STANDARDS ITS TRAINING

WELCOME

U.S. Department of Transportation

Office of the Assistant Secretary for
Research and Technology

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Federal Transit Administration

ITS Transit Standards
Professional Capacity Building Program

Module 6:
Traveler Information, Part 1 of 2

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Instructor

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Target Audience

- Transit management staff;
- Transit agency procurement and grants staff;
- Transit information technology staff and third-party content providers;
- Transit technology vendors and consultants; and
- Transportation Management Center/Transportation Operations Center staff.

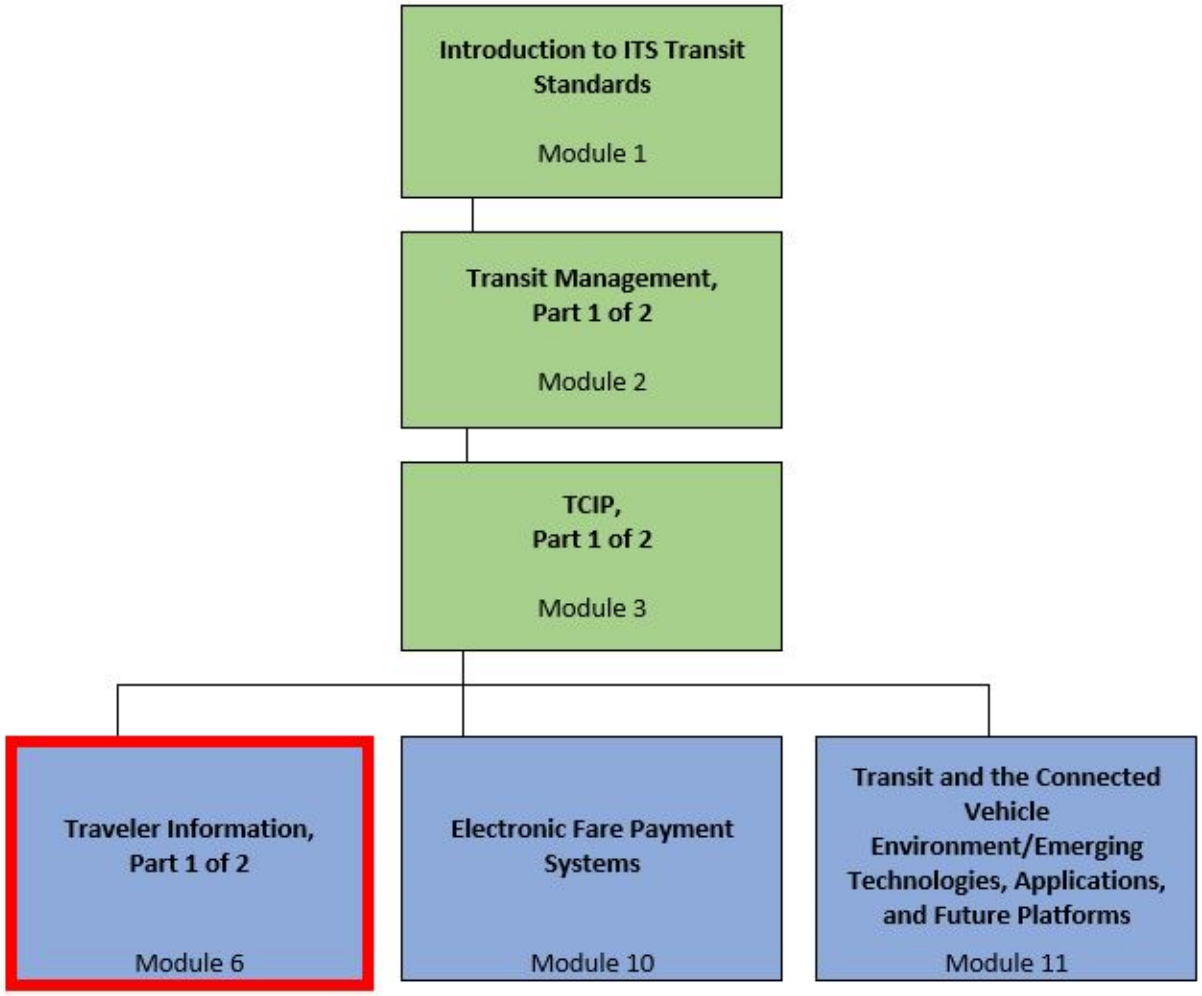
Recommended Prerequisite(s)

	Decision-Maker	Project Manager	Project Engineer
Module 1: Introduction to ITS Transit Standards	✔	✔	✔
Module 2: Transit Management Standards, Part 1 of 2	✔	✔	✔
Module 3: Transit Communications Interface Profiles (TCIP), Part 1 of 2	✔	✔	✔
Module 4: Transit Communications Interface Profiles, (TCIP), Part 2 of 2	N/A	✔	✔
Module 5: Transit Management Standards, Part 2 of 2	N/A	✔	✔

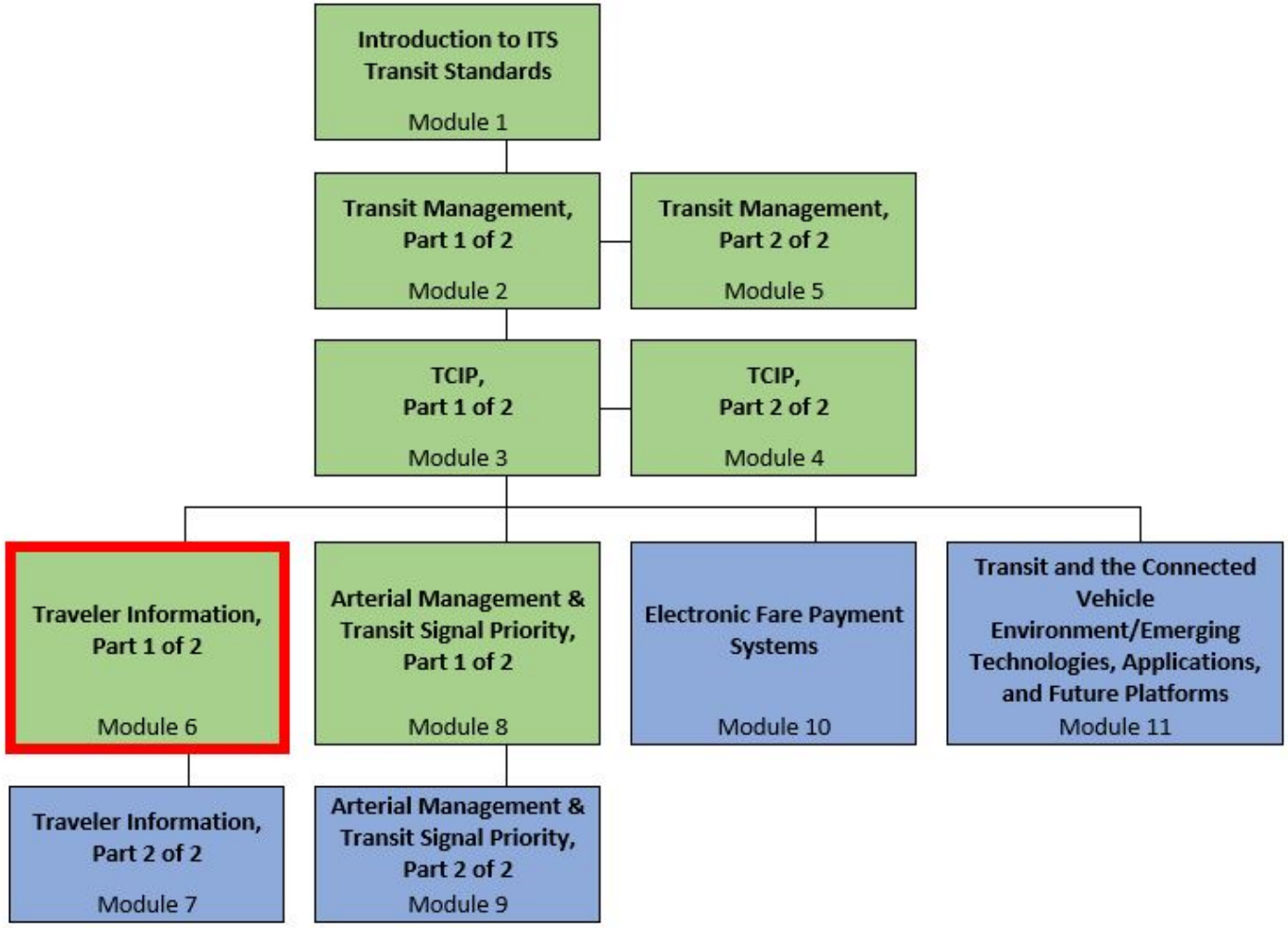
Recommended Prior Knowledge

- Basic understanding of traveler information, which can be provided by:
  - ITS PCB Program's ITS ePrimer, Module 7: Public Transportation
- General understanding of the technology that is used to generate and disseminate traveler information, which can be provided by:
  - ITS PCB Program's ITS ePrimer, Module 7: Public Transportation
  - NTI course FTA/NTI ITS Workshop

