



W E L C O M E

RITA Intelligent Transportation Systems
Joint Program Office

Welcome



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

The screenshot shows the RITA website header with the logo and navigation menu. The main content area is titled "ITS Professional Capacity Building Program" and includes sections for "Welcome to ITS Professional Capacity Building", "ITS Technical Assistance", "News", and "Scheduled T3 Webinars".

ITS Professional Capacity Building

The ITS Professional Capacity Building (PCB) Program provides comprehensive, accessible, and flexible ITS learning for the transportation industry. By using the program, public agencies can build and sustain a capable and technically proficient ITS workforce, and transportation professionals can develop their knowledge, skills, and abilities while furthering their career paths.

The plan, [ITS Professional Capacity Building: Setting Strategic Direction 2010-2014](#), describes the strategy the ITS PCB Program is pursuing to create a 21st century learning environment and build an ITS profession that leads the world in the innovative use of ITS technologies.

ITS Technical Assistance

The ITS PCB Program offers technical assistance resources to State and local transportation agencies, and to FHWA Field Offices.

- [ITS Peer-to-Peer Program](#) helps resolve ITS challenges by speaking to your peers.
- The ITS Help Line provides [technical support by e-mail](#) or telephone 866-367-7487.

Scheduled T3 Webinars

Register now for these upcoming T3 webinars:

	June 23, 2011 1:00 PM – 2:30 PM ET 2011 Enhancements to the ITS Knowledge Resources Websites: Improving Access to Information on ITS Benefits, Costs, Lessons Learned and Deployment
	June 29, 2011 1:00 PM – 2:30 PM ET Open Payments, Mobile Payments and Personal Identification Verification (PIV) Acceptance – Overview of Innovations in Public Transit Payment Systems

[View T3 webinar archives.](#)

WWW.PCB.ITS.DOT.GOV



RITA

U.S. Department of Transportation
Research and Innovative Technology Administration



A101

Introduction to Acquiring Standards-based ITS Systems



RITA

U.S. Department of Transportation
Research and Innovative Technology Administration



Target Audience

- Procurement managers
- Procurement decision makers
- Project managers



RITA

U.S. Department of Transportation
Research and Innovative Technology Administration

STANDARDS
ITS
TRAINING

Instructor



Ken Vaughn, P.E.

President

Trevilon Corporation

Herndon, VA, USA



RITA

U.S. Department of Transportation
Research and Innovative Technology Administration

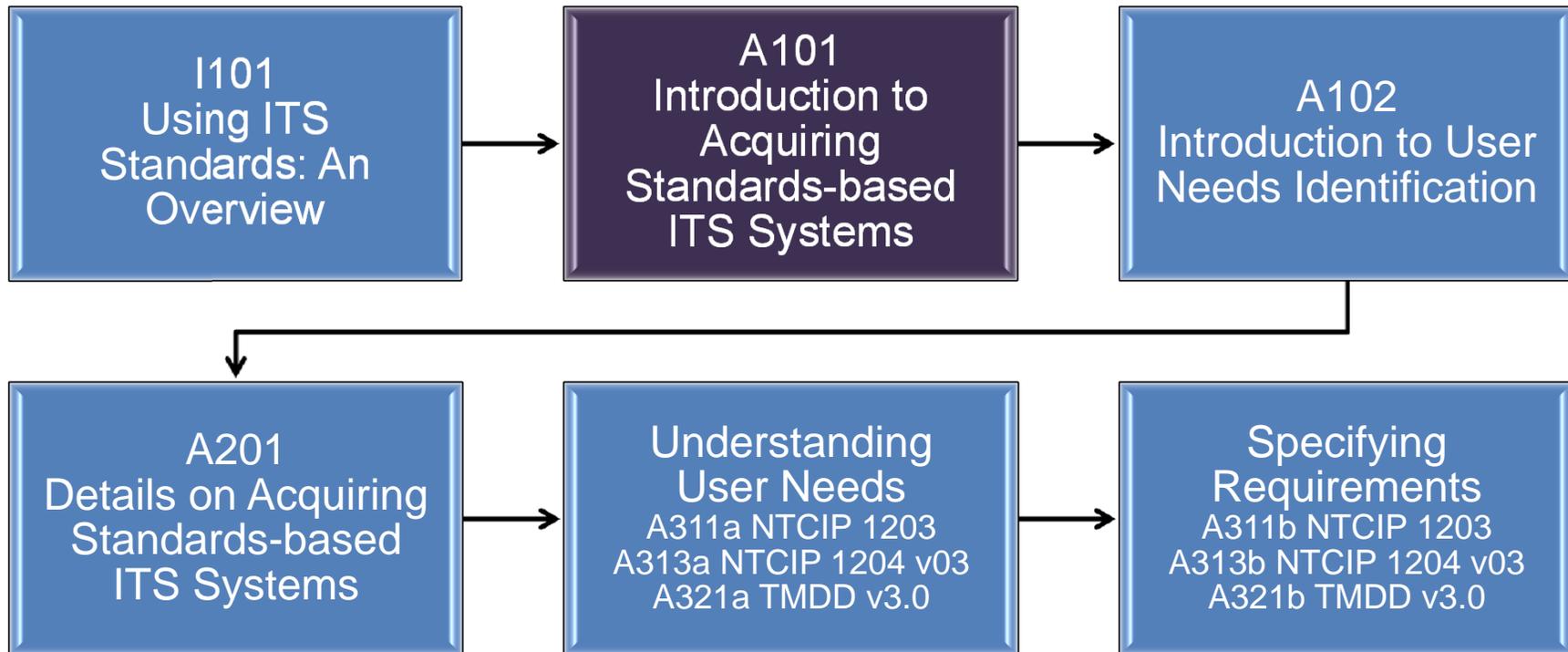


Recommended Prerequisites

- I101: Using ITS Standards: An Overview
- Helpful to have knowledge of
 - Intelligent Transportation Systems (ITS)
 - Managing ITS deployment projects
 - Government procurement processes
 - Benefits of standards
 - Systems engineering process (SEP)



Curriculum Path (SEP)

