New National ITS Architecture’s V7 – What’s New and How to Use It!

July 10, 2012
Agenda

- National ITS Architecture
  - Overview
  - Version 7.0 update
  - Example Use of Version 7.0
- Turbo Architecture version 7.0
New National ITS Architecture’s V7 – What’s New and How to Use It!

Overview of National Architecture
Intelligent Transportation Systems (ITS) include the electronics, communications or information processing used singly or integrated to improve the efficiency or safety of surface transportation.

Examples:
- Traffic signal controllers
- Traffic Management Centers
- 511 (traveler information)
- Electronic toll-tagging
What is an ITS Architecture?

- Framework for developing integrated transportation systems
- Identifies:
  - Organizations
  - Systems operated
  - Functions performed
  - Communications
  - Information exchanged
ITS Architectures Provide a Framework for Integration

Traffic

traffic information

request for traffic information

Travelers

Transit

Emergency Service Providers

I-93 Closed at Decatur Blvd.
What is the National ITS Architecture?

- High-level national framework, “blueprint”, used to help guide ITS deployment and transportation planning
- Based on 33 transportation related ITS User Services
- Used as a template to create regional and project architectures
Available on Website

Can download website and create a CD-ROM

Contains
- Hypertext
- PDF docs
- Databases
National Architecture Products

Architecture Layers

User Services

Standards Mapping

Logical Architecture

Processes

Data Flows

Physical Architecture

Subsystems & Terminators

Architecture Flows

Equipment Packages

Architecture Use

For Planning

For Project Development

Security Considerations

Service Packages

Theory of Operations

1

2
Physical Entities - Subsystems

- Part of the overall Intelligent Transportation System
- Identify major systems, functionality
- Identify major interfaces
- Define key standardization points

4 Categories
- Centers
- Field
- Vehicles
- Travelers
Physical Entities - Terminators

- Entities outside of ITS
- Define the ITS boundary
- Define interfaces but not functionality
- Four types of Terminators
  - Environment
  - Human
  - System
  - Other System
Define information exchanged
Also known as “information flows”
ITS standards are mapped to architecture flows
Service Packages

Architecture
Framework spanning all of ITS

Service Packages
Contain pieces of the architecture that provide a particular ITS service
Service Packages

- Represent ITS services in the National ITS Architecture
- Formerly known as market packages
- Examples:
  - Traffic Incident Management System
  - Broadcast Traveler Information
  - Surface Street Control
  - Transit Vehicle Tracking
APTS09: Transit Signal Priority Service Package

- Traffic Management
  - TMC Multimodal Coordination
  - TMC Signal Control
- Roadway
  - Signal control commands
  - Right-of-way request notification
  - Signal control status
  - Signal fault data
- Transit Management
  - Traffic control priority status
  - Traffic control priority request
- Transit Vehicle
  - On-board Transit Signal Priority
  - Transit vehicle schedule
  - Performance
  - Transit vehicle operator display
  - Transit vehicle operator inputs
- Transit Vehicle Operator
  - Transit vehicle operator display
  - Transit vehicle operator inputs
- Transit Operations Personnel
  - Transit operations status
  - Transit operations personnel inputs
  - Transit Center Signal Priority

Local signal priority request

Transit schedule information
Service Package Groups

Traffic Management

Emergency Management

Traveler Information

Commercial Vehicle Operations

Transit Management

Maintenance and Construction

Archived Data

Vehicle Safety
New National ITS Architecture’s V7 – What’s New and How to Use It!

National Architecture Version 7.0 Update
National ITS Architecture is a “Living Document”

- Continuing evolution over 16 years
Architecture Evolution in Step with Industry

- Research and Federal Programs
  - DOT Initiatives
  - Commercial Vehicle Information and System Networks (CVISN)
  - Connected Vehicles Program
- ITS Standards
- Deployment Lessons Learned
What’s New in V7.0

National ITS Architecture

The National ITS Architecture provides a common framework for planning, defining, and integrating intelligent transportation systems. It is a mature product that reflects the contributions of a broad cross-section of the ITS community transportation practitioners, systems engineers, system developers, technology specialists, consultants, etc.

The architecture defines:

- The functions (e.g., gather traffic information or request a route) that are required for ITS.
- The physical entities or subsystems where these functions reside (e.g., the field or the vehicle).
- The information flows and data flows that connect these functions and physical subsystems together into an integrated system.

If you would prefer a summary document that you can print and read over coffee, a brief document is available that presents the key architecture concepts.

High Level Changes

Detailed Change Log
What’s New in V7.0

- Updated institutional layer
- Planning view of the architecture
- Synchronization with other initiatives
  - FMCSA Commercial Vehicle Information Systems and Networks (CVISN)
  - Canadian Architecture
- Reflect current ITS standards
What’s New in V7.0 (cont.)

- Represent ITS advancements
  - Active Traffic Management (ATM)
  - Connected Vehicle Program
  - Road User Pricing
- Enhanced website
Institutional Layer

- Provides a perspective of the architecture that includes the stakeholders and institutions associated with the surface transportation system
- Available on the website
Planning View

- Provides an entry point to the architecture that is oriented to the transportation planning process
  - Can enter view planning factors, goals or objectives
- Provide support for planning of ITS programs & projects
- Each service package linked to planning items
Planning View

- Planning4Operations
- ITS Knowledge Resources

### Knowledge Resources

<table>
<thead>
<tr>
<th>Benefits</th>
<th>Costs</th>
<th>Lessons Learned</th>
<th>Deployment Stats</th>
<th>Applications</th>
</tr>
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<td>Intelligent Infrastructure</td>
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<td>Arterial Management</td>
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<td>Freeway Management</td>
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<td>Crash Prevention and Safety</td>
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<td>Road Weather Management</td>
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<td>Roadway Operations 4</td>
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<td>Transit Management</td>
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<td>Transportation Management</td>
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<td>Traffic Incident Management</td>
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</table>
Synchronization with CVISN