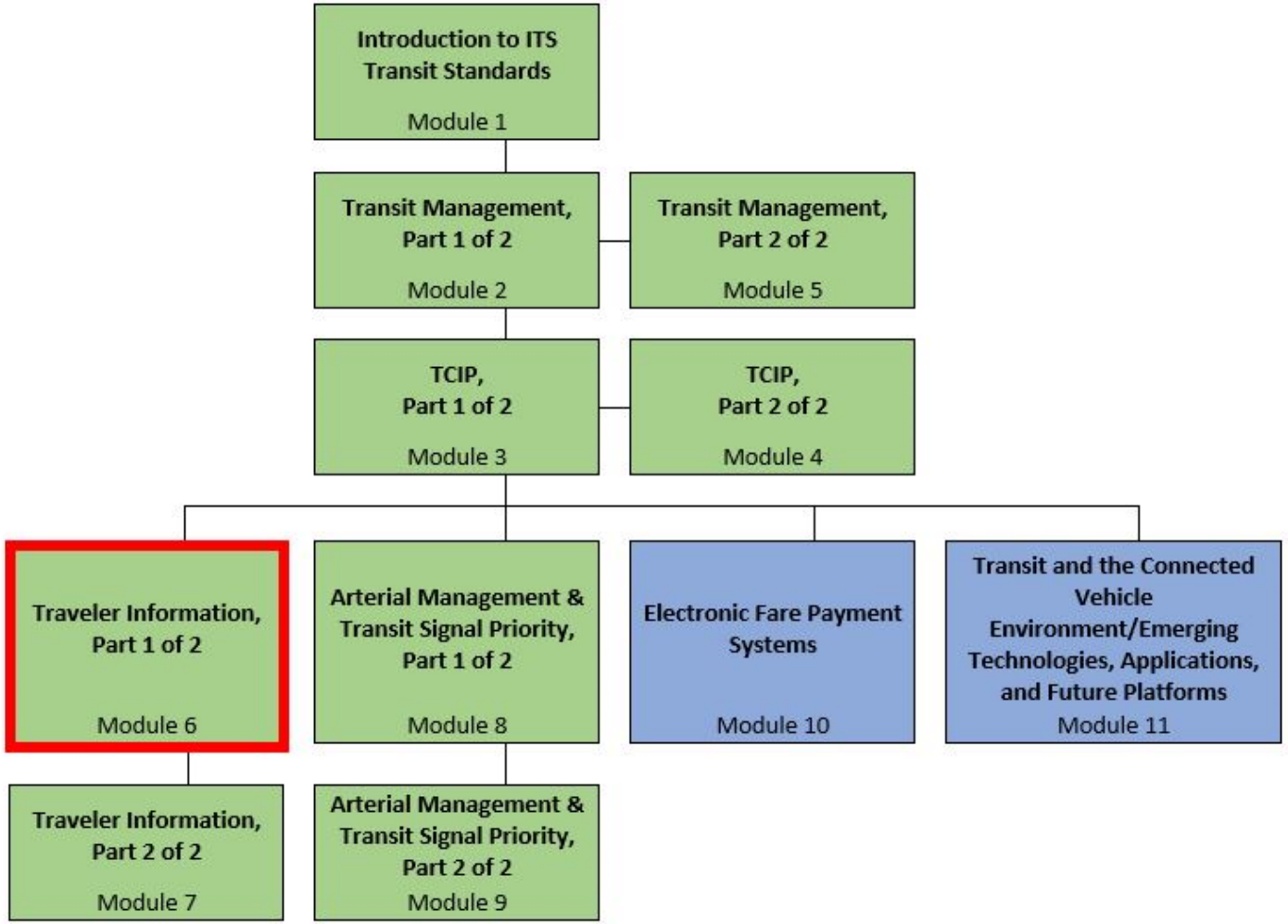
Curriculum Path (Decision-Maker)



Curriculum Path (Project Manager)



Curriculum Path (Project Engineer)



Learning Objectives

1. Describe (in overview terms) how traveler information systems fit into the National ITS Architecture
2. Describe the core functions and taxonomy of traveler information systems
3. Describe the functions of systems within the traveler Information and briefly identify the relationships and data exchange between transit management and traveler information systems taxonomy
4. Identify and describe how standards can be used to specify requirements for the procurement of traveler information systems
5. Explain the role of standards in traveler information systems procurement

Learning Objective #1: Describe (in Overview Terms) How Traveler Information Systems Fit into the National ITS Architecture

- Brief review of key traveler information-related concepts within the National ITS Architecture
- Transit Traveler Information Service Package (SP)
- Related service packages (e.g., selected Traveler Information Service Packages)

Traveler Information

- Customer-facing technologies provide public with information regarding trip planning and real-time operational information
- Generated by on-board and central systems (see next slide)
- Provided directly or indirectly (through open data) to public
- Where provided:
  - Pre-trip
  - En route
  - At wayside
  - Mobile/social media
- Categories: static and dynamic
- Various dissemination media

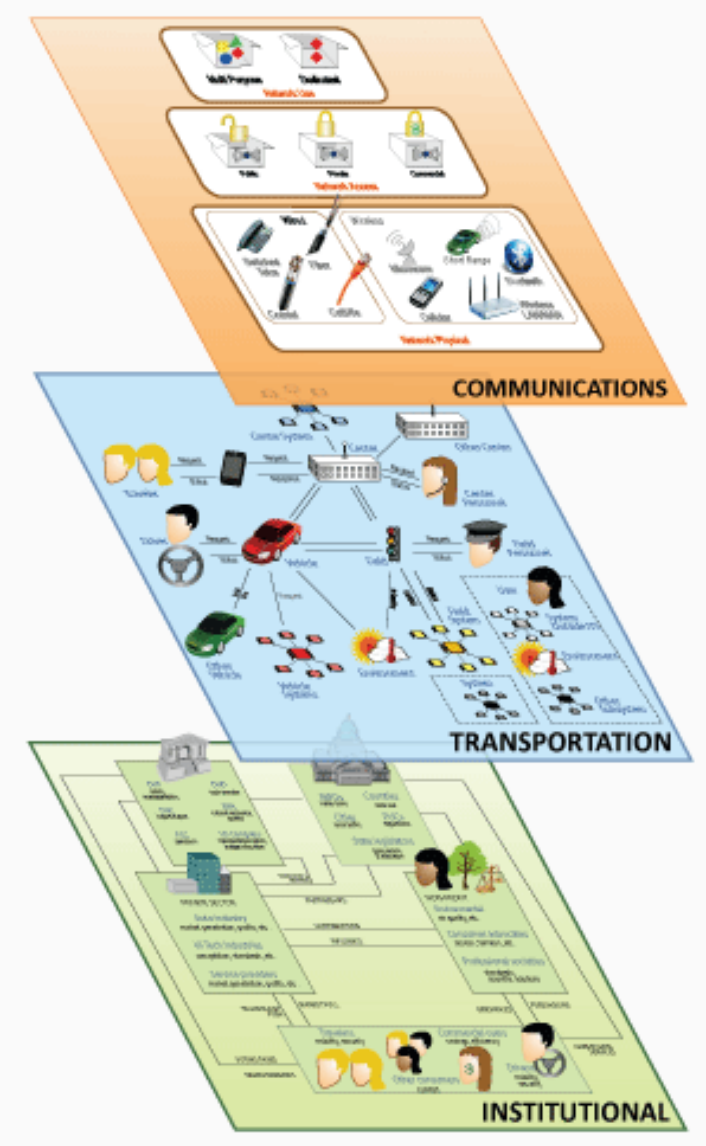
Traveler Information (cont.)