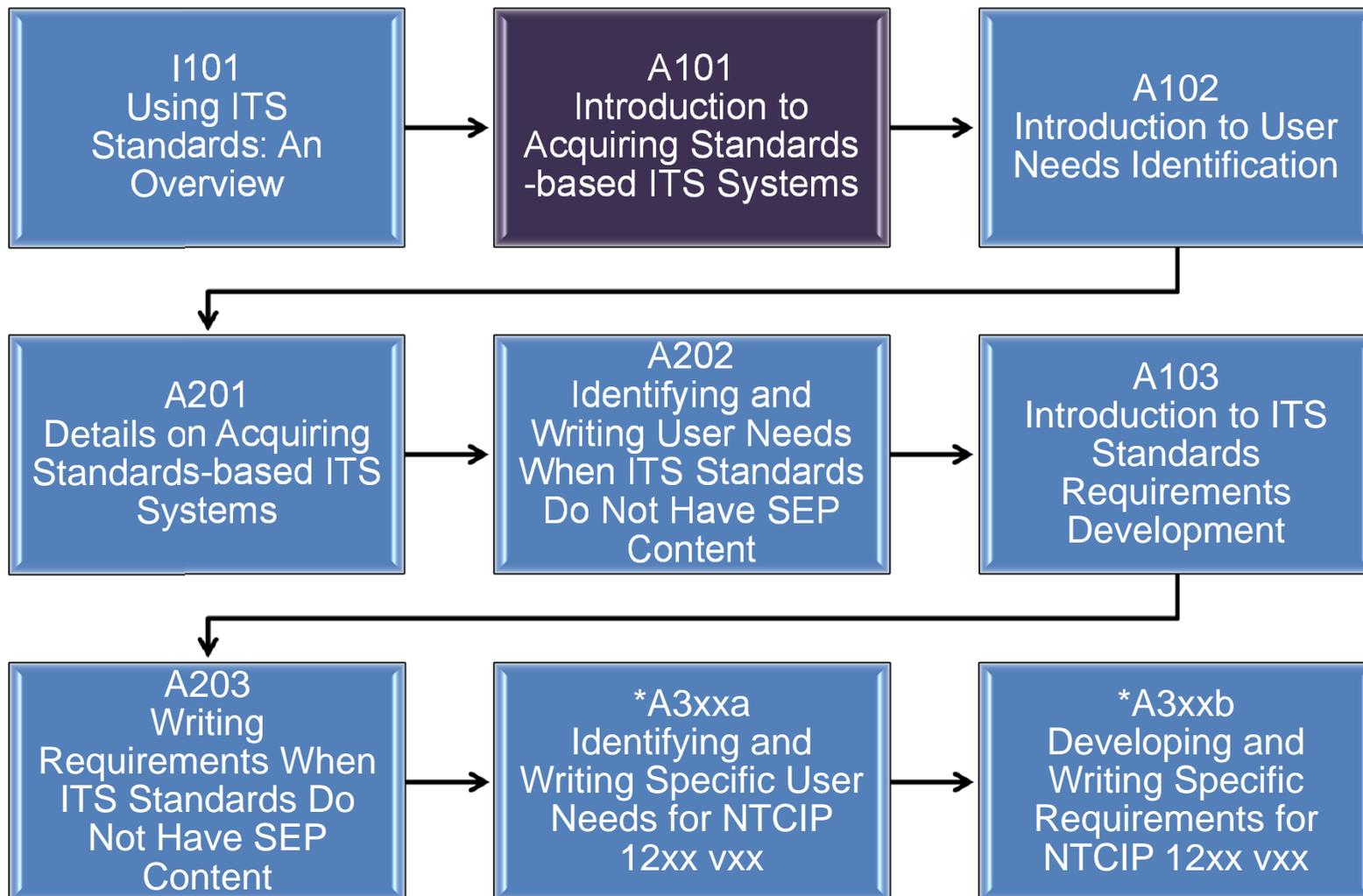


RITA

U.S. Department of Transportation
Research and Innovative Technology Administration



Curriculum Path (Non-SEP)

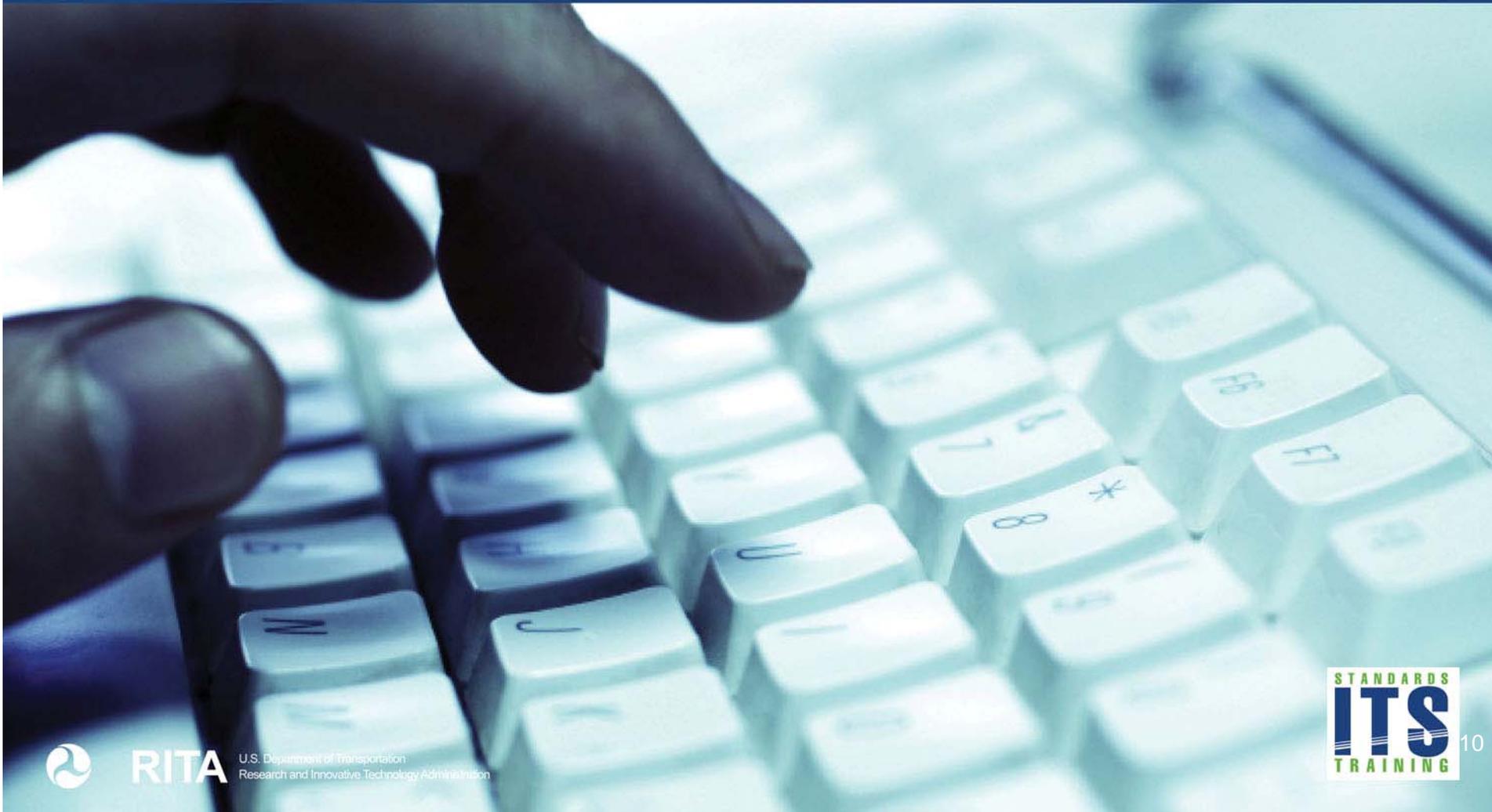


Learning Objectives

1. Identify what managers should know
2. Articulate process for acquiring standards-compliant ITS systems
3. Differentiate between standards with and without SEP