- Addition of several architecture flows to support exchange of credentials information to support citations and sharing of border clearance status
- Adds support for Wireless Roadside Inspection (WRI) functions and interfaces
Synchronization with Canadian Architecture

- Replacement of the term "market package" with "service package"
- Adjustment of architecture flows
- Two new service packages
  - APTS11: Multimodal Connection Protection
  - ATMS26: Mixed User Warning Systems
ATMS26: Mixed User Warning Systems

Traffic Management

- TMC Roadway Warning
- TMC Signal Control

Roadway

- signal control status + road user protection data
- right-of-way request notification + traffic flow
- signal control commands + road user protection device control
- roadway warning system control
- roadway warning system status
- signal fault data
- traffic sensor control

Pedestrians

- crossing call + non-vehicular presence crossing permission

Driver

- driver information

Roadway Mixed Use Sensing
Roadway Warning
ITS Advancements: Active Traffic Management (ATM)

- “Practice of dynamically managing recurrent and nonrecurrent congestion based on prevailing traffic conditions”
- “Use of integrated systems with new technology, including the automation of dynamic deployment to optimize performance quickly”
ITS Advancements: Active Traffic Management (ATM)

- Strategies:
  - Speed Harmonization
  - Hard Shoulder Running
  - Queue Warning
  - Dynamic Merge Control
  - Dynamic Truck Restriction
  - Dynamic Rerouting and Traveler Info
  - Dynamic Lane Markings
  - Automated Enforcement
ITS Advancements: Active Traffic Management (ATM)

- New service packages
  - ATMS22: Variable Speed Limits
  - ATMS23: Dynamic Lane Management and Shoulder Use
  - ATMS24: Dynamic Roadway Warning

- ATM strategies were removed from
  - ATMS04: Freeway Control → Traffic Metering
ITS Advancements: Connected Vehicle Program

- Continue updates in Version 6.0 and 6.1
- Only minor changes were required to update terminology to match the connected vehicle program
ITS Advancements: Road User Pricing

- Support for alternative pricing of roadways including road use or vehicle miles traveled (VMT) fee-based systems
- New service package
  - ATMS25: VMT Road User Payment
- Changes to subsystems for methods besides traditional toll collection
  - Toll Collection Administration → Payment Administration
  - Toll Collection → Roadway Payment
1. What ITS advancements of Version 7 of the National ITS Architecture are or will become relevant to your region? *(You may choose more than one.)*

   a) Active Traffic Management (ATM)
   b) Connected Vehicle Program
   c) Road User Pricing
2. When do you plan to update your regional/statewide architecture?

a) Within 6 months  
b) 6-12 months  
c) 1 year  
d) 2+ years  
e) I don’t know
Website Enhancements

National ITS Architecture
Version 6.1

What's New
Version 6.1 of the National ITS Architecture includes a host of new features that enhance the architecture definition and make it easier for you to access the information that you need. The architecture will continue to evolve as new user services are developed, standards activities progress, and more and more ITS implementations put the architecture into action.

Where to Start?
The National ITS Architecture provides a common framework for planning, defining, and integrating intelligent transportation systems. It is a mature product that reflects the contributions of a broad cross-section of the ITS community (transportation practitioners, systems engineers, system developers, technology specialists, consultants, etc.).

The architecture defines:
- The functions (e.g., gather traffic information or request a route) that are required for ITS
- The physical.subsystems or sub-systems where these functions reside (e.g., the road or the vehicle).
- The information flows and data flows that connect these functions and physical subsystems together into an integrated system.

If you would prefer a summary document that you can print and read over coffee, a brief document is available that presents the key architecture concepts.

National ITS Architecture News
February 14, 2012
Turbo Architecture Version 7.0 Released

January 2012
National ITS Architecture Version 7.0 Released

What's New in 7.0
Version 7.0 of the National ITS Architecture includes a host of new features that enhance the architecture definition and make it easier for you to access the information that you need. The architecture will continue to evolve as new user services are developed, standards activities progress, and more and more ITS implementations put the architecture into action.

The National ITS Architecture is now on LinkedIn

Last Updated 3/28/2012

United States Department of Transportation
Website Enhancements

- Menu structure
- Architecture Use pages
- Hyperlinked service package diagrams and physical architecture diagrams
- Download website options
  - CD-ROM Image
  - ZIP File
Website Demo

- Menu structure
- Institutional Layer
- Architecture Use pages
  - Use in planning (Planning View entry points)
  - Use in project development
- Service Package pages
- Download website options
  - CD-ROM Image
  - ZIP File
Website Demo – Menu Structure

- Architecture
  - Architecture Layers
  - User Services
  - Logical Architecture
  - Physical Architecture
  - Service Packages
  - Standards
  - Security

- Architecture Use
  - Planning
  - Project Development

- Architecture Products
  - Documents
  - Databases
  - Website Archives

- Training/Workshops

- Turbo Architecture

- Glossary
  - Glossary
  - Acronyms
Institutional Layer

The Institutional Layer considers the policies, funding incentives, working arrangements, and jurisdictional structure that support the technical layers of the architecture. The Institutional Layer provides the basis for understanding who the implementers will be and the roles these implementers could take in implementing architecture-based ITS systems.

The Institutional Layer is the source for objectives and requirements for the surface transportation system, including the User Services that are the driving requirements for the National ITS Architecture. The Institutional Layer also includes the policies and processes for architecture use to support transportation planning and project development.

