ITS World Congress

ITS for Underserved Communities: An Overview of the U.S. DOT’s ITS4US Deployment Program

September 21, 2022
ITS4US Program Video

https://youtu.be/cLJx0MOjY2o
Agenda

- ITS4US Program Background
- ITS4US Site Summaries
  - Georgia Department of Transportation (GDOT)
  - Heart of Iowa Regional Transit Agency (HIRTA)
  - Niagara Frontier Transportation Authority (NFTA)/Buffalo
  - University of Washington (UW)
- Q&A
ITS4US Program Background
Program Overview

- A USDOT Multimodal Deployment effort, led by ITS JPO and supported by OST, FHWA and FTA
- Supports multiple large-scale replicable deployments to address the challenges of planning and executing all segments of a complete trip

Vision

Innovative and integrated complete trip deployments to support seamless travel for all users across all modes, regardless of location, income, or disability
Program Goals

- Spur high-impact integrated Complete Trip deployments nationwide
- Identify needs and challenges by populations
- Develop and deploy mobility solutions that meet user needs
- Measure impact of integrated deployments
- Identify replicable solutions and disseminate lessons learned
ITS4US Program Fundamental Elements

- Site deployments will be real-world environment deployments
- Serve as replicable models and remain in operation
- There are multiple site deployments
- Unique solutions to address critical, local challenges
- Deployments are expected to be both large-scale and multi-modal
- Large-scale implies deployments will have measurable impact
- Sites will deploy multiple technologies and modes
Deployment Phases

**Pre-deployment Activities**
- Define Program Vision and Mission
- Organize Multimodal Federal Team
- Phase 1 Procurement Planning
- Phase 1 Contract Awards

**PHASE 1: Deployment Concept**
- Concept Development for Complete Trip Deployments
- Establish Roundtables
- Phase 2/3 Procurement Planning
- Phase 2/3 Cooperative Agreement Awards

**PHASE 2: Design & Test**
- Design, Test and Deploy Complete Trip Solutions
- Evaluation Framework and Planning

**PHASE 3: Operate & Evaluate**
- Demonstrate Multiple Large-Scale Deployments
- Evaluate Deployments
- Share Data & Lessons Learned

**Operations & Maintenance**
- Sustain operations for a minimum period of five years after the program is completed with no supplementary federal funds

**Program Initiation**
- Phase 1
  - BAA Solicitation
- Phase 2/3
  - NOFO Solicitation
- Phase NTP
- Phase 3 NTP
- Phase Completion

**Pre-Deployment**
- 18 months

**Deployment**
- 18 months
- Up to 24 months
- Minimum of 18 months

**Post-Deployment**
- 5 years

U.S. Department of Transportation
ITS Joint Program Office
Systems Engineering “Vee” Diagram
Phase 2 and 3 Awardees

University of Washington
OR, WA, MD

Niagara Frontier Transportation Authority
Buffalo, NY

Georgia Department of Transportation
Gwinnett County, GA

Heart of Iowa Regional Transit Agency
Dallas County, IA
ITS4US
IT’S TRANSPORTATION FOR ALL OF US

Georgia Department of Transportation (GDOT)
Safe Trips in a Connected Transportation Network (ST-CTN)

Maria Roell (Atlanta Regional Commission)
Maria Roell
Co-Deployment Lead GDOT Site
Atlanta Regional Commission
Safe Trips in a Connected Transportation Network (ST-CTN)

- Deployment area: Gwinnett County, Georgia

- Uses a mobile application with ability for users to
  - Create personalize trips plan information
  - Receive alternative trip routes

- Comprised of an integrated set of advanced transportation technologies including:
  - Connected vehicles
  - Transit signal priority
  - Machine learning
  - Predictive analysis
Deployment Concept – Phase 2/3
Project Team

Safe Trips in a Connected Transportation Network (ST-CTN)

- USDOT
  - GDOT
    - ARC
      - Kimley-Horn
      - GOSystems
      - ICF
      - GA Tech
      - IBI
      - Gwinnett County
  - HNTB
  - 360ns
  - SILCGA
    - GTRI
    - Avail
Deployment Concept - Goals

**Goal 1:** Enhance multimodal complete trip experience with the ST-CTN system functions and features, particularly for underserved communities.