ACTIVITY



RITA

U.S. Department of Transportation
Research and Innovative Technology Administration

STANDARDS
ITS
TRAINING

Discuss

- What do you think of when someone mentions “ITS Standards”?
- Use the chat pod to answer



Types of ITS Standards

- Data Standards
 - Define domain-specific information
 - DMS, ESS, TMDD, etc.
- Communication Standards
 - Define low-level communications
 - TCP/IP, Ethernet, serial, etc. in ITS environment
- Both must be defined for a system interface



Additional Key Terms

- Management system
- Device



RITA

U.S. Department of Transportation
Research and Innovative Technology Administration

STANDARDS
ITS
TRAINING

13

POLLING



RITA

U.S. Department of Transportation
Research and Innovative Technology Administration



Multiple Choice Poll

- How do ITS standards assist in procurements?
 - They define all requirements
 - They define details, but need tailoring
 - Communication standards are precise, but data standards need to be tailored
 - Data standards define precise requirements, but communication standards need to be tailored



Benefits of ITS Standards

- Standards define technical details, but need tailoring
 - Standard provides a checklist of features to consider
 - Optional features (e.g., display of graphics)
 - Desired ranges (e.g., number of messages)

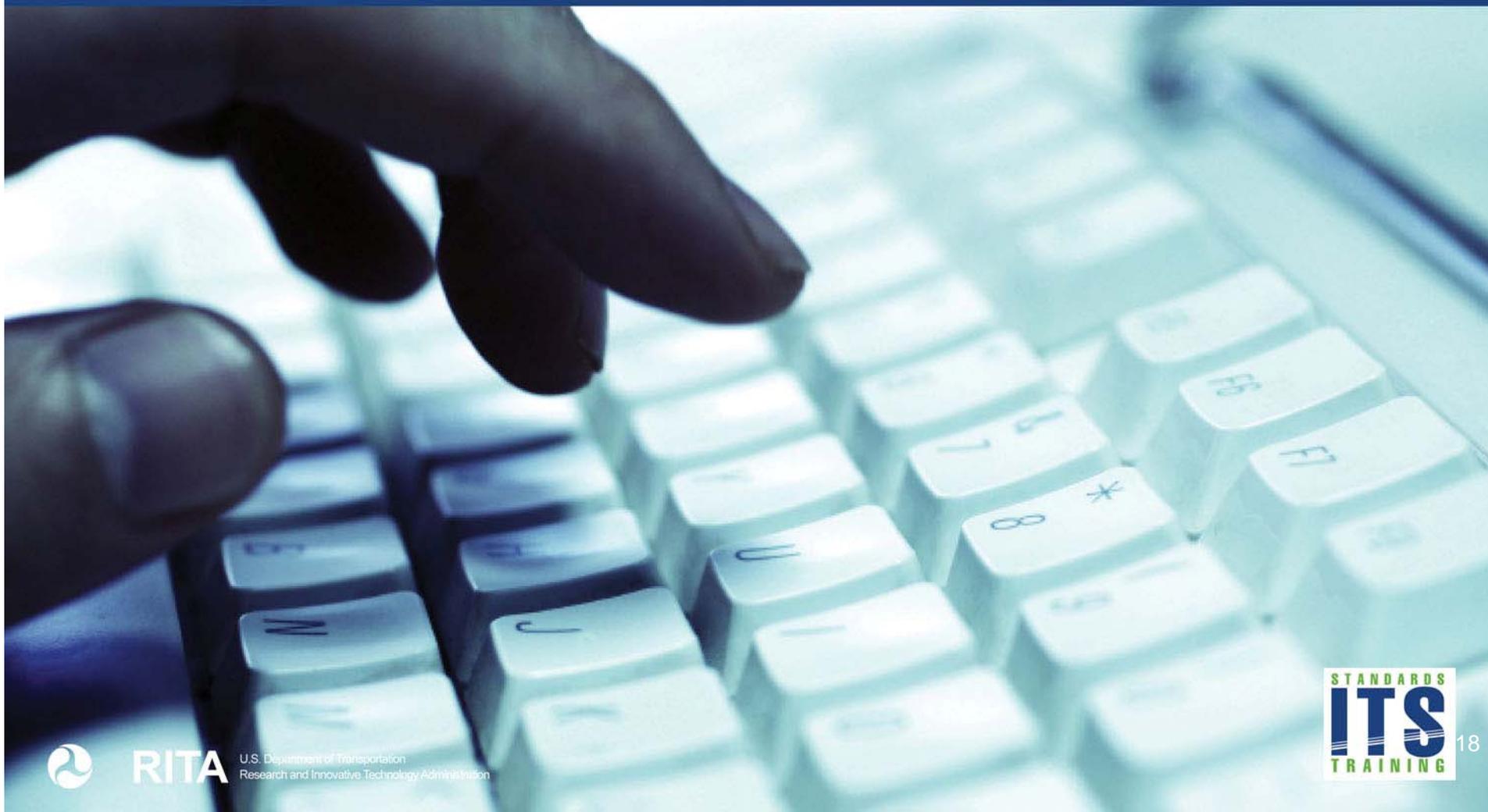


Other Benefits of ITS Standards

- Management Benefits
 - Addressed in Module I101
- Acquisition Benefits
 - Price competition among product vendors
 - Easier to switch from one vendor to another
 - Reduced integration costs for central system
 - Market synergies
 - Off-the-shelf testing tools



ACTIVITY



RITA

U.S. Department of Transportation
Research and Innovative Technology Administration