- Transportation layer most relevant:
  - 12 Traveler Information Service Packages
  - Communications – identifies four major types of communication to support the communications requirements
- Purpose of standards in an architecture:
  - Fundamental to open ITS environment
  - Facilitate deployment of interoperable systems

Review of Architecture Layers

Main Point: *The transportation layer is most relevant to traveler information.*

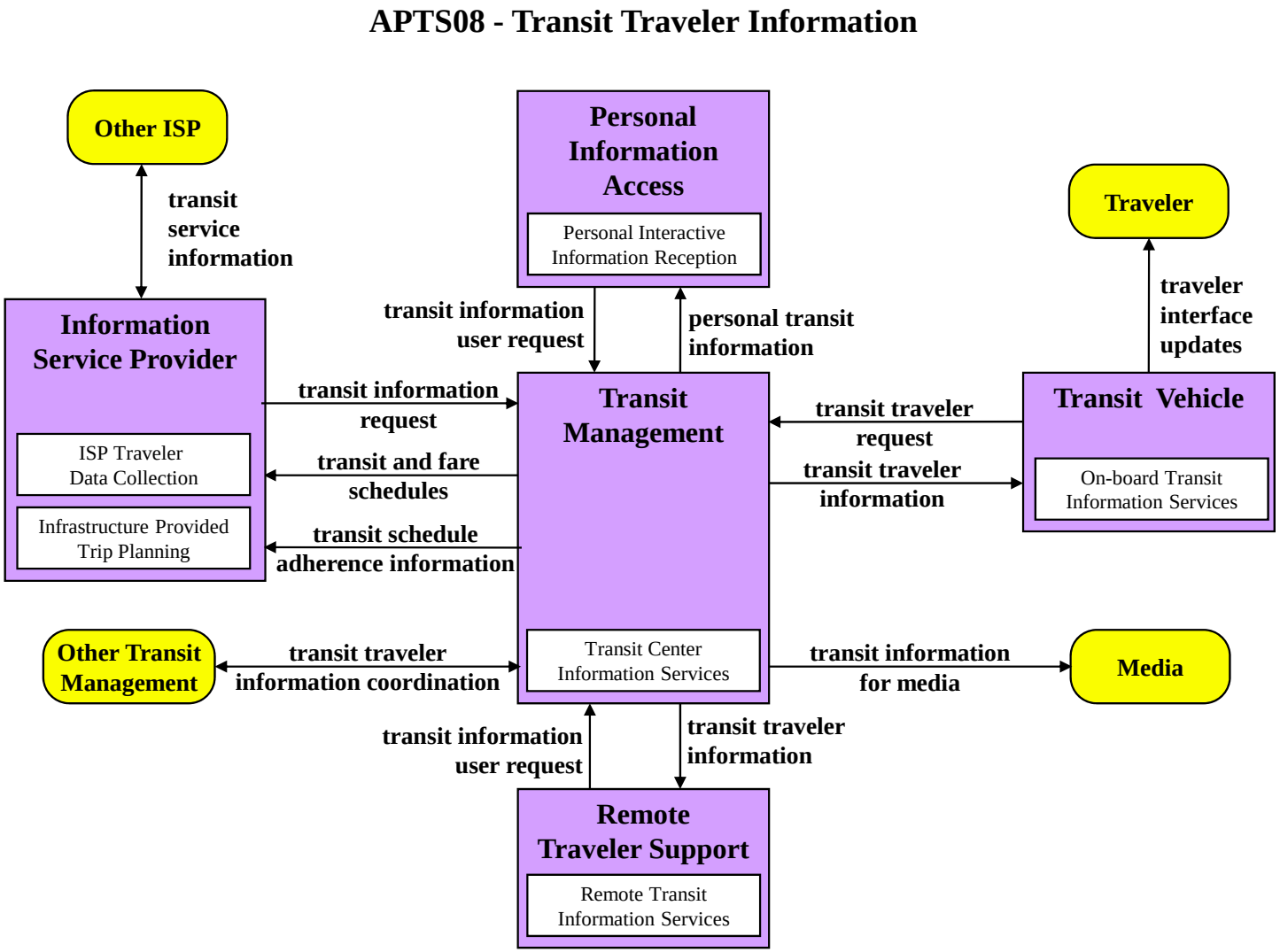
- **Communications Layer** – provides for accurate and timely exchange of information between systems to support transportation solutions
- **Transportation Layer** – where transportation solutions defined, including traveler information
- **Institutional Layer** – institutions, policies, funding mechanisms and processes required for effective ITS implementation, operation, and maintenance. Shown as base because solid institutional support and effective decisions are prerequisites to an effective ITS program.



Transit Traveler Information Service Package

- Pre-trip systems (e.g., itinerary planning software, Google Transit)
- On-board systems (e.g., automatic vehicle announcements [AVA])
- Wayside systems (e.g., electronic signage)
- Third-party smartphone applications and social media

Transit Traveler Information Service Package



Transit Traveler Information Architecture Flows

Source	Architecture Flow	Destination	In Graphic
Information Service Provider	transit service information Standards	Other ISP	Yes
Information Service Provider	transit information request Standards	Transit Management	Yes
Other ISP	transit service information Standards	Information Service Provider	Yes
Other Transit Management	transit traveler information coordination Standards	Transit Management	Yes
Personal Information Access	transit information user request Standards	Transit Management	Yes
Remote Traveler Support	transit information user request Standards	Transit Management	Yes
Remote Traveler Support	traveler interface updates	Traveler	No
Transit Management	transit and fare schedules Standards	Information Service Provider	Yes
Transit Management	transit schedule adherence information Standards	Information Service Provider	Yes
Transit Management	transit information for media	Media	Yes
Transit Management	transit traveler information coordination Standards	Other Transit Management	Yes
Transit Management	personal transit information Standards	Personal Information Access	Yes
Transit Management	transit traveler information Standards	Remote Traveler Support	Yes
Transit Management	transit traveler information Standards	Transit Vehicle	Yes
Transit Vehicle	transit traveler request Standards	Transit Management	Yes
Transit Vehicle	traveler interface updates	Traveler	Yes
Traveler	traveler inputs	Remote Traveler Support	No
Traveler	traveler inputs	Transit Vehicle	No

Standards This icon indicates that the associated architecture flow either has been or will be addressed by ITS Standards. Select the architecture flow for more information on relevant standards activities.

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Which one of these components is NOT in the Transit Traveler Information Service Package (SP)?

Answer Choices

a) On-board systems

b) Wayside systems

c) Dynamic ridesharing

d) Pre-trip systems

Review of Answers

a) On-board systems

Incorrect. On-board systems are included in this SP.

b) Wayside systems

Incorrect. Wayside systems are included in this SP.

c) Dynamic ridesharing

Correct! While dynamic ridesharing is a Traveler Information SP, it is not in the Transit Traveler Information SP.

d) Pre-trip systems

Incorrect. Pre-trip systems are included in this SP.

When on the Transit Traveler Information Service Package web page in the National ITS Architecture literature, you can click on the architecture flow and it will show you the standards associated with that data exchange.

Answer Choices

a) True

b) False

Review of Answers

a) True

Correct! You can use the information flow view of the Transit Traveler Information SP to determine which standards are associated with this SP.

b) False

Incorrect. You can determine which standards are associated with architecture flows within the Transit Traveler Information SP by viewing the information flow in the National ITS Architecture documentation.

Other Traveler Information Service Packages

- **Broadcast Traveler Information** – collects data on multimodal travel conditions and broadcasts information directly to travelers using multiple technologies, or through information service providers (ISPs)
- **Interactive Traveler Information** – provides tailored information in response to a traveler request
- **ISP-Based Trip Planning and Route Guidance** – offers the user trip planning and en route guidance services
- **Transportation Operations Data Sharing** – makes real-time transportation operations data available to transportation system operators

Other Traveler Information Service Packages (cont.)

- **Travel Services Information and Reservation** – provides travel information and reservation services to the user
- **Dynamic Ridesharing** – provides dynamic ridesharing/ride matching services to travelers
- **In-Vehicle Signing** – augments regulatory, warning, and informational signs and signals by providing information directly to drivers through in-vehicle devices
- **Short Range Communications Traveler Information** – provides location-specific or situation-relevant information to travelers in vehicles using dedicated short-range communications (DSRC) infrastructure supporting mobility applications for connected vehicles