A host of actors from the public sector and the private sector make up the Institutional Layer. Within the realm of public sector investment, the relationships between the actors have become rather established. This is in large part because ITS deployment decisions can be considered part and parcel of the larger transportation investment decision-making process. This process has matured over the last 50 years of major infrastructure development (e.g., the interstate highway system). A component of this process is the changing legislative underpinnings stemming from Title 23 of the United States Code (USTC), the most recent reauthorization of which was the Safe, Accountable, Flexible, Efficient Transportation Equity Act: A Legacy for Users (SAFETEA-LU). From the vantage of the private sector, both the automotive and communications industries have been major participants in developing various consumer products and services related to ITS. The actors described in the following paragraphs have defined relationships to the sub-systems included in the National ITS Architecture.

Federal Government

In general, Congress sets the overall policy direction for the country (such as through the ISTEA, TEA-21, and SAFETEA-LU transportation acts), determines the level of funding for transportation, programs to be emphasized, and mandates to be met. The U.S. Department of Transportation influences, interprets, and implements the legislation.

State/Local Government

The state legislature and state departments of transportation perform similar functions for each state. In some states, transportation policy and funding is also shaped by voter initiatives, which can affect the level of revenue (e.g., through bonds) and the use thereof (e.g., for transit). There are also a host of related agencies (e.g., state level air resource boards) that can provide a regulatory framework for transportation (and hence ITS) deployment. Metropolitan planning organizations (MPOs) develop regional transportation plans and programs, playing a crucial role in developing regional system designs and public funding priorities for ITS. The state, county, and local government agencies are the primary transportation system operators and implementers of ITS. The nation’s cities are hubs for jobs and traffic, and are responsible for managing the largest transit and rail systems. The state DOTs are primarily responsible for the freeway systems and state arteries which handle most of the long distance and high volume traffic.

Non-Profit/Advisory

The nonprofit sector plays a key role in advising the public sector, and integrating public and private sector needs. This sector includes advisory organizations (such as ITS America), standard setting bodies (such as IEEE), advocacy groups (such as environmental and consumer groups), and educational organizations.

Private Sector

Private sector expertise is necessary to develop ITS technologies and to help ensure that new transportation system infrastructure is properly operated and maintained. While legislation and documented practices aid in characterizing public sector decision-making relative to ITS, private sector decision-making is even more diverse. ITS has a variety of private sector participants, from automobile manufacturers (OEMs), to telecommunications companies, to product entrepreneurs, to major trucking companies. The private sector has established expertise in many areas including technology, traffic engineering, marketing, finance, research, and operations. It is driven to expand these areas by increasing revenue from product and service sales back into its business area.

General Public

Ultimately, ITS enhances the transportation services that are provided to the general public. A range of travelers are intended beneficiaries, including drivers, transit users, bicyclists, and pedestrians. Commercial users are vital stakeholders since they represent key early beneficiaries and adopters of ITS technologies. The general public also includes the public at large since many ITS services provide broad system benefits that are “used” by the public at large. Ultimately, the General Public pays for everything – either directly through user fees and direct purchase of on-board or on-site equipment, or through taxes.
### Institutional Roles

The following table presents the roles the actors defined in the Institutional Layer typically take in the development, operations, and maintenance of ITS systems (as defined here by the 22 subsystems of the Transportation Layer of the physical architecture). Many of the National ITS Architecture subsystems are developed, operated, and maintained by public sector agencies (e.g., state agencies). However, in most cases development (and sometimes the operations and maintenance) are actually carried out by private sector groups under contract to the public sector agency. An example of this would be Roadway Subsystem devices developed for a state DOT by a manufacturer, and then integrated with a Traffic Management Subsystem by a systems integrator.

<table>
<thead>
<tr>
<th>Subsystem</th>
<th>Public Sector</th>
<th>Non-Profit / Advisory</th>
<th>Private Sector</th>
<th>General Public</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Federal Agencies</td>
<td>State Agencies</td>
<td>Regional Authorities</td>
<td>Local Authorities</td>
</tr>
<tr>
<td>Commercial Vehicle</td>
<td>D</td>
<td>D</td>
<td>D</td>
<td>D</td>
</tr>
<tr>
<td>Emergency Vehicle</td>
<td>D, M</td>
<td>D</td>
<td>O</td>
<td>O</td>
</tr>
<tr>
<td>Fleet and Freight Management</td>
<td>D</td>
<td>D</td>
<td>D</td>
<td>D</td>
</tr>
<tr>
<td>Personal Information Access</td>
<td>D, M</td>
<td>D</td>
<td>O</td>
<td>O</td>
</tr>
<tr>
<td>Vehicle</td>
<td>O, M</td>
<td>O</td>
<td>O</td>
<td>O</td>
</tr>
</tbody>
</table>

**Legend**
- D - Develop
- O - Operate
- M - Maintain
- * - Private sector group develops, operates, or maintains under contract from the public sector (usually)
Use in Planning

Use in Transportation Planning

Technology-based systems can pose real challenges for transportation planning. No one can accurately forecast progressive technology advances over a 20-year timeframe, but we know that technology advances will occur. We also know that individual systems will become increasingly integrated over time, but this can be even more difficult to plan with institutional challenges adding to technology uncertainty. The National ITS Architecture was developed specifically to address these challenges and support planning for progressive integration and technology advances to improve the surface transportation system over time.

Most states and metropolitan areas have already developed a regional ITS architecture based on the National ITS Architecture that represents the future integrated surface transportation systems in this region. Using the regional ITS architecture, a region can plan for technology application and integration to support more effective planning for operations. The regional ITS architecture provides context for ITS projects so that each project can build a piece of the envisioned transportation system. By using the architecture as a planning tool, the steps taken by each project will be on the path to fulfilling the larger objectives set forth in the long range transportation plan. The details of how the regional ITS architecture can be used as a tool to support metropolitan and statewide transportation planning is defined in this planning view.

