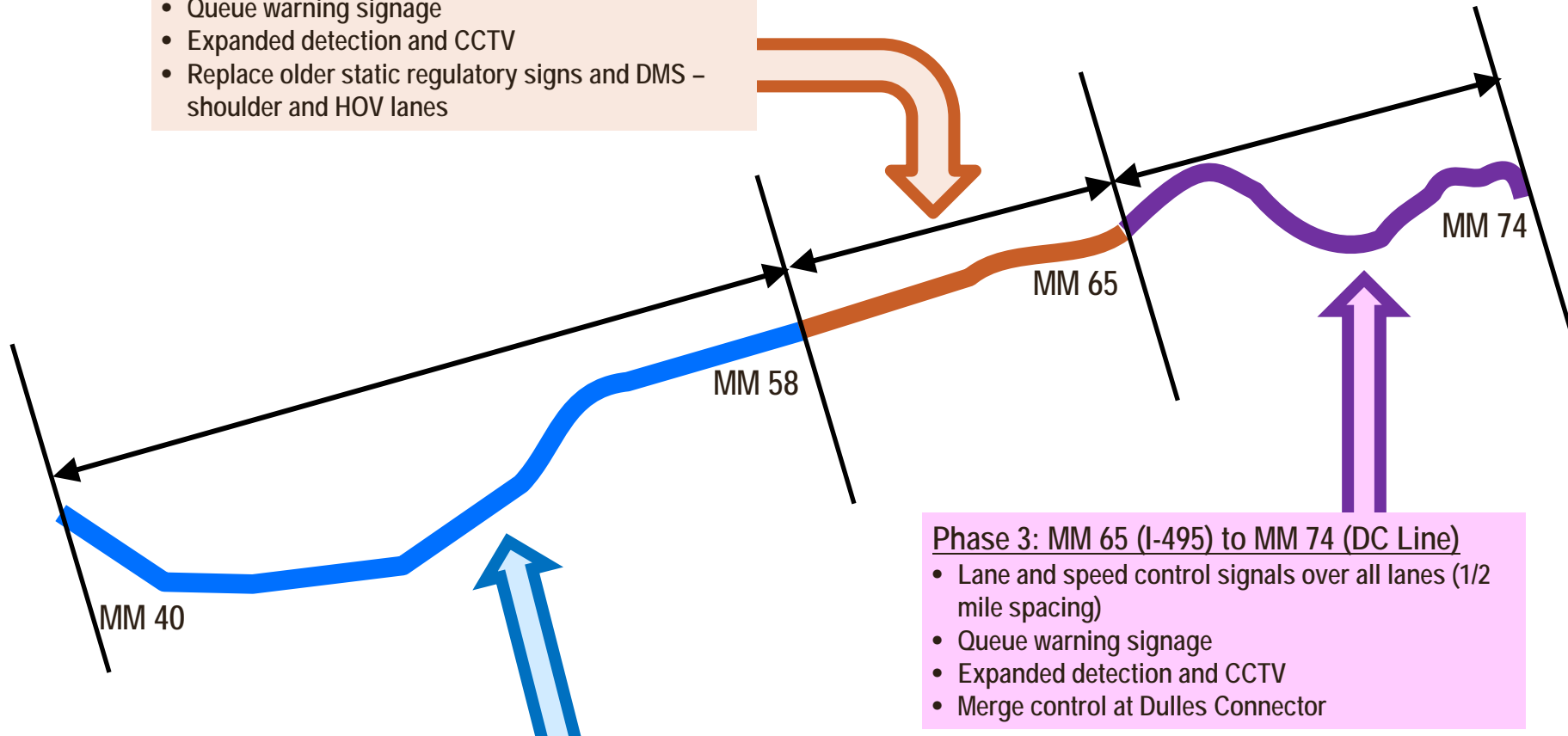
Dynamic Network Management - The provision of real-time transit information in tandem with real-time traffic conditions would allow commuters to make informed modal choices based on prevailing traffic conditions. Proposed enhanced corridor specific traveler information system would incorporate real-time transit information from transit providers that operate along I-66 into VA511

Connected Vehicle Test Bed - Outfit VDOT and transit vehicles with on-board equipment to support testing of various Connected Vehicle technology application (pavement assessment, SPat, safety). Planned deployment of Connected Vehicle roadside equipment (RSE) infrastructure

I-66 ATM Project Phasing

Phase 1: MM 58 (US-50) to MM 65 (I-495)

- Enhance existing shoulder running – operate based on congestion levels rather than time schedule
- Lane and speed control signals over all lanes (1/2 mile spacing)
- Merge control at US 50 eastbound ramp (EB I-66)
- Queue warning signage
- Expanded detection and CCTV
- Replace older static regulatory signs and DMS – shoulder and HOV lanes



Phase 2: MM 40 (US-15) to MM 58 (US-50)

- Lane and speed control signals over all lanes (1/2 mile spacing)
- Queue warning signage
- Expanded detection and CCTV
- Replace older static regulatory signs and DMS –HOV lanes

Phase 3: MM 65 (I-495) to MM 74 (DC Line)

- Lane and speed control signals over all lanes (1/2 mile spacing)
- Queue warning signage
- Expanded detection and CCTV
- Merge control at Dulles Connector

I-66 ATM Project

- **Project Limits**
 - Mile Marker 40 (US-15) to Mile Marker 74.8 (DC Line)
- **ATM Applications**
 - **Enhanced Shoulder Lane Control**
 - **Dynamic Lane Management** (Lane Tapers in advance of Closures, HOV-2 Lane Status, Shoulder Lane Operations Status)
 - **Queue Warning** (due to congestion, incidents, weather, etc.)
 - **Dynamic Ramp Metering and Merge Control**
 - **Speed Harmonization**
- **Phasing**
 - **Phase 1:** MM 58 (US-50) to MM 65 (I-495)
 - **Phase 2:** MM 40 (US-15) to MM 58 (US-50)
 - **Phase 3:** MM 65 (I-495) to MM 74 (DC Line)

Display Options

Separate Lane and Queue Warning (similar to Washington State, Europe)



Integrated Full-Color Displays (using MUTCD-based sign graphics)



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.

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.

RCTO Regional Architecture and Focus Areas

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

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

Smart Technologies for Communities Act

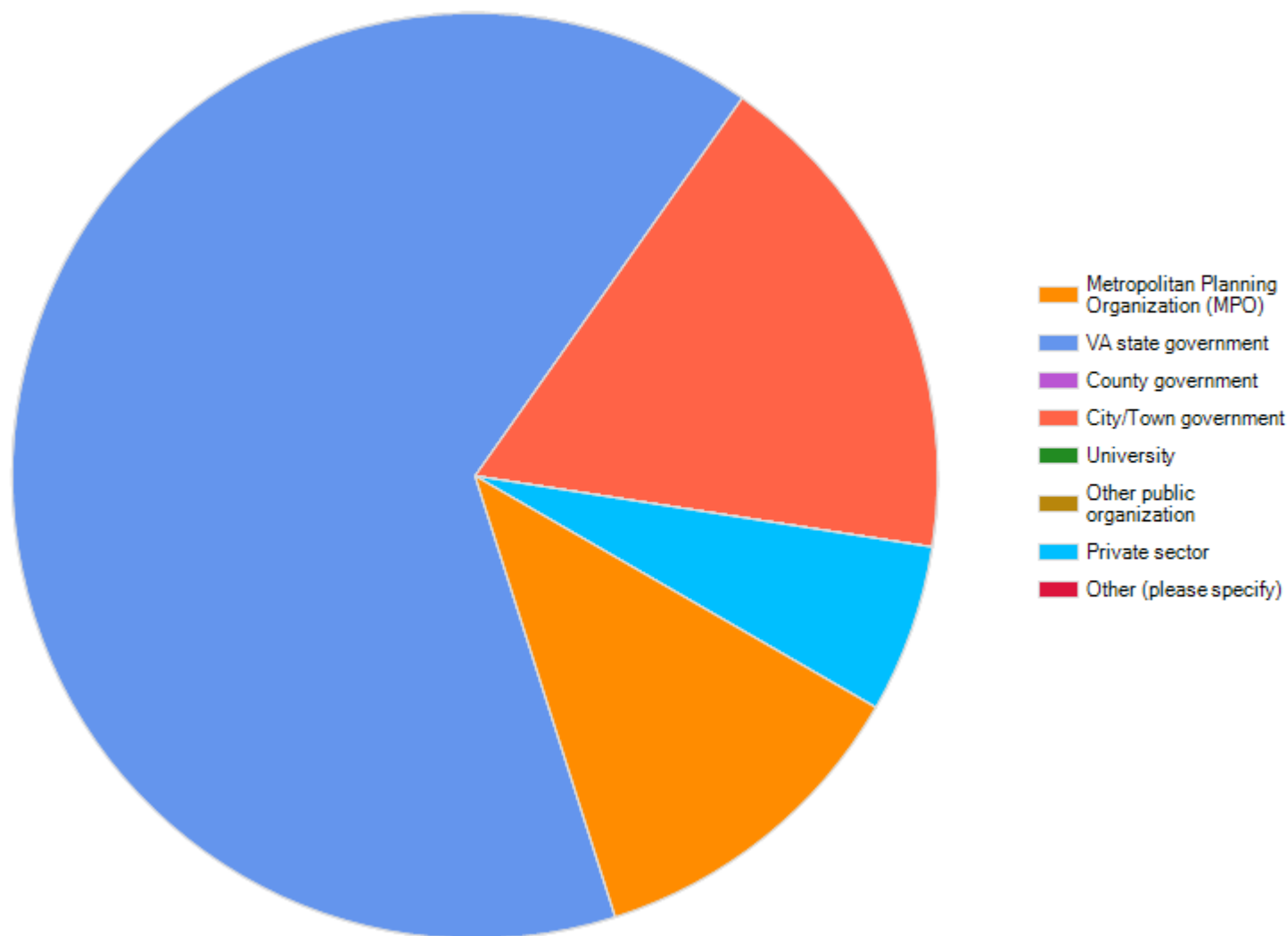
“We cannot continue to simply build our way into a transportation system necessary for the demands of the 21st Century.....Technology and information exist today to cost-effectively, safely and effectively manage our nation’s roads and infrastructure”.

Mike Rogers and Russ Camahan

STAKEHOLDER NEEDS SURVEY RESULTS

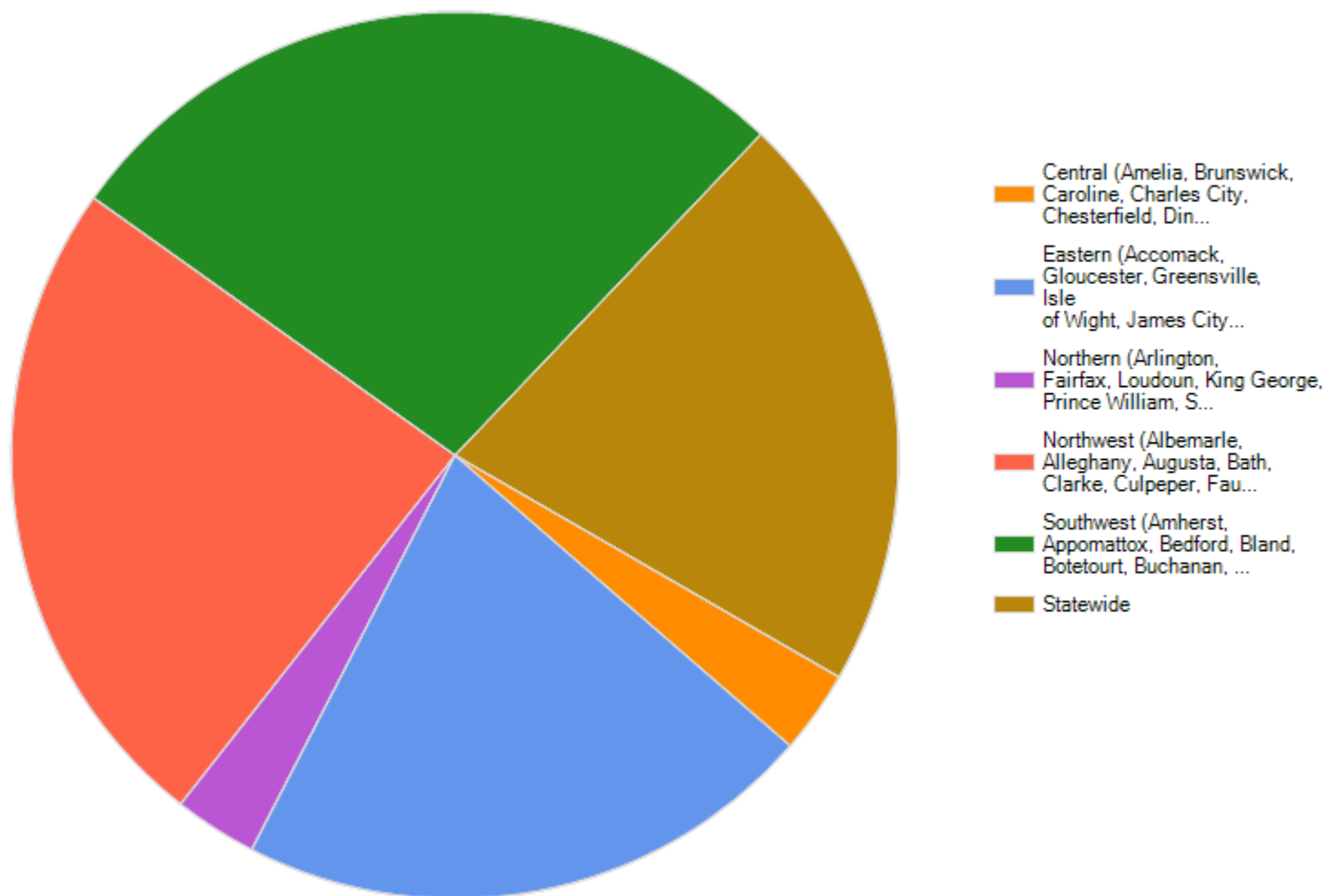
Organizations responding

Is your organization represented as:



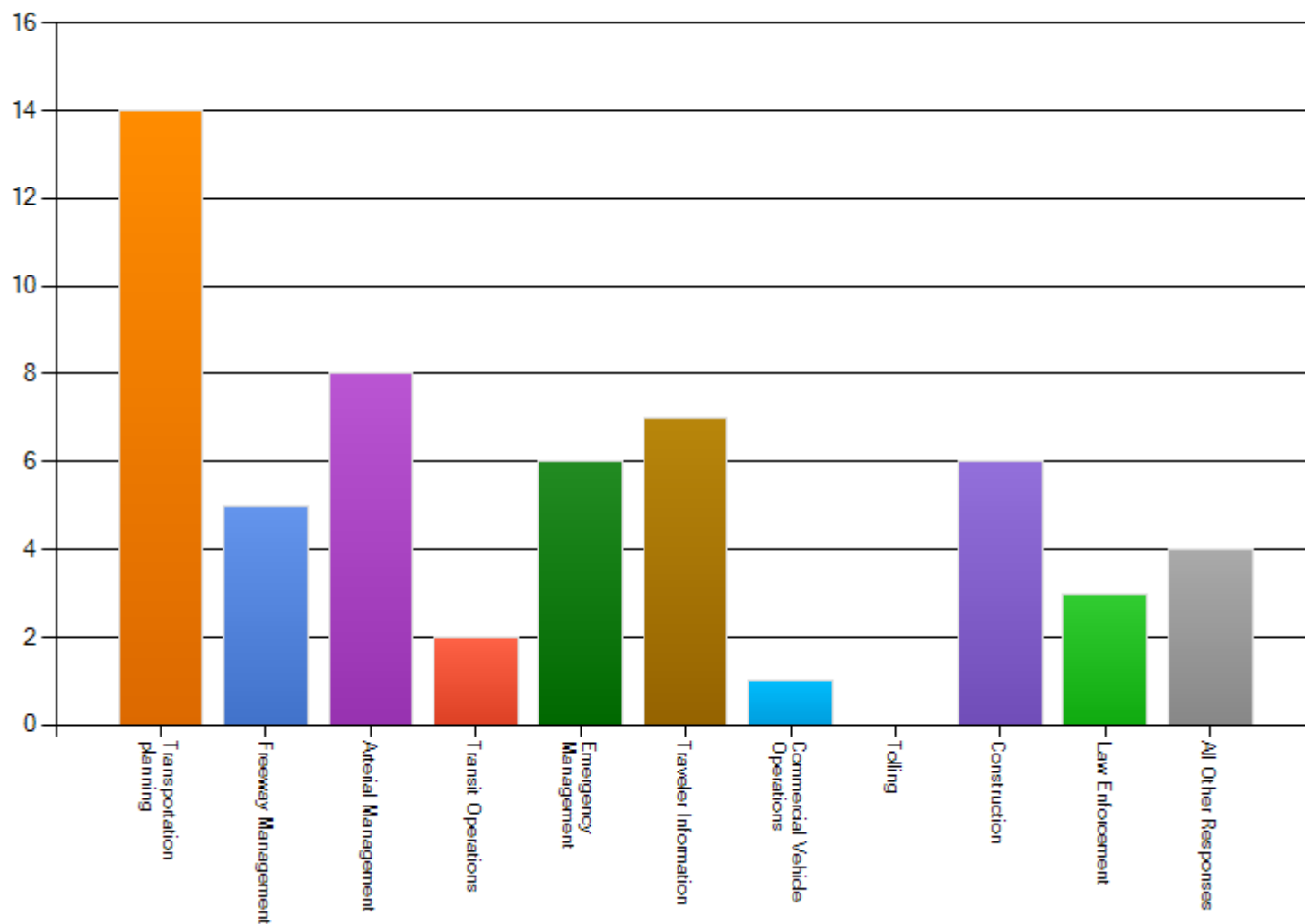
Regions responding

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



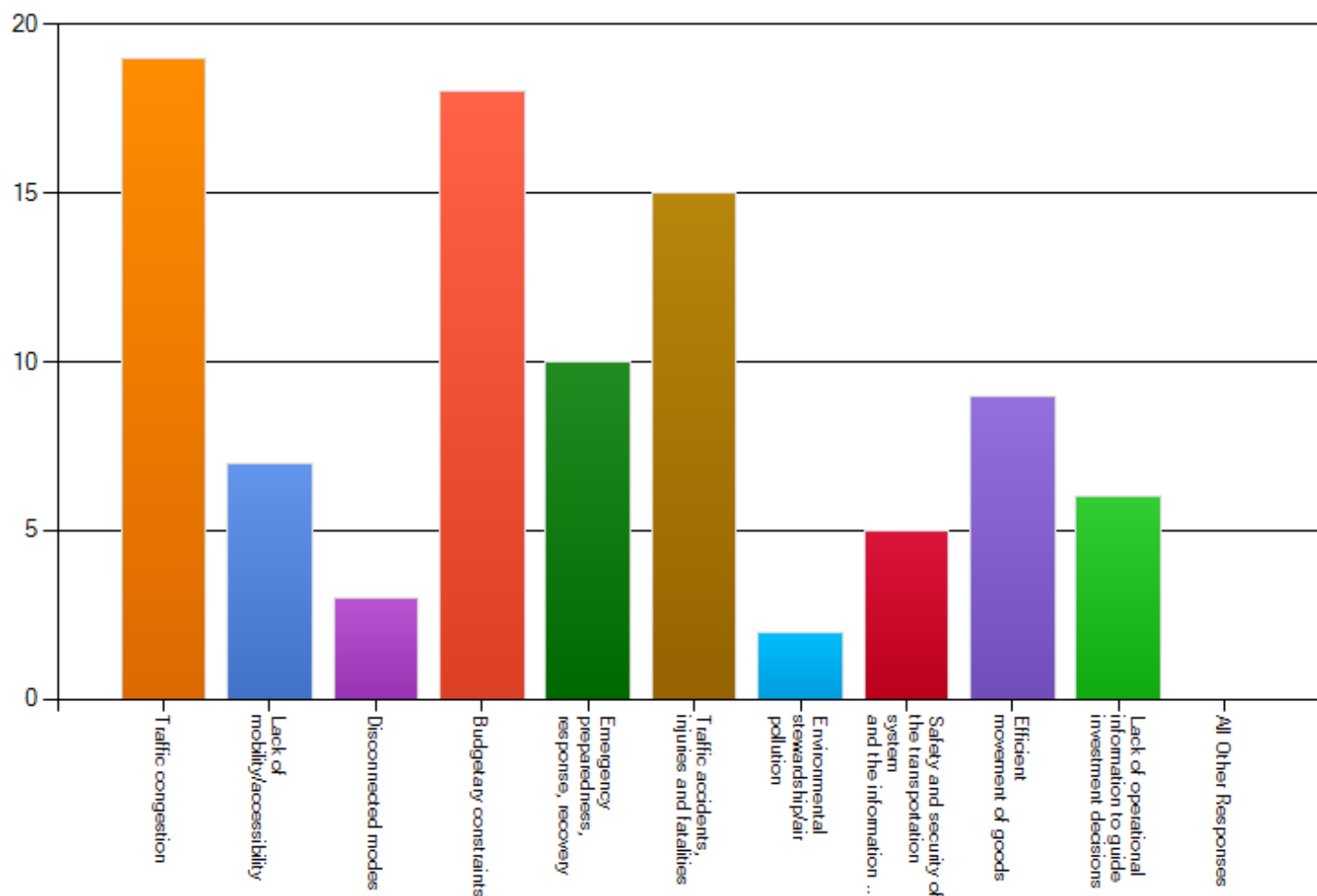
Primary focus of organization

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



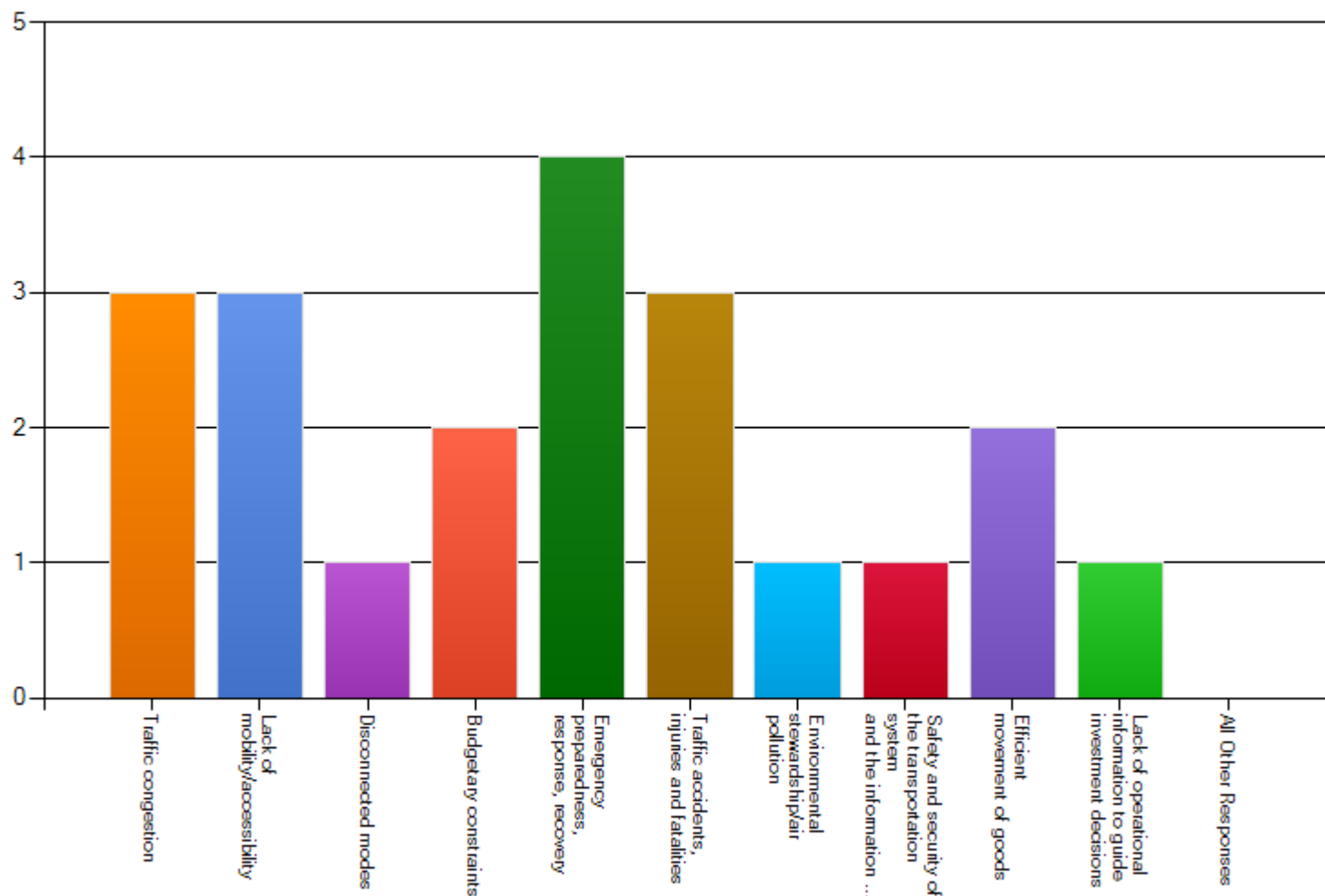
Statewide transportation problems

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



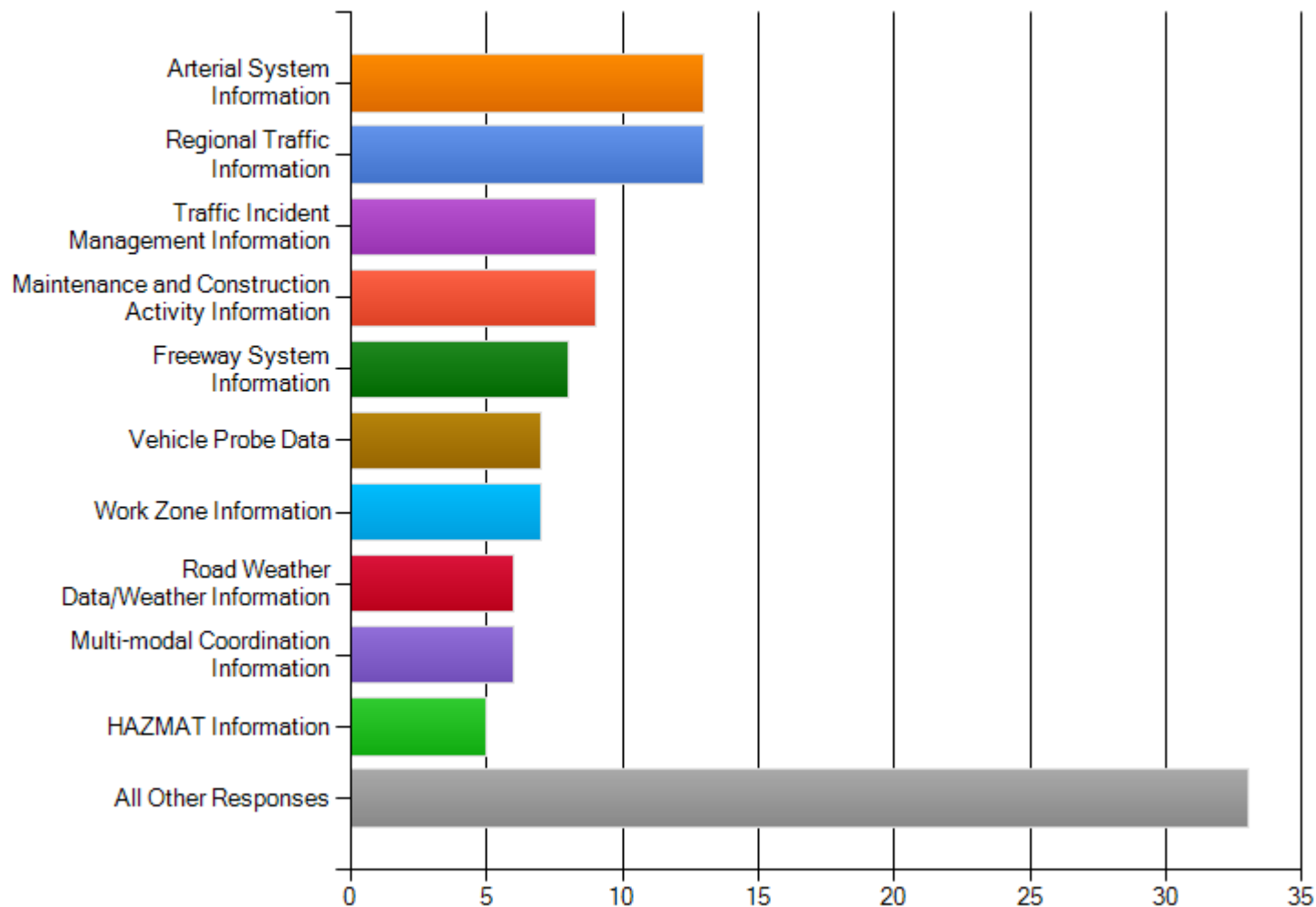
Northwest region transportation problems

