



ACCESSIBLE TRANSPORTATION TECHNOLOGIES  
RESEARCH INITIATIVE

# Accessible Transportation Technologies Research Initiative (ATTRI)

Applications Workshop

May 18-19, 2015



# Today's Moderator



## Deborah Curtis

Highway Research Engineer, Office of Operations  
Research and Development  
U.S. Department of Transportation  
Federal Highway Administration



# Welcome & Introduction



**Bryna Helfer**  
*Office of the Secretary of Transportation*  
Director of Public Engagement



**Mohammed Yousuf**  
*FHWA*  
*ATTRI Program Manager*



## **Bryna Helfer**

Deputy Assistant Secretary for Public Engagement, U.S. Department of Transportation, Office of the Secretary

- Why we are here and where we are going!
- “Ladders of Opportunity” and Beyond Traffic 2045



## **Mohammed Yousuf**

ATTRI Program Manager, Office of  
Operations and Research  
Development, Federal Highway  
Administration

- Who is in the audience?
- Workshop Agenda Overview,  
Goals & Outcomes

# Plato Proverb

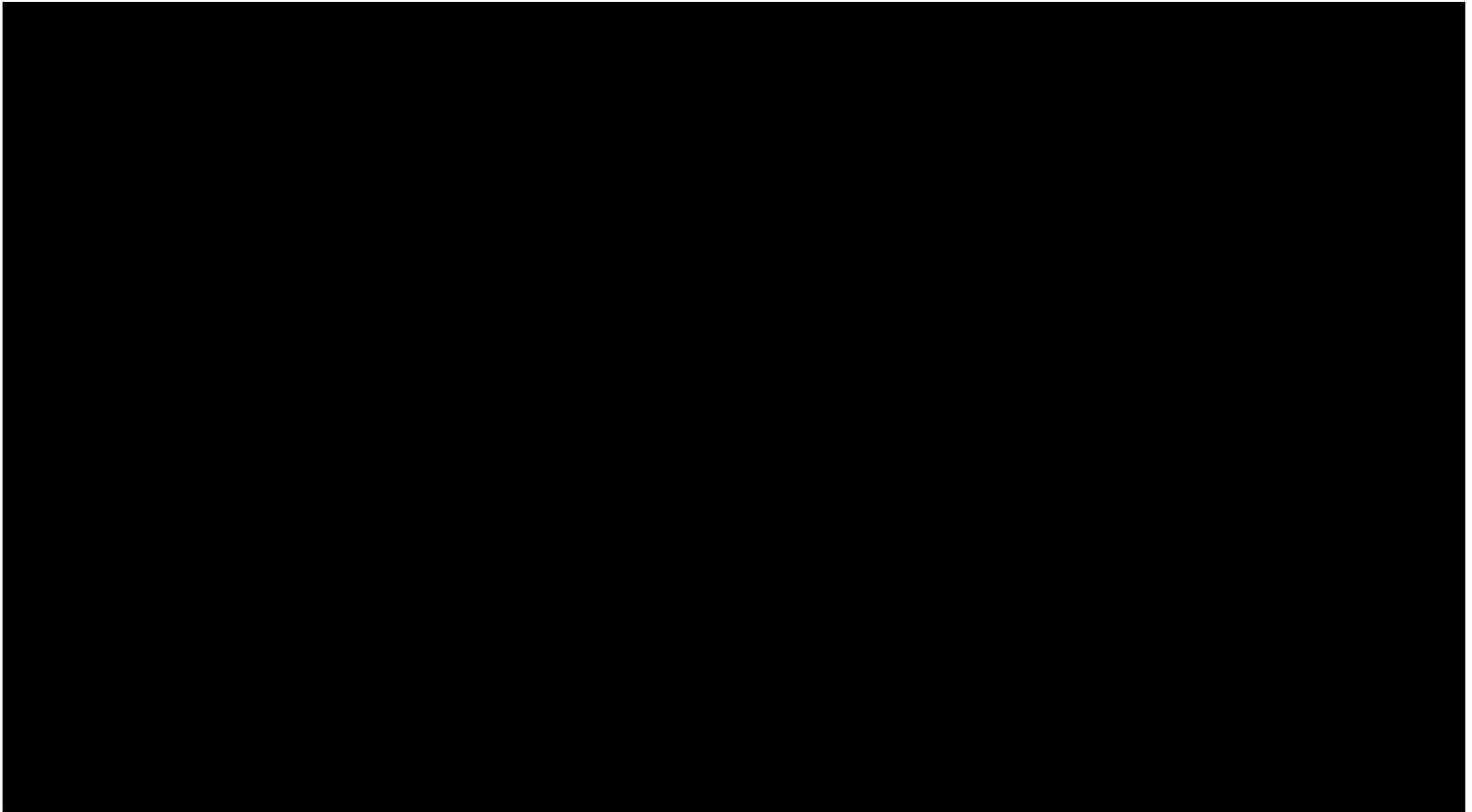
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Necessity is the mother of Invention!

# Stacy Zoern, Kenguru

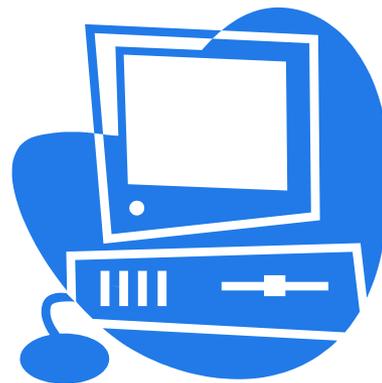
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[https://www.youtube.com/watch?t=51&v=2s\\_QDH8jYyk](https://www.youtube.com/watch?t=51&v=2s_QDH8jYyk)



# Needs of travelers with Disabilities



# Introduction to ATTRI

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- Understand user needs of travelers with disabilities to improve personal mobility
- Build collaboration with stakeholders to design integrated applications addressing diverse needs
- Pursue accessible and multi-modal transportation technology solutions
- Develop applications using universal design principles to ensure benefit to all travelers



# Search for Applications

User  
Needs

Tech  
Scan

RFI



Applications  
Workshop



**ATTRI  
Application  
IDEAS**

# Together, we can get there!

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- Technologists
- Researchers
- Disability Advocates
- Users
- Government Officials
- Contractors and Support Staff

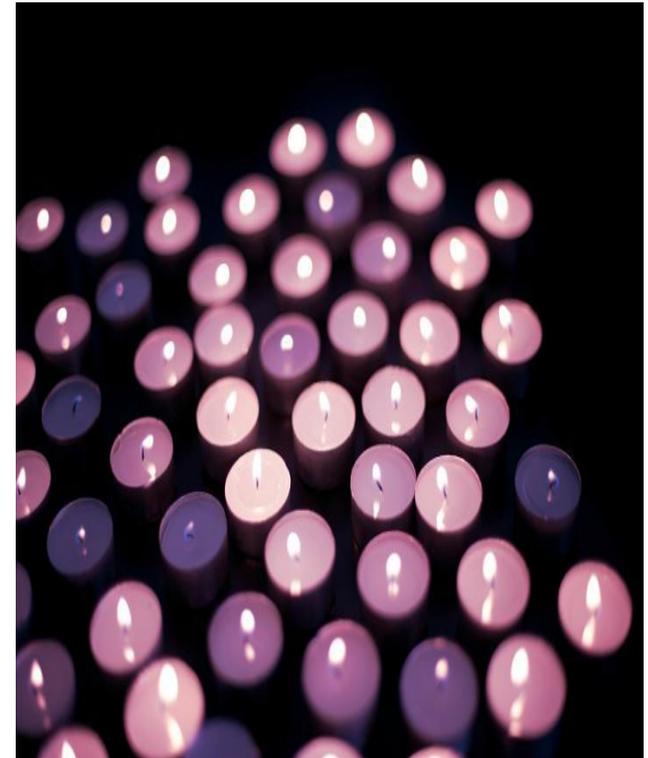
# Goals & Outcomes

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- Engage stakeholders
- Identify and document new technology application concepts
- Discuss and refine application ideas
- Build consensus on promising technology solutions
- Prioritize ideas based on needs and feasibility