STANDARDS
ITS
TRAINING

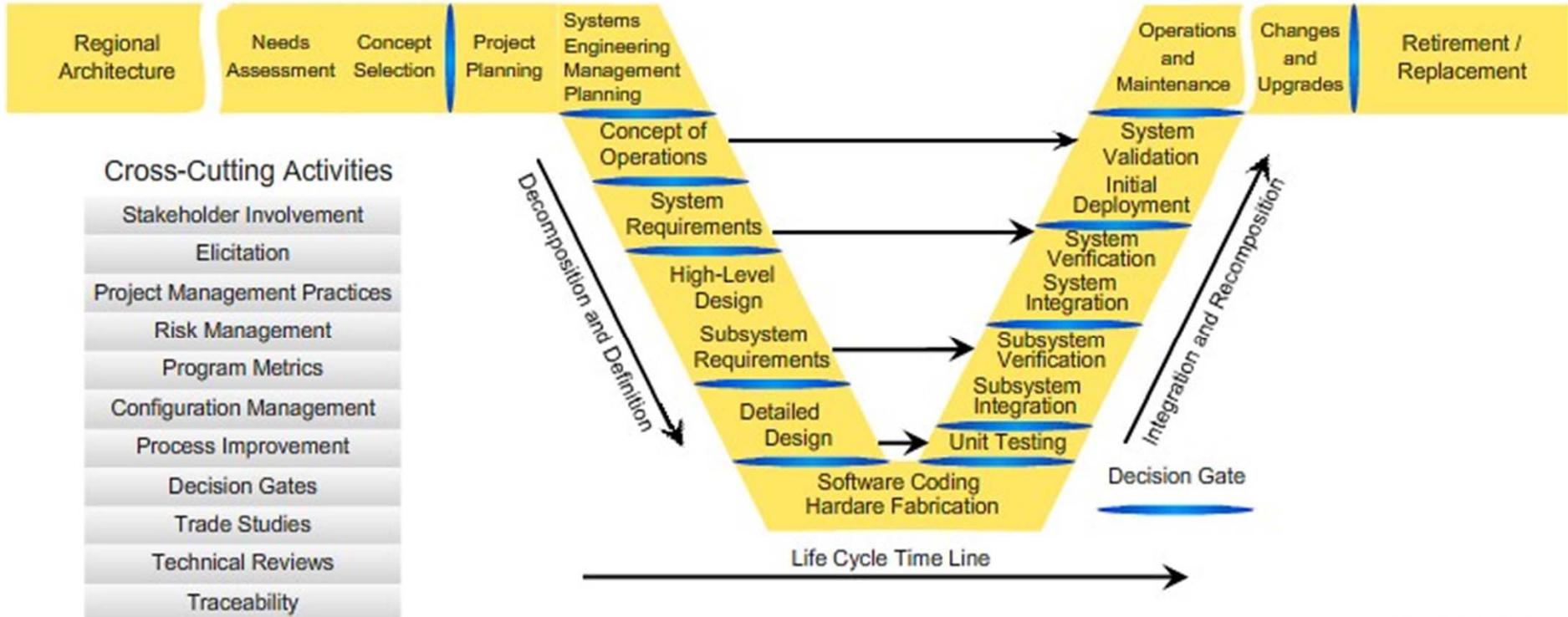
Discussion

- How do we determine the appropriate tailoring?
- Use the chat pod to answer



Systems Engineering Process (SEP)

Phase -1	Phase 0	Phase 1	Phase 2	Phase 3	Phase 4	Phase 5
Interfacing with Planning and the Regional Architecture	Concept Exploration and Benefits Analysis	Project Planning and Concept of Operations Development	System Definition and Design	System Development and Implementation	Validation, Operations and Maintenance, Changes & Upgrades	System Retirement / Replacement

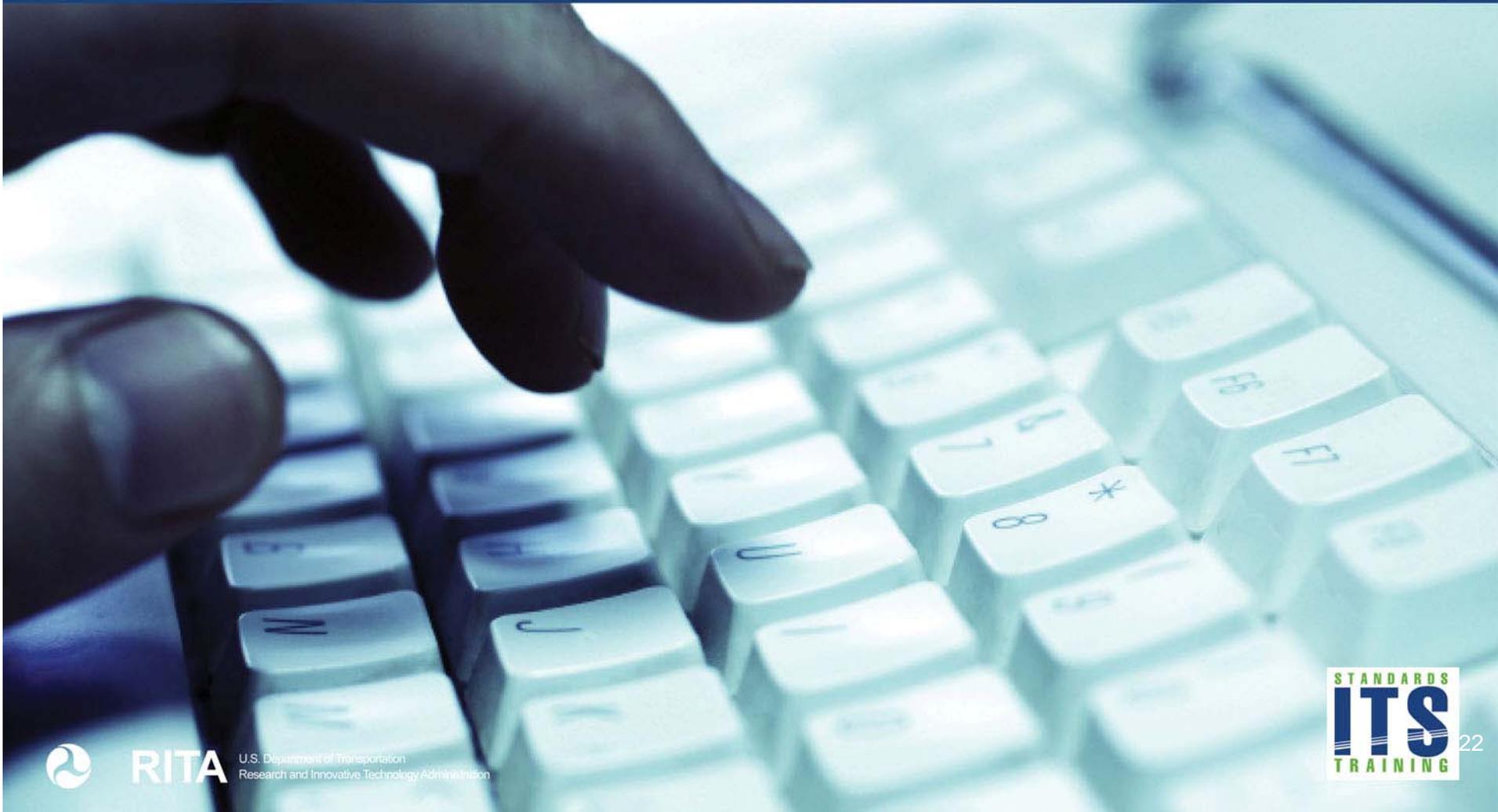


Benefits of SEP

- Helps define scope
 - Higher level of stakeholder participation
 - More likely that system meets user expectations
 - Better system documentation
- Reduced risk of cost and schedule overruns
 - Fewer defects in accepted product
 - More predictable outcomes