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



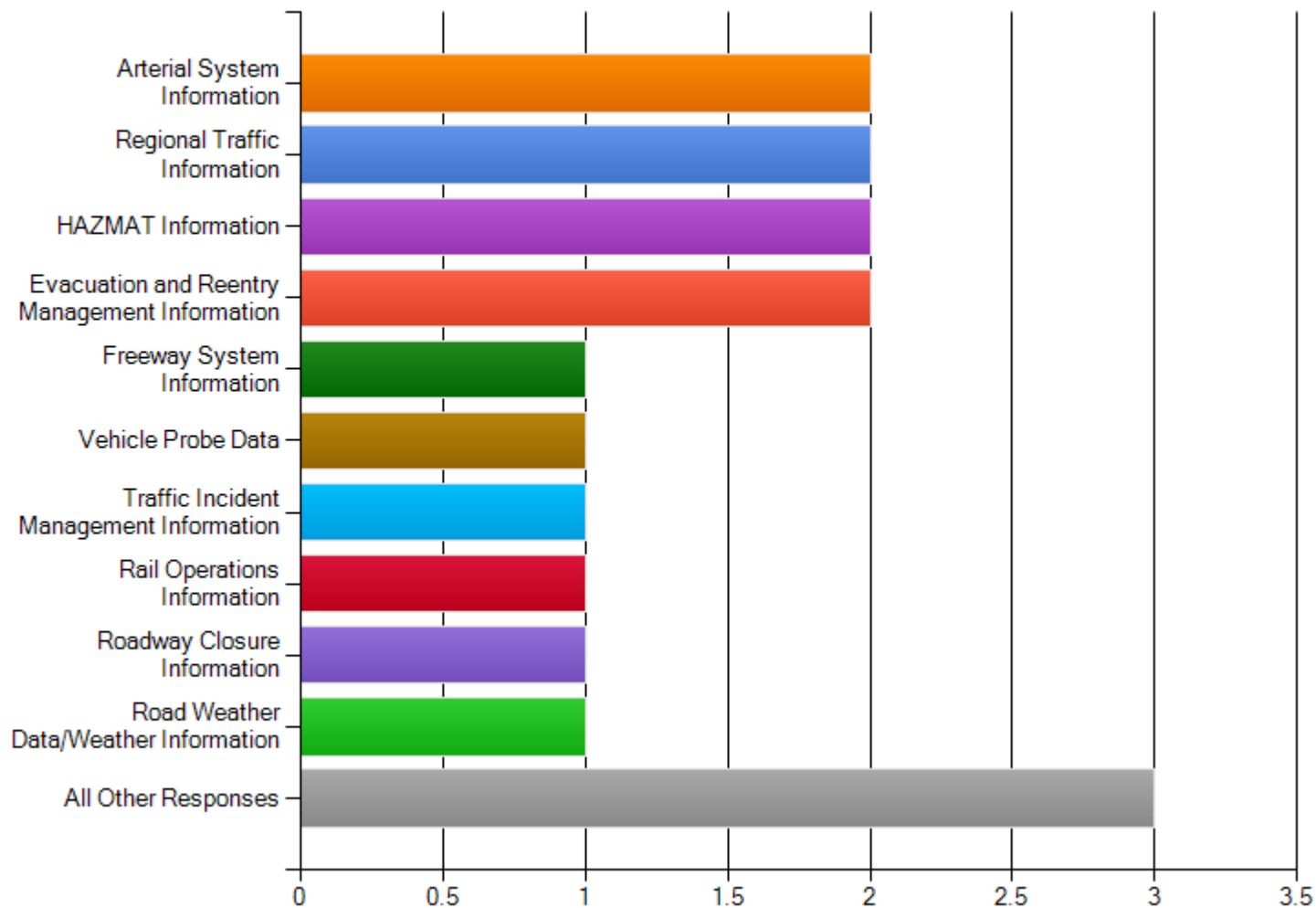
Statewide information needs

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



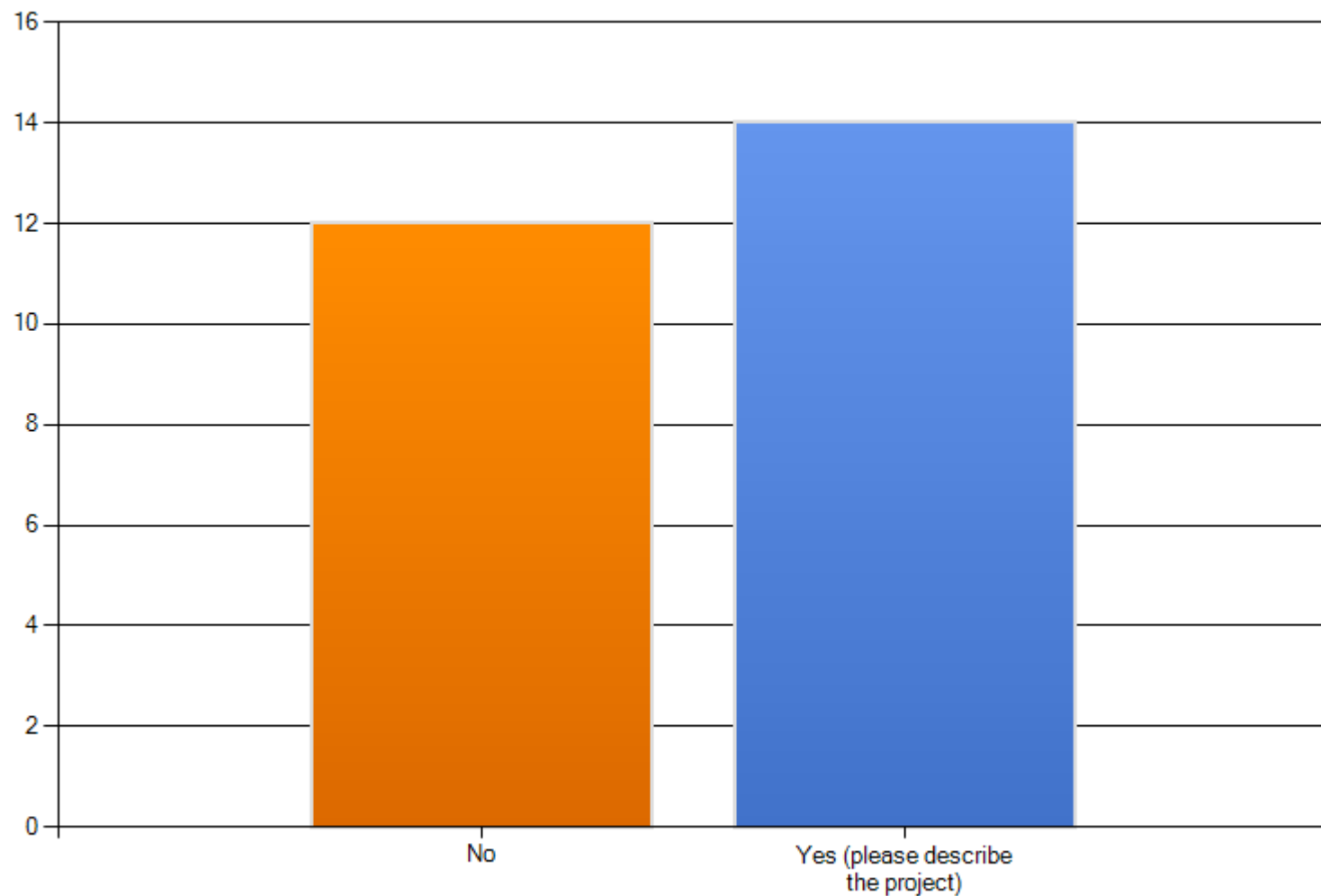
Northwest region information needs

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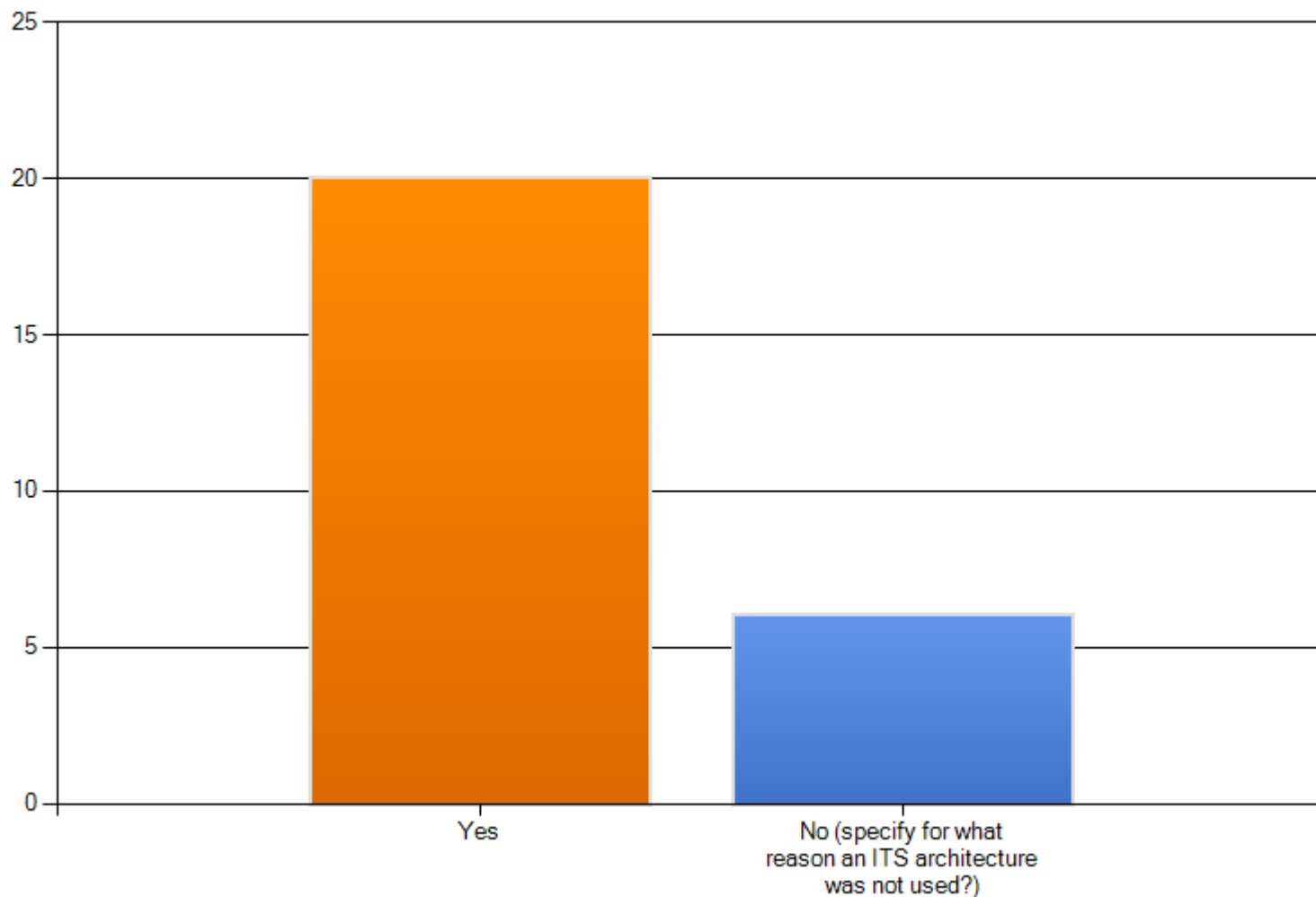
New ITS projects

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



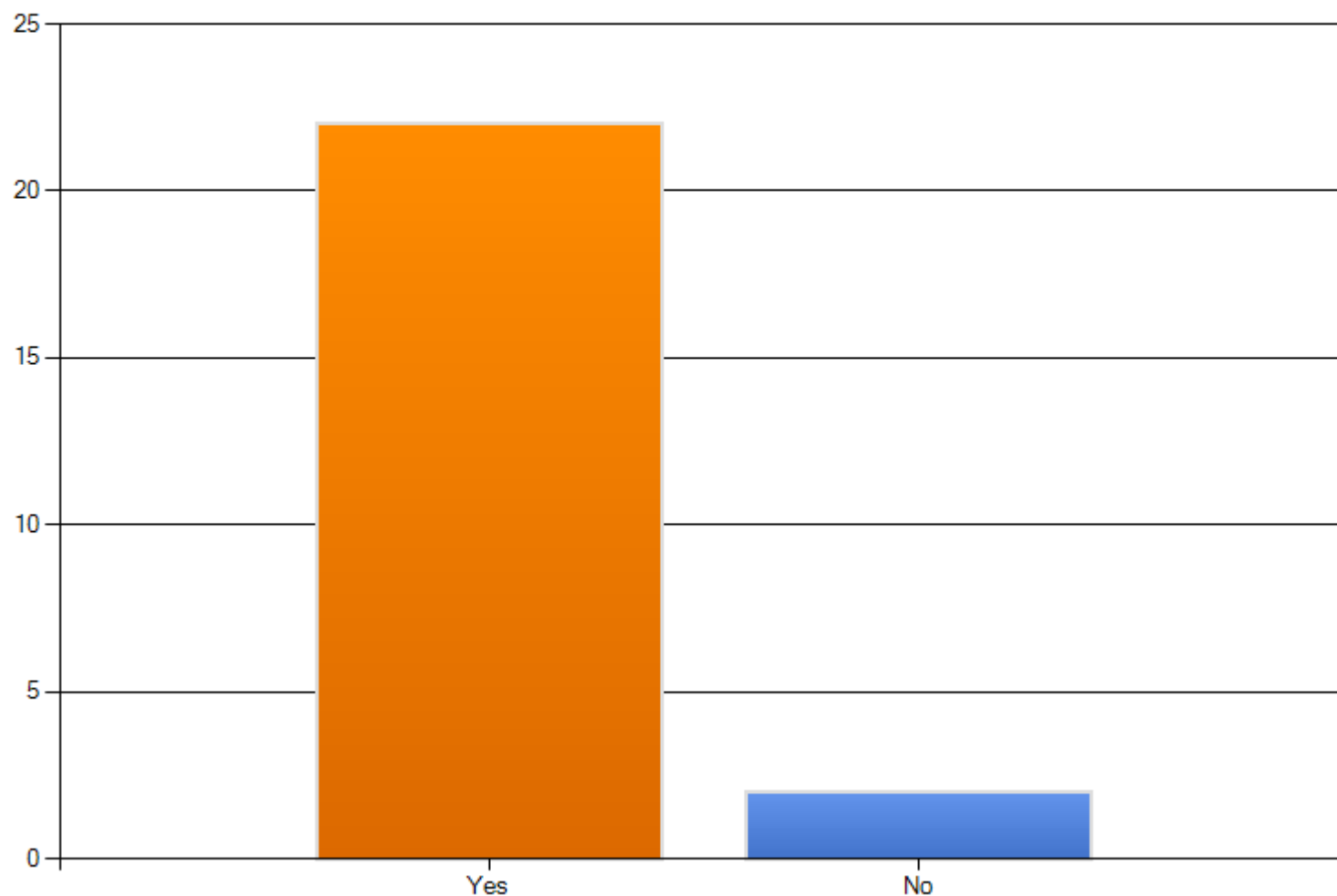
Use of VA ITS Architectures

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/virginiaitsarchitecture/>.



TRANSPORTATION/ITS NEEDS BREAKOUT GROUPS

ITS

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

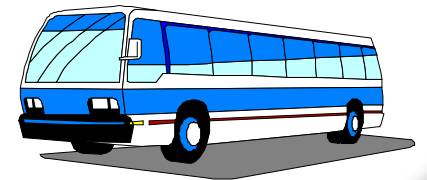
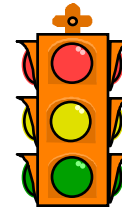


ITS Architecture

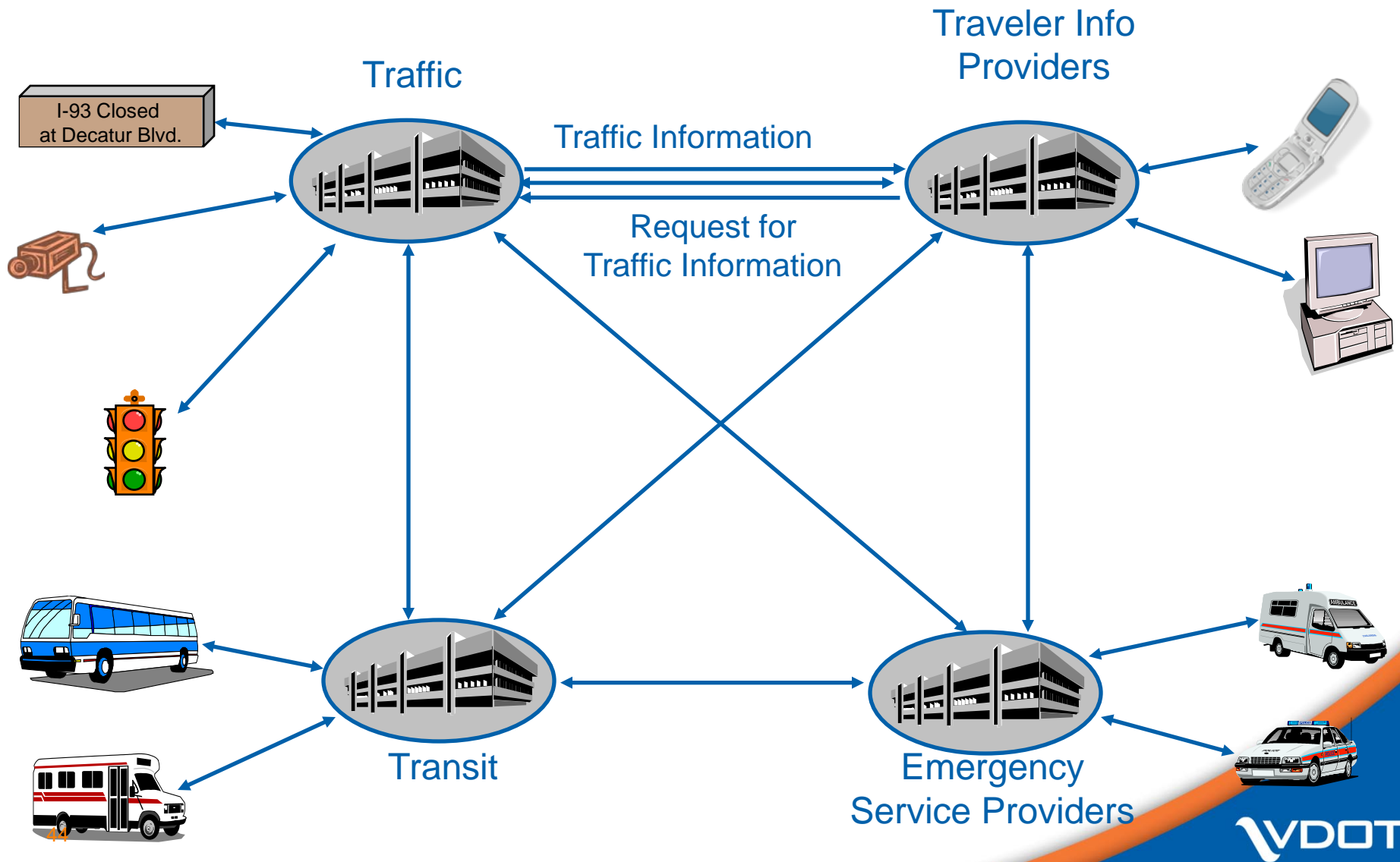
Framework for Developing Integrated Transportation Systems