# Ross Silvers

“It was a pleasure learning from you and the others in attendance about this exciting field, and as a fellow individual with far less than perfect eyesight, I look forward to the day when I can help my wife with driving the kids to all of their activities”



# Simple, Innovative, Inclusive.

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# Workshop Agenda

Time	Session
8:30 a.m.	Welcome and Introductions
9:15 a.m.	Opening Remarks
10:00 a.m.	ATTRI Program Overview & Status Update
10:30 a.m.	Break (15 minutes)
10:45 a.m.	ATTRI Challenges, Opportunities and User Needs
11:15 a.m.	ATTRI Technology Areas of Focus & Technology Scan
12:15 p.m.	LUNCH
1:30 p.m.	Review of ATTRI RFI Submissions
2:00 p.m.	Breakout Session Introduction
2:15 p.m.	Break (15 minutes)
2:30 p.m.	Breakout Sessions
4:00 p.m.	Report out



# Opening Remarks



**Michael Trentacoste**  
*Associate Administrator for  
Research, Development, and  
Technology  
Director of Turner-Fairbank  
Highway Research Center  
(TFHRC)*



**Vincent Valdes**  
*Associate Administrator  
for Research,  
Demonstration and  
Innovation, Federal  
Transit Administration  
(FTA)*



**Ken Leonard**  
*Director of the Intelligent  
Transportation Systems  
(ITS) Joint Program  
Office (JPO), USDOT*



**John Tschida**  
*Director, National Institute  
on Disability, Independent  
Living, and Rehabilitation  
Research (NIDILRR)*



## **Michael Trentacoste**

Associate Administrator for Research,  
Development, and Technology

Director of Turner-Fairbank Highway  
Research Center (TFHRC)



## **Vincent Valdes**

Associate Administrator for Research,  
Demonstration and Innovation, Federal  
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Director of the Intelligent  
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## **John Tschida**

Director, National Institute on  
Disability, Independent Living, and  
Rehabilitation Research (NIDILRR)

# ATTRI Program Overview & Status Update



**Bob Sheehan**

*ITS JPO*

Program Manager, Multimodal ITS



# Accessible Transportation Technologies Research Initiative (ATTRI)

- A U.S. DOT multimodal multi-agency research and development effort
  - Co-led by FHWA, FTA
  - Supported by ITS JPO, and NIDILRR
- Accessibility benefits that would extend to all travelers
- Building strong partnerships with U.S. and international research communities
- Seeking a national initiative across a broad spectrum of partners



# The Challenge



Persons with Disabilities

- Account for 56.7 million or 19% U.S. population [US Census]
- Unemployment Rate: 11.7% (5.5%) [2015 Bureau of Labor Statistics]
- Poverty: 28.4% (12.4%) [2013 Income and Poverty report]



Veterans with Disabilities

- 21.8 million Americans are Veterans [US Census]
- 3.5 million Veterans have a Service-Connected Disability [VA.gov]
- Number of veterans with disabilities is increasing [VA.gov]



Older Adults

- 43.1 million age 65 + or 1 in 7 people [2013 Administration on Aging Statistics]
- Disability rates rise as people get older [National Institute of Health]
- Expected to reach 72.1 million by 2030 [2013 Administration on Aging Statistics]

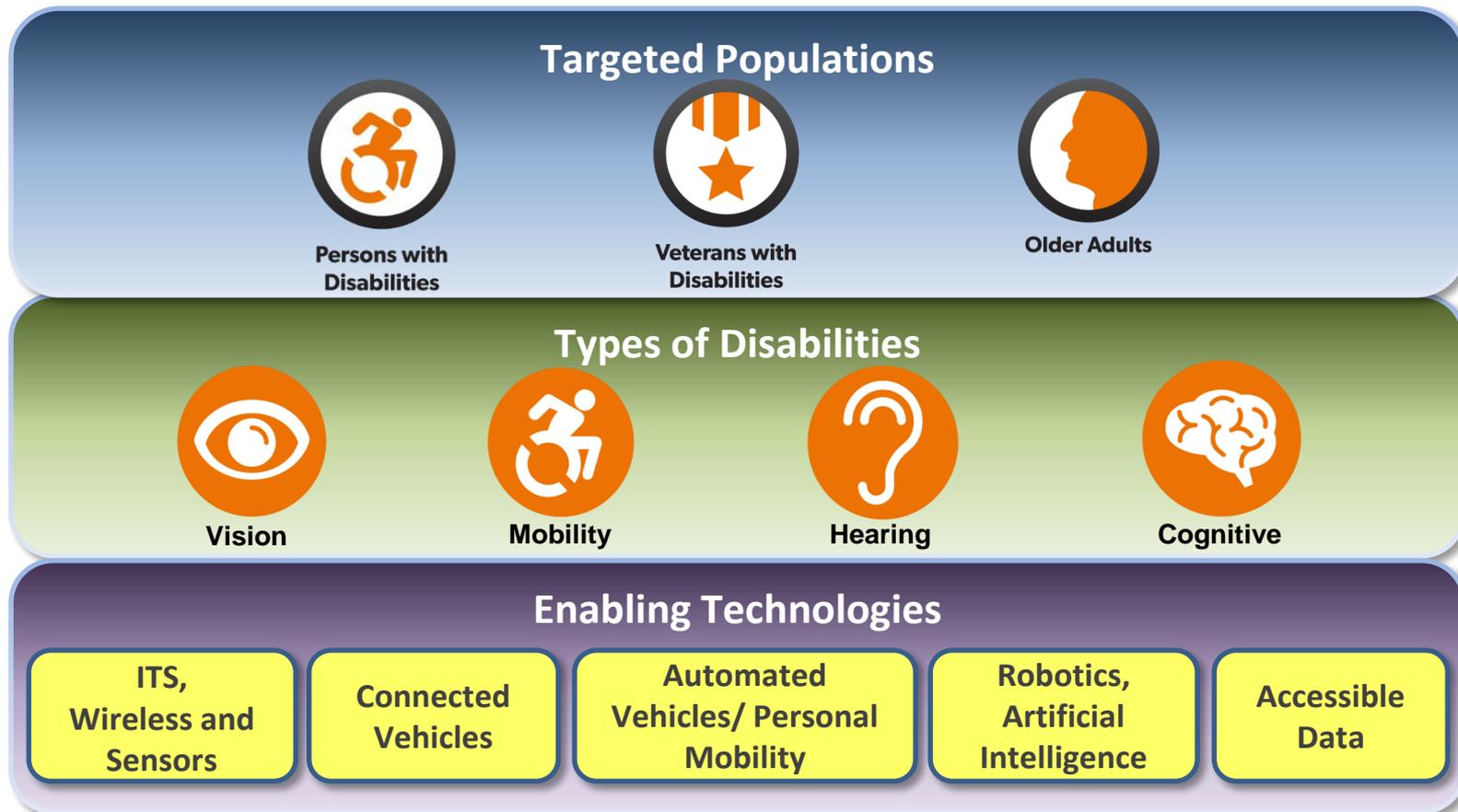
# ATTRI Vision

*To enhance the mobility of travelers with disabilities by providing the capability to reliably, safely and independently plan and execute their travel. ATTRI identifies, coordinates, develops, and implements new integrated solutions in advancing such capabilities.*



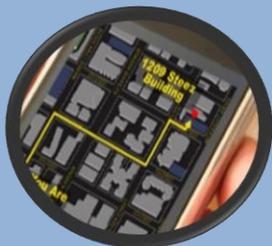
Image Source: Thinkstock/Bing Creative Commons