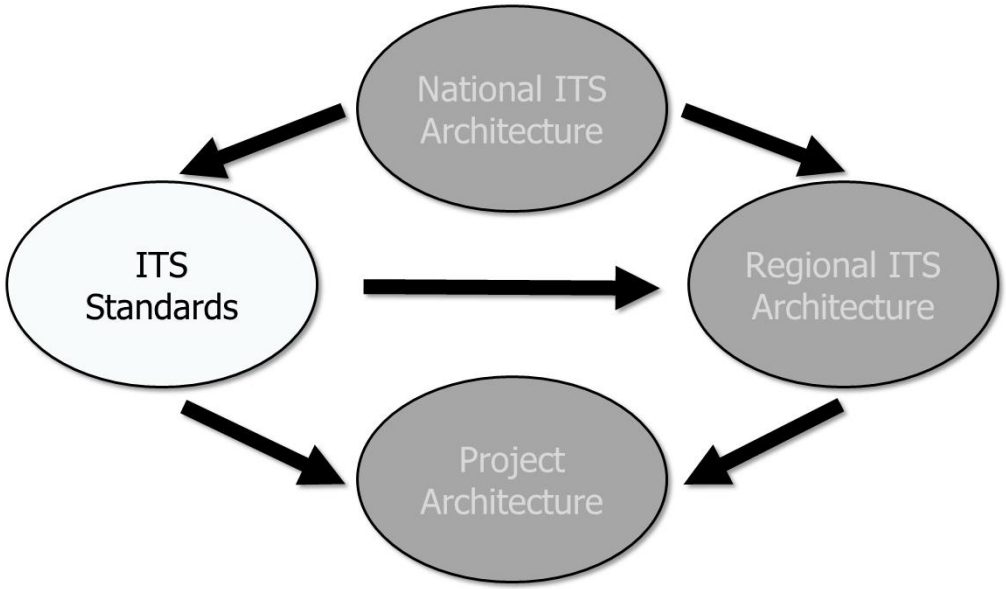
Other Traveler Information Service Packages (concluded)

- **Wide-Area Alert** – uses ITS driver and traveler information systems to alert the public in emergency situations
- **Early Warning System** – monitors and detects potential, looming, and actual disasters including natural disasters and technological and man-made disasters
- **Disaster Traveler Information** – uses ITS to provide disaster-related traveler information to the general public, including evacuation and re-entry information and other information concerning the operation of the transportation system during a disaster

Purpose of Standards in an Architecture

Main Point: *Standards have a role in the National ITS Architecture as well as Regional ITS Architectures and Project Architecture.*

- Fundamental to open ITS environment
- Facilitate deployment of interoperable systems
- This figure shows the relationship between ITS standards and architectures



Summary of Learning Objective #1

Describe (in Overview Terms) How Traveler Information Systems Fit into the National ITS Architecture

- The transportation layer is most relevant to traveler information
- Traveler information can be provided at any point in “trip chain”
- Transit Traveler Information SP covers:
  - Pre-trip systems
  - On-board systems
  - Wayside systems
  - Third-party applications and social media
- There are 11 other traveler information-related SPs

Learning Objective #2: Describe the Core Functions and Taxonomy of Traveler Information Systems

- Pre-trip systems (e.g., itinerary planning software, Google Transit)
- On-board systems (e.g., automatic vehicle announcements [AVA])
- Wayside systems (e.g., electronic signage)
- Third-party applications and social media

Pre-Trip Traveler Information

- **Definition**: Systems that provide information before taking a trip:
  - Proactive information provided regardless of user needs
  - Interactive information provided based on user needs upon request
- **Dimensions**:
  - Locations where information disseminated
  - Static and dynamic
  - Types (e.g., trip planning, estimated time of arrival for next vehicle)
  - Impacts

Trip Planner

Start: Oak Grove Station

End: 38 Chauncy Street, Boston, MA 02111

Help

Plan your trip using Landmarks & Stations

Depart Arrive 04:24 PM 3/31/2015

Minimize Time and use all services

With a walking distance of 1/2 mile Accessible trip

Clear SUBMIT

Itinerary 1 - Approx. 19 mins. *(shown below)*

Itinerary 2 - Approx. 19 mins.

Itinerary 1 - Approx. 19 mins. Print

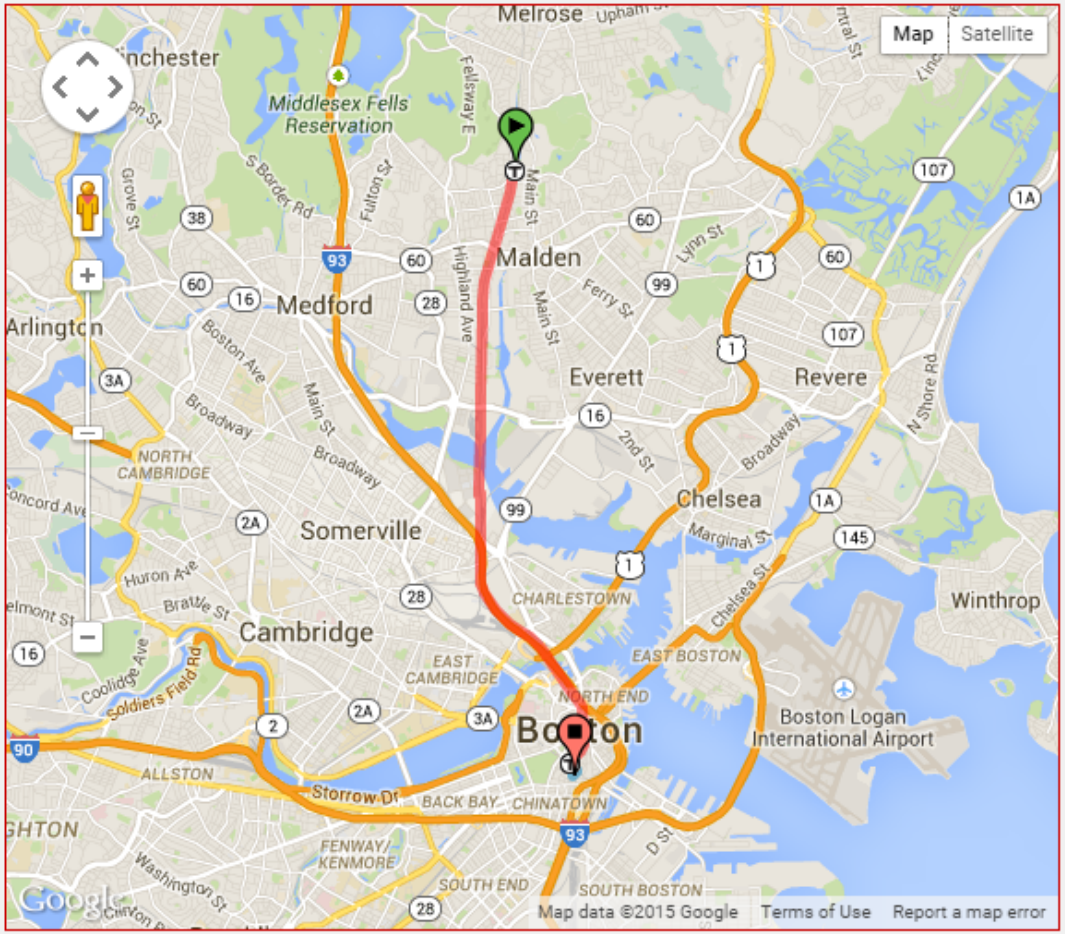
Take Orange Line - Forest Hills To Downtown Crossing - To Forest Hills view route