Planning for Operations (planoperations.dot.gov) seeks to integrate operations into the metropolitan and statewide transportation planning processes. The Planning for Operations Web Site includes a wealth of resources including two that are primary sources for the content presented in this view:

- The Building Blocks of a Model Transportation Plan Incorporating Operations: A Desk Reference
- An Objectives-Driven, Performance-Based Approach — A Guidebook

An objectives-driven, performance-based approach is recommended so that operations needs are addressed in regional planning and investment decisions in a systematic, measurable way. Many of the management and operations strategies that are defined through this process rely on technology and system integration, and this is where an ITS architecture can be an effective tool to support planning for operations. A new Primer for Applying the Regional ITS Architecture to Support Planning for Operations will be available on the Planning for Operations web site soon.

Select the steps in the objectives-driven, performance-based approach to planning for operations (in the diagram above) to explore sample planning outputs and their connection to the ITS Architecture.

The mapping between goals, objectives, and service packages that is included in the Use in Planning Web Pages can be used to support an analysis of the service packages that are most relevant for your region. The mappings included on this site should only be used as a starting point; users should do their own analysis to identify the best service packages for their region.
### Goals

Transportation planning and investment decisions are based on the public’s desired outcomes for the transportation system. Transportation planning begins with a set of broad goals that reflect the desired outcomes and the transportation vision for the region. The goals identified in the table below are representative of the goals that are included in metropolitan and statewide transportation plans. As shown in the table, the representative goals included in the National ITS Architecture are closely tied to the planning factors required by 23 CFR 400. Select any of the goals to traverse to more specific objectives that support the goals, performance measures that can be used to measure the progress towards the objectives, and ultimately the service packages in the National ITS Architecture that support each objective.

<table>
<thead>
<tr>
<th>Planning Factor</th>
<th>Goal</th>
</tr>
</thead>
<tbody>
<tr>
<td>A. Support the economic vitality of the metropolitan area, especially by enabling global competitiveness, productivity, and efficiency;</td>
<td>Support regional economic productivity and development</td>
</tr>
<tr>
<td>B. Increase the safety of the transportation system for motorized and nonmotorized users;</td>
<td>Improve the safety of the transportation system</td>
</tr>
<tr>
<td>C. Increase the security of the transportation system for motorized and nonmotorized users;</td>
<td>Improve the security of the transportation system</td>
</tr>
<tr>
<td>D. Increase the accessibility and mobility of people and for freight;</td>
<td>Enhance mobility, convenience, and comfort for transportation system users</td>
</tr>
<tr>
<td>E. Protect and enhance the environment, promote energy conservation, improve the quality of life, and promote consistency between transportation improvements and State and local planned growth and economic development patterns;</td>
<td>Reduce environmental impacts</td>
</tr>
<tr>
<td>F. Enhance the integration and connectivity of the transportation system, across and between modes, for people and freight;</td>
<td>Enhance the integration and connectivity of the transportation system</td>
</tr>
<tr>
<td>G. Promote efficient system management and operation;</td>
<td>Increase operational efficiency and reliability of the transportation system</td>
</tr>
<tr>
<td>H. Emphasize the preservation of the existing transportation system.</td>
<td>Preserve the transportation system</td>
</tr>
</tbody>
</table>

### Architecture Use

The regional ITS architecture must be consistent with the goals established in the relevant transportation plan(s) to facilitate use of the architecture in transportation planning. When this connection is established, the regional ITS architecture can help regions realize their goals by defining the integrated framework for ITS components that support the goals. If your regional ITS architecture does not include this connection, the links between the representative goals and the National ITS Architecture defined in this planning view may be used as a starting point.
# Improve the safety of the transportation system (Goal!)

Each of the goals in a metropolitan or statewide transportation plan is supported by one or more "Objectives" that define what needs to occur to accomplish the goal. The objectives define what a region plans to achieve and help to determine the strategies and investments that will be included in the transportation plan. In practice, objectives range from high-level regional statements to specific, measurable, time-bound "SMART" objectives. A range of objectives are included in the National ITS Architecture, gathered from a variety of references and recent transportation plans, that reflect the spectrum of objectives that are used in current practice. The objectives identified below support the identified goal. Select an objective to identify its source, associated performance measures, and the service packages that support the objective.