**Goal 2:** Enhance safety for ST-CTN system users, particularly for underserved communities.

**Goal 3:** Improve reliability for system users, particularly for underserved communities.

**Goal 4:** Improve mobility and accessibility for system users, particularly for underserved communities.
Deployment Concept – Project Overview

Safe Trips in a Connected Transportation Network

1. Pre-Trip Planning: Receives Safe Accessible Route
2. Begins Trip: Receives Turn-by-Turn Directions, Alerts, and Transit Priority
3. Transition to Transit: Vehicle Receives Priority and is Notified of User’s Needs
4. Intersection Crossing: Signal Controller Extends Pedestrian in the Direction of User Travel
5. CV Broadcast Message: RSU Broadcasts Safety Message to Alert of Pedestrian in Vicinity
6. Outdoor/Indoor Navigation: Turn by Turn Directions to Safe Accessible Route
Technical Approach – Hybrid SE and Agile

**Inputs**
- ConOps
- SyRS
- ICTDP
- Dataset formats/API
- System Architecture

**ST-CTN Development Team**
1. Confirm requirements
2. Develop user stories and system stories
3. Plan unit and integration tests (acceptance criteria)

**Product Backlog**
1. Prioritized list of what is required, features, etc.
2. Refine (“trim”) user story and criteria
3. Develop roadmap

**Feasibility Study/Concept Exploration**
- Concept of Operations
- System Requirements
- High-Level Design

**System Validation**
- System Verification & Deployment
- System Maintenance
- Operations & Upgrades
- Changes & Upgrades
- Retirement/Replacement

**Final Release** (operational readiness test/demonstration) for USDOT

**Step 1**

**Step 2**
- ST-CTN Tech Teams
- Sprint Planning Mtgs
- User Story Dev: Design Template
- 2 to 4 weeks sprints

**Step 3**
- Development
  - Confirm technical approach
  - Build feature
  - Build unit and integration tests
- Review
  - Code review (functionality/technical approach)
  - Revise feature
  - Code review (code hygiene)
  - Revise feature
- Test & Deploy
  - Merge feature into main branch
  - Internal testing
  - Bug fixes
  - Cut release
  - Deploy for acceptance test

**Step 4**
- Sprint review & demo
- Product versions/releases
- Sprint retrospective

Starting from MVP: Operations & Maintenance (includes data custodian plans)

*SDLC – software development lifecycle*
# Phase 2 Milestones

<table>
<thead>
<tr>
<th>MILESTONE</th>
<th>% COMPLETE</th>
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<tr>
<td><strong>Phase 2 Objectives</strong></td>
<td></td>
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<tr>
<td>ATL RIDES subsystem functionality supporting customer account management.</td>
<td>100%</td>
</tr>
<tr>
<td>Customer accounts (250 users recruited prior to Phase 3).</td>
<td>25%</td>
</tr>
<tr>
<td>Space-Time Memory subsystem impedance values for trip routing and execution.</td>
<td>100%</td>
</tr>
<tr>
<td>Functionality and equipment installed in Gwinnett County Transit vehicles to support TSP and connection protection.</td>
<td>100%</td>
</tr>
<tr>
<td>Sidewalk data collected in the project boundaries.</td>
<td>100%</td>
</tr>
<tr>
<td>Facilities outfitted with sensors for indoor navigation.</td>
<td>80%</td>
</tr>
<tr>
<td>Operations and maintenance processes (including software updates).</td>
<td>100%</td>
</tr>
<tr>
<td>Performance Management Dashboard data ingestion, curation, and analytical processes.</td>
<td>80%</td>
</tr>
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Heart of Iowa Regional Transit Agency (HIRTA)
Health Connector for the Most Vulnerable: An Inclusive Mobility Experience from Beginning to End

Santosh Mishra, IBI Group
Santosh Mishra

Systems Engineering Lead
Heart of Iowa Regional Transit Agency
Health Connector for the Most Vulnerable

- Deployment area: Dallas County, Iowa
- Implement a scalable and replicable solution enabling transportation access to healthcare for all underserved populations and their caregivers
  - Use advanced technologies to resolve barriers
- Include information and wayfinding services to guide each step of user’s trip
- Provide enhanced access to healthcare options for all travelers in Dallas County, a mostly rural county
HIRTA and Dallas County Overview

- HIRTA provides demand response services to population in 7 county areas, including Dallas County
- Dallas County grew 36% in the last decade
- Coordination of medical transportation services for underserved a major challenge
Dallas County Underserved Population

