WELCOME

STANDARDS ITS TRAINING TRANSIT

U.S. Department of Transportation

Office of the Assistant Secretary for
Research and Technology

Module: 17

Instructor

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Consensus Systems Technologies

Learning Objectives

Understand Background, Vision and Objectives of ATTRI

Discuss the ATTRI Focused Technology Areas

Describe ATTRI Foundation Considerations, Application Areas, and Applicable Standards

Learning Objective 1

Understand Background, Vision, and Objectives of ATTRI

What is the Background of ATTRI?

What is ATTRI?

- U.S. DOT Multimodal **Research and Development Effort**
  - Co-led by FHWA and FTA with support from ITS-JPO

- Solve door-to-door **accessible transportation** issues for **persons with disabilities**

Source: Thinkstock/USDOT

What is the Background of ATTRI?

Who is ATTRI meant for?

- Persons with Disabilities
  - 56.7 million or **19%** U.S. population
  - **Older adults** growing proportion of total

Targeted Populations	Persons with Disabilities	Veterans with Disabilities	Older Adults

Types of Disabilities	Vision	Mobility	Hearing	Cognitive

Program Trajectory

Phase 1: Exploratory Research & Partnership Development

Phase 2: Application Selection and Prototyping
• Collaboration & Partnerships

Phase 3: Integrated Demonstrations and Pilots

ATTRI Program Trajectory

ATTRI is addressing a significant transportation problem in a comprehensive way. The ATTRI Program is positioned to capitalize on potential large-scale opportunities
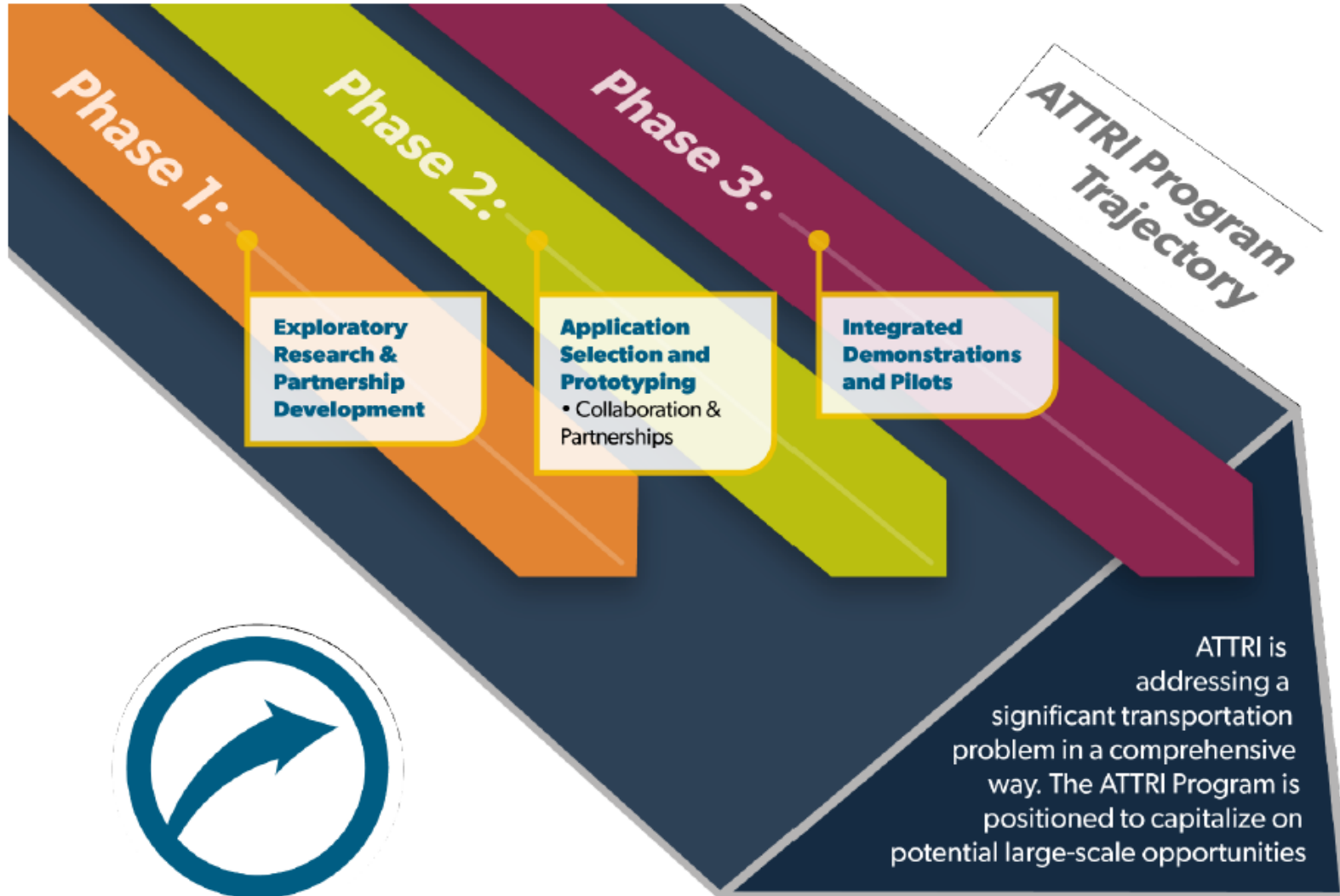
ATTRI Vision