ACTIVITY



RITA

U.S. Department of Transportation
Research and Innovative Technology Administration

STANDARDS
ITS
TRAINING

Discuss Roles

- Who are the key players that are involved in a typical systems procurement?
- Use the chat pod to answer



Roles

- Identify key players of the systems engineering process
 - System owner
 - Systems engineering assistant
 - Development team



Interaction Among Team

- Communication is critical
 - All three roles have distinct perspectives and skills
 - Each role provides value to the project
 - Issues should be identified and discussed early



POLLING



RITA

U.S. Department of Transportation
Research and Innovative Technology Administration



Multiple Choice

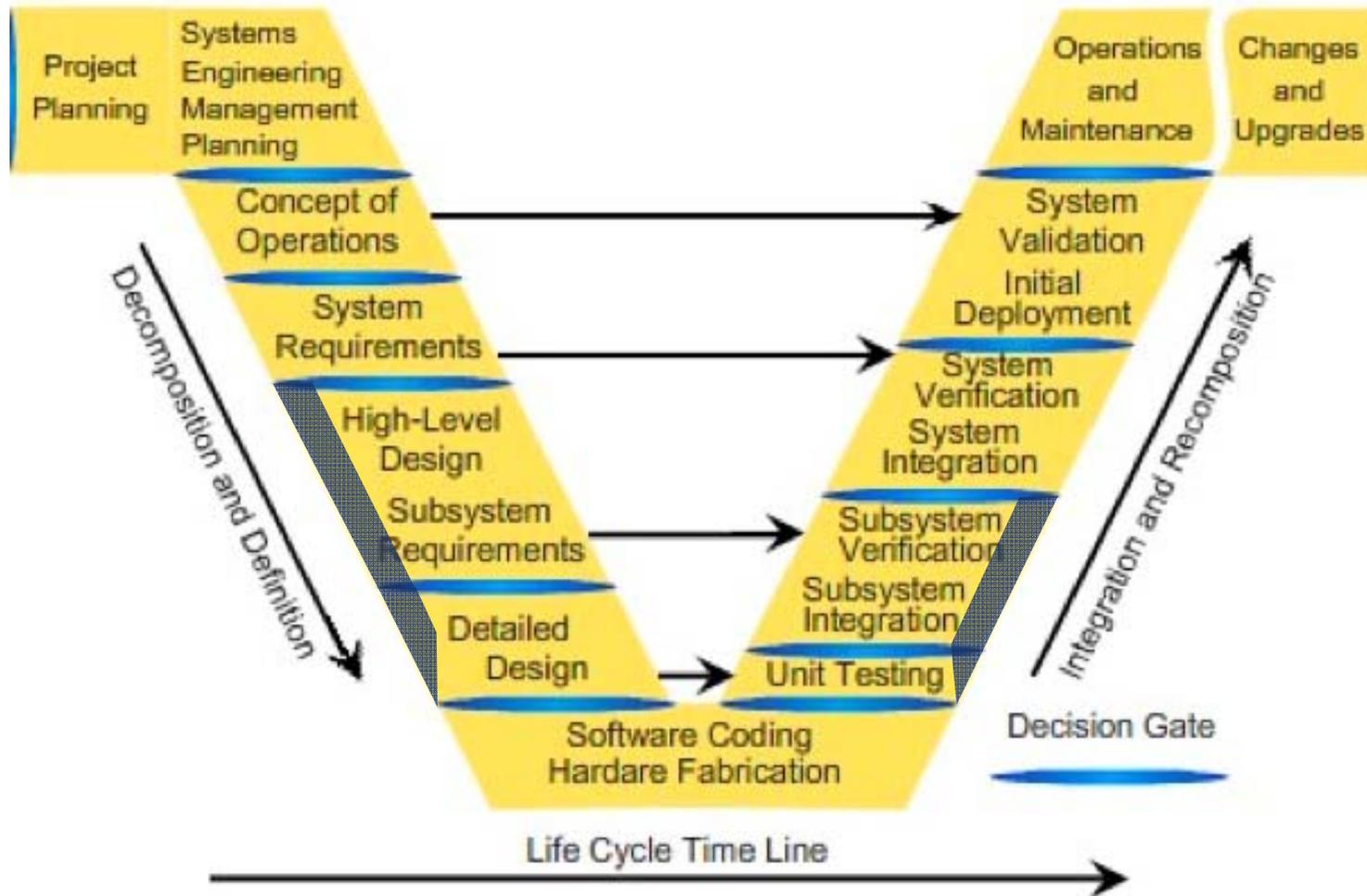
- Where do the standards fit into the SEP “V” diagram?
 - At the top of the “V”
 - Concept of Operations, System Requirements, and High-Level Design
 - High-Level Design and Detailed Design
 - ITS standards address issues outside of the “V” diagram



RITA

U.S. Department of Transportation
Research and Innovative Technology Administration

ITS Standards and the SEP



Standards With SEP Content

- Define subsystem user needs
 - E.g., manage fonts for a message sign
- Define subsystem requirements
 - E.g., determine number of fonts
 - Traced to user needs
- Trace each requirement to a single design



Standards Without SEP Content

- Earlier ITS standards only document design
 - Content was derived by perceived needs
 - Context has to be inferred by user
 - Missing components need to be defined by user
 - User needs
 - Requirements
 - Some design details
 - Must map user requirements to remaining details



POLLING



RITA

U.S. Department of Transportation
Research and Innovative Technology Administration



Multiple Choice

- How rigid are subsystem requirements?
- What type of contract do you use to acquire this subsystem?
 - Requirements are known, use fixed price
 - Requirements will be revised, use cost-plus
 - It depends