Approx. 4:25 PM Depart from Oak Grove Station - Orange Line

Approx. 4:41 PM Arrive at Downtown Crossing - to Forest Hills

Walk For 3 Mins. To 38 Chauncy Street, Boston, Ma 02111

COST:	Regular fare	Senior/Disabled fare
	$2.65	$1.05

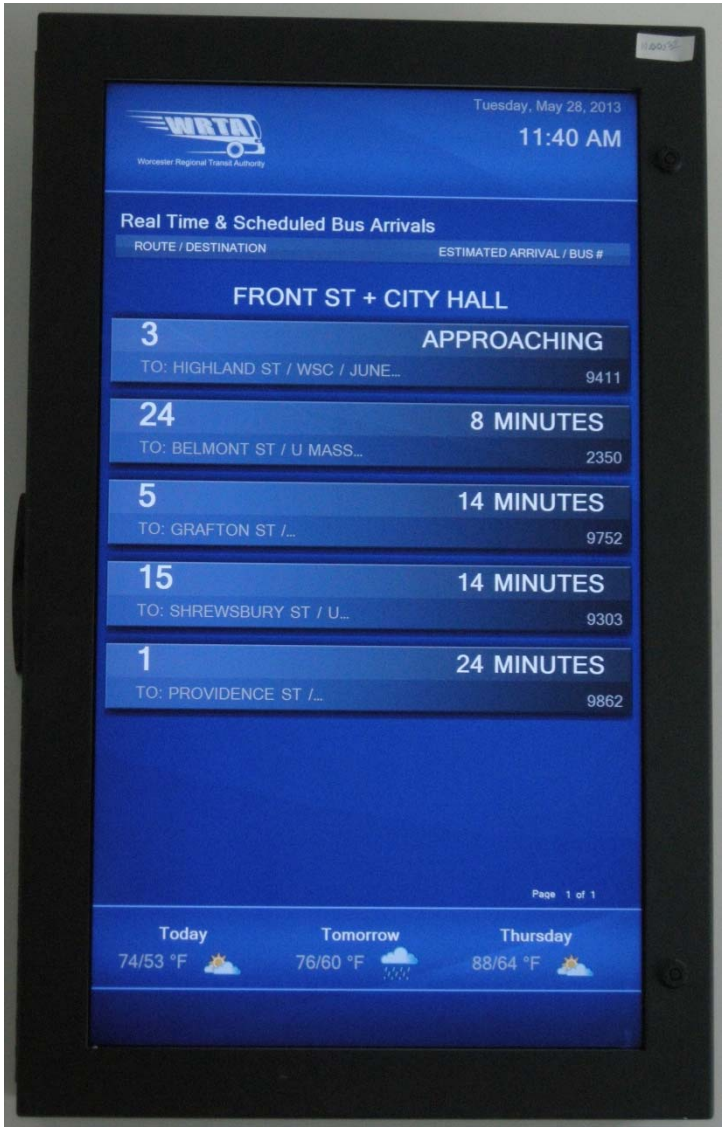


Find Landmarks on this route

Select Landmark Type Show Landmarks near Start point End point

Locations Where Pre-Trip Information Disseminated

- On fixed devices – dynamic message signs and kiosks:
  - In dedicated locations (e.g., office building)
  - At transit stops and stations
- Mobile, such as on mobile phones



Types of Pre-Trip Traveler Information

- Static (e.g., bus schedule, fares)
  - Trip itinerary (interactive)
  - Frequency of buses/trains, etc.
  - Fare cost
  - Possible interchanges
  - Facilities at stops/stations (e.g., parking)
- Dynamic information (e.g., arrival time of next vehicle)
  - Waiting time at the bus stop (proactive)
  - Travel time of route (proactive/interactive)
  - Weather conditions
  - Closure of stops/stations
  - Traffic disruption or rerouting

Impacts of Pre-Trip Traveler Information

- Whether or not a trip is taken
- Time of departure
- Mode(s) used for the trip
- Route(s) used for the trip

Pre-Trip Traveler Information

	When/Where				What			How		
	Pre-trip	Wayside/En route	On-board	Mobile	Trip planning	Static information	Real-time information	Proactive	Interactive	Custom
Printed Material	X	X	X			X		X		
Telephone	X				X	X	X		X	
Mobile Phone	X	X	X	X		X	X	X	X	X
Smartphone	X	X	X	X	X	X	X	X	X	X
E-mail	X	X	X	X		X	X	X		X
Short message service (SMS)	X	X	X	X			X	X		X
Other mobile devise (e.g., iPad)	X	X	X	X	X	X	X	X	X	X
Internet/Website	X				X	X	X		X	X
Kiosk	X	X			X	X			X	
Television	X					X	X	X		
Dynamic message sign		X	X			X	X	X		
Annunciator		X	X				X	X		
Social media	X			X			X	X		
Interactive voice response	X			X	X	X	X		X	X

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In which location is Pre-Trip Traveler Information NOT provided?

Answer Choices

a) Via a mobile device

b) On devices in dedicated locations

c) On devices at transit stops/stations

d) On board vehicles

Review of Answers

a) Via a mobile device

Incorrect. Pre-trip traveler information is provided via mobile devices.

b) On devices in dedicated locations

Incorrect. Pre-trip traveler information is provided via devices in dedicated locations.

c) On devices at transit tops/stations

Incorrect. Pre-trip traveler information is provided via devices at transit stops/stations.

d) On board vehicles

Correct! Pre-trip traveler information is NOT provided on board vehicles. Once an individual is on board a transit vehicle, they are no longer in the pre-trip stage of their trip.

On-Board Traveler Information

- **Definition**: Systems that provide static and real-time information on-board a transit vehicle
- **Static Types**:
  - Information on planned detours
  - Schedule information during special events
  - Information about non-motorized services
  - Services available at upcoming stops (e.g., carshare)
- **Dynamic Types**:
  - Name/location of upcoming stops
  - Emergency information
  - Vehicles/routes available for transfer
  - Display/announcement of the current route
  - Real-time elevator/escalator availability

On-Board Traveler Information (cont.)

	When/Where				What			How		
	Pre-trip	Wayside/En route	On-board	Mobile	Trip planning	Static information	Real-time information	Proactive	Interactive	Custom
Printed Material	X	X	X			X		X		
Telephone	X				X	X	X		X	
Mobile Phone	X	X	X	X		X	X	X	X	X
Smartphone	X	X	X	X	X	X	X	X	X	X
E-mail	X	X	X	X		X	X	X		X
Short message service (SMS)	X	X	X	X			X	X		X
Other mobile devise (e.g., iPad)	X	X	X	X	X	X	X	X	X	X
Internet/Website	X				X	X	X		X	X
Kiosk	X	X			X	X			X	
Television	X					X	X	X		
Dynamic message sign		X	X			X	X	X		
Annunciator		X	X				X	X		
Social media	X			X			X	X		
Interactive voice response	X			X	X	X	X		X	X

Wayside Traveler Information

- **Definition:** Systems that provide static and real-time information at the wayside
- **Static Types:**
  - Schedule information
- **Dynamic Type Examples:**
  - Availability of information dissemination
  - Identification of service disruptions
  - Next vehicle arrival prediction time
  - Schedule information during special events
  - Emergency information (e.g., evacuation due to fire)
  - Real-time information on availability of elevators and escalators

Wayside Traveler Information

	When/Where				What			How		
	Pre-trip	Wayside/En route	On-board	Mobile	Trip planning	Static information	Real-time information	Proactive	Interactive	Custom
Printed Material	X	X	X			X		X		
Telephone	X				X	X	X		X	
Mobile Phone	X	X	X	X		X	X	X	X	X
Smartphone	X	X	X	X	X	X	X	X	X	X
E-mail	X	X	X	X		X	X	X		X
Short message service (SMS)	X	X	X	X			X	X		X
Other mobile devise (e.g., iPad)	X	X	X	X	X	X	X	X	X	X
Internet/Website	X				X	X	X		X	X
Kiosk	X	X			X	X			X	
Television	X					X	X	X		
Dynamic message sign		X	X			X	X	X		
Annunciator		X	X				X	X		
Social media	X			X			X	X		
Interactive voice response	X			X	X	X	X		X	X

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Which type of dissemination media is NOT used to provide traveler information at the wayside/en route?

Answer Choices

a) Dynamic message sign (DMS)

b) Kiosk

c) Television

d) Smartphone

Review of Answers

a) Dynamic message sign (DMS)

Incorrect. A DMS can be used to provide traveler information at the wayside/en route.

b) Kiosk

Incorrect. A kiosk can be used to provide traveler information at the wayside/en route.

c) Television

Correct! Television is not used to provide traveler information at the wayside/en route.

d) Smartphone

Incorrect. A smartphone can be used to provide traveler information at the wayside/en route.

Third-Party Applications and Social Media

- **Definition**: Applications use open, proprietary, or internal transit operations data to provide traveler information
- Types of traveler information provided by third-party applications:
  - Next vehicle arrival/departure prediction time
  - Identification of service disruptions
  - Schedule information during special events
  - Information on planned detours
  - Real-time vehicle location
  - Emergency information
  - Comparative modal travel times
  - Energy usage
- Social media being used to provide:
  - Real-time service alerts
  - Static service information

Third-Party Applications and Social Media

	When/Where				What			How		
	Pre-trip	Wayside/En route	On-board	Mobile	Trip planning	Static information	Real-time information	Proactive	Interactive	Custom
Printed Material	X	X	X			X		X		
Telephone	X				X	X	X		X	
Mobile Phone	X	X	X	X		X	X	X	X	X
Smartphone	X	X	X	X	X	X	X	X	X	X
E-mail	X	X	X	X		X	X	X		X
Short message service (SMS)	X	X	X	X			X	X		X
Other mobile devise (e.g., iPad)	X	X	X	X	X	X	X	X	X	X
Internet/Website	X				X	X	X		X	X
Kiosk	X	X			X	X			X	
Television	X					X	X	X		
Dynamic message sign		X	X			X	X	X		
Annunciator		X	X				X	X		
Social media	X			X			X	X		
Interactive voice response	X			X	X	X	X		X	X

Summary of Learning Objective #2

Describe the Core Functions and Taxonomy of Traveler Information Systems

- Pre-trip traveler information impacts include whether or not the trip is taken, and which mode and route are used
- DMS is one type of dissemination media to display traveler information at wayside/en route
- On-board traveler information includes name/location of and services available at upcoming stops
- Third-party applications are overwhelmingly the approach transit agencies are taking to provide information on smartphones
- Social media is being used to provide real-time service alerts and static service information

