COMPLETE TRIP

ITS 4 US

Buffalo, NY
Phase 1 Integrated Complete Trip Deployment Plan Webinar

April 19, 2022
Agenda

- **Purpose of this Webinar**
  - To share the submitted Integrated Complete Trip Deployment Plan from Buffalo, NY with the stakeholders of the project and ITS4US community.

- **Webinar Content**
  - Complete Trip – ITS4US Deployment Program Overview (Elina Zlotchenko)
  - Site Orientation & Deployment Concept Overview (Robert Jones, Jamie Hamann-Burney and Deepak Gopalakrishna)
  - Integrated Complete Trip Deployment Plan (Robert Jones, Jamie Hamann-Burney, Deepak Gopalakrishna, Polly Okunieff and Kelly Dixon)
  - Stakeholder Q&A
  - How to Stay Connected (Elina Zlotchenko)

- **Webinar Protocol**
  - You are welcome to ask questions via chatbox
  - The webinar recording and the presentation material will be posted on the ITS4US website
Program Overview

Elina Zlotchenko, Site COR
ITS4US Deployment 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
Complete Trip Phase 1 Awardees

- **University of Washington**
  OR, WA, MD

- **California Association of Coordinated Transportation**
  CA, OR, and WA

- **Heart of Iowa Regional Transit Agency**
  Dallas County, IA

- **ICF**
  Buffalo, NY

- **Atlanta Regional Commission**
  Gwinnett County, GA
Summary of Phase 1 Deployment Concept

Deepak Gopalakrishna, ICF
System Overview

Complete Trips Platform

Integrated trip planning function for travelers.

Performance Dashboard

Measures and presents the performance of the system.

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.

Smart Infrastructure

Includes the technology and supporting infrastructure for wayfinding for indoor and outdoor orientation, navigation and destination confirmation.
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>
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<tbody>
<tr>
<td>Persons with Disability (PWD)</td>
<td>General Population (Patients, Visitors and Workers at BNMC Partner agencies)</td>
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<tr>
<td>▪ Mobility</td>
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<td>▪ Vision</td>
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<tr>
<td>▪ Cognitive</td>
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<td>▪ Hearing</td>
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<td>Low Income</td>
<td>Residents of Fruit Belt, Masten Park, Allentown and across Buffalo using BNMC services,</td>
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<td>Older Adults</td>
<td>transit facilities and healthcare</td>
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<td>Limited English Proficiency (LEP)</td>
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Stakeholder Engagement – Who We Talked To

Institutional Interviews/Meetings

- NITTEC
- City of Buffalo
- NFTA
- Buffalo Niagara Medical Campus (BNMC) Inc.
- Greater Buffalo Niagara Regional Transportation Council
- NYSDOT
- USDOT
- Erie County Office for People with Disabilities
- Erie County Senior Services

BNMC Partner Meetings

- Visually Impaired Advancement (VIA)
- Kaleida Health
- University at Buffalo
- Buffalo Hearing and Speech Center (BHSC)
- Roswell Park Comprehensive Cancer Center

Community organizations and groups

- Heart of the City Neighborhoods (HOCN)
- Fruit Belt Community Land Trust
- Western NY Independent Living (WNYIL)
- Local Initiatives Support Corporation (LISC) WNY
- Western NY Deaf Access Services
- Employment Consortium
- Northeast ADA Center
## Stakeholder Engagement – What We Heard

### Key Messages
- Flexibility in services and systems based on user preferences
- Accommodate non-smartphone users
- Leverage local resources as much as possible – 211 call center, local vans, buses
- Coordinate with ongoing physical improvements. Great opportunity to tie in physical improvements with technology
- Support independent travel
- Increase ability of users to make spontaneous trips
- Support transit and not replace transit with other modes
- Not just a BNMC system but a system for the community and for Buffalo
- Accommodate needs for service animals
- Support caregiver travel planning/support
- Consider costs (both for traveler and agency)

### Resulting User Needs
- 37 User-Related Needs in following areas
  - Travel needs and traveler information
  - Assistive technology compatibility
  - Service integration
  - Trip booking
  - Trip costs
  - Use of transit and shuttles
  - Wayfinding – Outdoor
  - Wayfinding-Indoor
  - Vulnerable Road User (VRU) safety
  - Notification and alerts
  - Adverse weather
  - Nighttime travel
  - Customer Points of Contact
  - Training
  - Low-tech or no-tech access
  - Caregiver support
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.
Complete Trip Capabilities