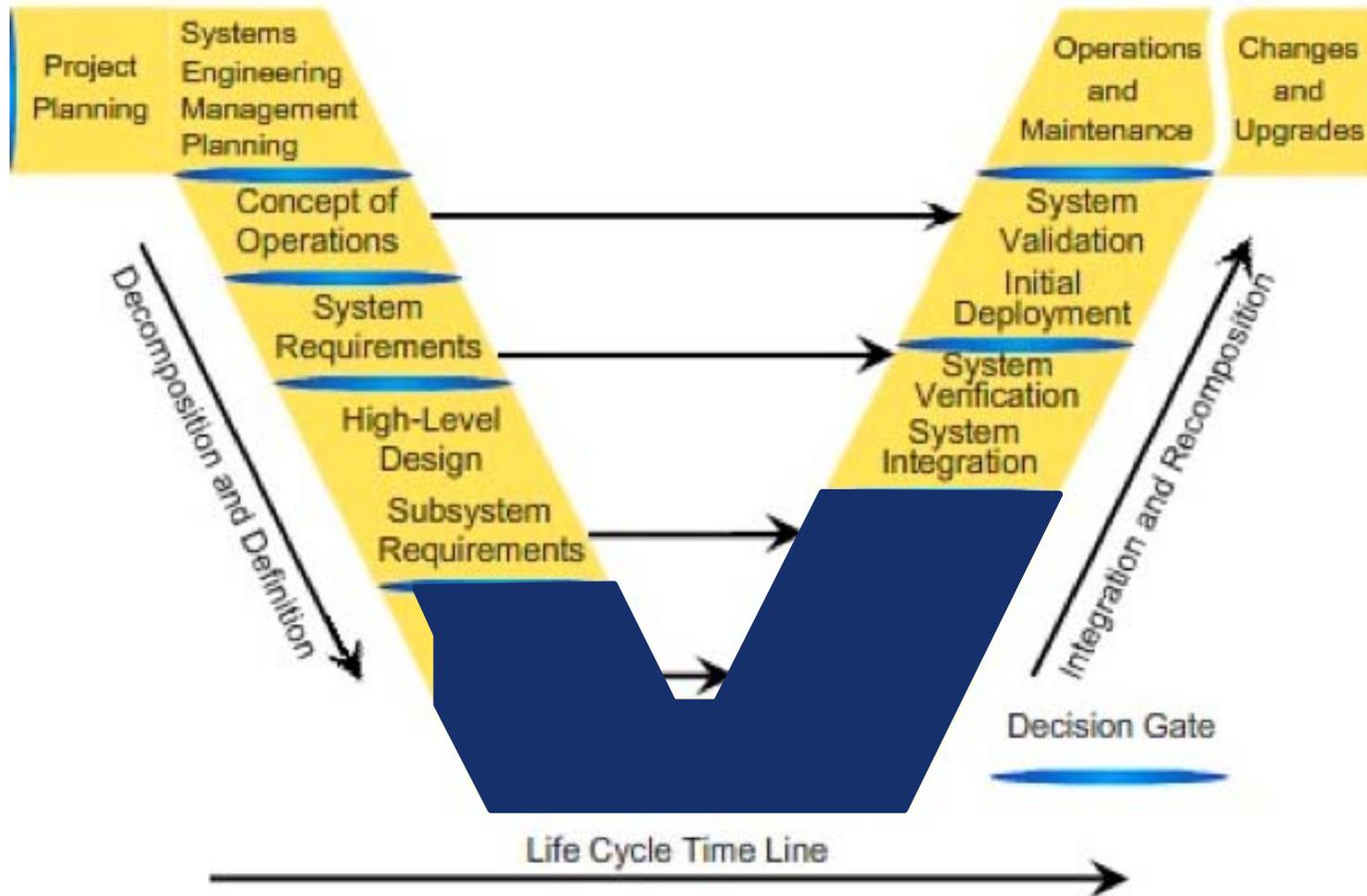


Combining SEP and Procurement

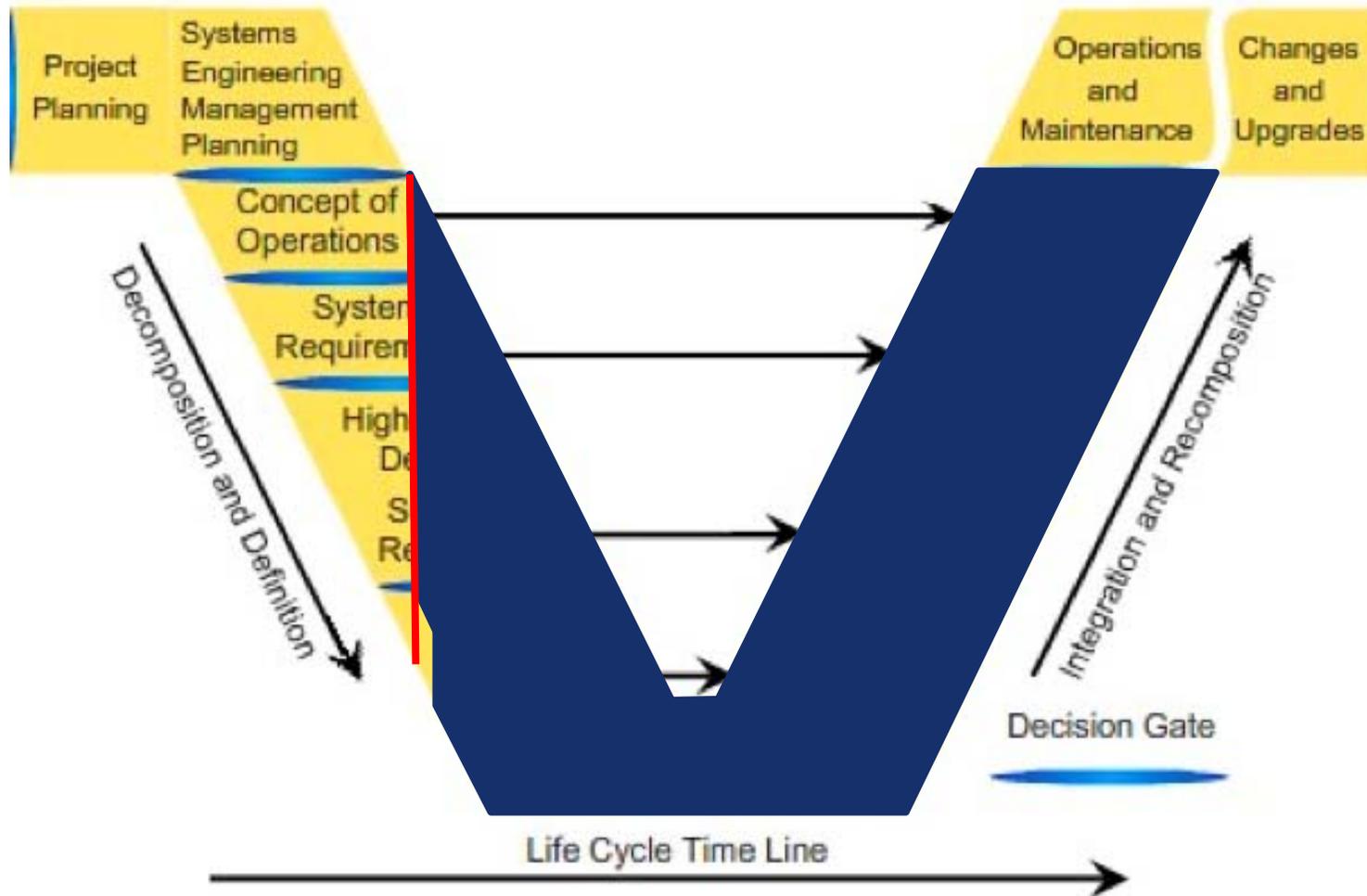
- Devices are largely off-the-shelf
 - Requirements are well-known
- Management systems often require software development
 - Requirements are refined during project life
- Different scope requires
 - different procurement vehicle
 - different interface within the SEP