<table>
<thead>
<tr>
<th>Objective Category</th>
<th>Objective</th>
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<tbody>
<tr>
<td>Emergency/Incident Management: Execution Time</td>
<td>Reduce the percent time to evacuate persons in the region by X percent over Y years.</td>
</tr>
<tr>
<td>Emergency/Incident Management: Incident Duration</td>
<td>Reduce mean incident clearance time per incident by X percent over Y years. (Defined as the time between awareness of an incident and the time the last responder has left the scene.)</td>
</tr>
<tr>
<td>Emergency/Incident Management: Notification Time</td>
<td>Reduce mean incident notification time. (Defined as the time between the first agency's awareness of an incident and the time to notify needed response agencies) by X percent over Y years. (e.g., through &quot;Modified Decision&quot; integrated programs, reduction of incorrect notifications, etc.)</td>
</tr>
<tr>
<td>Emergency/Incident Management: Incident Duration</td>
<td>Reduce mean roadway clearance time per incident by X percent over Y years. (Defined as the time between awareness of an incident and restoration of lanes to full operational status.)</td>
</tr>
<tr>
<td>Emergency/Incident Management: Incidents Cleared</td>
<td>Reduce mean time for first responders to arrive on scene after notification by X percent over Y years.</td>
</tr>
<tr>
<td>Emergency/Incident Management: Incidents Cleared</td>
<td>Reduce mean time of incident duration (time awareness incident to restored traffic flow) on transit services and arterial and expressway facilities by X percent in Y years.</td>
</tr>
<tr>
<td>Emergency/Incident Management: Training</td>
<td>By Y (year), X percent of staff in region with incident management responsibilities will have completed the National Incident Management System (NIMS) Training and at least X percent of transportation responders in the region are familiar with the incident command structure (ICS).</td>
</tr>
<tr>
<td>Emergency/Incident Management: Use of Technology</td>
<td>Increase number of ITS-related assets (e.g., mobile cameras, dynamic message signs, vehicle speed detection) in use for incident and emergency detection by X percent in Y years.</td>
</tr>
<tr>
<td>Emergency/Incident Management: Use of Technology</td>
<td>Increase number of road miles covered by ITS-related assets (e.g., mobile cameras, dynamic message signs, vehicle speed detection) in use for incident detection by X percent in Y years.</td>
</tr>
<tr>
<td>Emergency/Incident Management: Use of Technology</td>
<td>Increase number of traffic signals equipped with emergency vehicle preemption by X percent in Y years.</td>
</tr>
<tr>
<td>Safety: Vehicle Crashes and Fatalities</td>
<td>Reduce crashes at intersections.</td>
</tr>
<tr>
<td>Safety: Vehicle Crashes and Fatalities</td>
<td>Reduce crashes at railroad crossings.</td>
</tr>
<tr>
<td>Safety: Vehicle Crashes and Fatalities</td>
<td>Reduce crashes due to driver errors and limitations.</td>
</tr>
<tr>
<td>Safety: Vehicle Crashes and Fatalities</td>
<td>Reduce crashes due to red light running.</td>
</tr>
<tr>
<td>Safety: Vehicle Crashes and Fatalities</td>
<td>Reduce crashes due to road weather conditions.</td>
</tr>
<tr>
<td>Safety: Vehicle Crashes and Fatalities</td>
<td>Reduce crashes due to unexpected congestion.</td>
</tr>
<tr>
<td>Safety: Vehicle Crashes and Fatalities</td>
<td>Reduce crashes due to unsafe drivers, vehicles and cargo on the transportation system.</td>
</tr>
<tr>
<td>Safety: Vehicle Crashes and Fatalities</td>
<td>Reduce lane departure crashes.</td>
</tr>
<tr>
<td>Safety: Vehicle Crashes and Fatalities</td>
<td>Reduce secondary crashes.</td>
</tr>
<tr>
<td>Safety: Vehicle Crashes and Fatalities</td>
<td>Reduce speed differential.</td>
</tr>
<tr>
<td>Safety: Vehicle Crashes and Fatalities</td>
<td>Reduce the total number of crashes in the region by X percent by year Y.</td>
</tr>
<tr>
<td>Safety: Vehicle Crashes and Fatalities</td>
<td>Reduce the total number of crashes involving bicyclists and pedestrians in the region by X percent by year Y.</td>
</tr>
<tr>
<td>Safety: Vehicle Crashes and Fatalities</td>
<td>Reduce the total number of fatalities and severe injuries in the region by X percent by year Y.</td>
</tr>
</tbody>
</table>
Reduce mean incident clearance time per incident by X percent over Y years. (Defined as the time between awareness of an incident and the time the last responder has left the scene.) (Objective*)

Associated Performance Measures

Mean incident clearance time per incident

Service Packages that Support the Objective

ATMS&T: Traffic Incident Management System
EMT: Emergency Call-Taking and Dispatch
EMS: Emergency Medical Services
EMD: Medical Directing
EMR: Emergency Medical Response
EMS2: CCB2 for Ambulance Operations
EMS3: CCB3 for Cadaver Operations

Associated Goals

Improve the safety of the transportation system
Improve the security of the transportation system

Planning Factors

B. Increase the safety of the transportation systems for motorized and nonmotorized users;
C. Increase the security of the transportation systems for motorized and nonmotorized users;

Source

Planning for Operations Desk Reference

Since the mapping between objectives and service packages is not always straightforward and often situation-dependent, these mappings should only be used as a starting point. Users should do their own analysis to identify the best service packages for their region.
Use in Project Development

The regional ITS architecture provides context for ITS projects. By using the regional ITS architecture, the steps taken by each project will be on the path to the larger objectives set forth in the long range transportation plan.

Architecture Use

A well-maintained regional architecture can provide a tool for making a strong initial start in doing the systems engineering for a project. Regional ITS architecture content such as the stakeholders, their roles and responsibilities (included in the operational concept), and the list of agreements supports the project concept of operations. The functional requirements are high-level requirements that can support system requirements development, and the interfaces and ITS standards support project design. In addition to assisting project implementers in the preliminary engineering stage, planners may also benefit from participating in the conceptual development of projects and strategies prior to the start of the formal project development. These components can inform creation of project documents, including RFPs, and architectural details can inform the project’s scope of work.

The items from the regional ITS architecture that are used to jumpstart the systems engineering process are derived from the National ITS Architecture using the Turbo Architecture software. The subsystems and terminologies used to define the inventory elements, equipment packages, and functional requirements, architecture flows used to define the interfaces, and related ITS standards are all derived from the National ITS Architecture definition. More information on how the regional ITS architecture can be used to support systems engineering is included in the Systems Engineering for ITS Handbook, and the Systems Engineering Guidebook for ITS.
Website Demo – Service Package Pages

APTS09-Transit Signal Priority (Service Package*)

Description

This service package determines the need for transit priority on routes and at certain intersections and requests transit-vehicle priority at these locations. The signal priority may result from limited local coordination between the transit vehicle and the individual intersection for signal priority or may result from coordination between transit management and traffic management centers. Coordination between traffic and transit management is intended to improve on-time performance of the transit system to the extent that this can be accommodated without degrading overall performance of the traffic network.