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

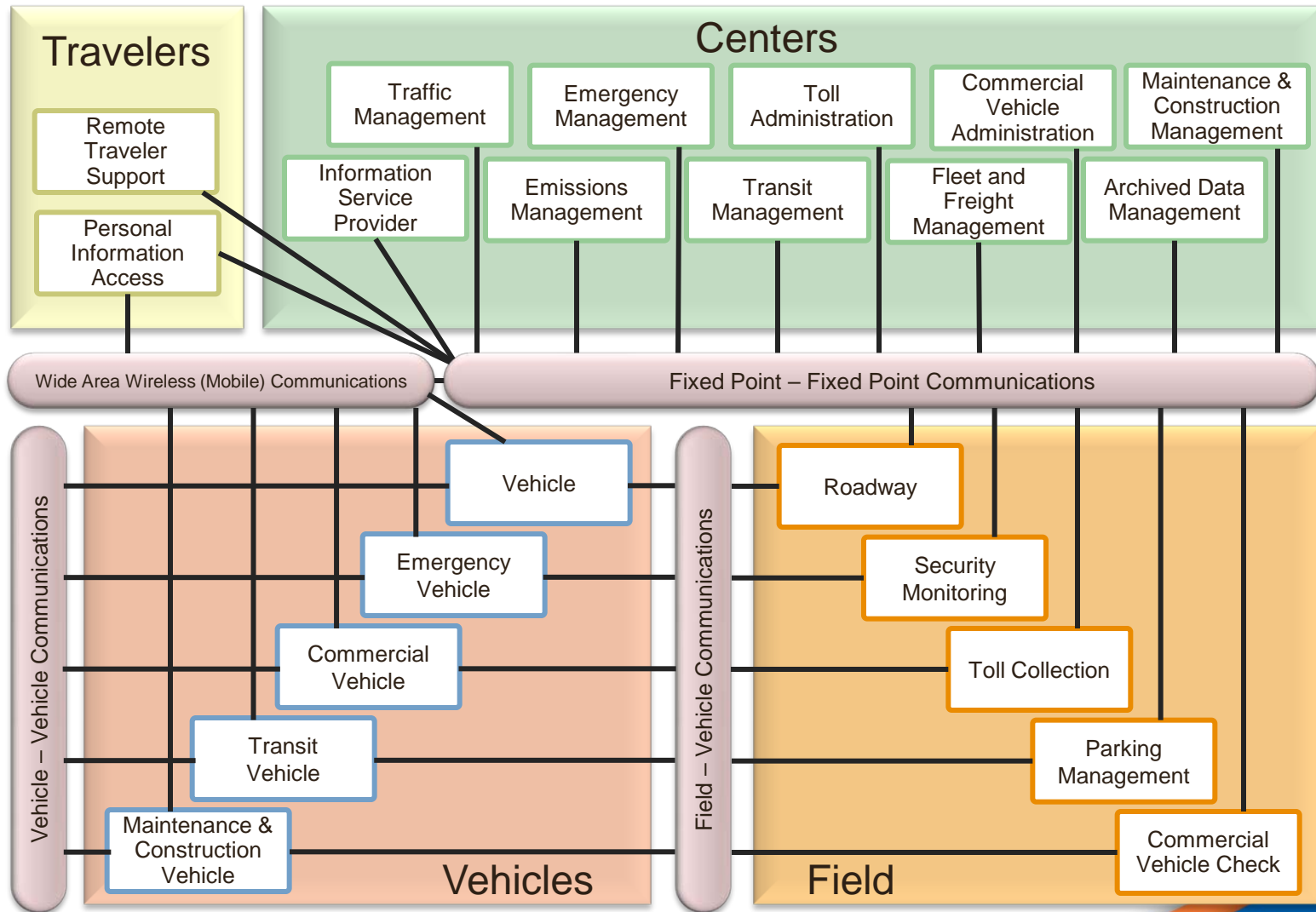
Between systems

Reduce risk

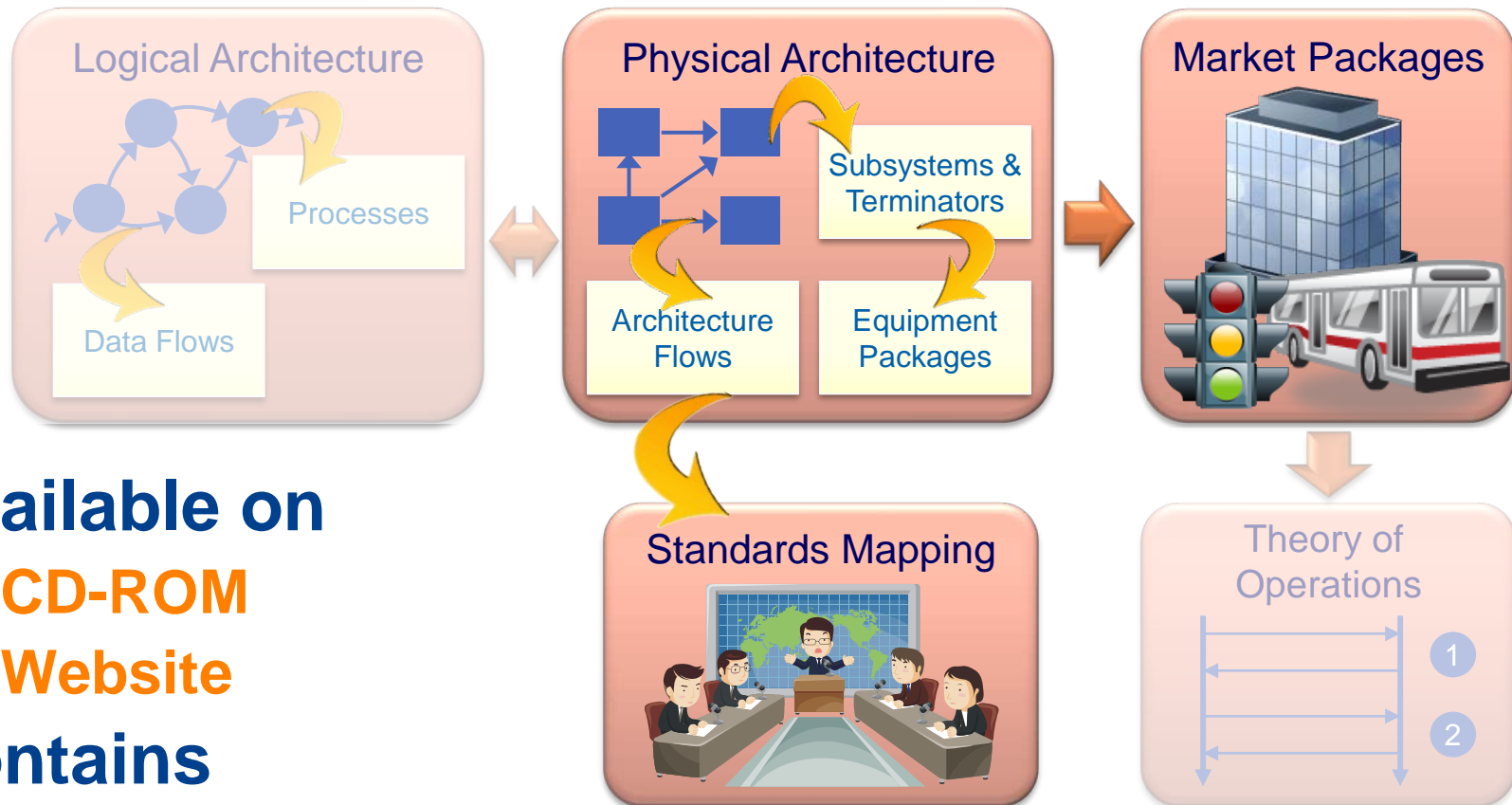
**Support compliance with ITS Architecture &
Standards Rule/Policy**



National ITS Architecture is a Framework and a Template

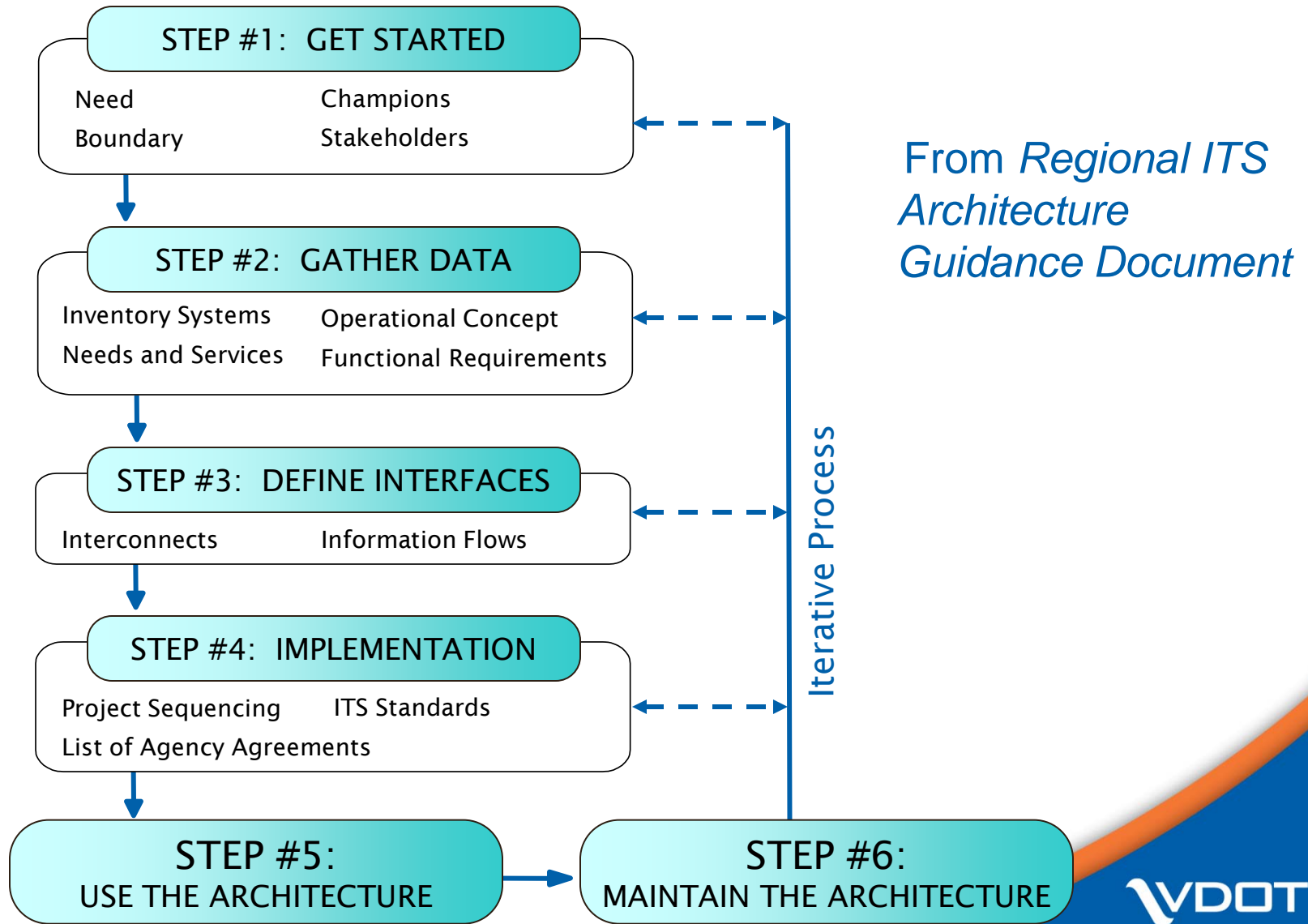


National ITS Architecture Products



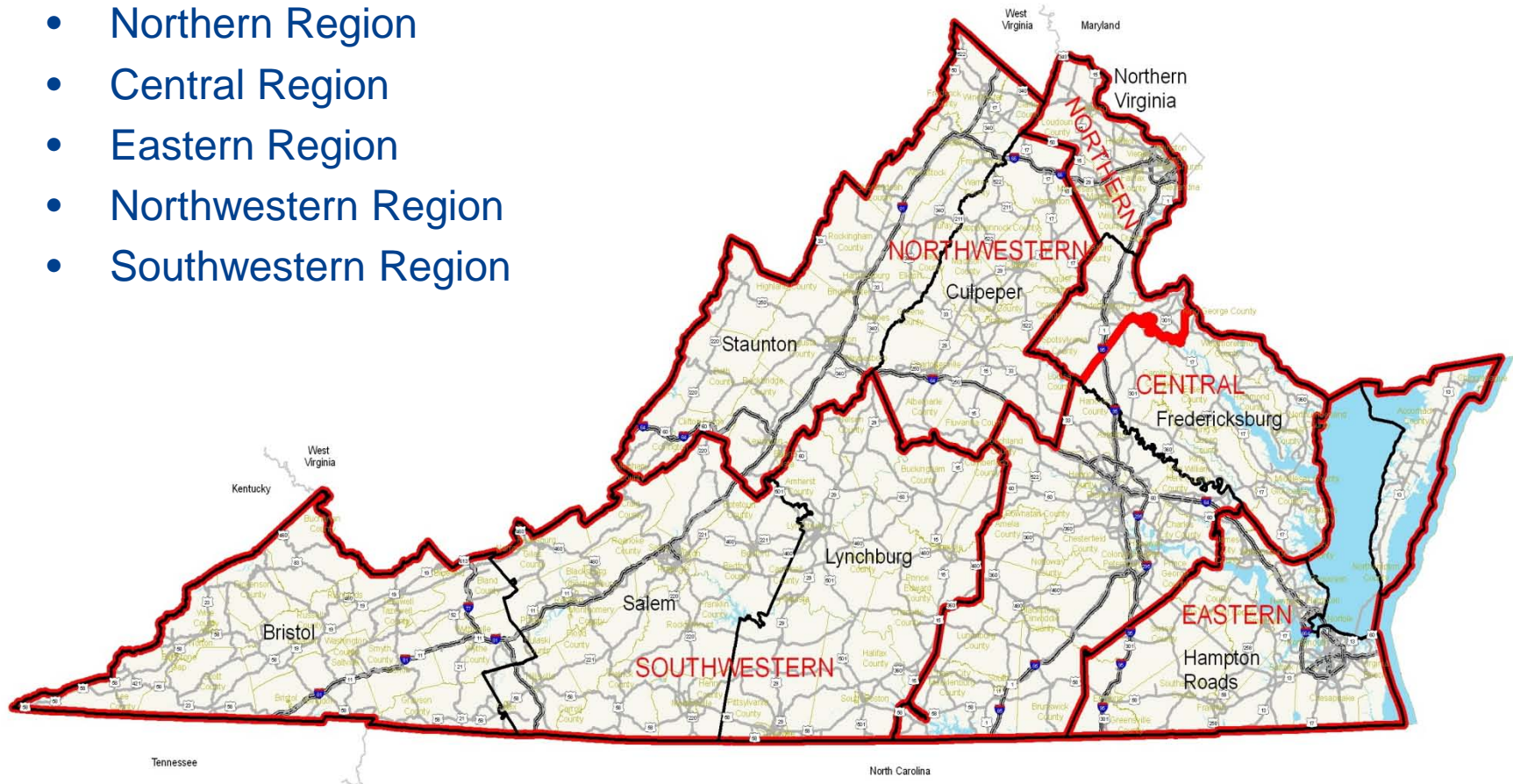
Available on
CD-ROM
Website
Contains
Hypertext
PDF documents
Databases

