NTOC Planning for Operations Webinar:
Leveraging a Regional ITS Architecture
in Planning for Operations

Ben Williams, FHWA Resource Center
Nathaniel Price, FHWA Oregon Division and Resource Center
Jim Hunt, FHWA Office of Operations
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Planning for Operations

Capacity Building Projects
- Demand Management
- Transit Improvements

ITS Projects
- Work Zone Coordination

Other Operational Improvements
- Traveler Information
Transportation Planning Process

- Regional Vision and Goals
- Alternate Improvement Strategies
  - Operations
  - Capital
- Evaluation & Prioritization of Strategies
- Development of Transportation Plan (LRP)
- Development of Transportation Improvement Programs (S/TIP)
- Project Development
- Systems Operations (Implementation)
- Monitor System Performance (Data)
An Objectives-Driven, Performance-Based Approach to Planning for Operations

1. Regional goals and motivation
2. Operations objectives
3. Systematic process to develop and select M&O strategies to meet objectives
4. Metropolitan transportation plan
5. Transportation improvement program and other funding programs
6. Implementation

Monitoring and evaluation:
- CMP uses this approach with a focus on congestion

Define performance measures
- Determine operations needs
- Identify M&O strategies
- Evaluate M&O strategies
- Select M&O strategies for the plan
M&O Strategies Directly Support Planning Goals

**Goal:** Improve System Reliability

**Objective:** Reduce hours of travel delay associated with scheduled non-recurring events by $X$ percent by year $Y$

**M&O Strategies:**
- Work zone management
- Special event management

**Projects & Programs**

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**U.S. Department of Transportation**
**Federal Highway Administration**
Value of Connecting the Regional ITS Architecture to Planning for Operations

• Regional ITS architecture offers a coordinated view of the institutional and technical aspects of ITS across agencies in region that is essential for planning for operations

• Integrating management and operations (M&O) into regional/Statewide planning requires significant inter-agency collaboration and regional view of system

• M&O is often underpinned by ITS

• Regional ITS architecture even more relevant with increased focus on data and performance measures in planning
Regional ITS Architecture

A framework for ensuring institutional agreement and technical integration for the implementation of ITS projects in a particular region
ITS Architectures are a Framework for Integration
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
Scope of Architecture
  – Geographic area
  – Time horizon
  – Breadth of ITS services

Stakeholders
  – Anyone who owns, operates, maintains or uses ITS infrastructure
Inventory of ITS Elements

A list of ITS elements and the elements that interface with them

And an element is:
“An ITS system or piece of a system”

An architecture is built around an inventory of existing and future ITS systems

- Know what you have today
- Plan for future systems
ITS Services

The ITS capabilities you use to meet operational goals and objectives

Example Services:
- Broadcast Traveler Information
- Surface Street Control
- Transit Vehicle Tracking

ITS Architecture

1. Region Description
2. Stakeholder Identification
3. ITS Elements
4. **ITS Services**
5. Operational Concept
6. Functional Requirements
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11. Maintenance Plan
Service Packages and the Regional Architecture

- Service Packages provide a menu of ITS services
  - Select Service Packages of interest
  - Map to your inventory and tailor

Traffic Management
Traveler Information
Transit Management
Emergency Management
Commercial Vehicle Operations
Maintenance and Construction
Archived Data
Vehicle Safety
Transit Vehicle Tracking
Transit Fixed-Route Operations
Demand Response Transit Operations
Transit Fare Collection Management
Transit Security
Traffic Information Dissemination (ATMS06)

Traffic Operations Personnel
- Traffic operator inputs
- Traffic operator data

Media
- Road network conditions

Maintenance and Construction Management
- Current asset restrictions

Transit Management
- Road network conditions

Emergency Management
- Road network conditions

Traffic Management
- Road network conditions

Information Service Provider
- Broadcast advisories

Basic Vehicle
- Driver information

Roadway
- Roadway information system data
- Roadway information system status

Other Roadway
- Roadway equipment coordination

TMC Traffic Information Dissemination
- Roadway traffic information dissemination
Operational Concept

Identifies the roles and responsibilities of stakeholders in the operation, implementation and maintenance of the ITS systems