Enhance Mobility for Disabled Travelers

ATTRI seeks to **remove barriers** to transportation by leveraging **advanced technology** to enable people to **travel more easily, affordably, and effectively**, regardless of their individual abilities

Source: USDOT

Source: Thinkstock/USDOT

ATTRI Objectives

- Explore state of the art **technology solutions** in the U.S. and Europe

- Gather **stakeholder input on needs and solutions** from users for incorporation in ATTRI's future efforts

- Identify **application areas** for prototyping

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Question

Which one is NOT a key population meant to be served by ATTRI?

Answer Choices

- ○ A) Older Adults
- ● B) Children
- ○ C) Persons with Disabilities
- ○ D) Veterans with Disabilities

The correct answer is:

You did not answer this

You must answer the question before continuing

press Control Y to continue

press Control Y to continue

Submit   Clear

Review of Answers

a) Older Adults

Incorrect. Older adults are considered because of possibility of reduction in all 4 dimension.

b) Children

Correct! Considering the needs of children is not a part of ATTRI.

c) Persons with Disabilities

Incorrect. Persons with disabilities are a key population.

d) Veterans with Disabilities

Incorrect. Veterans with Disabilities are a key subset of Persons with Disabilities.

Learning Objective 2

Discuss the ATTRI Focused Technology Areas

ATTRI Technology Areas

Wayfinding & Navigation Solutions

- Indoor/Outdoor navigation & orientation Apps
- Situational awareness and text recognition devices

ITS & Assistive Technologies

- Travel and emergency announcements with captioning and haptic/flashing alerts
- V2V, V2I and V2P apps for pedestrians

Automation & Robotics

- Personal mobility vehicles for first/last mile
- Virtual caregivers/concierge services with machine vision/AI, V2X

Data Integration

- Accessibility data and information systems
- Interoperability and data needs

Enhanced Human Services Transportation

- Real-time multimodal trip planning & services
- Inclusive one-fare payment application for all travelers
- Paratransit to Fixed-route

ATTRI Technology Areas

Wayfinding and Navigation Solutions

- Navigation Systems
  - Smartphone-based navigation systems
  - Beacons or electronic tags
  - Multiple communication formats
- Wearable Technologies
- Community Navigators

Wayfinding & Navigation Solutions

- Indoor/Outdoor navigation & orientation Apps
- Situational awareness and text recognition devices

ATTRI Technology Areas

Wayfinding and Navigation Solutions

- Technology Examples
  - Indoor Wayfinding Device
  - Wearable Device to provide guidance

Source: USDOT

Source: Thinkstock/USDOT

ATTRI Technology Areas

ITS and Assistive Technologies

- ITS provides a broad range of wireless and sensor-based communications and information technology
  - Real-Time situational awareness
  - Accessible, assistive, and adaptive devices
  - Information in accessible communication formats

- Connected vehicle technologies support applications for Pedestrians
  - Adaptive Pedestrian Signal Timing
  - Emergency vehicle and safety alerts