Typical Scope of Device Vendor



Typical Scope of System Integrator



ITS Standards

- Reduce work
 - Simplifies project specification
 - Allows reuse of design and implementation
 - Facilitates testing
- Reduce risk
- Reduce schedule



Four Procurement Scenarios

- Device procurement
 - Standard with SEP content
 - Standard without SEP content
- Management system procurement
 - Standard with SEP content
 - Standard without SEP content



Preparatory Steps

- Define system concept of operations
 - Inform public about current traffic-related events
- Define system requirements
 - System shall allow the user to define the message to convey to the public, which will automatically expire when the event ends



Preparatory Steps

- Define major subsystems
 - Management system
 - Message signs
- Define communications environment
- Identify services needed from external subsystems



Device: Standard With SEP Content

- Select services from defined user needs
 - Define a message
 - Activate and display a message
- Select subsystem requirements from standard
 - Support multi-page messages
- Mapping to design elements is standardized



Device: Standard Without SEP Content

- Define needed services
- Define subsystem requirements
- Map to standardized design elements
 - Define missing design elements (e.g., dialogs)

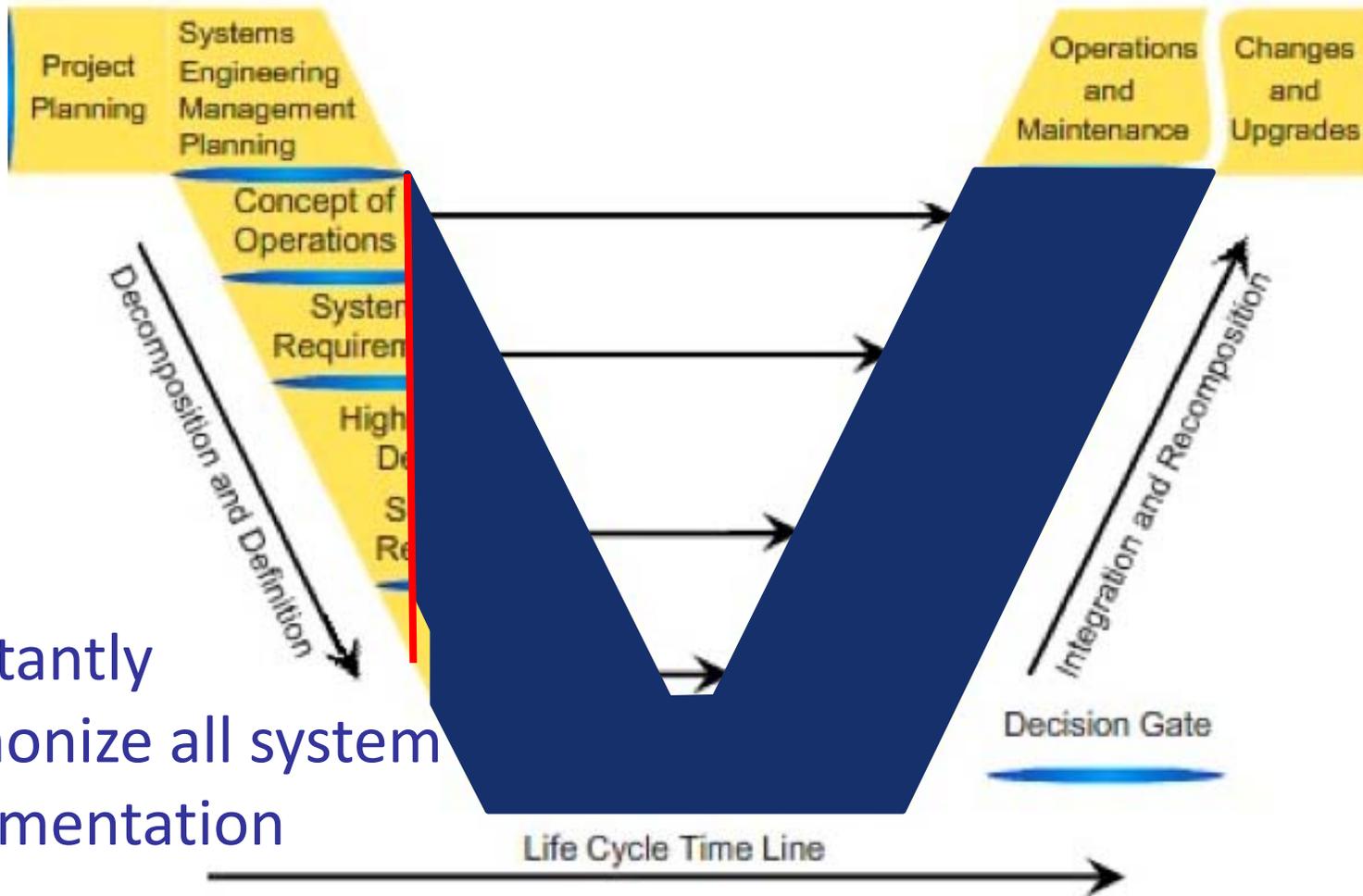


Management System: Standard With SEP Content

- Standard with SEP Content
 - Select user needs from standard
 - Select requirements from standard
 - Define scenarios when data exchange is required



When Do We Document Need for Standardized Features?