# ATTRI Focus



# ATTRI Technology Research 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



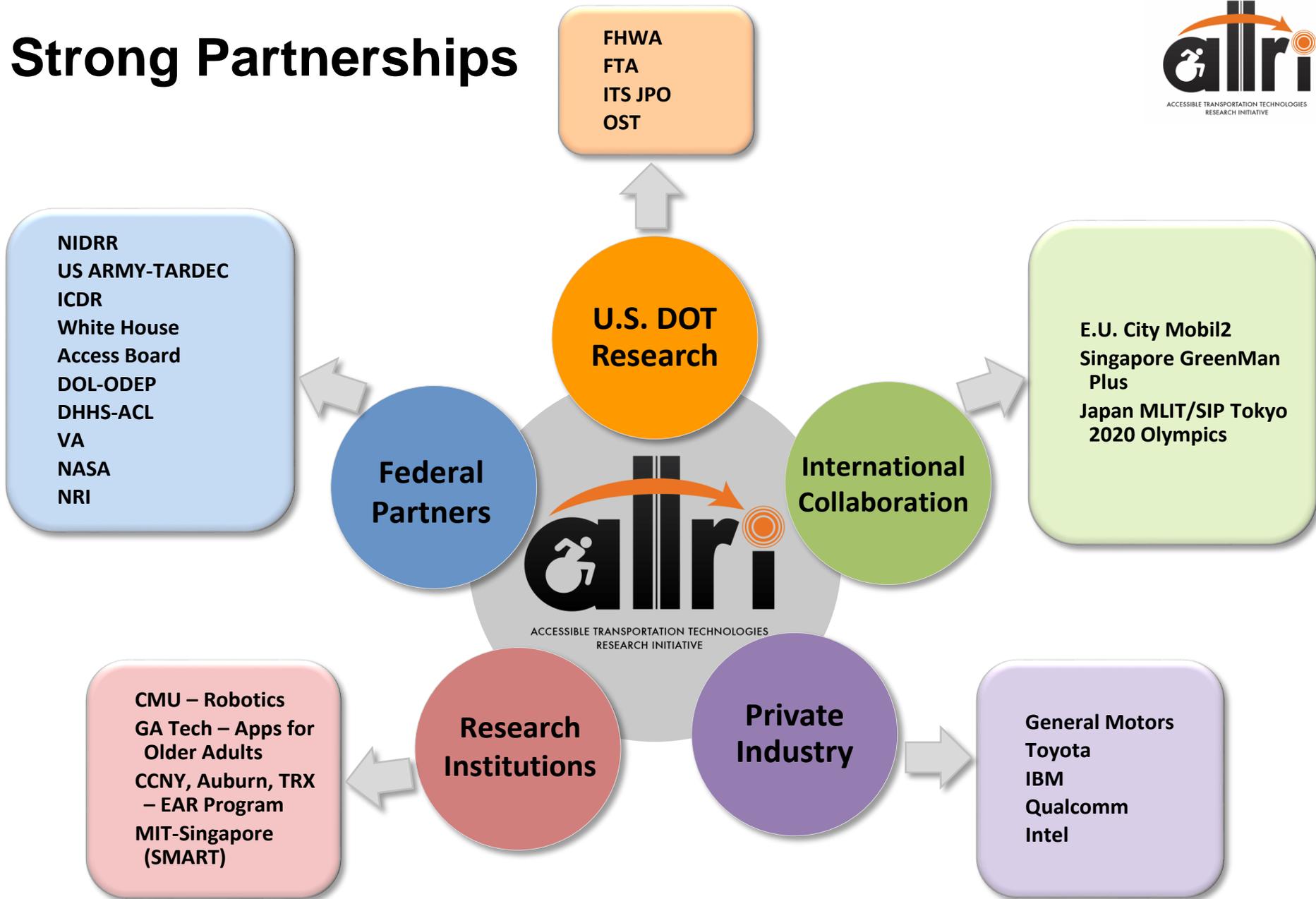
- Real-time multimodal trip planning & services
- Inclusive one-fare payment application for all travelers
- Paratransit to Fixed-route

# Collaboration – Path to Success

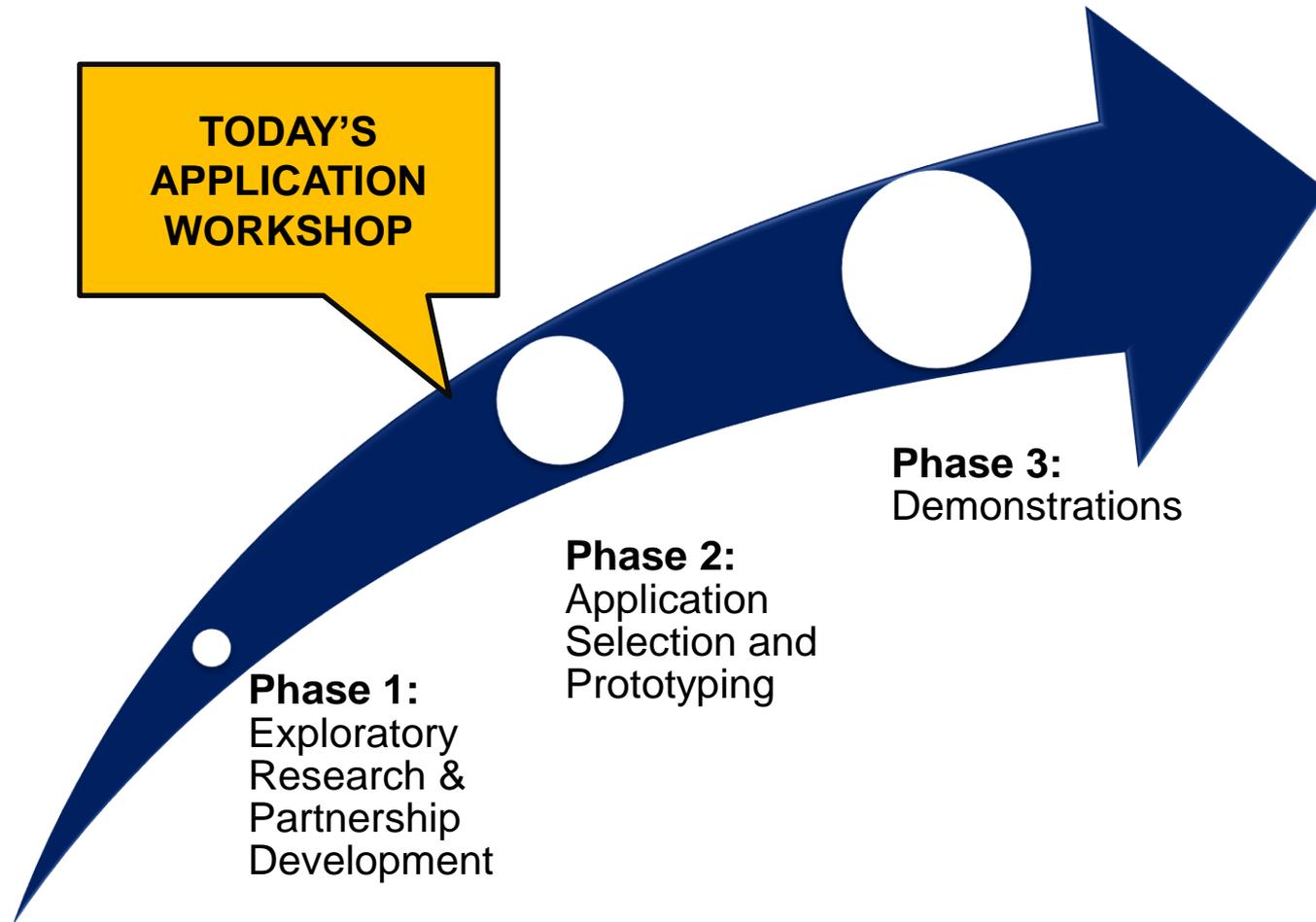
- Transportation is a complex challenge that affects all aspects of life, including health, education, recreation, and social and economic activities
- There is a need for multi-agency cooperation and coordination leveraging resources to address these challenges in a comprehensive way
- ATTRI is expanding beyond a single-agency approach to help solve mobility challenges of travelers including those with disabilities



# Strong Partnerships



# ATTRI Program Trajectory



*ATTRI is addressing a significant transportation problem in a comprehensive way*