ITS & Assistive Technologies

- Travel and emergency announcements with captioning and haptic/flashing alerts
- V2V, V2I and V2P apps for pedestrians

ATTRI Technology Areas

ITS and Assistive Technologies

- Technology Examples
  - Connected Vehicle Technologies
    - Smartphones, watches or glasses to **interface with vehicles, infrastructure, and pedestrians**

Source: USDOT

ATTRI Technology Areas

Automation and Robotics

- Vehicle automation technology to solve first mile/last mile mobility issues

- Collaborative robots
  - Provide concierge services
  - Assist with activities such as walking

- Machine Vision, artificial intelligence, assistive robots

Automation & Robotics

- Personal mobility vehicles for first/last mile
- Virtual caregivers/concierge services with machine vision/AI, V2X

ATTRI Technology Areas

Automation and Robotics

- Technology Examples
  - Shared Autonomous Vehicles (SAV)
  - Assistive Robots

Source: USDOT

Source: USDOT

EXAMPLE

ATTRI Technology Areas

Data Integration

- Enable the **integration** of data and information systems
    - **In-depth** accessibility information
    - Expanded **user profile** for persons with accessibility needs usable by service providers to customize service

Data Integration

- Accessibility data and information systems
- Interoperability and data needs

ATTRI Technology Areas

Data Integration

- Technology Example
  - Mobile App that can integrate the user mobility profile with accessibility needs

Source: USDOT

ATTRI Technology Areas

Enhanced Human Service Transportation

- Real-time, multimodal trip and services planning and traveler decision support

- Paratransit to Fixed-route

- Integrated Payment Systems

Enhanced Human Services Transportation

- Real-time multimodal trip planning & services
- Inclusive one-fare payment application for all travelers
- Paratransit to Fixed-route

ATTRI Technology Areas

Enhanced Human Service Transportation

- Technology Examples
  - Smart Card or Mobile App to pay for transit services
  - Applications to link various transit services

Source: USDOT

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Question

Which area was NOT identified as one of the ATTRI Technology Areas?

Answer Choices

- ○ A) Wayfinding and Navigation Solutions
- ◉ B) Integrated payment
- ○ C) Automation and Robotics
- ○ D) Data Integration

Your answer:

You did not answer this

You must answer the question before continuing

Incorrect - Click anywhere or ...ntrol Y to continue

press Control Y to co...

Submit   Clear

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Review of Answers

a) Wayfinding and Navigation Solutions

Incorrect. This is one of the 5 technology areas.

b) Integrated payment

Correct! Integrated Payment is not a technology area, but is a foundational consideration.

c) Automation and Robotics

Incorrect. This is one of the 5 technology areas.

d) Data Integration

Incorrect. This is one of the 5 technology areas.

Learning Objective 3

Describe ATTRI Foundational Considerations, Application Areas, and Applicable Standards

ATTRI Foundational Considerations

Considerations Overview

- All ATTRI applications should include four **"cross-cutting"** considerations

Standard Accessible Data Platform

Universal Design Standards

Integrated Payment

Leverage Existing Technologies

ATTRI Foundational Considerations

Standard Accessible Data Platform

- Access to real-time, situational data sources

- Data standardization and interoperability

ATTRI Foundational Considerations

Universal Design Standards

- New Applications or leveraging of existing solutions
  - Applicability of technical solution applies to the needs of all user groups
- Multiple accessible communication formats and user interfaces

Source: USDOT

ATTRI Foundational Considerations

Integrated Mobile Payment

- Payment for transportation
- Usable by travelers **of any abilities**
- **Interoperability** across modes

ATTRI Foundational Considerations

Leverage Existing Technologies

- Apply existing technologies to user needs
  - ITS
  - On-Demand
  - Data Standards
  - Mobile Technology
  - Wearables
  - Assistive Technologies

- Either currently available or already under development

Focused Application Areas

How Chosen?