Traffic Operations Center

- Detects & verifies incidents via CCTV video images
- Receives automated incident alerts from Fire CAD

ITS Architecture

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10. Agreements
11. Maintenance Plan
Functional Requirements

- High-level descriptions of what ITS elements will do in the region
  - NOT detailed design requirements
- Typically written as “shall” statements

The center shall remotely control environmental sensors that measure road surface temperature, moisture, icing and salinity.
Interfaces

- Identify Interconnects
  Which systems will share info?
- Define Information Flows
  What information will they share?
Project Sequencing

- Order in which ITS projects should be implemented
- Impacted by:
  - Technical issues
  - Institutional issues

<table>
<thead>
<tr>
<th>Camera with Visual Tracking System (VTS) Installation</th>
<th>EM05-2: Transportation Infrastructure Security</th>
<th>Short-term</th>
<th>$1.2M</th>
</tr>
</thead>
<tbody>
<tr>
<td>Automated Parking System</td>
<td>ATMS16-1: Parking Facility Management</td>
<td>Mid-term</td>
<td>$15.0M</td>
</tr>
</tbody>
</table>
Agreements

• Document institutional integration in region
• May be required for interjurisdictional interfaces
• Define:
  – Integration plans
  – Maintenance & operations plans
  – Funding responsibilities

ITS Architecture

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Architecture Development is a Planning Process

Step #1: Get Started
Need | Scope | Champions | Stakeholders

Step #2: Gather Data
Inventory | Needs and Services | Operational Concept | Functional Requirements

Step #3: Define Interfaces
Interconnects | Information Flows

Step #4: Implementation
Project Sequencing | ITS Standards | List of Agency Agreements

Step #5: Use the Architecture

Step #6: Maintain the Architecture

U.S. Department of Transportation
Federal Highway Administration
Turbo Interface Reflects Maintenance Process

STEP #1: GET STARTED
- Need
  - Champions
- Scope
- Stakeholders

STEP #2: GATHER DATA
- Inventory Systems
  - Operational Concept
  - Needs and Services
  - Functional Requirements

STEP #3: DEFINE INTERFACES
- Interconnects
  - Information Flows

STEP #4: IMPLEMENTATION
- Project Sequencing
- ITS Standards
- List of Agency Agreements

STEP #5: USE THE ARCHITECTURE

STEP #6: MAINTAIN THE ARCHITECTURE

Turbo Interface Reflects Maintenance Process

U.S. Department of Transportation
Federal Highway Administration
Architecture Link to Planning Process Example

Transportation Planning

Goal: Provide an Efficient, Reliable Transportation System.

Objective:
• Reduce the mean duration of incidents (response & clearance time) by 20 percent in 5 years.

Strategy:
• Provide traveler information on incidents

Performance Measure:
• Mean duration of incidents

ITS Architecture

ITS Services:
• Broadcast Traveler Information (ATIS01)
• Interactive Traveler Information (ATIS02)
• Traffic Information Dissemination (ATMS06)

Projects:
• State 511 System Expansion
• Agency Traveler Information Website Upgrade
• Portable DMS Acquisition
Opportunities to Leverage the Architecture in Planning for Operations
Overview

• Advancing Planning for Operations
• Opportunities for Architecture Use
• Creating a Planning Supportive Architecture
Overview

• Advancing Planning for Operations (P4O)
• Opportunities for Architecture Use
• Creating a Planning Supportive Architecture
Planning for Operations Guidebooks

Presents The Approach

Statewide Opportunities

Metropolitan
Overview

• Advancing P4O

• Opportunities for Architecture Use

• Creating a Planning Supportive Architecture
Regions Interviewed

1. Phoenix Metropolitan Region, Arizona
2. Ames Area Metropolitan Region, Iowa
3. Hampton Roads Metropolitan Region, Virginia
4. Southeast Michigan Metropolitan Region
5. Albuquerque Metropolitan Region, New Mexico
6. State of Minnesota
7. San Diego Metropolitan Region, California
Key Questions in Planning for Operations Addressed by Architecture

☑️ What M&O strategies supported by ITS will help achieve our operations objectives?