# Accomplishments

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- Accomplishments
  - Developed Strategic Plan, Program Plan and Roadmap
  - Stakeholder partnerships with NIDILRR, ARIBO & other Federal partners
  - Engaged international, private industry, research and the disability community partners
  - Outreach through listening sessions and workshops (30+ events)
  - Identifying user needs through literature review, online dialogues, webinars and workshops
- Currently Executing
  - Stakeholder Engagement and User Needs Task
  - SOP and Innovation Scan Task
  - ATTRI Application Identification

# Future Plans & Activities

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- Upcoming Tasks:
  - Institutional & Policy Issues Assessment (*proposal selection*)
  - International Research Coordination (*RFP released*)
  - ATTRI Social-Economic Impact
  - Standards Development & Harmonization
  - Interaction and Effects of ATTRI Applications on the Non-user
  - Concept of Operations & System Requirements
- Events & Outreach
  - ATTRI/ICDR Roundtable on Collaboration Opportunities – Summer 2015
  - ATTRI Applications Announcement – Summer / Fall 2015
  - ITS American Annual Meeting Panel Session – Pittsburgh, PA, May 2015
  - CTAA Expo ATTRI Session – Tampa, FL, June 2015
- ADA 25th Anniversary Multi-Agency Challenge:
  - Tentative challenge on data integration technologies – Summer 2015

# Break

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# ATTRI Challenges, Opportunities, and User Needs



## **Bryna Helfer, Ed.D.**

*Office of the Secretary of Transportation*  
Deputy Assistant Secretary for Public  
Engagement



# Understanding Travel Needs



**People with Disabilities**

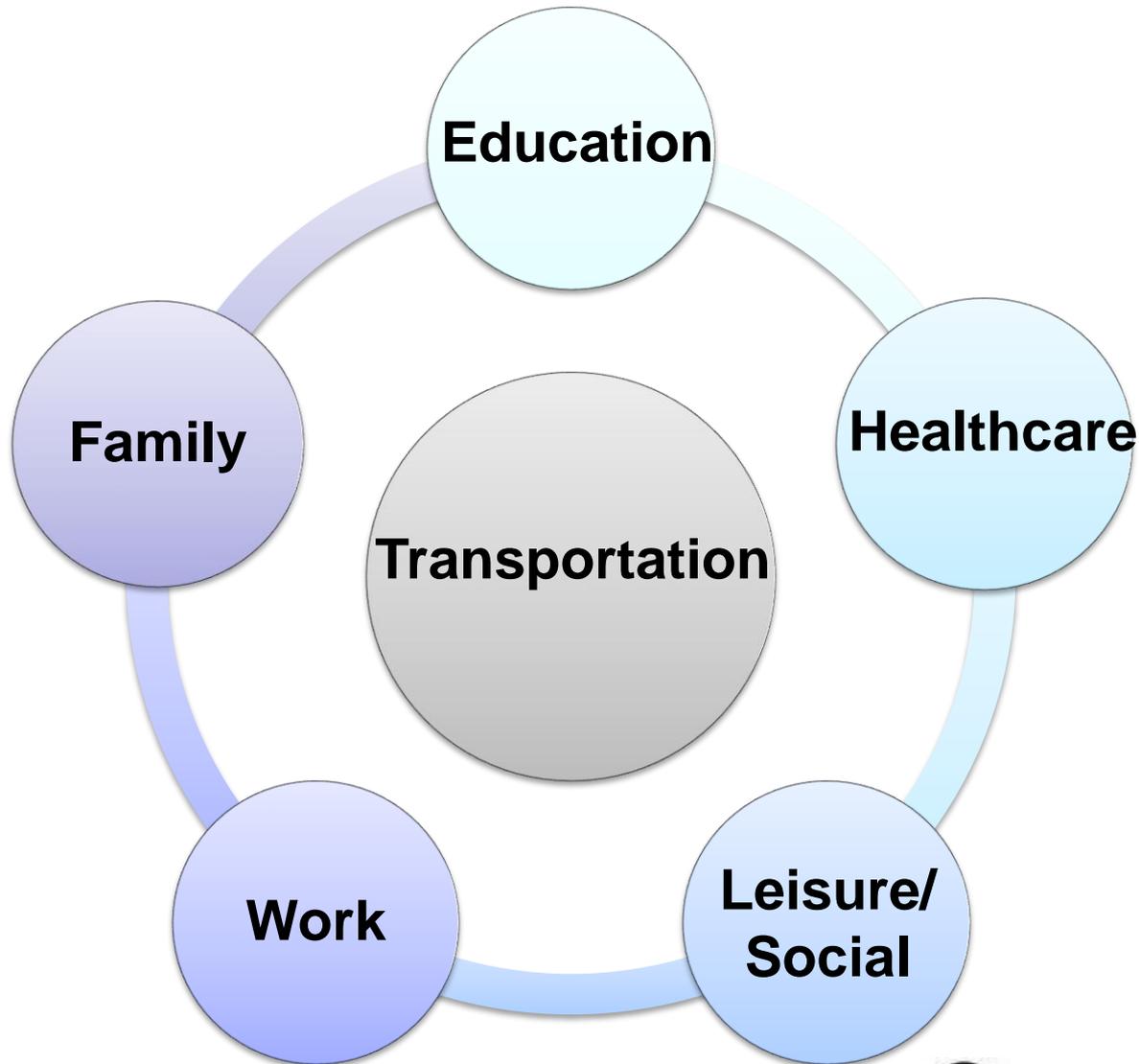


**Older Adults**



**Veterans with Disabilities**

# The Role of Transportation



# Independent Mobility



**Vision**



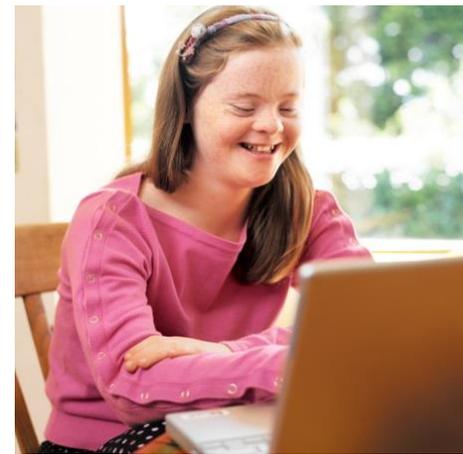
**Mobility**



**Hearing**



**Cognition**



# Webinar and Workshop Participation

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- Successful Webinar Outreach - Over 700 people participated in three webinars:
  - ***Understanding the Travel Needs of People with Disabilities***, March 3, 2015 (200 + attendees)
  - ***Understanding the Travel Needs of Older Adults***, March 24, 2015 (300+ attendees)
  - ***Understanding the Travel Needs of Veterans with Disabilities***, April 14, 2015 (200+ attendees)
- ATTRI User Needs Assessment Workshop (70+ attendees) Washington, DC, April 30, 2015

\* Recordings available on ATTRI website:

<http://its.dot.gov/attri/index.htm>



# ATTRI Webinar Series Purpose and Goal

Gain input from **travelers** on transportation **needs** and mobility **challenges**



