WELCOME

RITA
Intelligent Transportation Systems
Joint Program Office
Welcome

- Shelley Row, P.E.,
  PTOE
- Director
- ITS Joint Program Office
- Shelley.Row@dot.gov

WWW.PCB.ITS.DOT.GOV
I101: Using ITS Standards
An Overview
Course Information

- Prerequisites: None
- **Target Audience:**
  - Public sector managers
  - Decision makers
Instructor

Gary B. Thomas, P.E., Ph.D.
Center Director
Texas Transportation Institute
College Station, TX, USA
Curriculum Path (Non-SEP)

I101 Using ITS Standards: An Overview

A101 Introduction to Acquiring Standards-based ITS Systems

A102 Introduction to User Needs Identification

A201 Details on Acquiring Standards-based ITS Systems

A202 Identifying and Writing User Needs When ITS Standards Do Not Have SEP Content

A103 Introduction to ITS Standards Requirements Development

A203 Writing Requirements When ITS Standards Do Not Have SEP Content

*A3xxa Identifying and Writing Specific User Needs for NTCIP 12xx vxx

*A3xxb Developing and Writing Specific Requirements for NTCIP 12xx vxx

* Expected in year 2 training modules
Learning Objectives

1. Identify the benefits and costs of using standards in ITS projects
2. Describe the benefits of using the systems engineering process in ITS projects
3. Identify and address high-level technical and institutional challenges to using standards
4. Describe the role of ITS standards in ITS applications
What Are Standards?

- Established norm or requirement about technical systems that establishes:
  - Uniform engineering or
  - Technical criteria, methods, processes, and practices
- Most standards are:
  - Voluntary
  - Consensus based
  - Open
ACTIVITY
Benefits of Using Standards

- What do you see as possible benefits of using standards?
- Use the chat pod to answer
What Are ITS Standards?

- Define how ITS systems, products, and components:
  - Interconnect…
  - Exchange information…
  - Interact…
  - Within a transportation network
- They are not design standards
Benefits

- Supports interoperability
- Supports 940 compliance
- Minimizes future integration costs
- Facilitates regional integration
- Supports incremental measurable development
- Prevents technological obstacles
- Minimizes operations and maintenance costs
- Prepares for emerging technologies
- Makes procurements easier
- Makes testing easier
Benefits

Supports interoperability

- The ability of an ITS system to:
  - Provide information and services to other systems
  - Use exchanged information and services to operate together effectively

- Analogy: home theater system

Source: Gary B. Thomas
Benefits

Supports interoperability

Audio Standards

- Amplifier
- Receiver
- MP3 Player
- Record Turntable
- CD Player
- Future Device?
Benefits

Supports Rule 940 Compliance

- FHWA rule enacted on January 8, 2001
- Requires a systems engineering analysis for ITS projects using highway trust funds
- Seven requirements included in the SE analysis (see supplemental materials)
  - #6 states: Identification of applicable ITS standards and testing procedures
Benefits

Minimizes Future Integration Costs

- Not locked into proprietary systems
- Expansion is easier
- Still allows for innovation
Benefits

Facilitates Regional Integration

- Makes it easier to communicate with other jurisdictions
- Reduces miscommunication
- Improves coordination of field devices
Benefits

Others

- Supports incremental measurable development
- Prevents technological obstacles
- Minimizes operations and maintenance costs
- Prepares for emerging technologies
- Makes procurements easier
- Makes testing easier
- Minimizes risk
Costs of Using ITS Standards

- What do you think are potential COSTS of implementing a standards-based system?
- Use the chat pod to answer
# Systems Engineering Process (SEP)

<table>
<thead>
<tr>
<th>Phase 1</th>
<th>Phase 2</th>
<th>Phase 3</th>
<th>Phase 4</th>
<th>Phase 5</th>
</tr>
</thead>
<tbody>
<tr>
<td>Interfacing with Planning and the Regional Architecture</td>
<td>Project Planning and Concept of Operations Development</td>
<td>System Definition and Design</td>
<td>System Development and Implementation</td>
<td>Validation, Operations and Maintenance, Changes &amp; Upgrades</td>
</tr>
</tbody>
</table>

## Cross-Cutting Activities

- Stakeholder Involvement
- Elicitation
- Project Management Practices
- Risk Management
- Program Metrics
- Configuration Management
- Process Improvement
- Decision Gates
- Trade Studies
- Technical Reviews
- Traceability
Needs, Requirements, and Traceability

- Focus on the WHAT – not the HOW
- Every need has at least one requirement
- Every requirement should trace to at least one need
Benefits of Using SEP

- Provides framework and process to verify that the system meets user needs
- Improved stakeholder participation
- More adaptable, resilient systems
- Verified functionality and fewer defects
- Higher level of reuse from one project to the next
- Better documentation
How Do Standards Relate to SEP?