Learning Objective #3: Describe the Functions of Systems Within Traveler Information and Briefly Identify the Relationships and Data Exchange Between Transit Management and Traveler Information Systems

- On-board automated voice announcements (AVA)
- En route/wayside traveler information, including real-time arrival/departure information in a variety of dissemination media
- 511, 311, and 211 systems, and Google Transit
- Third-party applications and social media

On-Board Automated Voice Announcements (AVA)

- **Definition**: Provides audio and visual announcements to on-board riders and those waiting to board
- **Function**: As fixed-route vehicle approaches a stop or other designated location:
  - Digitally recorded announcement automatically made over on-board public address system speakers
  - Displayed on DMS inside vehicle to inform passengers about upcoming stops, major intersections, and landmarks
  - Can make time-based, location-based, and vehicle operator-initiated announcements/displays
  - Supports compliance with the Americans with Disabilities Act (ADA)
- **Dependent on**:
  - AVL system
  - Route and vehicle schedule data

AVA Example: Worcester Regional Transit Authority

- 46 fixed-route vehicles equipped with AVA
- Lessons learned:
  - Needed to shorten length of announcements
  - During design, a feature that had not been considered was defined – looping of announcements at terminals
  - Trip patterns had to be validated
  - Volume with which announcements were made on board had to be addressed
  - Implementation of Spanish announcements (in addition to English) cancelled due to differences associated with translating announcements into Spanish

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Can an on-board automated voice announcement (AVA) system be used to comply, in part, with the Americans with Disabilities Act (ADA)?

Answer Choices

a) Yes

b) No

Review of Answers

a) Yes

Correct! An on-board automated voice announcement (AVA) system can be used to comply, in part, with the Americans with Disabilities Act (ADA).

b) No

Incorrect. An on-board automated voice announcement (AVA) system can be used to comply, in part, with the ADA.

En Route/Wayside Traveler Information

- **Definition**: Provides both real-time and static information using various types of dissemination media
- **Function**:
  - CAD/AVL systems generate schedule adherence information
  - Schedule adherence information is combined with other conditions (e.g., speed of vehicle) to calculate when a vehicle will arrive at upstream stops
  - Estimated time of arrival displayed at wayside at upstream stops or via the Internet or mobile applications
- **Dependent on**:
  - Route and vehicle schedule data
  - AVL system
  - CAD system
  - Data communications technologies

En Route/Wayside Trip Chain Locations

- At the origin of the trip
- Between the origin and the first transit stop of the trip
- At a bus stop, station platform, station entrance, and common area, or terminal location
- On board a vehicle (inside a tunnel or at the surface)
- At a park-and-ride location
- Between the final stop and destination

Dissemination Media and Standards

- Dynamic message sign (DMS)
- Internet or mobile internet
- Interactive voice response (IVR) system
- Short message service (SMS) (a.k.a. text message)
- Smartphone application (see a section later in this module)
- Social media (e.g., Facebook)
- Alerts that are pushed to a customer based on registered preferences
- Staffed customer information service available by telephone

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- Different standards facilitate the use of each of these technologies where standards exist

Mobility Lab (Now TransitScreen) Example

DMS Examples

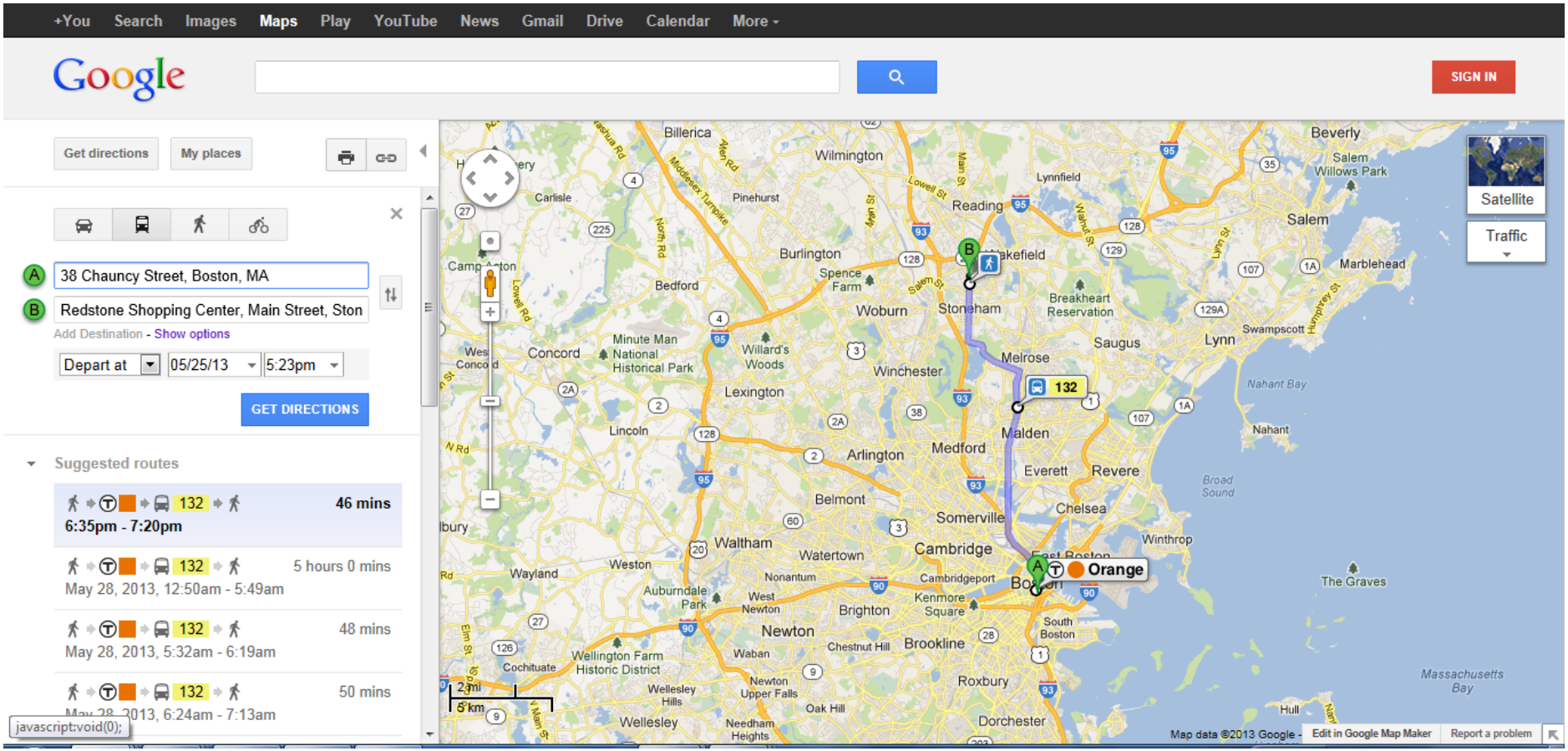
511, 311, and 211 Systems

- **Definition**:
  - 511 provides statewide and/or regional traveler information
  - 311 used for locally/regionally operated, staffed (live operator) phone systems for "non-emergency policy and other government services" information
  - 211 used for locally/regionally operated "community information and referral services" phone systems
- **Function**: 511, 311, and 211 systems are Federal Communications Commission (FCC)-designated phone numbers
- **Dependent on**: Open data

Google Transit

- **Definition:** Web-based application that imports agency data in specific file formats to provide portal for transit trip planning using Google Maps
- **Features:**
  - Regional trip planning tools
  - Origin and destination locations
  - Google Maps features
  - Google Point-of-Interest (POI) search around stop location
  - Walk directions with turn-by-turn guidance
  - Google Transit and Google Directions on same portal for trips that require both options
  - Over 800 cities covered throughout the world as of January 2015

Google Transit Example



Google Live Transit Updates

- Based on use of GTFS-realtime (de-facto standard)
- Can be seen on https://developers.google.com/transit/google-transit#LiveTransitUpdate
- Live Transit Updates:
  - Provide real-time transit updates to users of Google Maps and Google Maps for mobile
  - Include live departure and arrival times to transit stations, as well as service alerts
  - Provide two types of real-time updates to users:
    - Live departure times
    - Service alerts