- Planning factors/goals
- Objectives
- Performance measures
- Link to costs, benefits & lessons learned
### ATMS08-Traffic Incident Management System (Service Package)

**Description**

This service package manages both unexpected incidents and planned events so that the impact to the transportation network and traveler safety is minimized. The service package includes incident detection capabilities through roadside surveillance devices (e.g. CCTV) and through regional coordination with other traffic management, maintenance and construction management and emergency management centers as well as rail operations and event promoters. Information from these diverse sources is collected and correlated by the service package to detect and verify incidents and implement an appropriate response. This service package supports traffic operations personnel in developing an appropriate response in coordination with emergency management, maintenance and construction management, and other incident response personnel to confirmed incidents. The response may include traffic control strategy modifications or resource coordination between center subsystems. Incident response also includes presentation of information to affected travelers using the Traffic Information Dissemination Service package and dissemination of incident information to travelers through the Broadcast Traffic Information or Interactive Traveler Information service packages. The roadside equipment used to detect and verify incidents also allows the operator to monitor incident status as the response unfolds. The coordination with emergency management might be through a CAD system or through other communication with emergency field personnel. The coordination can also extend to local truths and other auxiliary response agencies and field service personnel.

<table>
<thead>
<tr>
<th>Associated Planning Factors and Goals</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Planning Factor</strong></td>
</tr>
<tr>
<td>A. Support the economic vitality of the metropolitan area, especially by enabling global competitiveness, productivity, and efficiency.</td>
</tr>
<tr>
<td>B. Increase the safety of the transportation system for motorized and nonmotorized users;</td>
</tr>
<tr>
<td>C. Increase the security of the transportation system for motorized and nonmotorized users;</td>
</tr>
<tr>
<td>D. Increase the accessibility and mobility of people and for freight;</td>
</tr>
<tr>
<td>F. Enhance the integration and connectivity of the transportation system, across and between modes, for people and freight;</td>
</tr>
<tr>
<td>G. Promote efficient system management and operation;</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Associated Objective Categories</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Objective Category</strong></td>
</tr>
<tr>
<td>Emergency Management: Reliability</td>
</tr>
<tr>
<td>Emergency Management: Customer Satisfaction</td>
</tr>
<tr>
<td>Emergency Management: Incident Duration</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Associated Objectives and Performance Measures</th>
<th>Performance Measure</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Objective</strong></td>
<td><strong>Performance Measure</strong></td>
</tr>
<tr>
<td>Annual rate of change in regional average commute travel time will not exceed regional rate of population growth through the year.</td>
<td>Average commute trip travel time (minutes).</td>
</tr>
<tr>
<td>By X year, X percent of staff in region with incident management responsibilities will have completed the National Incident Management System (NIMS) training and at least 6 percent of transportation responders in the region are familiar with the incident command structure (ICS).</td>
<td>Percent of staff having completed NIMS training and percent of transportation responders familiar with ICS.</td>
</tr>
<tr>
<td>Decrease the average buffer index for (multiple routes or trips) by X percent over Y years.</td>
<td>The buffer index represents the extra time (buffer) road travelers add to their average travel time when planning trips. This is the extra time between the average travel time and rear-end time (65th percentile). The buffer index is stated as a percentage of the average travel time. Average buffer index or buffer time can be calculated.</td>
</tr>
</tbody>
</table>
Website Archives

The National ITS Architecture website is compressed into two formats, a CD-ROM image and a ZIP file, each containing the same content as the National ITS Architecture website but can be available to you when you are not connected to the Internet. For more information about using these archives, see the sections below.

CD-ROM Image
Download the CD-ROM ISO image to your hard drive using the above link. Use your favorite CD-ROM burning tool along with the image file you downloaded to create a CD-ROM with the contents of the National ITS Architecture website. Most CD-ROM image burning tools allow you to use an ISO image file to create a CD-ROM. Refer to your tool documentation for details on how to do this.

ZIP File
Download the ZIP file to your hard drive using the above link. Use your favorite file compression utility to unzip the file you downloaded to create the contents of the National ITS Architecture website on your hard drive. Most current operating systems have built-in zip support.
New National ITS Architecture’s V7 – What’s New and How to Use It!

Example Use of Version 7.0
Example Use of Version 7

Coming Soon

I-66 Active Traffic Management System
Improving safety and incident management from the D.C. line to Haymarket

About the Project

This project will install an active traffic management system on I-66 through Arlington, Fairfax and Prince William counties from the Washington, D.C. line to Route 15 in Haymarket. The system would improve safety and incident management and include new sign gantries, shoulder and lane control signs, speed displays, incident and queue detection, and increased traffic camera coverage.

The total estimated cost is about $32 million ($6.4 million for preliminary engineering and $26.9 million for construction). There is no required right of way anticipated. Planning and design begin this summer with construction starting as early as fall 2012/winter 2013.