Regional ITS Architecture Development Process



VA ITS Architectures

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



Statewide vs Regional Scope

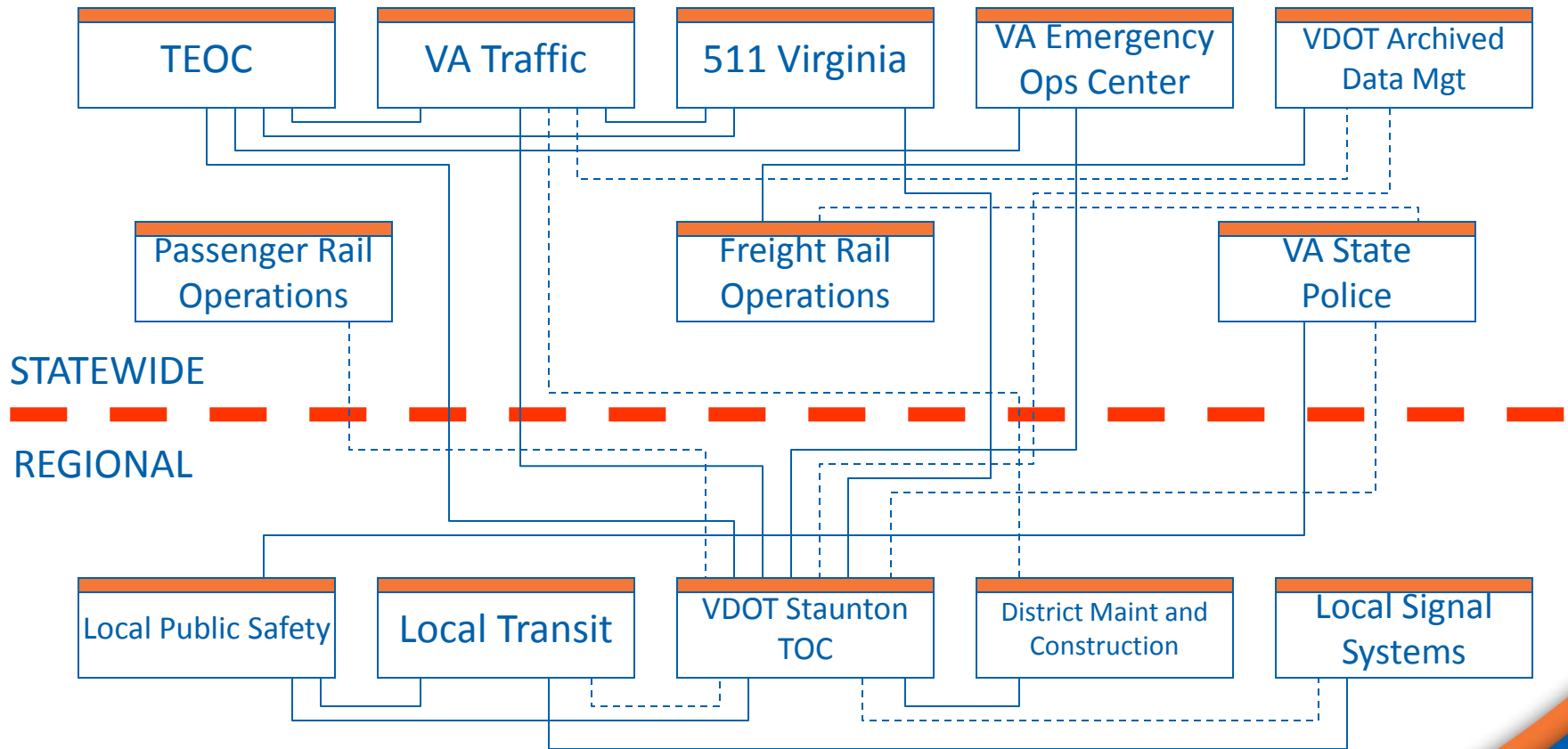
Statewide system functionality defined at statewide level in detail

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

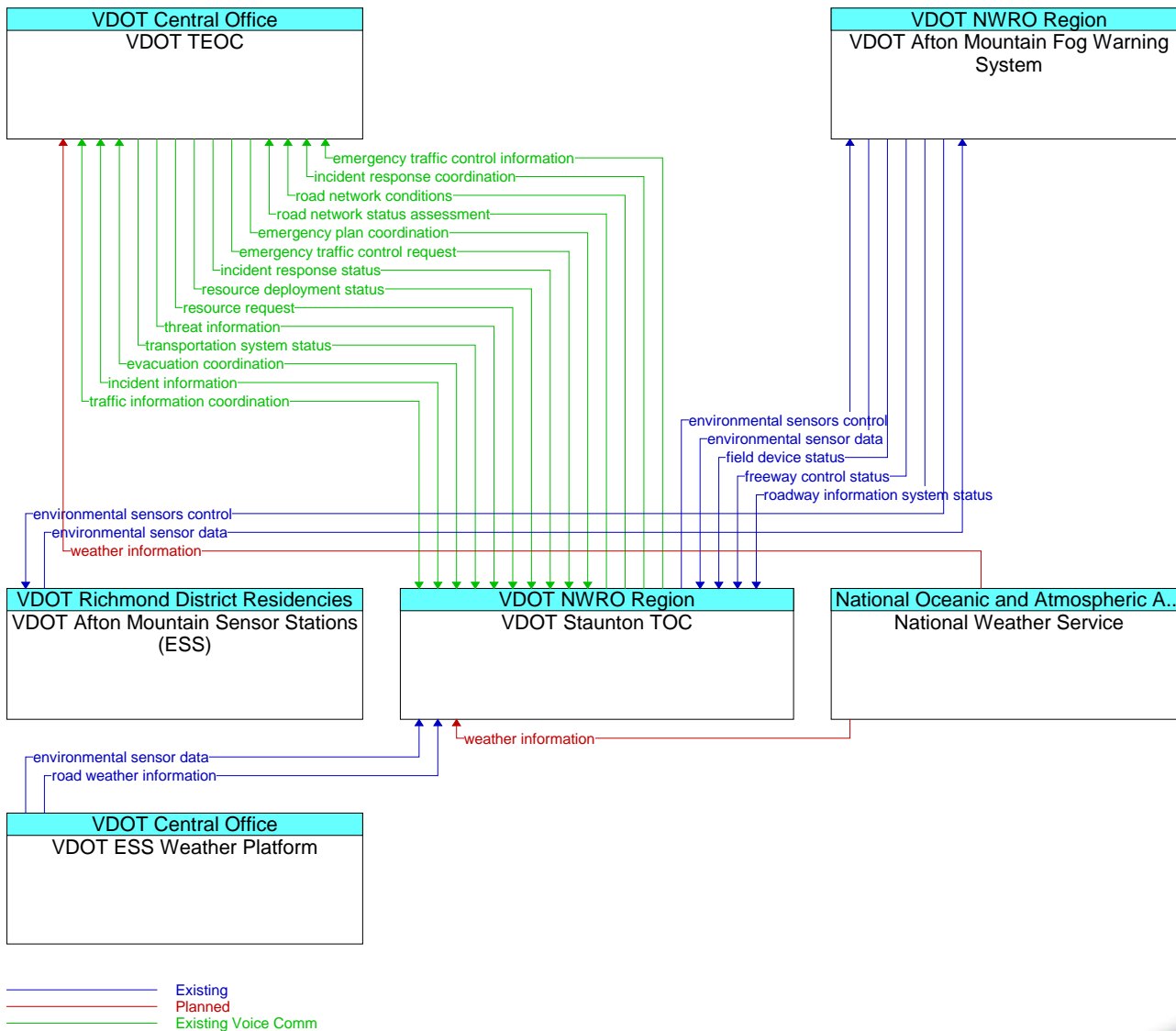
Regional system functionality defined at regional levels in detail

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

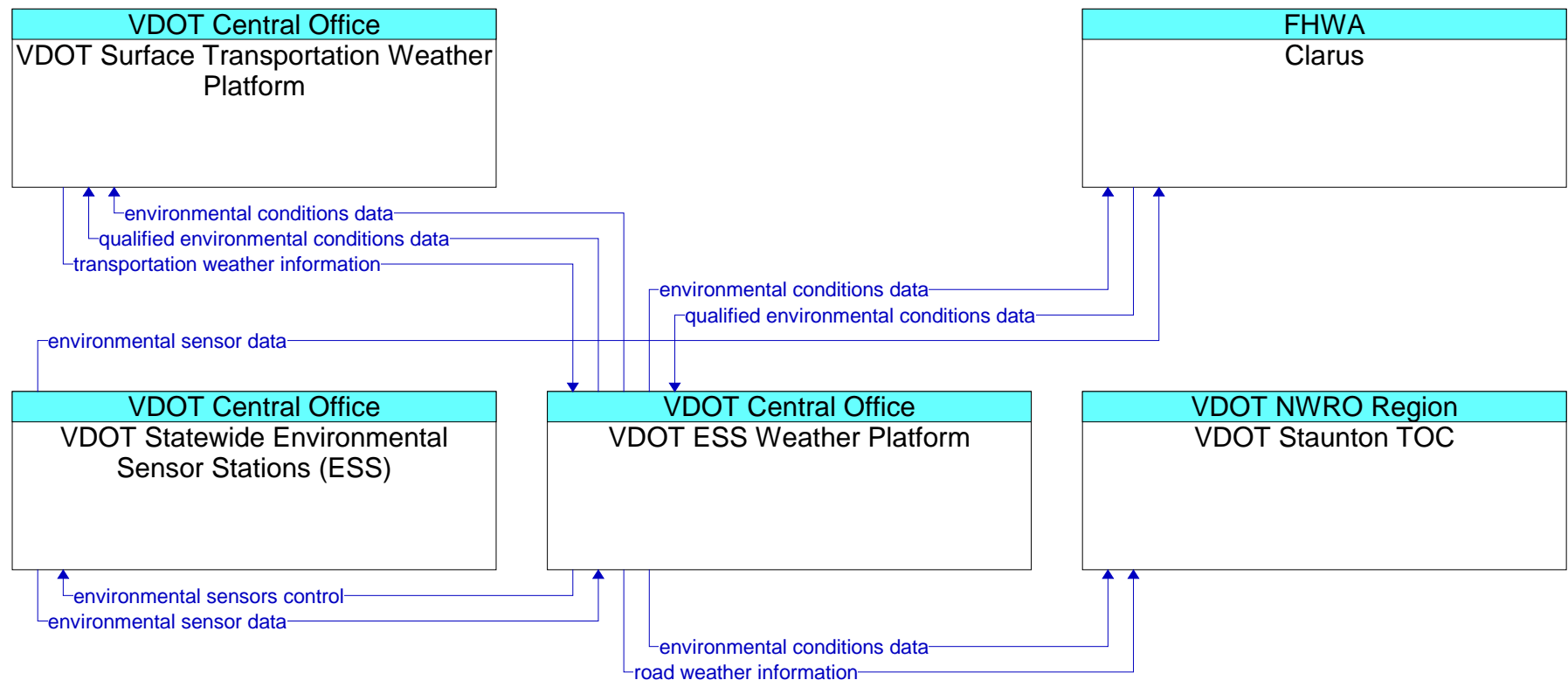
Statewide vs. Regional Example



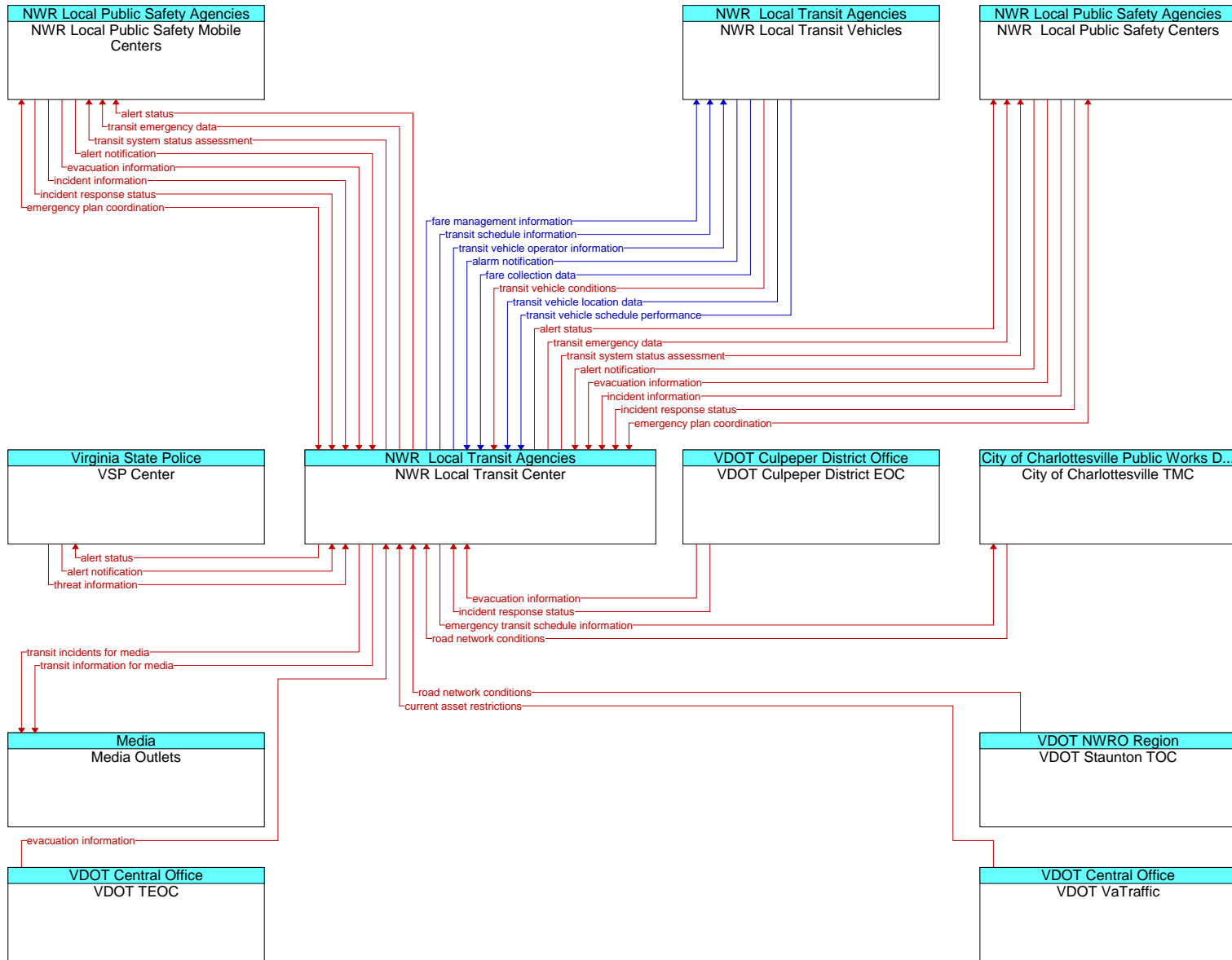
Northwest Weather-Related ITS



Weather (Statewide)