- ATTRI project obtained inputs on Application Areas in three different ways:
  - User Needs Webinars
  - Technology Scan
  - Request for Information

Focused Application Areas

Top application areas identified

1. Pre-Trip Concierge and Visualization

2. Smart Wayfinding and Navigation Systems

3. Shared Use, Automation and Robotics

4. Safe Intersection Crossing

Focused Application Areas

Pre-Trip Concierge and Visualization

- Pre-Trip Concierge
  - Provide **pre-trip and en-route** traveler information
  - Design for people with blindness, low vision, cognitive and mobility issues
- Visualization
  - Passengers "**see" their entire routes** on an app with landmarks
  - Virtual caregiver helps plan routes and track travelers movement
  - Connectivity to caregiver or family member

Source: Thinkstock/USDOT

Focused Application Areas

Pre-Trip Concierge and Visualization

- Application Examples
  - Assist for everyday activities: walking or getting to work
  - Ability to learn and remember routes
  - Integrating different modes with accessibility accommodations
  - Virtual exploration devices to help visually impaired
  - Voice overlay including family members
  - Emoji's for accessible transportation

Source: AIGA

Focused Application Areas

Pre-Trip Concierge and Visualization-Standards

- ITS Data Standards apply to static and real time transportation data
- Transit Static Data
    - GTFS
    - TCIP
- Transit Real Time Data
    - GTFS-realtime
    - SIRI
- Traffic Conditions
    - TMDD

Focused Application Areas

Transit Static Data Standards - General Transit Feed Specification (GTFS)

- Transit Static Data
    - Routes and Schedules
- Originally developed, still maintained by Google
- Specification, not a standard
- Now used by 1000's of Transit Agencies
- Primarily to support trip planning

SUPPLEMENT

Focused Application Areas

Transit Static Data Standards – Transit Communications Interface Profiles (TCIP)

- Published by the American Public Transportation Association (APTA)

- ITS standard for exchanging information among transit ITS systems and components

- Primarily designed for intra-agency use

- Includes passenger information for static schedules and routes

SUPPLEMENT

Focused Application Areas

Transit Real Time Data- GTFS-realtime

- **Real time** version of the **GTFS**
- Launched in 2011- 6 cities initially
- Maintained by Google
- Primarily to support en-route traveler information
- Information included
    - **Trip Update: When** will the vehicle arrive/depart?
    - **Vehicle Position: Where** is the vehicle?
    - **Alerts:** Are any planned or unplanned **events** affecting service?

SUPPLEMENT

Focused Application Areas

Transit Real Time Data- SIRI

- Service interface for real-time information relating to public transport operations (SIRI)
- European Committee for Standardization (CEN) standard.
- Functional Services covered
  - Production Timetable
  - Estimated Timetable
  - Stop Timetable/ Monitoring
  - Vehicle Timetable/ Monitoring
  - Connection Timetable/ Monitoring
- Increasing deployment in US

SUPPLEMENT

Focused Application Areas

Traffic Data Standards- TMDD

- Traffic Management Data Dictionary (TMDD)
- Developed and maintained by ITE and AASHTO
- Center-to-center standard for exchanging transportation information **between a traffic management center and other centers**
- Provides real-time information about road network conditions and Incidents
- Widely deployed by state transportation departments
- Supports trip planning

SUPPLEMENT

Focused Application Areas

Smart Wayfinding and Navigation Systems

- Navigation Systems
- Wearable Technologies
- Community Navigators

Source: Thinkstock/USDOT

Focused Application Areas

Smart Wayfinding and Navigation Systems

- Application Capabilities
  - Recognize and detect stationary objects
  - Read and recognize important text and signage
  - Detect, track, represent moving objects
  - One button push notification of location
  - Wearable sensors

Focused Application Areas

Smart Wayfinding & Navigation Systems-Standards

- Navigation Systems are supported by same set of ITS standards previously mentioned
  - GTFS
  - GTFS-realtime
  - SIRI
  - TMDD
- Wearable Technologies
  - ISO developing standards for haptic and tactile interactions

Focused Application Areas

Smart Wayfinding & Navigation Systems-Standards

- Wearable Technology Standard
  - ISO developing a set of standards relating to tactile and haptic interactions (ISO 9241-9xx)
  - Ergonomics of human-system interaction — Part 910: Framework for tactile and haptic interaction
  - Only published standard contains
    - Terms
    - Interactions
    - Devices