# ATTRI Stakeholder Engagement and User Needs Assessment

## Purpose:

**Gain input from users on transportation needs and mobility challenges**

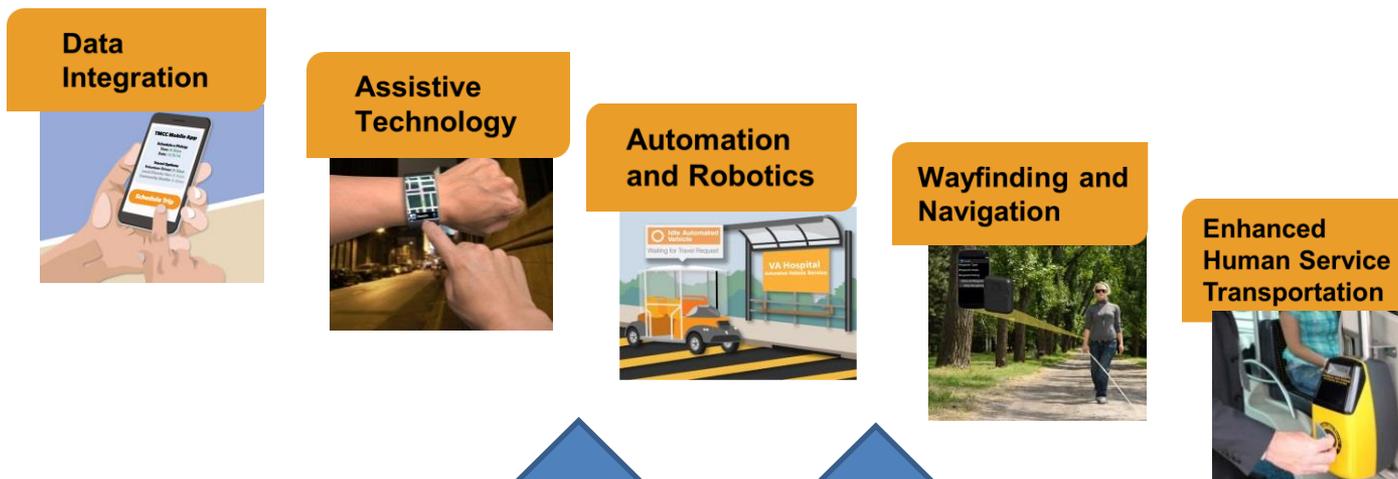
## Desired Outcome:

Link **needs** to **technology**

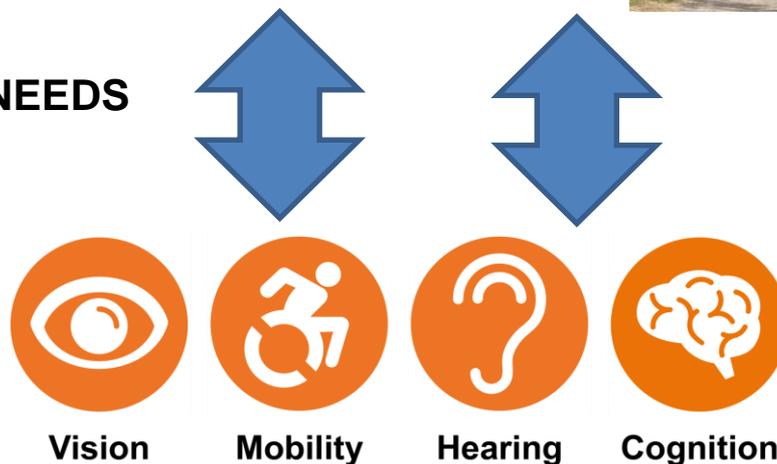


# Workshop Desired Outcome

Map the five ATTRI target **technology** areas to the identified traveler **needs**



OF FOUR DISABILITY NEEDS CATEGORIES



# Identified Barriers

Top Eight Barriers	Number of Responses
Lack or inaccessible signage / maps / landmark identifiers/ announcements	75
Navigation difficulties (do not know when arrive, transfer time, distance)	71
Inconsistent accessible pathway infrastructure	67
Lack of accessible service, facility information	58
Lack of available transportation (limited hours, vehicles, service area, etc.)	57
Weather	54
Limited or no accessible amenities (restrooms, benches, shelter, water fountains)	49
Unreliable transportation (fleet, equipment, on-time performance)	48



# Identified Needs

Top Ten User Needs	Number of Responses
Amenity information (e.g. restroom, shelter)	102
Real-time transportation information	88
Safety, security and emergency information	76
Traveler help line / customer service	61
Connected, continuous, accessible pathways	61
Transit schedule and other information	60
Destination information (hours, entrances, layout)	58
Mapping / directions	55
Roadway / pathway real-time conditions	55
Personal care attendant or other assistive / training services	54

# Identified Technology Issues

Issues with Technology	Percent of Total Responses
Training to use and awareness of new technology	46%
Affordability	21%
Performance quality (especially long-distance travel, rural areas)	16%
Accessibility to all disability types	7%
Integration and compatibility with existing technology	4%
Maintenance	4%
Confidentiality and theft	2%

# Overarching Themes

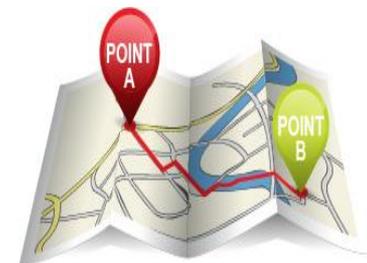
## ON DEMAND

- Travelers are seeking on-demand transportation when and where they need it



## TRIP PLANNING

- Travelers want better trip planning information
- Travelers are looking to crowd sourced data for transportation options
- Information must be accessible in multiple formats – audible, visual, and haptic
- People raised possible privacy concerns



# Overarching Themes

## INDEPENDENT MOBILITY

- Travel training for both users and transportation providers is essential for new technologies.
- Indoor and outdoor navigation apps that identify obstacles and street conditions are desired.
- It is important to build in point of corrections – “what to do when things change”
- Communication with the person’s caregiver or family member is essential for some individuals



# Overarching Themes

## DESIGN and STANDARDS

- Automation and robotics may serve as a bridge to connect travelers to more places and enhance independent travel.
- Consider the needs of pedestrians when designing ITS, Connected Vehicle, and Automation solutions.
- Engineers need to spend time in the shoes of people with disabilities and design with the individual in mind.
- Standards are important to assure the system operates the same way wherever you go.
- Cost is a major factor in adoption.



# Lessons Learned and Opportunities

- Users are passionate about making transportation accessible
- Understanding user needs leads to better transportation solutions
- Applications are to be designed using universal design principles to ensure benefit to all travelers
- Opportunity to build on collaboration with stakeholders to design integrated applications addressing diverse needs



# Discussion

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# Accessible Transportation Technologies Research Initiative (ATTRI)



**Mohammed Yousuf**

*FHWA*

ATTRI Program Manager



# Accessible Transportation Technologies Research Initiative (ATTRI)



**Mohammed Yousuf**

*FHWA*

ATTRI Program Manager



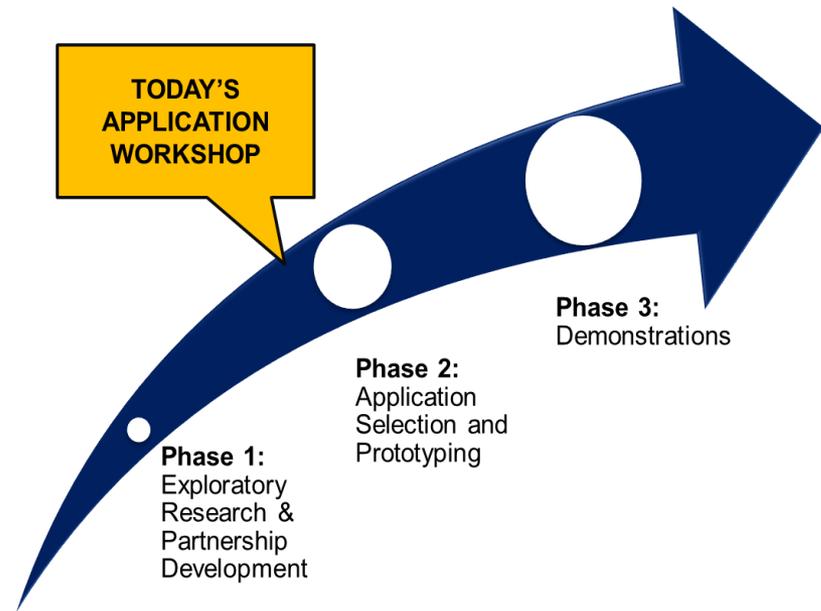
# ATTRI Genesis

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- The notion that the diverse needs of travelers with disabilities requires a diverse set of technology solutions
- The belief that diverse solutions are present outside the realm of Intelligent Transportation Systems (ITS) and general transportation technology and they must be discovered
- The possibility that research and results pursued through other distinct Federal agencies can be leveraged to produce results
- The hope that new and emerging technologies promise innovative accessibility benefits, personal mobility options, and added convenience for all travelers