Northwest Transit-Related ITS



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

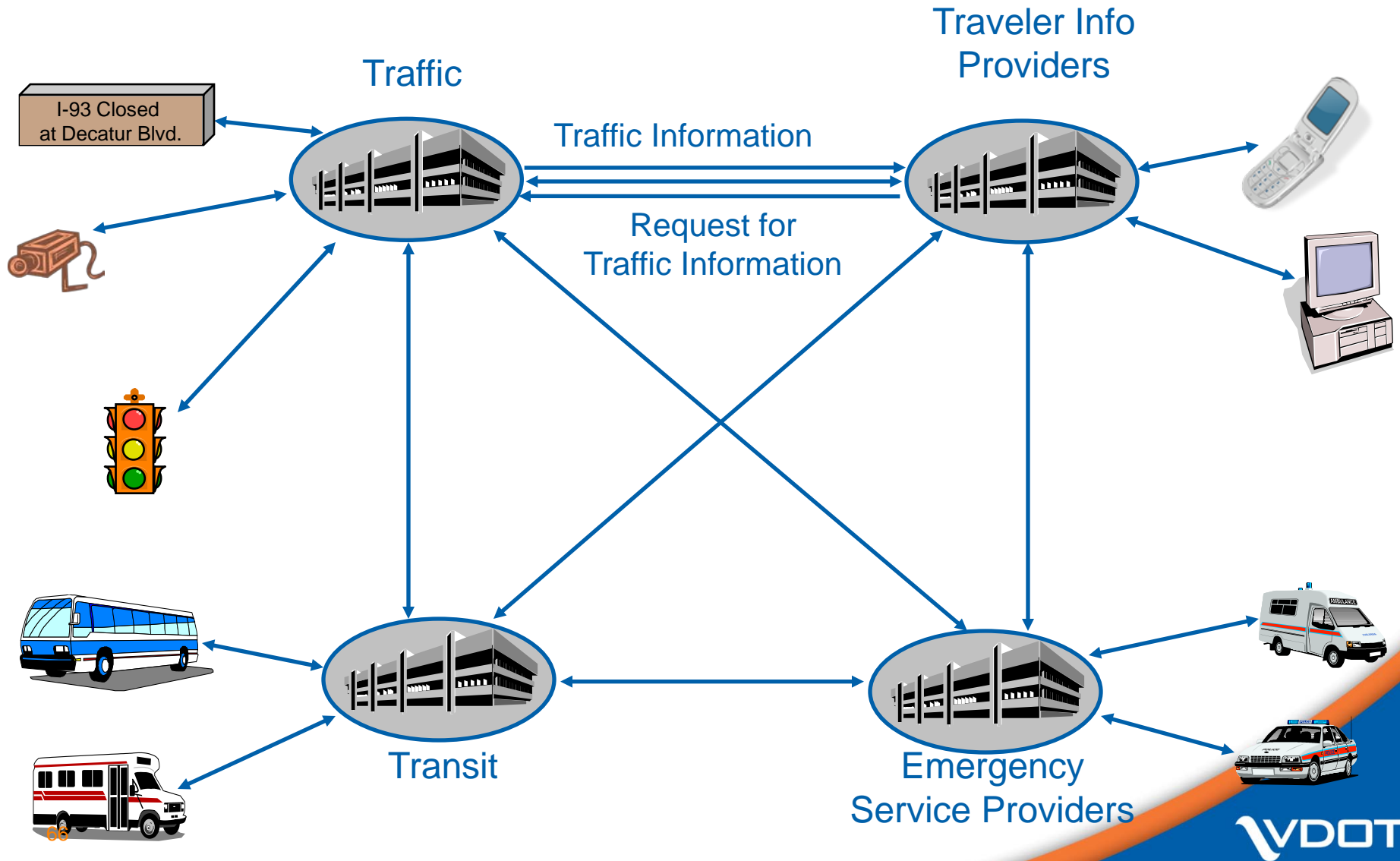
Problems

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

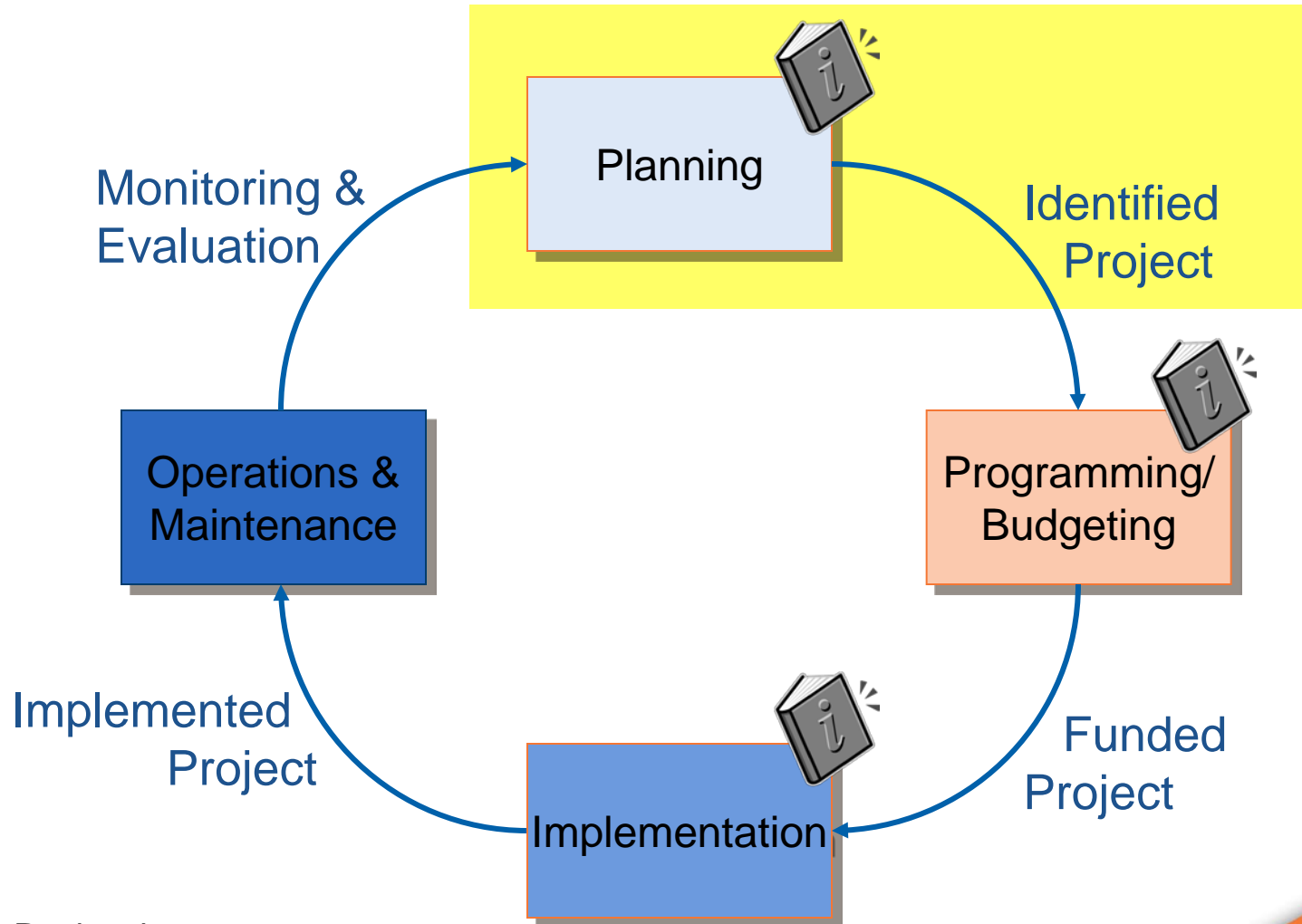
1. Region description
2. Stakeholder identification
3. ITS elements
4. ITS services
5. Operational concept
6. Functional requirements
7. Interfaces / Information flows
8. Standards identification
9. Project sequencing
10. Agreements
11. Maintenance plan

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

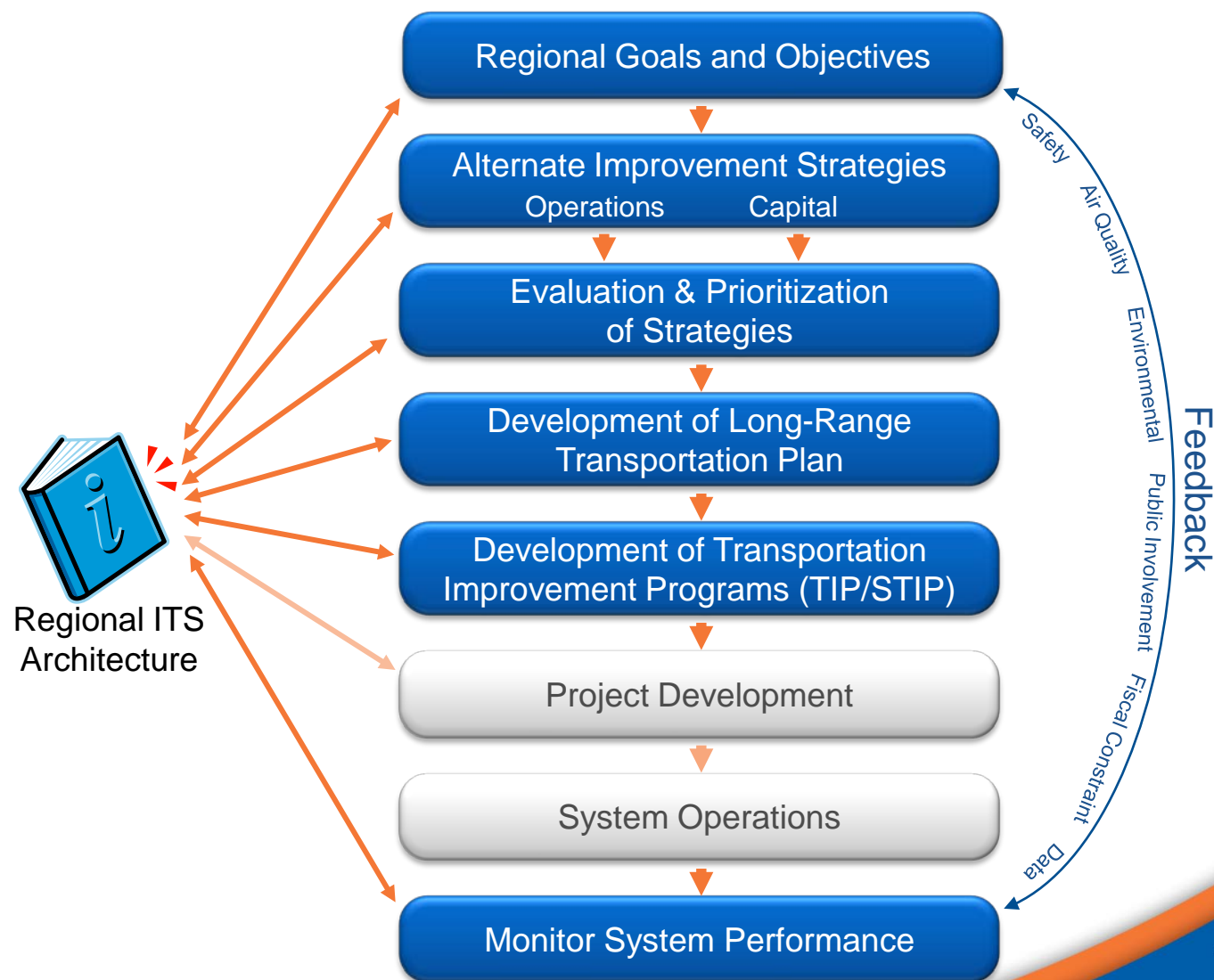
Addresses both short range projects and long range strategies



Transportation Planning Process



Regional Architecture and Transportation Planning



Strategy Evaluation and Prioritization

Potential
Strategies

Evaluation and
prioritization

Selected
Strategies

Included in

Long Range
Plan

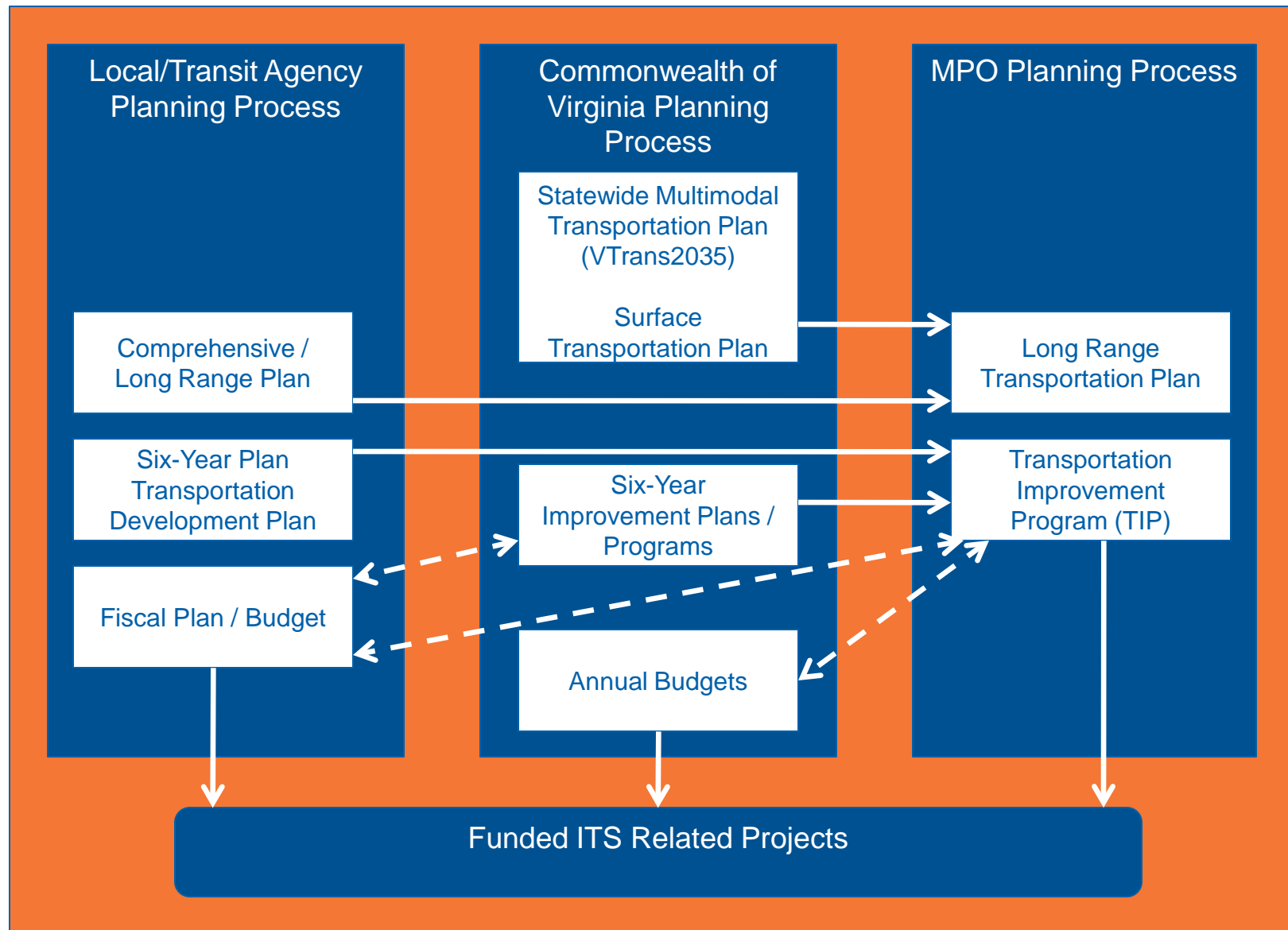
Regional Goals and Objectives

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

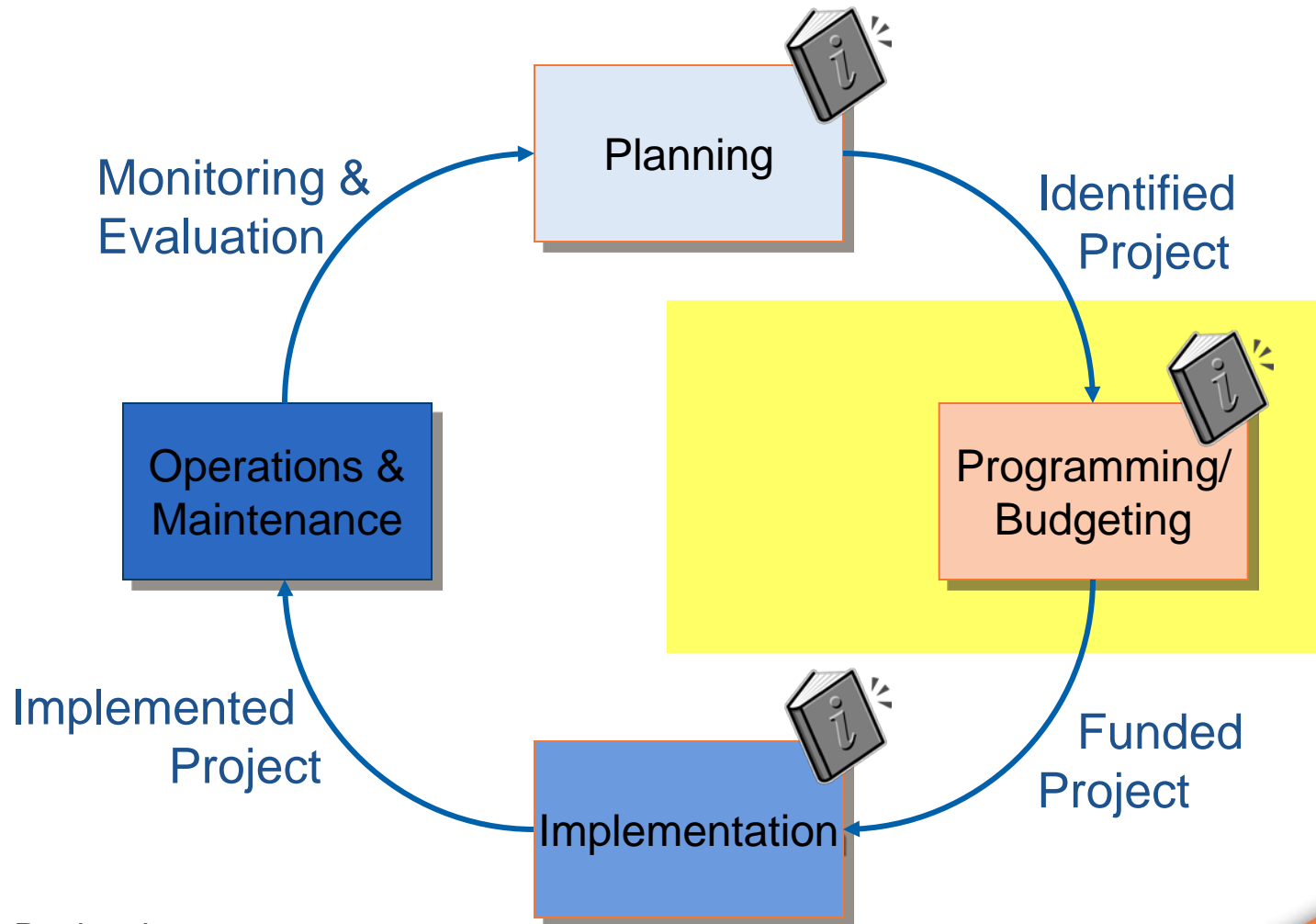
- Liaison between MPOs and other planning organizations