State Project Number: 0865-364-917  UFC: 96017

Videos

[Video of I-66 Active Traffic Management System]
ATM Project Consideration

- What ATM strategies are applicable?
- What elements are involved in the strategies?
- What are realistic goals/objectives?
- What benefits can be expected?
**Example Use of Version 7**

- Identify potential strategies

<table>
<thead>
<tr>
<th>Service Area</th>
<th>Service Package</th>
<th>Service Package Name</th>
</tr>
</thead>
<tbody>
<tr>
<td>ATMS01</td>
<td></td>
<td>Network Surveillance</td>
</tr>
<tr>
<td>ATMS02</td>
<td></td>
<td>Traffic Probe Surveillance</td>
</tr>
<tr>
<td>ATMS03</td>
<td></td>
<td>Traffic Signal Control</td>
</tr>
<tr>
<td>ATMS04</td>
<td>√</td>
<td>Traffic Metering</td>
</tr>
<tr>
<td>ATMS05</td>
<td></td>
<td>HOV Lane Management</td>
</tr>
<tr>
<td>ATMS06</td>
<td></td>
<td>Traffic Information Dissemination</td>
</tr>
<tr>
<td>ATMS07</td>
<td></td>
<td>Regional Traffic Management</td>
</tr>
<tr>
<td>ATMS08</td>
<td></td>
<td>Traffic Incident Management System</td>
</tr>
<tr>
<td>ATMS09</td>
<td></td>
<td>Transportation Decision Support and Demand Management</td>
</tr>
<tr>
<td>ATMS10</td>
<td></td>
<td>Electronic Toll Collection</td>
</tr>
<tr>
<td>ATMS11</td>
<td></td>
<td>Emissions Monitoring and Management</td>
</tr>
<tr>
<td>ATMS12</td>
<td></td>
<td>Roadside Lighting System Control</td>
</tr>
<tr>
<td>ATMS13</td>
<td></td>
<td>Standard Railroad Grade Crossing</td>
</tr>
<tr>
<td>ATMS14</td>
<td></td>
<td>Advanced Railroad Grade Crossing</td>
</tr>
<tr>
<td>ATMS15</td>
<td></td>
<td>Railroad Operations Coordination</td>
</tr>
<tr>
<td>ATMS16</td>
<td></td>
<td>Parking Facility Management</td>
</tr>
<tr>
<td>ATMS17</td>
<td></td>
<td>Regional Parking Management</td>
</tr>
<tr>
<td>ATMS18</td>
<td></td>
<td>Reversible Lane Management</td>
</tr>
<tr>
<td>ATMS19</td>
<td></td>
<td>Speed Warning and Enforcement</td>
</tr>
<tr>
<td>ATMS20</td>
<td></td>
<td>Drawbridge Management</td>
</tr>
<tr>
<td>ATMS21</td>
<td></td>
<td>Roadway Closure Management</td>
</tr>
<tr>
<td>ATMS22</td>
<td>✓</td>
<td>Variable Speed Limits</td>
</tr>
<tr>
<td>ATMS23</td>
<td>✓</td>
<td>Dynamic Lane Management and Shoulder Use</td>
</tr>
<tr>
<td>ATMS24</td>
<td>✓</td>
<td>Dynamic Roadway Warning</td>
</tr>
<tr>
<td>ATMS25</td>
<td></td>
<td>VMT Road User Payment</td>
</tr>
<tr>
<td>ATMS26</td>
<td></td>
<td>Mixed Use Warning Systems</td>
</tr>
</tbody>
</table>
Example Use of Version 7

- Identify elements (& their stakeholders) potentially involved

ATMS23-Dynamic Lane Management and Shoulder Use
Example Use of Version 7

- Identify goals, objectives & performance measures

ATMS23-Dynamic Lane Management and Shoulder Use *(Service Package)*

**Description**

This service package provides for active management of travel lanes along a roadway. The package includes the field equipment, physical overhead lane signs and associated control electronics that are used to manage and control specific lanes and/or the shoulders. This equipment can be used to change the lane configuration on the roadway according to traffic demand and lane destination along a typical roadway section or an approach to or access from a border crossing, multimodal crossing or intermodal freight depot. This package can be used for temporary or interim use of shoulders as travel lanes. The equipment can be used to electronically reconfigure intersections and interchanges and manage right-of-way dynamically including merges. Also, lanes can be designated for use by special vehicles only, such as buses, high occupancy vehicles (HOVs), vehicles attending a special event, etc. Prohibitions or restrictions of types of vehicles from using particular lanes can be implemented.

The lane management system can be centrally monitored and controlled by a traffic management center or it can be autonomous. This service also can include automated enforcement equipment that notifies the enforcement agency of violators of the lane controls.

Dynamic lane management and shoulder use is an Advanced Management (ATM) strategy and is typically used in conjunction with other ATM strategies (such as ATMS22-Variable Speed Limits and ATMS24-Dynamic Roadway Warning).

**Associated Planning Factors and Goals**

<table>
<thead>
<tr>
<th>Planning Factor</th>
<th>Objective</th>
<th>Performance Measure</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>A. Support the economic vitality of the metropolitan area, especially enabling global competitiveness, productivity, and efficiency.</td>
<td><em>Goal: Support regional economic productivity and development</em></td>
</tr>
<tr>
<td>G. Promote efficient system management and operation</td>
<td>Annual rate of change in regional average commute travel time will not exceed regional rate of population growth through the year Y</td>
<td>Average commute trip travel time (minutes)</td>
</tr>
<tr>
<td>Associated Objective Categories</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Objective Category</strong></td>
<td><strong>Objective</strong></td>
<td><strong>Performance Measure</strong></td>
</tr>
<tr>
<td>Freeway Management: Efficiency</td>
<td>Increase buffer index for specific travel routes by X percent over the next Y years</td>
<td>Extra time between the average travel time and near-worst case travel time (95th percentile). The buffer index is stated as a percentage of the average travel time. Average buffer index or buffer time can be calculated using miles traveled as a weighting factor. Buffer time = 95th percentile travel time (min) – average travel time (min).</td>
</tr>
<tr>
<td>Freeway Management: Managed Lanes</td>
<td>Ensure that all managed lanes (e.g., HOV lanes, HOT lanes) operate at no less than 50 mph during their hours of operation.</td>
<td>Average speeds in managed lanes.</td>
</tr>
<tr>
<td>Freeway Management: Reliability</td>
<td>Ensure that all managed lanes (e.g., HOV lanes, HOT lanes) operate with a volume of at least X vehicles per hour.</td>
<td>Vehicle volumes in managed lanes.</td>
</tr>
<tr>
<td>Freight Management: Intermodal Facilities</td>
<td>Ensure that all managed lanes (e.g., HOV lanes, HOT lanes) operate with a volume of at least X vehicles per hour.</td>
<td>Vehicle volumes in managed lanes.</td>
</tr>
<tr>
<td>Freight Management: Travel Time Reliability</td>
<td>Improve average travel time during peak periods by X percent for route Y</td>
<td>Average travel time during peak periods (minutes).</td>
</tr>
<tr>
<td>Special Event Management: Entry/Exit Travel Times</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Example Use of Version 7