- Older adults: 12%
- Persons w Disabilities: 4%
- Persons w Low Income: 5%
- Veterans: 4%
- LEP: 11%
- Other Populations: 64%
Stakeholders

**Government Agencies**
- FTA Region 7
- Iowa DOT
- Dallas County
- City of Perry
- City of Waukee
- City of Adel

**Community Partners**
- Community Members part of Transportation Advisory Group (TAG)

**HIRTA Staff**

**HIRTA Customers**

**HealthCare Providers**
- Iowa Total Care (MCO for IME)
- Mercy One Hospital
- Unity Point Health
- Broadlawns Clinics
- Dallas County Hospital

**Human/Social Service Agencies**
- United Way of Central Iowa
- Waukee Area Christian Services
- American Cancer Society
- Aging Resources of Central Iowa
- Disability Rights Iowa
- New Opportunities
High-Level Findings from Stakeholders

- Lack of awareness on transportation options
- Lack of integrated booking and trip management experience
- Limited capabilities in current modes to meet the needs of underserved
- Limited wayfinding capabilities
- Service management challenges with return trips
- Same day and after hour service issues
- Limited data sharing and reporting to measure the performance of healthcare transportation
Concept Overview

2. Vehicle Dispatched and Arrives
3. Wayfinding and Boarding the Correct Vehicle
4. In-vehicle Information
5. Arrival at Healthcare Center
6. Wayfinding at the Healthcare Center
7. Guidance on Intake and Wait-time
8. As-needed Wayfinding/Customer Information
9. Appointment Complete
10. Return Ride Requested

Source: HIRTA Team
System Overview

Diagram showing the system overview with various components and connections. The diagram includes:

- HIRTA Vehicle Systems
- Traveler or Caregiver Devices (non-Medicaid)
- Health Connector Middleware
- Access2Care (Medicaid)
- EHR Software
- External Access to Patient/Traveler Medical Appointment and Transportation (DCHD, Healthcare Staff, Health Navigators, Caregivers)

Legend:
- System to be procured
- New Development for Health Connector
- External Systems to be interfaced for Health Connector

Connections:
- Wireless Data Communication for trip manifest and details, including payment
- Trip Request for a Medical Appointment, Customer Information (via phone)
- Trip Request for a Medical Appointment, Customer Information (via web, smart device)
- Automated trip manifest detail exchange for service delivery
- Connectivity with wayfinding sensor/visual marker
- Provide turn-by-turn guidance
- Transportation and Medical Appointment Availability
- Trip Request for a Medical Appointment, Customer Information

Department of Transportation ITS Joint Program Office
# At-Scale Deployment

<table>
<thead>
<tr>
<th>Line Item</th>
<th>20% At-Scale Deployment</th>
<th>50% At-Scale Deployment</th>
<th>100% At-Scale Deployment</th>
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<tbody>
<tr>
<td>Service Area</td>
<td>Within 5 miles of City of Perry, Dallas County</td>
<td>Cities of Waukee, Adel and Perry, Dallas County</td>
<td>Entire Dallas County</td>
</tr>
<tr>
<td>Number of healthcare facilities</td>
<td>1</td>
<td>2</td>
<td>4</td>
</tr>
<tr>
<td>Max number of HIRTA vehicles</td>
<td>2</td>
<td>5</td>
<td>10</td>
</tr>
<tr>
<td>Number of contractor vehicles</td>
<td>1</td>
<td>2</td>
<td>5</td>
</tr>
<tr>
<td>Max number of trips (HIRTA vehicles)</td>
<td>20</td>
<td>50</td>
<td>100</td>
</tr>
<tr>
<td>Max number of trips (contractor vehicles)</td>
<td>5</td>
<td>10</td>
<td>20</td>
</tr>
<tr>
<td>Vehicle devices</td>
<td>2</td>
<td>5</td>
<td>10</td>
</tr>
<tr>
<td>Number of kiosks</td>
<td>2</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>Visual markers for wayfinding</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Vehicles (inside and outside)</td>
<td>4</td>
<td>10</td>
<td>20</td>
</tr>
<tr>
<td>Healthcare facility (indoor and outdoor)</td>
<td>20</td>
<td>50</td>
<td>150</td>
</tr>
<tr>
<td>Fixed pickup spots</td>
<td>5</td>
<td>15</td>
<td>30</td>
</tr>
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</table>
Niagara Frontier Transportation Authority (NFTA)
Complete Trip Deployment in Buffalo, NY