MPOs and other Planning Organizations

- Evaluate planning processes for inclusion of architecture

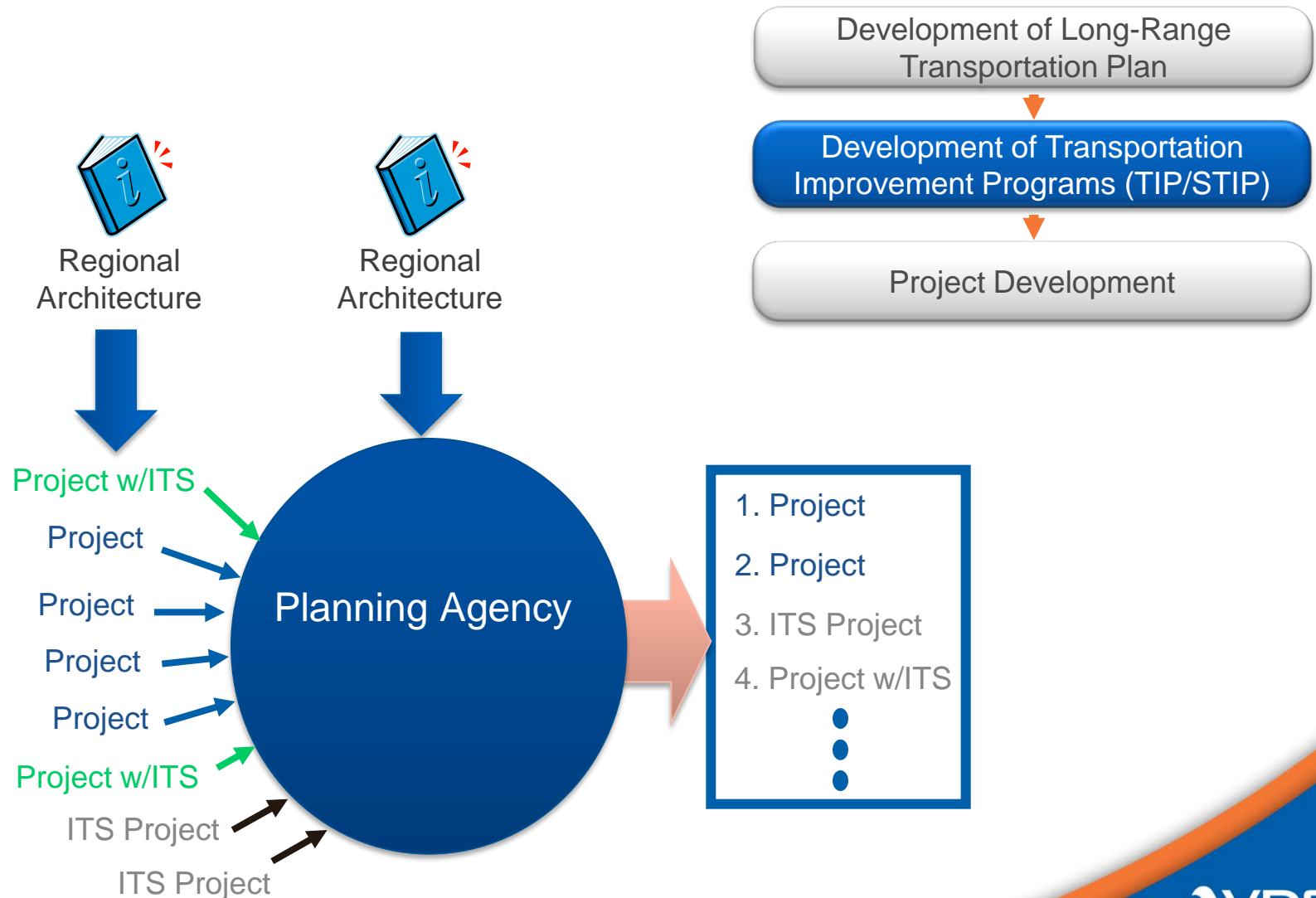
- Coordinate with VDOT

Architecture Use in Project Life Cycle



 = Regional Architecture Use

Architecture Use in Programming/Budgeting



Benefits of Architecture Use in Programming/Budgeting

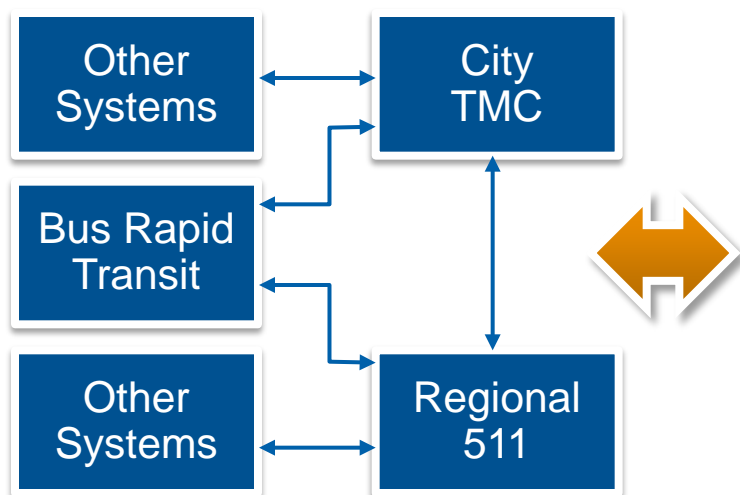
**Link objectives and needs of the region with ITS
deployed in the field**

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

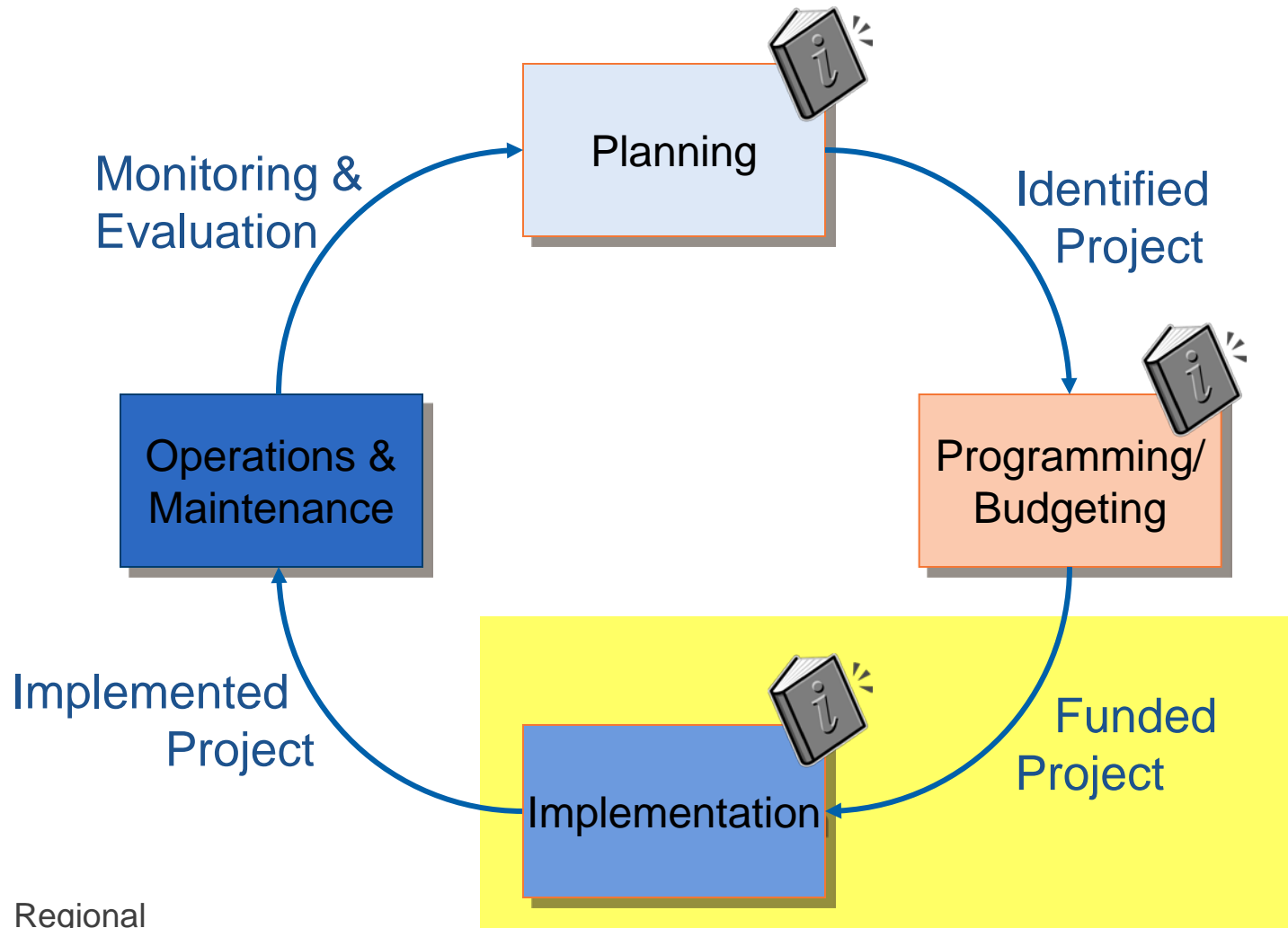
Regional Architecture



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

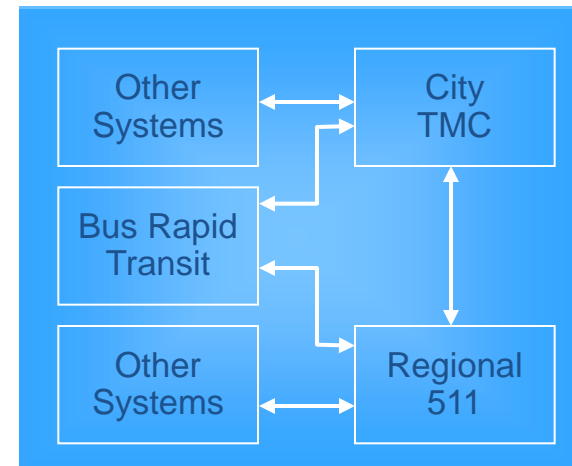
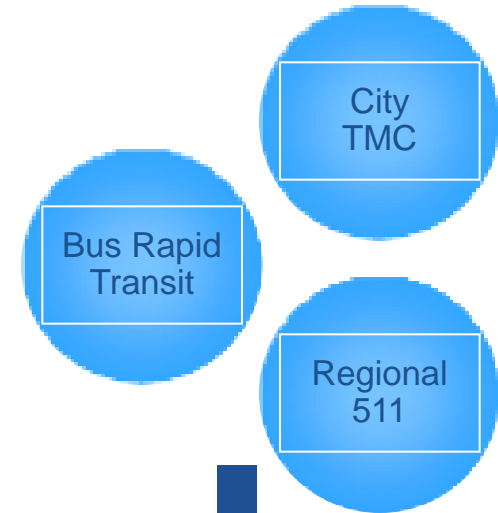
Architecture Use in Project Life Cycle



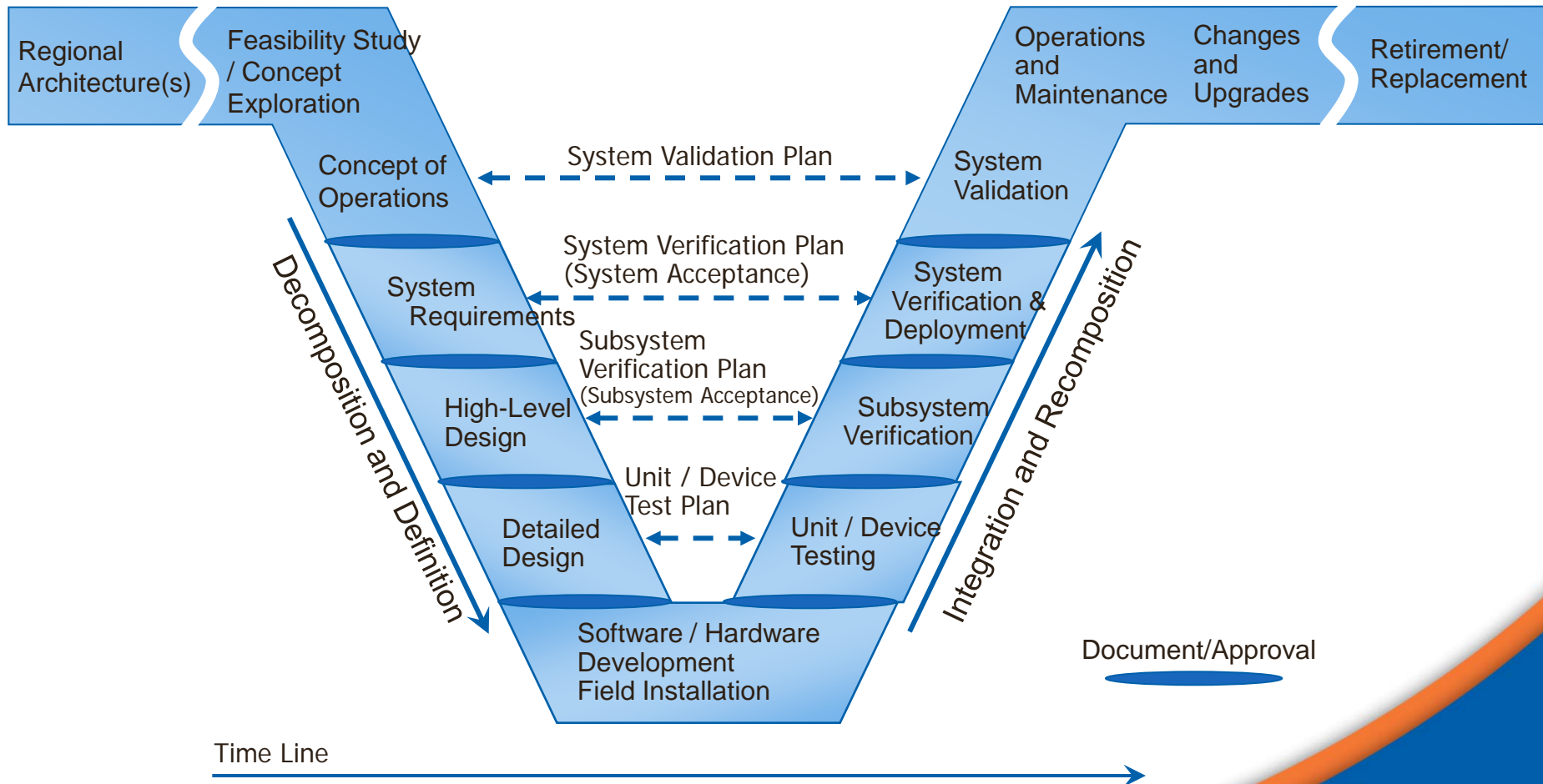
Reasons for Architecture Use in Project Implementation