Constantly harmonize all system documentation



RITA

U.S. Department of Transportation
Research and Innovative Technology Administration

Management System: Standard Without SEP Content

- Standard Without SEP Content
 - Define detailed requirements for each exchange
 - Map exchanges to design details and enhance
 - Dialog
 - Messages
 - Data Elements
 - Define scenarios when data exchange is required



Management System: Real-World

- Most management systems will control multiple types of devices
 - Some based on standards with SEP content
 - Some based on standards without SEP content
 - Some not based on standards
- All projects should follow SEP
 - The SEP content within standards merely simplify this work



Follow-on Steps

- Select communication stacks and standards
- Define other requirements (e.g., hardware)
- Procure
- Implement
- Test



Testing with SEP

- Standards with SEP Content
 - Standardized test procedures (ESS and soon for DMS)
 - Facilitates testing and testing market
 - Others have reusable test procedures in industry
 - Requirements are standardized and stable
 - Once a test procedure is written for one deployment, it can be reused repeatedly
- Standards without SEP Content
 - Test development effort is more involved since tests must be based on system requirements



Testing the Final Product

- Testing is critical step
 - Verify subsystems meet standardized interface
 - Verify system integrates all components together
 - Validate system meets user needs
- Document all testing
 - Allows reproducible results
 - Documents what was done
- Budget and schedule for multiple rounds
 - Allows for problems identified during initial tests



Practical Impacts

- What are your concerns about applying the Systems Engineering Process, as we have described, to acquire standards-based ITS systems?
- Use the chat pod to answer



Practical Impacts

- How large is the resulting specification?
 - Specifications should be as detailed as necessary
- Is a feature important? If yes,
 - Identify in concept of operations
 - Define in requirements
 - Verify in a test procedure
 - Validate that it meets user needs
 - Budget for the effort

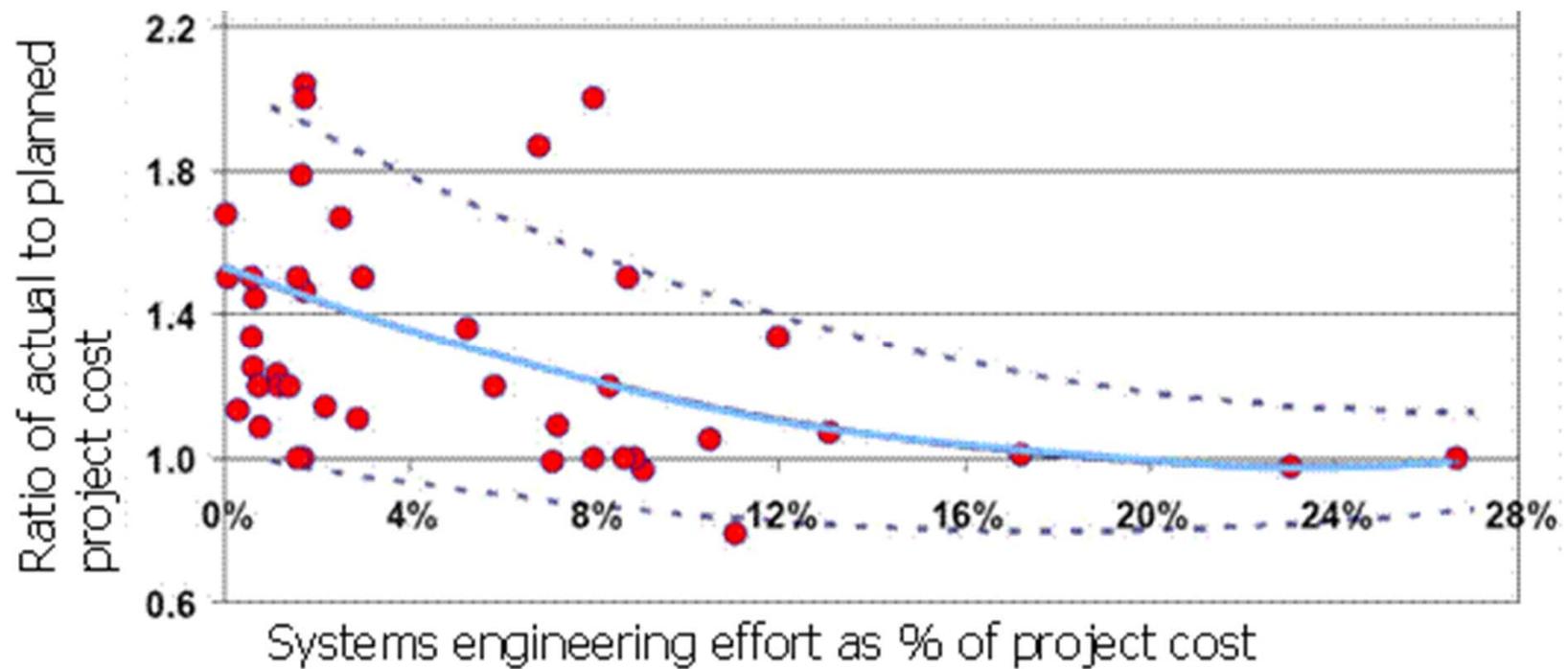


Understanding Cost Implications

- SEP requires
 - Time
 - Experienced personnel
 - Commitment
- Proven to lower risks and increase quality
- Requires investment



Benefits of SEP



Eric Honour, "Understanding the Value of Systems Engineering," 2004.



RITA

U.S. Department of Transportation
Research and Innovative Technology Administration



SEP Benefits vs. Type of Acquisition

- SEP reduces risks
- Even acquiring a DMS entails risks
- Risks are higher for standards without SEP content
- Risks are higher for custom development (e.g., central systems)
- Risks are higher when dealing with multiple standards (e.g., central systems)



Today's Objectives

- Identified key concepts that managers should know
- Described process for acquiring standards compliant ITS systems
- Differentiated between standards with and without SEP



What Did We Learn Today?

- 1) All projects should follow the Systems Engineering Process.
- 2) The SEP assists in defining the Scope for a project and in meeting the project Budget and Schedule.
- 3) ITS Standards with SEP content reduce Systems Engineering effort on a project.
- 4) ITS Standards without SEP content still Assist in projects using the SEP.
- 5) All requirements should be fully Tested prior to acceptance.



Where to Learn More

- Module supplement
 - NTCIP Guide
 - TMDD Guide
 - IEEE 1512 Guide
 - Systems Engineering Guidebook for ITS
- Other ITS courses
 - A102: Next module for all standard curriculum paths
 - A201: Follows A102 for all paths
 - T101: For more information on testing



RITA

U.S. Department of Transportation
Research and Innovative Technology Administration

QUESTIONS?



RITA

U.S. Department of Transportation
Research and Innovative Technology Administration