Deepak Gopalakrishna, ICF
Deepak Gopalakrishna
VP, ICF
Complete Trip Deployment in Buffalo, NY

- Deployment area: Buffalo Niagara Medical Campus
- Deploys new and advanced technologies to address existing mobility and accessibility challenges
- Integrates accessible trip planning too with
  - Current transit services
  - Indoor/outdoor wayfinding
  - On-demand shuttle service
  - Intersection pedestrian safety technologies
- Factors in travelers’ preferences and accessibility-related needs for comprehensive trip planning
System Overview

Trips Platform
- Integrated trip planning function for travelers.

Performance Dashboard
- Measures and presents the performance of the system.
- Includes the technology and supporting infrastructure for wayfinding for indoor and outdoor orientation, navigation and destination confirmation.

Smart Infrastructure

Community Shuttle
- Shuttle system provides fixed and on-demand transit services within a specified zone of operations. Includes a combination of vehicle types and services.
Deployment Objectives

**Consistent, continuous trips** to, from, and within the BNMC area.

**Online and offline** ways to receive real time information on services, and infrastructure usability and accessibility.

Trip paths that are **safe, accessible, and compatible** with user-defined preferences and capabilities.

**Integrated, flexible, demand-responsive, end-to-end transit options** for the community.
The Location

- Buffalo Niagara Medical Campus
- 120-acre campus
- Adjacent to downtown and Main St.
- 9 million sq. ft.
- 8 member institutions
- 150+ private companies
- Social, technology incubator
- Transportation innovation lab

More than 16,000 people work or study at the BNMC and more than 1.5 million visit each year for health care and other services, generating significant transportation demand for the area, its visitors, and its employees.
## Target Users

<table>
<thead>
<tr>
<th>Target Users</th>
<th>Populations of Interest</th>
</tr>
</thead>
<tbody>
<tr>
<td>Persons with Disability (PWD)</td>
<td>General Population (Patients, Visitors and Workers at BNMC Partner agencies)</td>
</tr>
<tr>
<td>• Mobility</td>
<td></td>
</tr>
<tr>
<td>• Vision</td>
<td></td>
</tr>
<tr>
<td>• Cognitive</td>
<td></td>
</tr>
<tr>
<td>• Hearing</td>
<td></td>
</tr>
<tr>
<td>Low Income</td>
<td>Residents of adjacent Fruit Belt, Masten Park &amp; Allentown</td>
</tr>
<tr>
<td>Older Adults</td>
<td>Neighborhoods and across Buffalo using BNMC services, transit facilities and healthcare</td>
</tr>
<tr>
<td>Limited English Proficiency (LEP)</td>
<td></td>
</tr>
</tbody>
</table>
# At-Scale Deployment Summary

<table>
<thead>
<tr>
<th>Deployment Element</th>
<th>Estimated Number</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Participants</strong></td>
<td>100 participants during Phase 2 to support development and testing of the system and its components. 300-500 participants total in Phase 3 (including Phase 2 participants). Final number will be dependent on the number of people interested in participating. Outreach and recruitment efforts will focus on obtaining the highest and most diverse number of participants possible.</td>
</tr>
<tr>
<td><strong>Beacons/Smart Signs</strong></td>
<td>Under 100 devices. The final number is unknown at the time and will be determined once the facilities are measured.</td>
</tr>
<tr>
<td><strong>Touch Models</strong></td>
<td>1 model as part of this pilot (location to be determined in Phase 2). Note that pilot will leverage the efforts of an external study that is placing another model at the Innovation Center on the BNMC.</td>
</tr>
<tr>
<td><strong>TIH</strong></td>
<td>2 hubs, with location to be determined in Phase 2.</td>
</tr>
<tr>
<td><strong>PED-X Intersections</strong></td>
<td>2 intersections, Main St. &amp; Best St. and Ellicott St. &amp; High St. 2 National Transportation Communications for Intelligent Transportation System Protocol (NTCIP) Supported MioVision platform to serve as a communications broker / gateway (one per intersection, total number: 2).</td>
</tr>
<tr>
<td><strong>Vehicles</strong></td>
<td>A maximum of 4 shuttles, a combination of SDS and HDS. Phase 2 will start with 2 shuttles for testing and integration efforts, and 2 additional shuttles will be added in Phase 3. SDS Vehicles: 1-2 (note: the number will depend on the procurement) HDS Vehicles: 2-3 depending on the service plan and demand.</td>
</tr>
<tr>
<td><strong>Online/Offline Platforms</strong></td>
<td>1 CTP website and mobile application. 1 Performance Dashboard.</td>
</tr>
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</table>
Performance Measures and Outcomes

The performance measures listed below were developed based on 10 use cases and the data that will be available. Note that each measure has a set of metrics and targets that allows the research team to assess each measure.