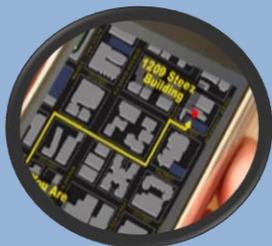
# ATTRI Development Process

- Strategic Plan, Program Plan and Roadmap development
- Stakeholder engagement efforts
  - Online dialogues
  - User needs assessment
  - Listening sessions
  - Webinars
  - Workshops
  - Partnership development
- Technology Scan Task
- Request for Information (RFI)
- Application Selection Workshop
- Phase 2 Implementation
- Demonstration of integrated applications



# ATTRI Technology Research 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

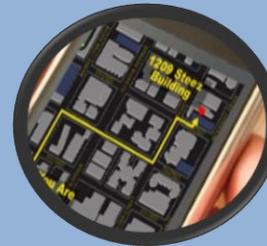


- Real-time multimodal trip planning & services
- Inclusive one-fare payment application for all travelers
- Paratransit to Fixed-route

# Wayfinding & Navigation

- Exploration and development of situational awareness and assistive navigation solutions.
- These solutions assist with waypoint navigation, path planning, and advanced warning of events.
- These applications can recognize and detect stationary objects, read and recognize important text and signage, and detect, track, and represent moving objects and dynamic changes to a traveler's environment.
- Wearable sensors, such as three-dimensional orientation devices, and pedometers, may be used in conjunction with a display unit

## Wayfinding & Navigation Solutions



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

# ITS & Assistive Technologies

- Broad range of wireless and sensor-based communications and information technology employed in ITS and traditional accessible, assistive, and adaptive devices.
- Technologies will help track the user's movements, infer map information, and discover key sensor signatures to create routes.
- Integrate with vehicles, infrastructure, and pedestrians using Dedicated Short Range Communication (DSRC) or other communication technologies.
- This area will also explore other emerging technologies within the connected vehicles, connected automation, and connected cities initiatives.

## ITS & Assistive Technologies



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

# Automation & Robotics

- Goal is to improve mobility for those unable or unwilling to drive and enhance independent and spontaneous travel capabilities.
- Solve first mile/last mile mobility issues and connections for all travelers to existing public transportation.
- Collaborative robots that not only assist with activities of daily life such as walking, but also work with individual travelers and human transportation services to provide related concierge services.
- Machine vision, Artificial Intelligence, assistive robots (potentially partially humanized), and facial recognition software.

**Automation & Robotics**



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

# Data Integration

- Solutions that enable the integration and interoperability of data and information systems to create new accessible transportation applications and data standards.
- Two main areas of focus:
  - In-depth accessibility information, in a variety of formats, about points of interest (POIs), infrastructure, facility amenities, and potential obstacles, integrated with maps.
  - Travelers providing specific information to build a standardized user profile with accessibility needs that allows for location based services
- Applications can be developed to alert relevant service providers in advance of a user's trip requiring special accommodations.



## Data Integration

- Accessibility data and information systems
- Interoperability and data needs

# Enhanced Human Service Transportation

- Real-time, multimodal trip and services planning and traveler decision support applications for accessible transportation solutions.
  - Pre-trip planning and information that integrates multi-modal options.
- Integrated payment systems where travelers can use the same smart card or mobile app to pay for various types of transportation, mobility options, and parking.
- Linking paratransit, demand-response transportation, and fixed-route transit in order to increase flexibility and options of travelers with disabilities.

**Enhanced Human Services Transportation**



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

# Lessons Learned & Opportunities

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- To meet the diverse needs of travelers with disabilities more than one application is needed
- Synergies exist between technology areas
- Applications will have to be integrated or bundled to provide total transportation experience
- Need for testing applications in all technology areas
- Applications may be within a technology area or across multiple technology areas
- Universal design principles in designing and developing applications must be utilized to ensure benefit to all travelers

# The ATTRI Vision



*Integrated solutions to enhance the mobility of all travelers*

# ATTRI Technology Scan & Partnership

- U.S. DOT and Federal Highway Administration entered into an Interagency Agreement (IAA) with the Department of Health and Human Services
- National Institute on Disability, Independent Living, and Rehabilitation Research (NIDILRR) leads scan task
  - State of the Practice
  - Innovation
  - Assessment of Relevant Research



# Technology Scans



**Ken Wood**

*NIDILRR*

Program Specialist and Manager,  
Switzer Research Fellowship Program

# ATTRI Technology Scan

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- ATTRI Technology scans seek to determine the state of the practice, innovations, and research in accessible transportation or related fields.
  - Creating knowledge base for phase 2 of ATTRI
- Joint project in coordination with National Institute on Disability, Independent Living, and Rehabilitation Research (NIDILRR) under US Department of Health and Human Services and Federal Highway Administration (FHWA)
  - NIDILRR Mission:
    - Generating new knowledge and promoting its effective use in improving the ability of persons with disabilities to perform activities of their choice in the community, and
    - Expanding society's capacity to provide full opportunities and accommodations for its citizens with disabilities.
- Research being conducted by Carnegie Mellon and Rehabilitation Engineering Research Center on Accessible Public Transportation (RERC-APT)

# State of the Practice Scan

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## Goal:

Identify current practices in accessible transportation, assistive technologies, applications and systems for travelers with disabilities

## ■ Example Technologies:

- Google Maps
- Accessible GPS
  - Portable Standalone Devices and Software Solutions
    - Talking menus, talking maps, integrated GPS information
    - Create and save routes and Points of Interest (POI)
- ParkPGH – integrated parking data across a city
  - Public and private garage occupancy
  - Location aware and integrated with cultural POIs

# State of the Practice Scan *cont.*

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- Coordinated Fare Systems across cities
  - Multi-modal fare payment (e.g., San Francisco Bay Clipper Card)
  - Support for other purchases through partnerships (e.g., some university ID cards, Korea T-Money)
  - Reduces confusion and effort from multiple cards
    - Multiple balances (Cognition)
    - Selecting (Fine motor control)
    - Determining which card (Vision)
- In-vehicle collision avoidance systems (e.g. blind spot warnings)
- Pedestrian warning systems
- Automated vehicle parking

# Innovation Scan

## Goal:

Identify other research or demonstrations currently being conducted which offer innovation in the field of transportation

### Technology Examples:

- AccessMyNYC - Web application with multimodal transportation options including public, private, and walking
  - Integrated points of interest – users can rate accessibility
  - Embedded accessibility details for transportation routes and points of interest
  - Personalization of the application for abilities and favorites.
- Tactile Kiosks - station maps in prominent locations of train stations
  - High contrast with integrated audio



Image Source: Carnegie Mellon University

# Innovation Scan *cont.*

- Novel Fare Gates
  - Low smartcard reader placement height
  - Wide gate with no barrier
- Microsoft 3D sound scape technology
  - Bluetooth beacons installed around a city
  - Beacons send information directly to bone-conducting headphones
  - Information can include directions, POI information, and other information relevant to the immediate area
- Tiramisu Transit
  - Crowdsource real-time accessibility data
  - Merges agency-supplied data with transit rider observations
  - Current and future travel
  - Universal design supports multiple disabilities

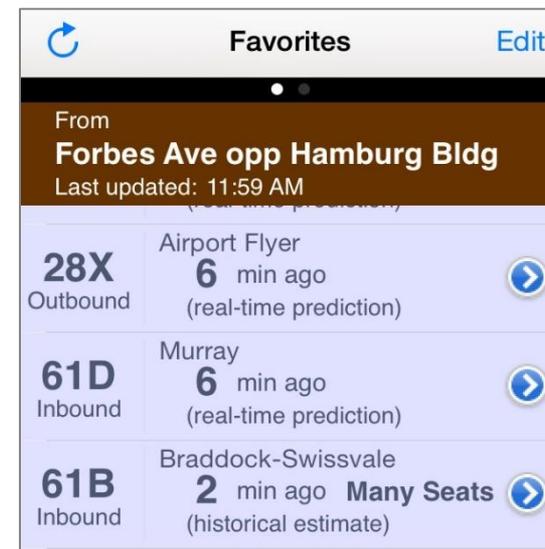


Image Source: Carnegie Mellon University

# Assessment of Relevant Research

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## Goal:

Gain a clear understanding of current relevant research and development activities in the area of accessible transportation and travelers with disabilities to determine how these might impact the development and eventual deployment of ATTRI

# Innovation & Research Examples



**Mohammed Yousuf**

*FHWA*

ATTRI Program Manager



# Wayfinding & Navigation

- FHWA Exploratory Advanced Research (EAR) projects
  - Extended Event Horizon Navigation and Wayfinding for Blind and Visually Impaired Pedestrians in Unstructured Environments
  - Intelligent Situation Awareness and Navigation Aid for Visually Impaired Persons
  - Navigation Guidance for People with Vision Impairment
- Simultaneous Localization and Mapping (SLAM) –
  - Constructing and updating maps of unknown environments while knowing your location within the environment.
- Driver and Vehicle interfaces for blind drivers/pedestrians
  - Converts visual information into other modes with tactile gloves or seat back vibrations

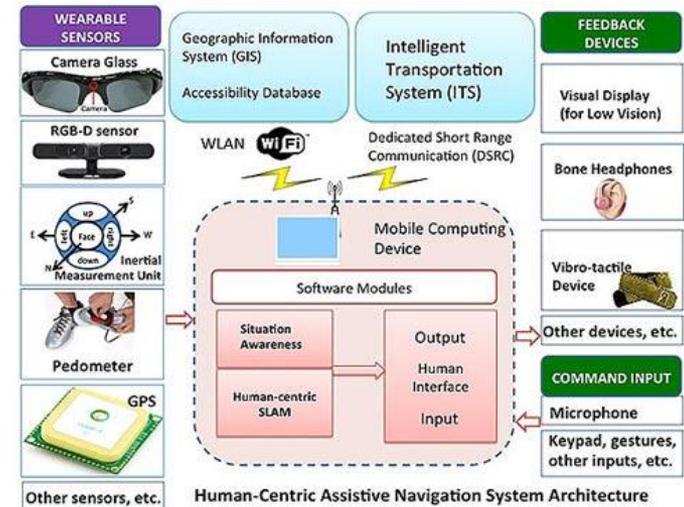


Image Source: FHWA

# ITS & Assistive Technologies

- Connected Vehicles
  - Smart alert status application
  - MMITSS DMA bundle
  
- Responsive Street Furniture
  - Persons with disabilities have a chip that contains information about their needs
  - Street light can brighten or dim based on need and proximity



Image Source: FHWA



Image Source: Marshalls

# Automation & Robotics

- Helper / Guide Robots

- Specialized location knowledge
- Greet at entry points
- Provide information and directions
- Can assist with retrieving and transporting items
- Value to multiple user groups



Image Source: Advanced Telecommunications Research Institute International (ATR)



Image Source: Carnegie Mellon University

- Autonomous Vehicles

- Allows non-drivers greater transportation options
- True curb-to-curb service with no concerns about parking spaces



Carnegie Mellon-GM autonomous Cadillac

# Automation & Robotics *cont.*

- Pedestrian Path Prediction
- Activity forecasting
  - Predict where pedestrians will travel
  - Learn from observation
  - Some techniques work with previously unobserved settings
- Useful for:
  - Anomaly detection (dangerous actions)
  - Finding good routes to take
  - Path planning around people
  - Collision warning



Source: Kitani, et al 2012

# Data Integration

## ■ Interoperability & Common Data Formats

- Atlanta Regional Council (ARC) is offering a new user platform enabling geospatial data discovery, accessibility data, exploration, and collaboration. Planning and coordinating with use of data integration is helping to improve the efficiency of limited transportation resources, reducing duplication of services and improving customer satisfaction.
- Access My City, an IBM platform is providing a smarter, more inclusive approach to mobile-enabled route planning. The technology brings together real-time transit data, geo-location and mapping technologies and publicly available accessibility information and delivers it to a range of mobile devices to help city residents and visitors



Image Source: IBM

# Enhanced Human Service Transportation



- ACCESS 2 ALL (Mobility Schemes Ensuring Accessibility of Public Transport for All Users)
  - Encourages key players in the public transport (PT) sector within the project target group to adopt innovative technological concepts and mobility schemes that enable high quality mobility and transportation services for all,
  - Provides personnel with the necessary knowledge on the particularities of specific user groups, such as seniors and persons with disabilities, information and communication technology



# Lunch

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# ATTRI Request for Information (RFI) Summary Review



**Mohammed Yousuf**

*FHWA*

ATTRI Program Manager

# ATTRI Request for Information (RFI)

- FHWA published RFI to gain additional insight on technology applications in the realm of accessible transportation
- Published to [www.FedBizOpps.gov](http://www.FedBizOpps.gov) on February 19, 2015
- Response deadline of March 19, 2015
- Seeking responses solely for planning purposes
- RFI does not commit Government to future contract actions



# ATTRI RFI - Purpose

- Obtain informed views from researchers, technologists, citizens...
- Document opportunities and challenges to technology development
- Engage industry on accessible technology development and infrastructure:
  - Research
  - Deployment
  - Operation
  - Use



# ATTRI RFI – Documentation

- Gathering information on potential technology applications that will:
  - Enable greater multimodal access in the transportation system
  - Promote independent living and the mobility of travelers with disabilities.
  - Improve the overall travel experience of all users



# ATTRI RFI - Results

- Approximately 25 respondents
- Other ideas and responses being considered
- ATTRI User Needs webinars and workshops generated additional input
- Respondents included:
  - Research institutions
  - Private organizations
  - Universities
  - Individual citizens



# ATTRI RFI Technology Themes

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- RFI responses included various reoccurring themes which provided technology solutions in various forms
- Examples of technology themes include:
  - Mobile / real-time applications
  - Common data / interoperable data platforms
  - Web-enabling technologies and access
  - Automated Transit Networks (ATN)
  - Mobile Neighborhood Navigator
  - Mechanical devices
  - Assistive technologies
  - Trip planning and guidance applications

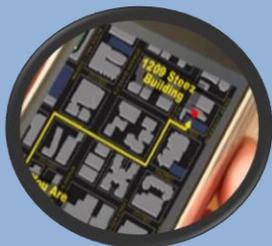
# ATTRI RFI – Category Responses

Category – ATTRI Technology Focus Areas	Number of Responses
Wayfinding & Navigation	9
Automation & Robotics	4
Enhanced Human Service Transportation	9
ITS and Assistive Technologies	7
Data Integration	11

- RFI respondents referenced multiple technology focus areas in their responses
- Various degrees of technology overlaps in presented solutions or concepts

# ATTRI Technology Research 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

# RFI Wayfinding & Navigation Responses

- Neighborhood Navigators
  - pre-trip and in-route traveler information
  - accessible infrastructure information
- Navigation Systems
  - Smartphone-based navigation systems
  - Provide accessible route information in real-time
- Wearable Technologies
  - Motion sensors
  - Wireless communication integrated with smart transportation technologies.