Blueprint
Integration Opportunities
Efficiency
Rule/Policy

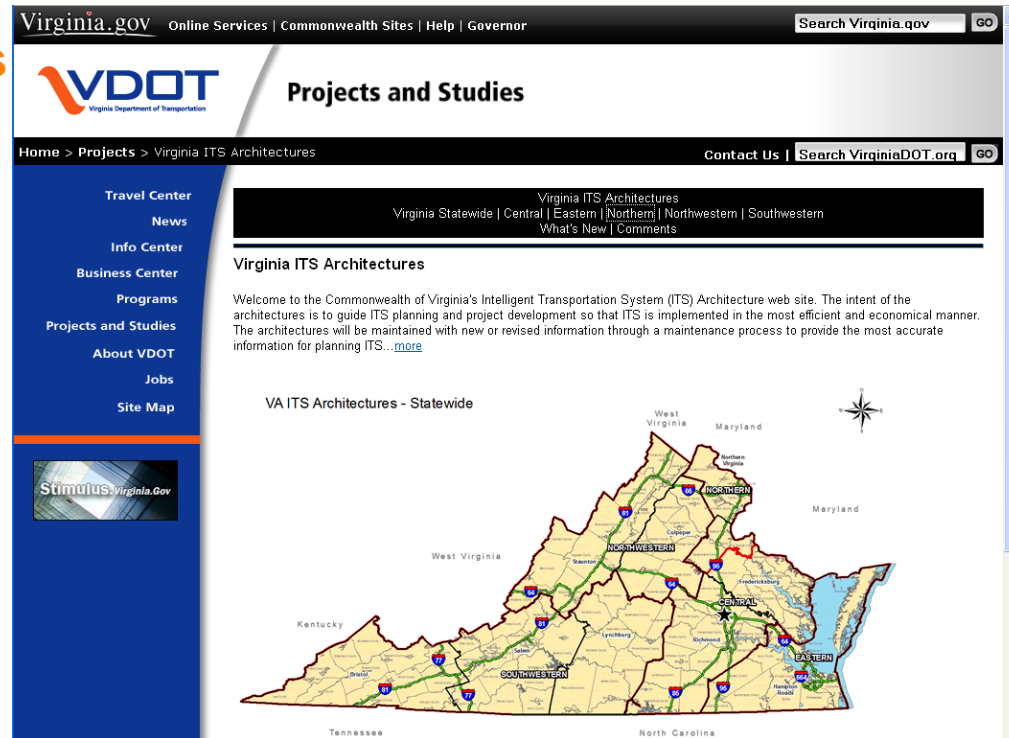


Systems Engineering Process



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**



VDOT I-64 MM0-41 CMS/VDS/RWIS Project

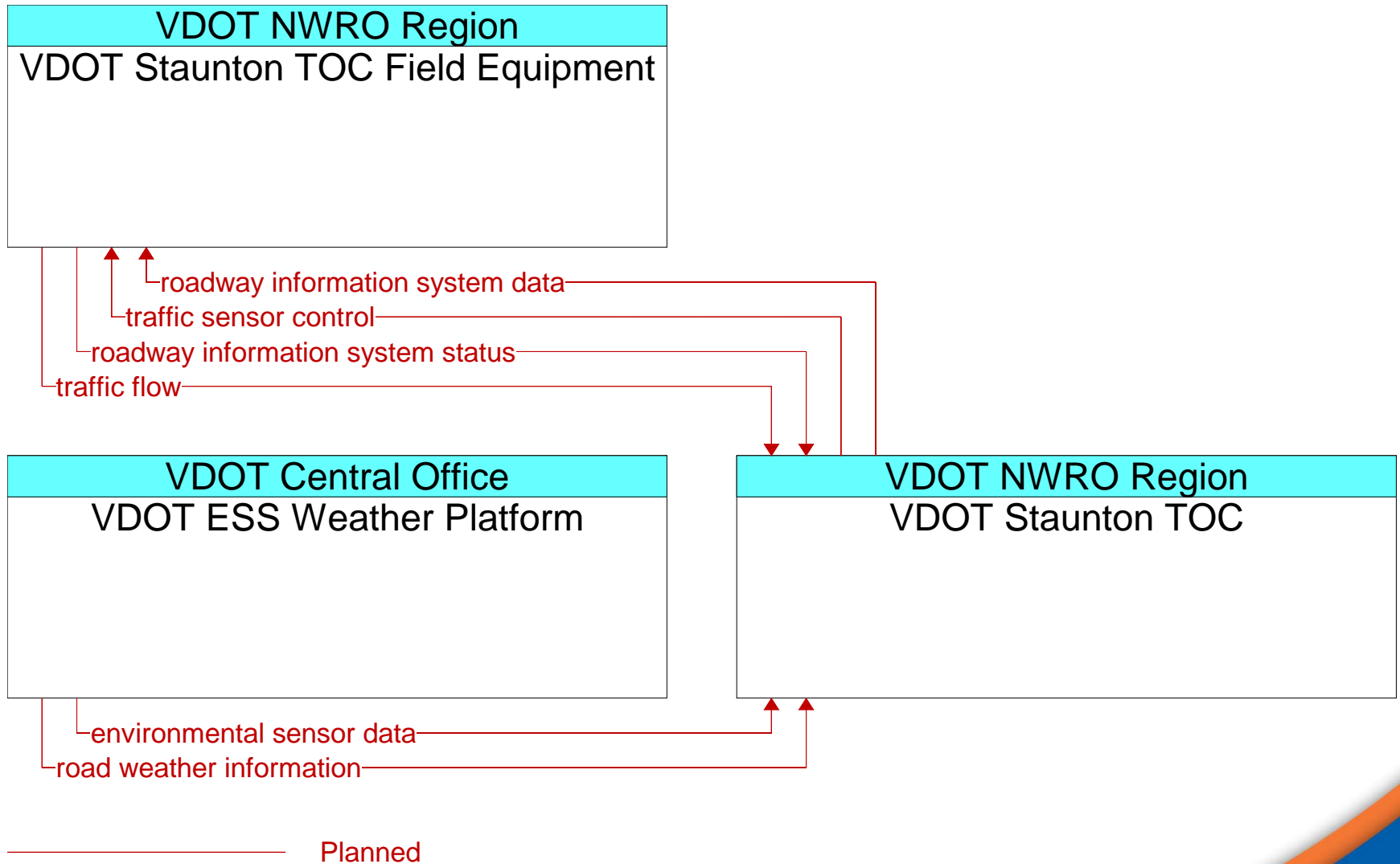
**Addresses Emergency Response gap on I-64
between West Virginia State Line and MM 41**

3 RWIS (Road Weather Information System)

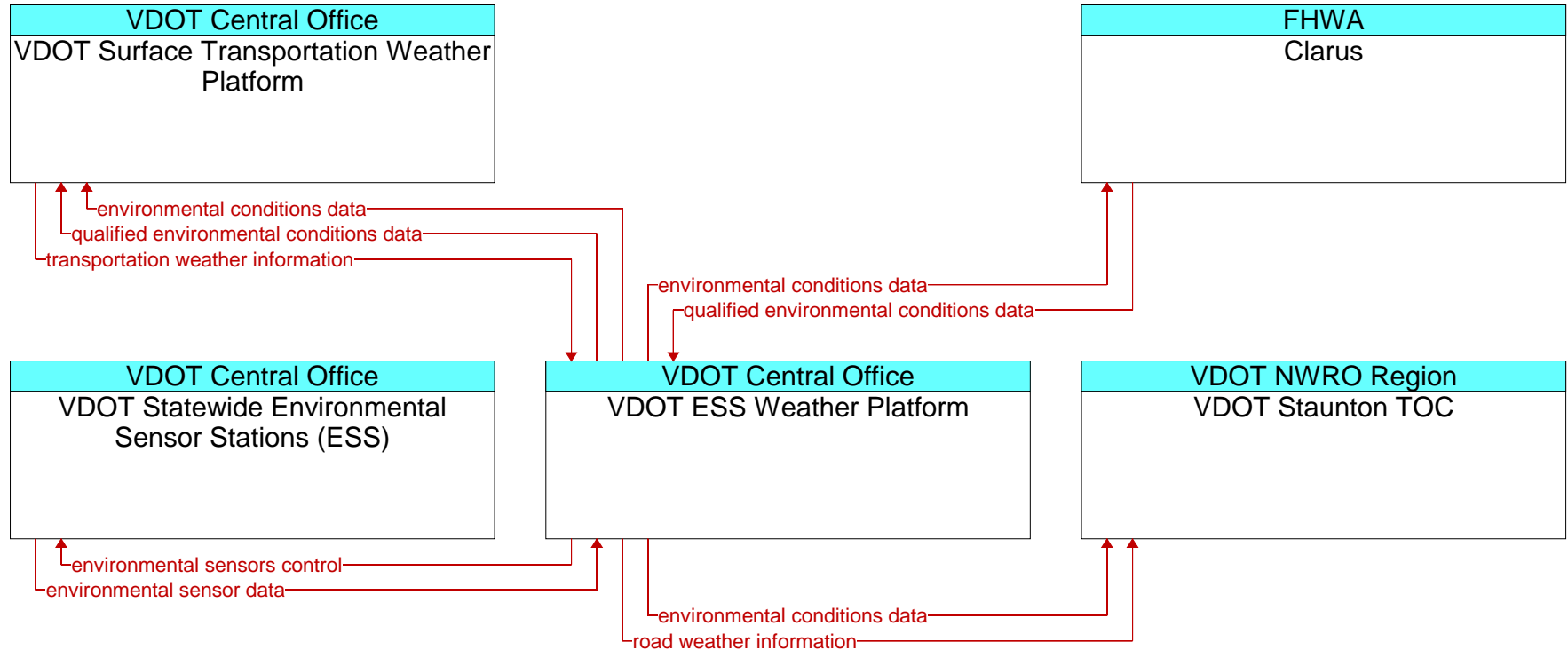
4 CMS (Changeable Message Sign)

3 VDS (Vehicle Detection System)

VDOT I-64 MM0-41 CMS/VDS/RWIS Project ITS Architecture



VDOT I-64 MM0-41 CMS/VDS/RWIS Project ITS Architecture



Planned

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

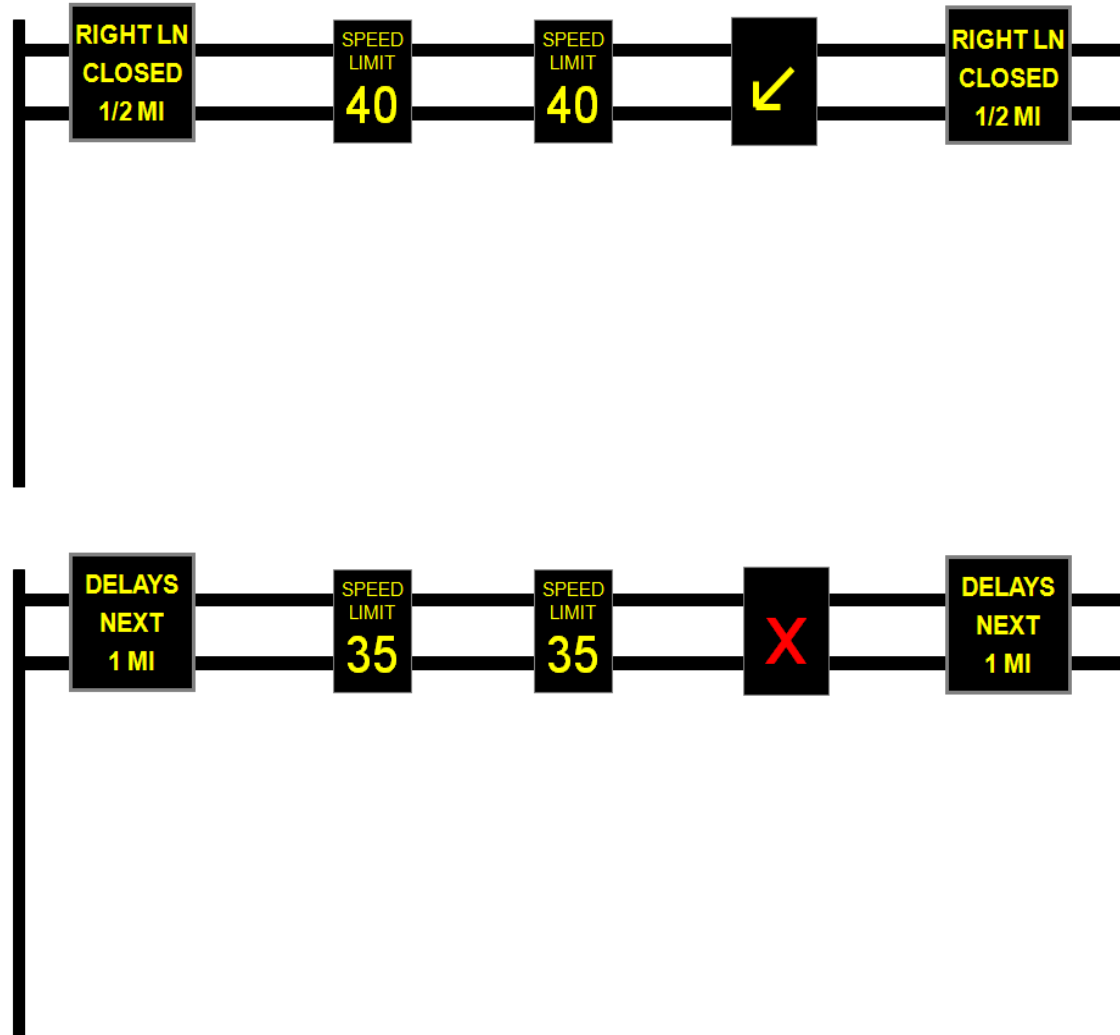
10 Overhead Lane Management Systems (OLMS)

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

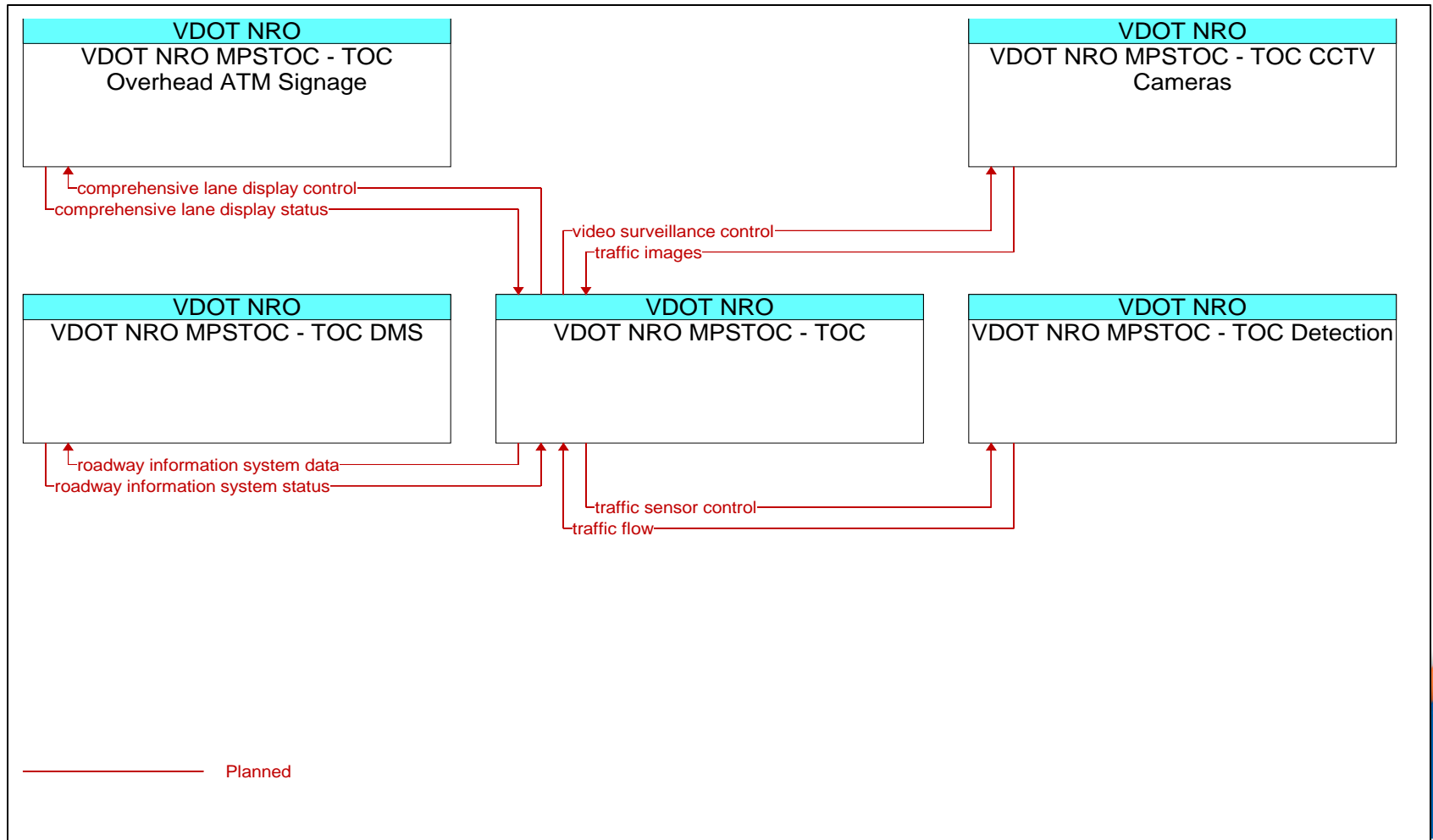
4 CCTV (Closed Circuit Television)

2 DMS (Dynamic Message Signs)

Typical OLMS Display



Project ITS architecture

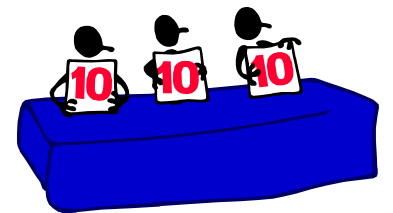
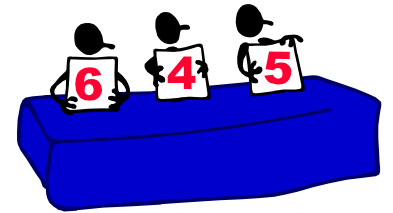


IDENTIFY GAPS AND SUGGESTED ARCHITECTURE CHANGES

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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