- Improved ability of the CTP users to make satisfactory trips in the study area or help others to do so in the case of caregivers.
- Usefulness of the CTP Registration and Trip Preferences Processes.
- Usefulness of the CTP Trip Planning and Booking Processes.
- Improved ability to find destinations efficiently using the CTP wayfinding functionality.
- Improved ability to cross specific intersections safely using CTP smart signal functionality.
- Provision of an efficient, reliable, and safe new on-demand transit shuttle system.
Anat Caspi, PhD
PI, Deployment Lead
University of Washington
Transportation Data Equity Initiative

- Deployment area: Washington, Oregon, and Maryland
- Create tools and infrastructure for public and private data sharing for interoperable transportation data that provide equitable navigation and discovery outcomes for all travelers irrespective of location, income, or disability
- Includes three main activities:
  - Work with existing standards committees to refine the OpenSidewalks, GTFS-Flex, and GTFS-Pathways data standards
  - Develop tools to collect, store and share the data generated using these data standards
  - Demonstrate uses of the three data using three unique accessible mobility applications
Trip Information Gaps
Using a tool like directions on Google Maps doesn’t really help me get around. Actually sometimes this does more harm than good. I’m sent down streets I can’t cross, or up inclines that are impossible to climb. It can be deeply frustrating.
Deployment Approach

**Thriving Diverse Community**
Creating a diverse data stewardship community working to center the voices of all travelers, focused on mobility data creation, maintenance, measurement, use, and improvement.

**Demonstrative Data Uses**
Build demonstrative data consuming applications to demonstrate the utility and resilience of the data infrastructure in varied traveler settings.

**Pilot Data Collections**
Build Demonstrative datasets in pilot regions to demonstrate use of built data infrastructure.

**Mobility Data Specifications**
Pragmatic extension and updates to designed to meet producer, developer and traveler needs.

**High Quality Data**
Build usable tools to enable data collection and vetting for diverse data tenants.

**Responsible Data Governance**
Build provenance tools and best practices to encourage meta data collection, confidence metrics, safe and private interoperability across agencies and regions.

**Demonstrative Data Uses**
Build demonstrative data consuming applications to demonstrate the utility and resilience of the data infrastructure in varied traveler settings.
All travelers need useful travel data they can trust.
Main Project Goals

This project is designed to create, modify and improve data standards and data integration, validation and maintenance tools necessary for modern applications to provide mobility benefits more equitably.

<table>
<thead>
<tr>
<th>Coordinate collaborative releases of data standards</th>
<th>Publish and maintain interoperable data infrastructure</th>
<th>Deploy and sustain three accessible mobility applications</th>
</tr>
</thead>
<tbody>
<tr>
<td>OpenSidewalks</td>
<td>Data Collection</td>
<td>Multimodal AccessMap</td>
</tr>
<tr>
<td>GTFS-Pathways</td>
<td>Data Vetting</td>
<td>Soundscape</td>
</tr>
<tr>
<td>GTFS-Flex</td>
<td>Data Provisioning Services</td>
<td>Audium</td>
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</table>
Deployment Sites

WASHINGTON
- Snohomish
- King

OREGON
- Columbia
- Multnomah

MARYLAND
- Baltimore
- Harford
## ITS4US Site Contact Information

<table>
<thead>
<tr>
<th>Organization</th>
<th>Name</th>
<th>Role</th>
<th>Contact Information</th>
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<tbody>
<tr>
<td><strong>GDOT</strong></td>
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</tr>
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<td>Deployment Development Lead</td>
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<td><a href="https://transitequity.cs.washington.edu/">https://transitequity.cs.washington.edu/</a></td>
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</table>
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Visit the ITS4US Deployment Program Website:
https://its.dot.gov/its4us/
Questions & Answers