Third-Party Trip Planning

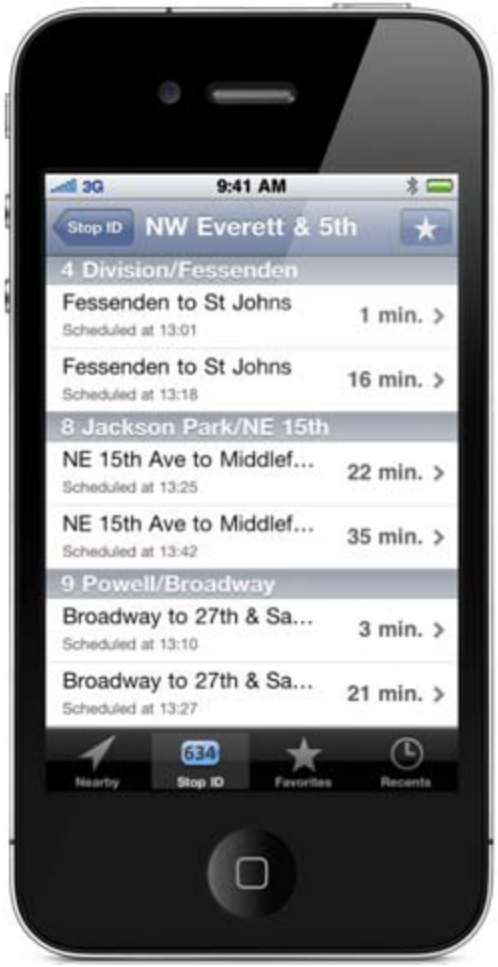
- Bing Maps – transit routing and real-time information using GTFS
- MapQuest – transit and walking directions in 2011
- HopStop:
  - Provides door-to-door walking, biking, transit, taxi and hourly car rental directions
  - Intra-city and city-to-city travel
  - Includes real-time social transit app
- goroo® provides:
  - Directions using combination of bus/train routes, driving, biking and walking directions
  - Travel itineraries, public transit schedules, maps, alternative routes, area attractions, travel alerts, and suggested ways to reduce your carbon footprint

Third-Party Applications and Social Media

- **Definition**:
  - Third-party applications provide static and real-time information based on open data provided by transit agencies
  - Social media being used by transit agencies to provide real-time service alerts and static service information
- **Function**:
  - Third-party applications function differently based on information being provided
  - Social media functions
- **Dependent on**:
  - Open data
  - Private or proprietary data within transit agency

Third-Party Smartphone Applications

OneBusAway for Seattle Area
Where's my MBTA Bus?



Traveler Information Dependencies

Category	System/Technology	Dependent on
Traveler Information	On-board automated voice announcements (AVA)	• AVL system • Route and vehicle schedule data
	En route/wayside traveler information, including real-time arrival/departure information in a variety of dissemination media	• Route and vehicle schedule data • AVL system • CAD system • Data communications technologies
	On-board Internet access for passengers	Data communications technologies
	511, 311, and 211 systems, and Google Transit	Open data
	Third-party smartphone applications	Open data

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En route/wayside information is NOT dependent on which system?

Answer Choices

a) Data communications technologies

b) Open data

c) Route and vehicle schedule data

d) AVL system

Review of Answers

a) Data communications technologies

Incorrect. En route/wayside information is dependent on data communications technologies.

b) Open data

Correct! En route/wayside information is not typically dependent on open data, although it could be.

c) Route and vehicle schedule data

Incorrect. En route/wayside information is dependent on route and vehicle schedule data.

d) AVL system

Incorrect. En route/wayside information is dependent on an AVL system.

Summary of Learning Objective #3

Describe Functions of Systems Within Traveler Information and Identify Relationships and Data Exchange Between Transit Management and Traveler Information Systems

- Variety of dissemination media that use different standards
- 511, 311, and 211 phone numbers were designated by FCC
- Third-party tools use standards and formats such as GTFS and GTFS-real-time
- Third-party smartphone applications use open data provided by transit agencies
- Social media provides traveler information, mostly real-time service alerts

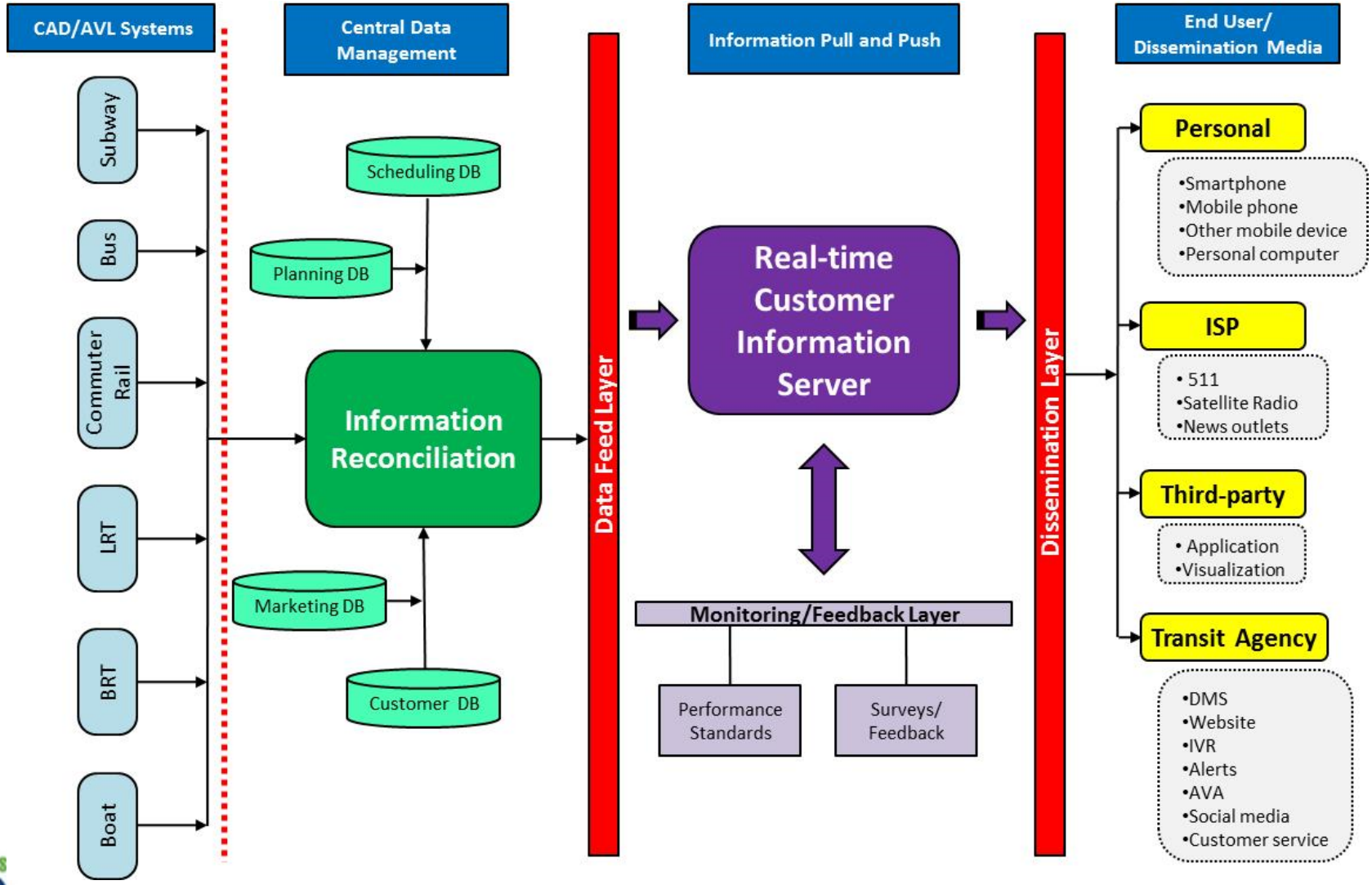
Learning Objective #4: Identify and Describe How Standards Can Be Used to Specify Requirements for the Procurement of Traveler Information Systems

- Linking information resources and management systems to Traveler Information
- Communication network requirements
- Location criteria and environments for Traveler Information hardware (e.g., electronic displays at bus stops)
- Types of dissemination media
- Examples of relating requirements to specific standards

Linking Information Resources and Management Systems to Traveler Information

- CAD/AVL systems provide raw data
- Information is collected from various databases and processed
- Processed data fed to a customer/traveler information server
- Server is monitored for activity and feedback from customers
- Information is then:
  - Pushed to customers via various dissemination media
  - Pulled by customers looking for specific information
- Need to consider user needs (key part of systems engineering process) when determining most appropriate standards

Traveler Information Data Exchanges



Communication Network Requirements

- Example: Communicating with DMS in the field (at stops or stations) could be done:
  - Using wired means, such as phone lines and T-1 lines
  - Using wireless means, such as radio, cellular, or Wi-Fi
- Typical communication network divided into the following:
  - **Backbone**: Capable of carrying all types of data traffic. Interconnects number of nodes
  - **Distribution**: Distribution portion of network provides connection between backbone node and group of ITS devices or buildings
  - **Local**: Local portion of network or "drop" that connects end device or building to distribution cable or directly to node on backbone

Communication Network Requirements (cont.)