Smart Wayfinding & Navigation Systems-Standards

- Wayfindr Standard
    - Open standard for digital wayfinding on mobile devices through audio-based navigation
    - Developed by not-for-profit venture of ustwo and RLSB
    - Standard contains
        - Design principles
        - Guidelines for navigation instructions
        - Technology best practices
        - Wayfindr demo mobile app

SUPPLEMENT

Focused Application Areas

Shared Use, Automation and Robotics

- Assistive and collaborative robotics to enhance mobility

- Ability to plan and execute trips, associated services

- Transformative transportation alternatives

Source:USDOT

Source:Google

Source:USDOT

Focused Application Areas

Shared Use, Automation and Robotics-Standards

- Application of Autonomous Vehicles to Transit
  - Address first/last mile
  - Application in controlled areas

Personal Mobility
A small, driverless vehicle operates on dedicated paths to transport passengers to their destinations. The passenger provides destination input, but does not control the vehicle at any time during the trip.

Automated Campus Vehicle

USDOT

PICK UP

Focused Application Areas

Shared Use, Automation and Robotics-Standards

- **Automated** (vs Autonomous) Vehicles
  - Automation is a continuum of advances
  - Autonomous is the end state where vehicle is "self-driving"
  - DSRC **Connected Vehicle** Standards (SAE J2735 and J2945) apply for **data into and out of the vehicle**
  - Many other activities underway, but not completed yet
    - IEEE P2040 - Standard for Connected, Automated and Intelligent Vehicles: Overview and Architecture
    - SAE On-Road Automated Vehicle Systems (ORAV)
    - FHWA Automated Vehicle Research Program

SUPPLEMENT

Focused Application Areas

Dedicated Short Range Communications (DSRC)

On-Board Unit (OBU):

- Broadcasts a set of "basic" data such as vehicle location, speed, and direction of travel; AND/OR

- Receives data from other vehicles or the infrastructure

RoadSide Unit (RSU):