- Identify benefits, costs & lessons learned

ATMS23-Dynamic Lane Management and Shoulder Use (Service Package)

Description

This service package provides for active management of travel lanes along a roadway. The package includes the field equipment, physical overhead lane signs and associated control electronics that are used to manage and control specific lanes and/or the shoulders. This equipment can be used to change the lane configuration on the roadway according to traffic demand and lane destination along a typical roadway section or on approach to or access from a broader crossing, multimodal parking, or intermodal freight depot. This package can be used to allow temporary or interim use of shoulders as travel lanes. The equipment can be used to electronically reconfigure intersections and interchanges and manage right-of-way dynamically, including mergers. Also, lanes can be designated for use by special vehicles only, such as buses, high occupancy vehicles (HOVs), vehicles attending a special event, etc. Prohibitions or restrictions of types of vehicles from using particular lanes can be implemented.

The lane management system can be centrally monitored and controlled by a traffic management center or it can be autonomous. This service also can include automated enforcement equipment that notifies the enforcement agency of violators of the lane controls.

Dynamic lane management and shoulder use is an Active Traffic Management strategy and is typically used in conjunction with other ATM strategies (such as ATMS22 - Variable Speed Limits and ATMS24 - Dynamic Roadway Warning).

Related ITS Applications of ITS Taxonomy

<table>
<thead>
<tr>
<th>Classification</th>
<th>Category</th>
<th>ITS Application Area</th>
<th>ITS Application(s)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Intelligent Infrastructure</td>
<td>Arterial Management</td>
<td>Lane Management</td>
<td>Lane Control</td>
</tr>
<tr>
<td>Intelligent Infrastructure</td>
<td>Freeway Management</td>
<td>Lane Management</td>
<td>Lane Control</td>
</tr>
<tr>
<td>Intelligent Infrastructure</td>
<td>Roadway Operations &amp; Maintenance</td>
<td>Work Zone Management</td>
<td>Lane Control</td>
</tr>
</tbody>
</table>

RITA

Last Updated 3/8/2012
Example Use of Version 7

- Identify benefits

Freeway Management > Lane Management > Lane Control

Lane control signs, supported by surveillance and detection technologies, allow the temporary closure of lanes to avoid incidents on freeways.

- It was estimated that variable speed limit signs and lane control signals installed on the autobahn in Germany would generate cost savings due to crash reductions that would be equal to the cost of the system within two to three years of deployment. (August 1999)
- Advanced traffic management systems in the Netherlands and Germany reduced crash rates by 20 to 23 percent. (August 1999)
Example Use of Version 7

- Identify system costs

**View By Application**

**Freeway Management > Lane Management > Lane Control**

Lane control signs, supported by surveillance and detection technologies, allow the temporary closure of lanes to avoid incidents on freeways.

- The total 10-year project cost of implementing Integrated Corridor Management (ICM) strategies on the U.S. 75 Corridor in Dallas, Texas is estimated at $13.6 million with annualized costs of $1.62 million per year (September 2016)
Example Use of Version 7

- Identify unit costs
Example Use of Version 7

- Identify related lessons learned

Lane control signs, supported by surveillance and detection technologies, allow the temporary closure of lanes to avoid incidents on freeways.

- Consider various toll methods to push traffic demand away from peak hours. (September, 2006)
- Effectively communicate plans for implementing contraflow lanes during a hurricane evacuation. (11/1/2003)
- Enable and enforce managed lane facilities using various ITS tools. (January 2003)
3. In the example, we saw how the National ITS Architecture supported development of an ITS project. Which use of the architecture would you find to be most useful? (Select only one.)

a) To identify what ITS strategies are applicable.
b) To identify what elements are involved in the strategies.
c) To identify realistic goals/objectives.
d) To identify the benefits can be expected.
New National ITS Architecture’s V7 – What’s New and How to Use It!

Turbo Architecture Version 7.0 Update
What is Turbo Architecture?

A software tool that automates use of the National ITS Architecture
Released February 14, 2012

- Supports Version 7.0 of the National ITS Architecture (& align version numbers)
- Bug fixes to ensure trouble-free operation
- New features and capabilities to ease use
- Publish document for a project architecture
- Clear all filters with one click
- Context menus: right-click to undo, cut, copy, paste, select all, or spell check
Transfer service package selections from the Planning tab to the Services tab

Service package diagrams available in SP search
Turbo Version 7.0 Availability

- Free download
- Follow links from http://www.its.dot.gov/arch
More on Turbo Architecture

- NHI Web-based Course (#137048)
  http://www.nhi.fhwa.dot.gov

- T3 Webinar (from Feb. 2012)
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New National ITS Architecture’s V7 – What’s New and How to Use It!

Questions & Answers