☑️ What data is available in the region to monitor transportation system performance and track progress toward operations objectives?

☑️ Where are there gaps in providing transportation system management across our region?
Key Questions in Planning for Operations Addressed by Architecture (Cont’d)

☑ How can we most effectively integrate a new M&O strategy with other existing or planned technology deployments?

☑ How can we define M&O projects or program in terms of functional requirements, operations concepts, supporting ITS standards, etc.?
Opportunities for Architecture Use in Planning for Operations

1. Regional goals and motivation
2. Operations objectives
3. Systematic process to develop and select M&O strategies to meet objectives
4. M&O strategies
5. Metropolitan transportation plan
6. Transportation improvement program and other funding programs
7. Implementation

CMP uses this approach with a focus on congestion

- Define performance measures
- Determine operations needs
- Identify M&O strategies
- Evaluate M&O strategies
- Select M&O strategies for the plan
Regional Collaboration and Coordination

Regional Goals and Motivation

Operations Objectives

Systematic Process to Develop and Select M&O Strategies to Meet Objectives
- Define Performance Measures
- Determine Operations Needs
- Identify M&O Strategies
- Evaluate M&O Strategies
- Select M&O Strategies for the Plan

Regional ITS Architecture

Metropolitan or Statewide Transportation Plan

Metropolitan or Statewide Transportation Improvement Program or Other Funding Programs

Implementation/System Operations

Monitoring and Evaluation
### Link Objectives, Strategies, Service Packages

<table>
<thead>
<tr>
<th>Objective</th>
<th>Strategies</th>
<th>Service Packages</th>
</tr>
</thead>
<tbody>
<tr>
<td>Improve average vehicular travel time by at least 1.5 minutes during peak hour periods on major traffic corridors by 2035</td>
<td>Continue signal upgrades, periodic re-timing, and coordination of all new and existing signalized intersections</td>
<td>ATMS03: Traffic Signal Control</td>
</tr>
<tr>
<td></td>
<td>Utilize car sharing programs and park and ride facilities to remove vehicle trips from the roadway network</td>
<td>ATIS08: Dynamic Ridesharing ATMS16: Parking Facility Management</td>
</tr>
<tr>
<td></td>
<td>Continue adding connected pedestrian, bicycle and transit facilities to the existing transportation network making these travel modes more efficient</td>
<td>APTS02: Transit Fixed Route Operations APTS03: Demand Response Transit Operations APTS07: Multi-modal coordination</td>
</tr>
</tbody>
</table>
1 PROJECT OVERVIEW

PROVIDE PROJECT OVERVIEW TEXT HERE INCLUDING PROJECT PURPOSE, LIMITS AND EXPECTED OUTCOMES

2 GOALS AND OBJECTIVES

PROVIDE SUMMARY TEXT OF STRATEGIC PLAN GOALS AND OBJECTIVES MET BY THIS PROJECT

VDOT’s vision for the region and also for the Project Corridor is to:

Make Roadway Travel Safe, Efficient, and Reliable.

To meet this vision, VDOT NRO plans to achieve through this project by: (example below)

- Serving the public by providing them with the information they need to make good travel decisions;
- Monitoring real-time traffic conditions and the condition of its infrastructure;
- Proactively and rapidly identifying problems, including traffic congestion, crashes, and other mobility and safety needs;
- Taking rapid and effective action to address current and developing problems, appropriately applying a range of methods including physical improvements and advanced technologies;
- Sharing information, coordinating responses, and planning jointly with its partner agencies.

Goals and objectives met by this project include:

FOR EASE OF USE, PLACE AN “X” IN THE CELLS TO THE LEFT OF THE GOALS AND OBJECTIVES THAT WILL BE ADDRESSED BY THIS PROJECT