- Primarily used in the design stage of SEP
- After the concept of operations and initial project planning has been developed
SEP-based Standards

- Early ITS standards were not developed using SEP
- Some have been redeveloped using SEP
- SEP-based standards include user needs, requirements, needs to requirements and requirements to design matrices and design solutions
- SEP-based standards better ensure that systems will be conformant to ITS standards
ACTIVITY
Technical and Institutional Challenges

- What do you think some of the most common technical challenges are?
- Use chat pod to answer

- What do you think some of the most common institutional challenges are?
- Use chat pod to answer
# Technical and Institutional Challenges

<table>
<thead>
<tr>
<th>Technical</th>
<th>Institutional</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gaps in existing skills</td>
<td>Not everyone in an agency is willing to articulate their needs</td>
</tr>
<tr>
<td>Inconsistent industry support for standards</td>
<td>Resistance to change</td>
</tr>
<tr>
<td>Conformance to standards</td>
<td>Not all agencies have bought into regional integration</td>
</tr>
<tr>
<td>Paradigm shift from non-standards based to standards based</td>
<td>Paradigm shift from non-standards based to standards based</td>
</tr>
<tr>
<td>Paradigm shift from non-SE based to SE-based</td>
<td>Paradigm shift from non-SE based to SE-based</td>
</tr>
</tbody>
</table>
CASE STUDY
Lessons From the Field

Functional Integration

- Develop usable systems that meet user needs, assess user needs, and follow accepted usability engineering practices when developing interactive systems.
- Use ITS standards when developing systems to maximize vendor flexibility and data exchange compatibility and ensure comprehension by agencies.
Lessons From the Field

Jurisdictional Integration

- Create systems and plans that allow information sharing and coordination among regional agencies and states
- Consider developing an emergency response plan that coordinates command, control, and communications among regional agencies
Lessons From the Field

Legacy Systems

- Comply with standards and select proven commercial off-the-shelf technology (hardware and software) when possible to save money and facilitate integration with existing legacy systems.

- To identify and resolve system integration issues with existing legacy equipment, plan on adequate development time and thorough system testing to ensure systems are working properly after system integration.
Lessons From the Field

Functional integration
- TriMet (Oregon)
- Traffic Management Center (TMC) study

Jurisdictional integration
- Washington, DC metro area
- Iowa DOT

Legacy systems
- TriMet
Lessons From the Field

Functional Integration

TriMet’s LED signs

- No TCP/IP standards existed for LED sign interface
- TriMet provided specs that required vendors to interface with protocols
- Such compliance ensured a modular and compatible infrastructure
- Benefits: Supports interoperability, facilitates regional integration, minimizes operations and maintenance costs
Lessons From the Field

Functional Integration

TMC Study

- 10 states
- Use of standards allows better coordination of TMC efforts
- Increased efficiency of traffic and emergency operations
- Incomplete/inaccessible information is an impediment
- Benefits: Facilitates regional integration
Lessons From the Field

Jurisdictional Integration

Washington. DC metro area

- September 11 revealed negative consequences of a lack of coordination
- No communication between different DOTs or between DOTs and transit agencies
- Emergency evacuation strategies hampered
- Benefits: Facilitates regional integration, supports interoperability
Lessons From the Field

Jurisdictional Integration

Iowa DOT

- Statewide ITS architecture emphasized interoperability between transit agencies
- Template developed for ITS contracts
- Transit agencies must agree to terms in contract template
- Benefits: Supports interoperability, makes procurements easier

Learning Objective #3
Lessons From the Field

Legacy Systems

TriMet’s TransitTracker

- Built upon an existing bus dispatch system and rail central control system
- Same platform for existing and proposed systems
- Saved software development time and costs
- Benefits: Minimizes future integration costs, makes procurements easier
Lessons From the Field

Participant Experiences

- What lessons have you learned from your own projects?
- Answer in chat pod
Role of ITS Standards in ITS Applications

**Information Service Provider**
- Private Sector Traveler Information Services
- City Web Site
- State 511 System

**Traffic Management**
- NTCIP 1205
  - Video camera control
- City Traffic Operations Center
- Traffic images
- NTCIP 1206
  - Traffic sensor control

**Roadway Subsystem**
- City Field Equipment

---

**Center to Center**
- Road network conditions
- Request for road network conditions

---

**Center to Field**
- Existing flow
- Planned and future flow
Review of Learning Objectives

1. Identify the benefits and costs of using standards in ITS projects
2. Describe the benefits of using the systems engineering process in ITS projects
3. Identify and address high-level technical and institutional challenges to using standards
4. Describe the role of ITS standards in ITS applications
Student Supplement

- ITS Standards FAQ
- General ITS standards reference information
- ITS Architecture and Standards Final Rule (01/08/01)
QUESTIONS?
For More Information

RITA/ITS Web site
   http://standards.its.dot.gov/

ITE Web site
   http://www.ite.org/standards/

ITS Architecture Implementation Program
   http://www.ops.fhwa.dot.gov/its_arch_imp/

NTCIP Web site
   http://www.ntcip.org/

Systems Engineering Guide for ITS
   http://www.fhwa.dot.gov/cadiv/segb
Next Course

A101: Introduction to Acquiring Standards-Based ITS Systems

The module provides key reference points and information for participants to be able to communicate procurement strategies for standards-compliant systems.