- Receives a set of "basic" data from an OBE on vehicles; AND/OR

- Broadcasts information to vehicles or other mobile devices

Source:USDOT
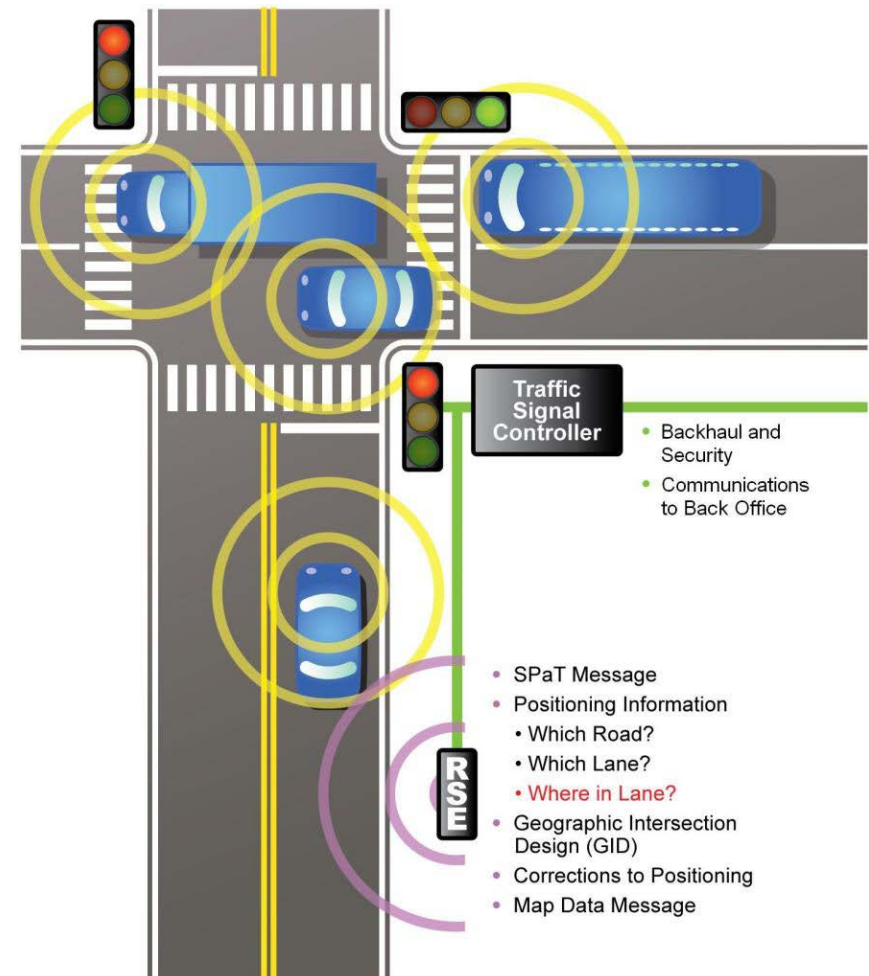
Focused Application Areas

Connected Vehicle Standard: SAE J2735 DSRC Message Set Dictionary

- Developed and published by the Society of Automotive Engineers

- Defines messages and data elements for connected devices
  - Vehicle to Vehicle (V2V)-
    - Basic Safety Message
  - Vehicle to Infrastructure (V2I)
    - Signal Phase and Timing (SPaT)
    - Traveler Information Message (TIM)

Focused Application Areas

Connected Vehicle Standard: SAE J2945 DSRC Minimum Performance Requirements

- Series of standards being developed to define performance requirements for different messages defined in SAE J2735
  - J2945/0 will define common requirements for DSRC
  - J2945/1 Performance Requirements for V2V Safety Applications
  - J2945/6 Performance Requirements for Cooperative Adaptive Cruise Control and Platooning
  - J2945/9 Performance Requirements for Safety Communications to Vulnerable Road Users

Focused Application Areas

Safe Intersection Crossing

- **Intersection crossing assistance** for all travelers

- Pedestrians interface with traffic signals, vehicles and nomadic devices

- Guidance, notifications and alerts

Focused Application Areas

Safe Intersection Crossing-Standards

- Connected Vehicle and Mobile Device Standards
  - DSRC Standards currently focus on vehicles
    - SAE J2735/ SAE J2945
  - DSRC committee currently extending standards for mobile device interfaces (J2945/9)

- Connected Intersections
  - NTCIP Standards being updated to address

Focused Application Areas

Safe Intersection Crossing Standards: NTCIP 1202

- National Transportation Communications for ITS Protocol (NTCIP)
  - Series of standards addressing primarily field device interfaces
  - Created and maintained by AASHTO, ITE, and NEMA
- NTCIP 1202- Object Definitions for Actuated Signal Controllers (ASC)
  - Being updated to address connected intersections

Focused Application Areas

The Road Ahead

- Prototyping of Application Areas
  - FHWA/FTA BAA
    - Addresses three application areas
  - HHS National Institute on Disability, Independent Living, and Rehabilitation Research (NIDILRR)
    - Addresses automation and robotics to enhance accessible transportation
- Integrated Demonstrations and Pilots

Focused Application Areas

The Road Ahead

- Additional Implementation Issues
    - Integration into Planning Process
    - Include in strategies to improve mobility
    - New/ expanded standards to support implementation

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Question

Which of the following standards, relevant to ATTRI is NOT a formal standard?

Answer Choices

- ⦿ A) Google GTFS

- ○ B) APTA TCIP

- ○ C) CEN SIRI

- ○ D) SAE J2735

Correct - Click anywhe[...] press Control Y to con[...]

Incorrect - Click anywhere or

Your answer:

You did not answer this

The correct answer is:

You must answer the question before continuing

Submit   Clear

Review of Answers

a) Google GTFS

Correct! While GTFS is often considered the de facto standard for transit, it does not undergo a formal standardization process.

b) APTA TCIP

Incorrect. APTA TCIP undergoes a formal standardization process.

c) CEN SIRI

Incorrect. CEN SIRI undergoes a formal standardization process.

d) SAE J2735

Incorrect. SAE J2735 undergoes a formal standardization process.

Module Summary

What We Learned about ATTRI

1. It is a multiyear effort to identify solutions to solve **door-to-door accessible transportation** issues for **persons with disabilities**.

2. Defined 5 technology areas

3. Which, based on user inputs, has been used to define 4 application areas that will be prototyped

Thank you for completing this module.

Feedback

Please use the Feedback link below to provide us with your thoughts and comments about the value of the training.

Thank you!

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