<table>
<thead>
<tr>
<th>GOALS AND OBJECTIVES</th>
<th>EXPECTED BENEFITS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Goal #1: Reduce Congestion</td>
<td>Reduction in travel times</td>
</tr>
<tr>
<td>1.1 Reduce travel times and delays for all modes along identified major corridors</td>
<td>Reduction in delay (vehicle hours)</td>
</tr>
<tr>
<td>1.2 Improve travel time reliability on major corridors</td>
<td>Reduction in incident duration</td>
</tr>
<tr>
<td>1.3 Actively manage travel demand on NRO facilities</td>
<td>Improved travel time reliability</td>
</tr>
<tr>
<td>1.4 Reduce delays due to work zones and planned special events</td>
<td></td>
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<tr>
<td>1.5 Reduce incident clearance times</td>
<td></td>
</tr>
<tr>
<td>Goal #2: Improve Safety</td>
<td>Reduction in incidents</td>
</tr>
<tr>
<td>2.1 Reduce vehicular crashes</td>
<td></td>
</tr>
<tr>
<td>2.2 Reduce pedestrian and bicyclist crashes</td>
<td></td>
</tr>
</tbody>
</table>

6 PROJECT ARCHITECTURE

PROVIDE INFORMATION RELATED TO THE COMPONENTS OF THE NORTHERN VIRGINIA ITS ARCHITECTURE THAT ARE ASSOCIATED WITH THIS PROJECT. The Project Architecture provides a framework that identifies the institutional agreement and technical integration necessary to interface the ITS project with other ITS projects and systems. It addresses the application of the proposed system with a focus on integration and operation of the system(s). The NRO Regional ITS Architecture (http://www.vdot-virginia.com/Dgs/It.htm) should be used as the basis for generating the project architecture. The section should summarize key stakeholders (e.g. VDOT NRO, Private Sector ISs, MAYOR, etc.)
Overview

• Advancing P4O

• Opportunities for Architecture Use

• Creating a Planning Supportive Architecture
### Keeping it Planner-Friendly

<table>
<thead>
<tr>
<th>Challenge</th>
<th>Technique</th>
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</table>
| The regional ITS architecture is a specialized topic area with its own terminology and concepts. | **User Aids**  
- Provide links to resources like the Regional ITS Architecture Guidance Document and other resources.  
- Include a glossary of terms.  
- Provide contact information for those with questions.  
- Include training with your next regional ITS architecture update. |
# Keeping it Planner-Friendly

<table>
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<tbody>
<tr>
<td>The sheer amount of information in the architecture can be daunting – hundreds or even thousands of functional requirements and interfaces. Users can get lost and never find the information they were seeking.</td>
<td><strong>User-Friendly Organization</strong></td>
</tr>
<tr>
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<td>• Provide a roadmap</td>
</tr>
<tr>
<td></td>
<td>• Segment the regional ITS architecture documentation into “views” for different types of users.</td>
</tr>
<tr>
<td></td>
<td>• Include navigation queues.</td>
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<td></td>
<td>• Provide summary level information with the opportunity to “drill down” into the detail.</td>
</tr>
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Synergies are Two Way

Step #1: Get Started
- Need
- Scope
- Champions
- Stakeholders

Step #2: Gather Data
- Inventory
- Needs and Services
- Operational Concept
- Functional Requirements

Step #3: Define Interfaces
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Step #5: Use the Architecture

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Iterative Process

U.S. Department of Transportation
Federal Highway Administration
• Update Architecture in conjunction with Plan Updates
• Leverage same regional committee for operations and ITS
• Use the operations objectives from transportation plan to guide identification of needs and services in architecture
• Link operations and ITS needs for plan and architecture
• Link M&O strategies for plan and ITS architecture services
• Create project sequence in ITS arch consistent with TIP/STIP
The ITS architecture, along with the ITS Strategic Plan, has assisted in defining projects and the connections between various projects and stakeholders.

Keith Nichols, Hampton Roads Transportation Planning Organization (Virginia)

The architecture gets you one step ahead... The architecture has helped us build out projects here and I believe we have gotten far more than our money’s worth out of it.

Peter Thompson San Diego Association of Governments (California)
• U.S. DOT Planning for Operations Website
  – http://www.plan4operations.dot.gov

• National ITS Architecture
  – http://www.iteris.com/itsarch/

• Planning for Operations Workshop
  – Jim.hunt@dot.gov
  – ben.williams@dot.gov

• Regional Architecture Support
  – Nathaniel.Price@dot.gov
  – emiliano.lopez@dot.gov