- **Communication technology options:**
  - Cable
  - Fiber
  - Wireless
  - Leased communication services
  - Leased fiber
- **Backbone communication technology options:**
  - Asynchronous transfer mode (ATM)
  - Synchronous optical network (SONET)
  - Ethernet
- **Physical configurations:**
  - Star
  - Ring
  - Mesh
  - Hybrid
- **Distribution communication technology options:**
  - RS-232/485
  - Ethernet
  - Wireless

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Which one of these is not a basic element of a typical communication network?

Answer Choices

a) Backbone

b) Local

c) Regional

d) Distribution

Review of Answers

a) Backbone

Incorrect. The communication backbone is a basic element of a communication network as it is capable of carrying all types of the data traffic in the system.

b) Local

Incorrect. Local is a basic element of a communication network since the local portion of the network or "drop" connects an end device or building to a distribution cable or directly to a node on a backbone.

c) Regional

Correct! Regional is NOT a basic element of a communication network.

d) Distribution

Incorrect. Local is a basic element of a communication network since the distribution portion of the network provides a connection between the backbone node and a group of ITS devices or buildings.

Location Criteria/Environments for Traveler Information Hardware

Location Criteria	Response Percent
Boarding counts at stops/stations	67.9%
Availability of power	57.1%
Number of lines/routes at stop/station	53.6%
Availability of communication	42.9%
Number of transfers at stop/station	39.3%
Signs at all BRT/light rail/subway/commuter rail stations	35.7%
Physical obstructions/visibility	32.1%
Mounting infrastructure	32.1%
Safety considerations	25.0%
Security considerations	21.4%
Outdoor versus indoor mounting needs	14.3%
Environmental considerations	10.7%
Existence of alternate media to provide transit information	7.1%
Other: • Reasonable coverage per platform for passenger visibility of signs • Political (ward) considerations • Locations throughout the community. Beta sites are in offices and retail stores. • Title VI • At major BRT stations based on boardings • Standard Rail Station feature	

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Which location criterion for DMS is the most prevalent amongst transit agencies?

Answer Choices

a) Safety considerations

b) Availability of communication

c) Number of transfers at stops/stations

d) Boarding counts at stops/stations

Review of Answers

a) Safety considerations

Incorrect. Safety considerations is the ninth most prevalent location criteria amongst transit agencies.

b) Availability of communication

Incorrect. Availability of communication is the fourth most prevalent location criteria amongst transit agencies.

c) Number of transfers at stops/stations

Incorrect. The number of transfers at stops/stations is the fifth most prevalent location criteria amongst transit agencies.

d) Boarding counts at stops/stations

Correct! Boarding counts is the most prevalent location criteria amongst transit agencies.

Types of Dissemination Media

- Customer service agent
- Dynamic message sign (DMS)
- Internet accessed by:
  - Personal computer
  - Mobile device
- Data feed for independent developers
- Interactive voice response (IVR)
- Smartphone applications
- Two-way text messaging (SMS)
- Subscription alerts

Example of Relating Requirements to Specific Standards

- Require real-time information system to export data for use with Google Transit Trip Planner
- Stated fully in Student Supplement

1. The system shall provide an interface to Google Transit using the General Transit Feed Specification (GTFS).
2. The Contractor shall perform or help the transit agency with the following processes required to deliver its fixed-route data to Google Transit…
3. The Contractor shall coordinate with the transit agency to ensure that any abnormal situations in trip planning, including, but not limited to the following, are resolved…

Summary of Learning Objective #4

Identify and Describe How Standards Can be Used to Specify Requirements for the Procurement of Traveler Information Systems

- Different standards/formats are used for traveler information systems data exchanges
- Determining communication network architecture must consider certain options
- Specific criteria are used to locate dissemination media
- Variety of dissemination media provide traveler information to the public and app developers

Learning Objective #5: Explain the Role of Standards in Traveler Information Systems Procurement

- Traveler information systems with standards and those without standards
- Impact and importance of using systems engineering process (SEP) in procurement

Traveler Information Standards

- DATEX II*
- General Transit Feed Specification (GTFS)
- GTFS-real-time
- Identification of Fixed Objects in Public Transport (IFOPT)*
- International Traveler Information Systems (ITIS) / Society of Automotive Engineers (SAE) J2540/2
- National Transportation Communications for ITS Protocol (NTCIP)

* Indicates a European Standard

Traveler Information Standards (cont.)

- Radio Data System (RDS)*
- Service Interface for Real Time Information (SIRI)*
- Transit Communications Interface Profiles (TCIP)
- TransXChange (TxC)*
- eXtensible Markup Language (XML)

* Indicates a European Standard

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Which one of these is an SAE standard?

Answer Choices

a) National Transportation Communications for ITS Protocol (NTCIP)

b) Service Interface for Real Time Information (SIRI)

c) eXtensible Markup Language (XML)

d) International Traveler Information Systems (ITIS)

Review of Answers

a) National Transportation Communications for ITS Protocol (NTCIP)

Incorrect. NTCIP is not an SAE standard. NTCIP was an American Association of State Highway and Transportation Officials (AASHTO), ITE, and National Electrical Manufacturers Association (NEMA) joint standard.

b) Service Interface for Real Time Information (SIRI)

Incorrect. SIRI is not an SAE standard. SIRI is a European Committee for Standardization (CEN) product.

c) eXtensible Markup Language (XML)

Incorrect. XML is not an SAE standard. XML was developed by the World Wide Web Consortium and was initiated in 1996.

d) International Traveler Information Systems (ITIS)

Correct! ITIS is an SAE standard.

Impact and Importance of Using SE in Procurement

- Standards for traveler information systems consider user needs, which is part of systems engineering process (SEP)
- SEP overarching process applied to transition from stated capability need to affordable, operationally effective, and suitable system
- SEP encompasses application of SE processes in procurement life cycle
- Project development process strongly influenced by selected procurement strategy
- Selecting procurement approach facilitated by NCHRP “The Guide to Contracting ITS Projects” and companion web-based tool

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The systems engineering process (SEP) does not include considering user needs.

Answer Choices

a) True

b) False

Review of Answers

a) True

Incorrect. The systems engineering process (SEP) does include considering user needs.

b) False

Correct! The systems engineering process (SEP) includes considering user needs.

Summary of Learning Objective #5

Explain the Role of Standards in Traveler Information Systems Procurement

- Traveler information systems with standards and those without standards
- Impact and importance of using SE in procurement

What We Have Learned

1) There are 11 traveler information-related service packages (SPs) in addition to one called transit traveler information.
2) The core functions, which define the taxonomy of traveler information systems, are pre-trip, en route/wayside, on-board and mobile.
3) A typical communication network is divided into the following three basic elements:
   a) Backbone
   b) Distribution
   c) Local
4) The most prevalent criteria for locating DMS is boarding counts at stops/ stations.
5) Standards for Traveler Information systems consider user needs, which is part of the systems engineering process (SEP).

Resources

- The National ITS Architecture 7.0, Architecture Layers, http://www.iteris.com/itsarch/html/archlayers/archlayers.htm
- The National ITS Architecture 7.0, ITS Standards, http://www.iteris.com/itsarch/html/standard/standard.htm
- The National ITS Architecture 7.0, Service Packages, http://www.iteris.com/itsarch/html/mp/mpindex.htm
- The National ITS Architecture 7.0, APTS08-Transit Traveler Information, http://www.iteris.com/itsarch/html/mp/mpapts08.htm
- Dr. Ioanna Spyropoulou, "Pre-Trip Impacts of Advanced Traveller Information Systems," http://www.noehumanist.org/documents/DesignGuidelines-useracceptance-and-Impact-of-ITS/User-acceptance-and-impact-of-ITS/IoI2_ispyropoulou.pdf
- Carol L. Schweiger, Strategies for Improved Traveler Information, TCRP 92, 2003, http://onlinepubs.trb.org/onlinepubs/tcrp/tcrp_rpt_92.pdf
- Carol L. Schweiger, Use and Deployment of Mobile Device Technology for Real-Time Transit Information, TCRP Synthesis 91, 2011, http://onlinepubs.trb.org/onlinepubs/tcrp/tcrp_syn_91.pdf

Next Course Module

Module 7: Traveler Information Standards, Part 2 of 2

and

Module 11: Connected Vehicles and Transit Standards

Thank you for completing this module.

Click here to open the feedback form

OR

Please provide us your feedback:

http://www.pcb.its.dot.gov/stds_training.aspx

(insert exact location for feedback for each module as well as link to Transit ITS Standards – page to be developed as part of standards training site)

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