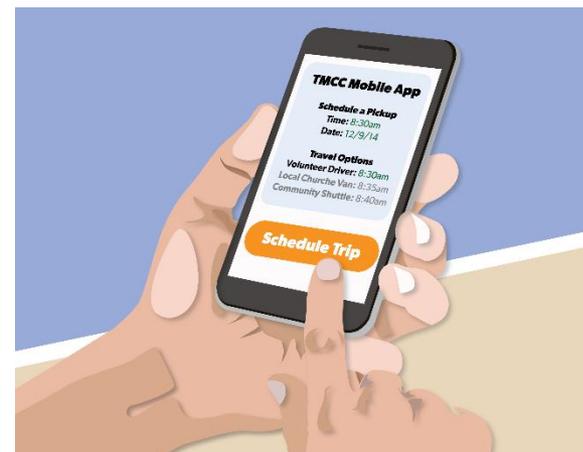
# RFI Automation & Robotics Responses



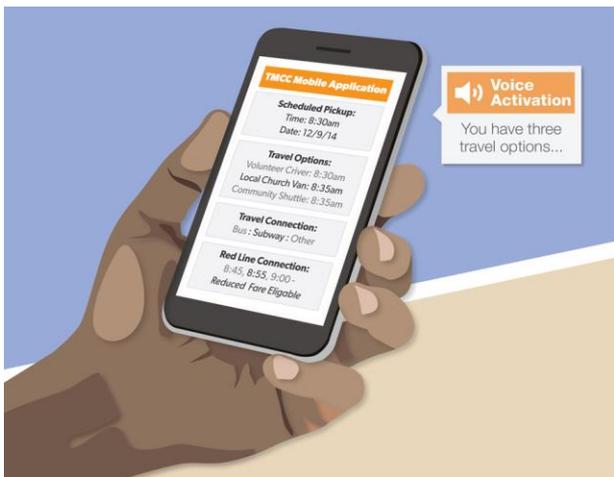
- Automated Transit Networks (ATN)
  - Automated systems running on guideways (virtual or physical)
  - Demand response environments
- Personalized Vehicles
  - Off-highway, low-speed, electric vehicles
  - Used on existing infrastructures throughout campuses, resorts, or to transit nodes
- Shared Autonomous Vehicles (SAV)
  - Provide first-mile/last-mile links to existing systems
  - Addresses door-to-door travel needs for those unable to drive

# RFI Enhanced HST Responses

- Ride Sharing Applications
  - Provide ride matching for optimization
  - Data standardization and real-time scheduling aid personal mobility
- Multimodal Trip-planning Technologies
  - Increased accessibility by enabling users to quickly and easily identify trip options
  - Demand-responsive transit (DRT), providing new mobility services and user options



# RFI ITS & Assistive Technologies Responses



- Demand-Response Transportation Services
  - Real-time, dynamic mobility rooted in shared-data
  - Leverages existing ITS solutions.
  
- Smartphone Applications
  - Empower individuals to manage their own needs
  - “Gamification” could provide encouragement and guidance along trips.

# RFI Data Integration Responses

- Common Data / Open Data Platforms
  - Data standards demand-response trips
  - Real-time data exchanges and clearinghouses for unmet trips
- Expand General Transit Feed Specifications (GTFS)
  - Demand response data specifications
  - Merging schedule, real-time AVL data, and crowdsourced information



# ATTRI RFI - Takeaways

- Technologies areas rely on one another for success
- Proposed technology solution can benefit multiple user groups
- Technology solutions vary greatly in size, scope, and complexity
- More foundational research is necessary to advance some proposed solutions
- Integrated technology solutions are necessary to match the diverse needs of all travelers to be affective



# Technology Areas Breakout Session Introduction



**Mohammed Yousuf**  
**FHWA**  
**ATTRI Program Manager**

# Blackboard Collaborate

## Voting Exercise

- From your smartphone or tablet, go to the app store and search **Blackboard Collaborate**
- It is a free app. Follow the instructions to download the app
- If using a laptop, follow instructions sent by email
- Alternative voting options are available upon request



# Technology Breakout - 5 ATTRI Focus Areas

- Wayfinding & Navigation
- ITS & Assistive Technologies
- Automation & Robotics
- Data Integration
- Enhanced Human Service Transportation



# Technology Breakout - Purpose

- Develop new technology application concepts
- Discuss and build consensus around developed ideas
- Recommend 2-3 applications in each technology area
- Recommendations must consider
  - Feasibility for development
  - Applicability across multiple disability groups
  - Universal design aspects which provide benefit to everyone
  - Affordability in development and implementation



# Technology Breakout - Background

- Other focus groups were held by ATTRI team
- Functional needs and user concerns have been identified
- Recommendations should consider these concerns:
  - Adequate amount of training necessary to use new technologies
  - Affordability
  - Premise that not everyone uses technology
  - Technology solutions may not be the answer for every need



# Technology Breakout – Ground Rules

- One speaker at a time
- Limit side-bar discussions
- Everyone waits for the microphone before speaking
- Keep the discussion focused on technologies
- Keep anecdotal stories to a minimum and solely for the purpose of making a point about technologies
- Ensure the note-taker has captured your comments
- Once we have added new ideas, we will narrow the selections to the top 2-3 recommendations



# Technology Breakout - Roles

- Thought Leaders from the U.S. DOT and collaborative agencies
  - Review technology focus areas
  - Discuss applicable RFI responses
  - Guide discussion and document recommendations
- Facilitators from Noblis and Easter Seals
  - Encourage conversation and use of ground rules
  - Solicit ideas for documentation
- Participants
  - Provide creative ideas
  - Provide input to ATTRI application recommendations



# Breakout Rooms

- Wayfinding & Navigation - **Congressional I**
- ITS & Assistive Technologies - **House**
- Automation & Robotics - **Congressional II**
- Data Integration - **Senate**
- Enhanced Human Service Transportation - **Capitol Ballroom**

**2:30 PM – 3:45 PM**



# Break

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ACCESSIBLE TRANSPORTATION TECHNOLOGIES  
RESEARCH INITIATIVE

# Accessible Transportation Technologies Research Initiative (ATTRI)

## Technology Breakout Results

May 18, 2015



# Wayfinding & Navigation Recommendations

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- **Navigation Systems**
  - Smartphone-based navigation systems for indoor and outdoor use as an affordable option
  - Provide pre-trip and in-route traveler information (crowd sourced)
  - Design for people with blindness, low vision, cognitive and mobility issues
  - Beacons or electronic tags to interact with the built environment
  - Multiple communication formats (visual, audible, haptic) including multiple languages
- **Wearable Technologies**
  - Wearable but needs to be discreet
  - Connect with assistive devices already in use (e.g. white cane)
- **Community Navigators**
  - Use community volunteers to provide data on their neighborhoods.

# ITS & Assistive Technologies Recommendations

- Pedestrian, vehicle, and infrastructure communication at intersections
  - Adaptive Pedestrian Signal Timing
  - Emergency vehicle and safety alerts (to and from pedestrians and vehicles)
- Real-Time situational awareness of transit system
  - Information from the system (e.g. next bus, route status, availability of accessible capacity)
  - Data from user to the system (reservations or needs for accessible technology)
- Shared use of accessible assets (e.g. school buses during the day)
- Drive by Wire systems
  - Connected vehicle technologies and applications to open more vehicle data for assistive driving systems using drive by wire



# Automation & Robotics Recommendations



1. Robo-Ped - Automated Robotic Characterization of Pedestrian Zones
  - Crowdsourced/Fleet, networked, real-time
  - Provides Market Intelligence
  - Smartphone / Mobile App
2. RoboScout – Machine and robotic cross-walk assistant
  - Leverages existing ITS and V2I technologies
  - Safe and Connected
  - Link to fare media
3. RoboSAV - Slow-speed Automated Vehicle Connectivity
  - Provides autonomous assistance to destination in constrained environment.
  - Demand Responsive, Real-time, Ridesharing

# Data Integration Recommendations

- Real-time, accessible trip planning
  - Data clearinghouse with customer profiles
- Provide operational performance/real-time information on service providers to users (transparently)
  - e.g., vehicle location
- Standardization
  - customer profiles/data
  - service provider



# Enhanced Human Services Transportation Recommendations

- **Capacity Sharing**
  - Door to door multimodal service to both local and long distance trips
  - System that utilizes unused capacity from vehicles (such as paratransit vehicles) to provide additional trips
  - Begin application development with specialized trips (educational, medical, employment). Longer term: broaden system to provide additional trips including shopping and recreational
  - User friendly with easy to understand icons to request pre-programmed trips ( such as 1, 2, 3 and Home)
- **Universal payment system:** Smart Card type payment system that could be used for all travel (could be app) – go across modes and agencies
- **Virtualization of routes** - for passengers and caregivers – Passengers could see their entire routes on an app with landmarks (to remove fear and facilitate independent mobility). At the same time the caregiver could help plan routes and track travelers movement



# Adjourn

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- Thank you for your help today!
- Please reconvene tomorrow at 8:30 am