1. Registration and select profile
   - Preferences
   - Notifications

2. Generate Trip Plan and Book a Trip

3. Use Transit
   - Fixed route, or community shuttle
   - Pickup (pre-boarding)
   - Traveling in
   - Alighting

4. Navigation
   - Outdoor
     - Begin Travel
     - Crosswalk
     - Sidewalk
   - Indoor
     - Transition to indoor

5. Reporting and History
   - Crowdsourced data on travel
   - Review history

6. Trip Planning, Ride-hailing Reservation and Dispatch

7. Passenger Pickup, Securement, Drop-off via SDS

8. Passenger Pickup, Securement, Drop-off via HDS

9. Manage Incidents

10. Pedestrian Crossing Support
Team Organization for Phase 2 and 3

- NFTA will be supported by a program delivery contractor team and partners to deliver the scope of work identified in the grant award
- A competitive Request for Qualifications (RFQ) process conducted by NFTA.
  - RFQ issued March 8
  - RFQ closed March 30
  - March 31, 2022 through April 30, 2022
    - NFTA Evaluation of Qualifications and Negotiation
  - May 2022 – Contract Award
  - June 2022 – Notice to Proceed
Summary of Phase 2 and 3 Management and Staffing Approach

Kelly Dixon, GBNRTC
Robert Jones, NFTA
Management Approach

• NFTA’s Management Approach
  • Require PMBOK-Guidance for program management
    • Detailed WBS
    • Earned Value Management
    • MS Project Scheduling
  • Follow a scope management plan to analyze impact of scope changes
  • Identify focal point for all contractual related issues
  • Develop a communications management plan
  • Identified POC to coordinate invoicing, subcontractor support, project tracking
  • Develop a team collaboration site with strong configuration control capabilities
  • Identify a tech editor and a 508 compliance POC to all documents

Robert Jones, NFTA
Concept Development Lead

Kelly Dixon, GBNRTC
Project Management Lead
Staffing Approach

Identify an integrated program delivery contractor to deliver Phase 2 and Phase 3. Key Requirements

- Existing or planned ability to leverage partner and stakeholder connections in the deployment area of interest
- Understanding of the USDOT-required Systems Engineering and Agile Development process, documentation and stakeholder engagement process
- Qualifications of proposed key staff and their experience in delivering managing large multi-stakeholder planning and deployment efforts including federal programs
- Deep bench of staff that can support the various teams identified by NFTA for Phase 2 and Phase 3 delivery
- Demonstrated ability to procure, pilot and test new technology in the Buffalo region Ability to share costs through cash, in-kind or other services in terms of delivery of the program
- Ability to seek and maintain human-use approvals for aspects of this pilot through institutional review boards (IRB)
- On-the-ground presence especially for outreach, performance measurement, recruitment and training

Selection Goal:

A team with deep connections to local community and partners that will make this project be seen as a true partnership and make it sustainable in the long-run.

A team that can deliver to USDOT processes and requirements.
Summary of Complete Trip Deployment Approach

Polly Okunieff, ICF
Deepak Gopalakrishna, ICF
A door-to-door travel planning app, or complete trip platform (CTP), that allows travelers to make safe, efficient and effective transit trips to and from the deployment area, including during inclement weather.

Supporting indoor and outdoor wayfinding guidance near the BNMC.

For paratransit access line (PAL) eligible travelers, an alternative way to access PAL services, as well as providing more flexibility and support for trips that are not supported by PAL.

Increased safety and improved capability to cross specific intersections and use specific prioritized pathways for accessing BNMC campus entities.

Access to a new community shuttle (CS) service with human-driven shuttle (HDS) and self-driving shuttle (SDS) that connects nearby neighborhoods to destinations and services within the deployment area.

Enabling caretakers to manage and monitor trips for the travelers who are in their care.
# At-Scale Deployment Summary

<table>
<thead>
<tr>
<th>Deployment Element</th>
<th>Estimated Number</th>
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<tr>
<td>Participants</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>
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<tr>
<td>Beacons/Smart Signs</td>
<td>Under 100 devices. The final number is unknown at the time and will be determined once the facilities are measured.</td>
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<td>Touch Models</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>
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<tr>
<td>TIH</td>
<td>2 hubs, with location to be determined in Phase 2.</td>
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<tr>
<td>PED-X Intersections</td>
<td>2 intersections, Main St. &amp; Best St. and Ellicott St. &amp; High St.</td>
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<td>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>
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<tr>
<td>Vehicles</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.</td>
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<td>SDS Vehicles: 1-2 (note: the number will depend on the procurement)</td>
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<td>HDS Vehicles: 2-3 depending on the service plan and demand.</td>
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<tr>
<td>Online/Offline Platforms</td>
<td>1 CTP website and mobile application.</td>
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<td>1 Performance Dashboard.</td>
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Overview of Technical Approach

Results of Phase 1 Planning
- Robust ConOps
- Verifiable System Requirements
- IRB Approval
- Strong PMBOK based management
- Early Vendor Engagement
- Performance Measurement Planning

(New) Team Capabilities
- Additional SE Staff
- Testing and Readiness Expertise
- Software developers
- Outreach and training experts for the target population

Finalized Partnerships
- Finalized Memorandums of Understanding
- Finalized scope of work
- Vendor specification documents
- Internal workload management

Phase 2 and 3 Approach
- Agile Application development
- Strong outreach plan
- Comprehensive Performance Management
Overview of Technical Approach (cont.)

Agile Development Methodology

P1 Defect can potentially Bypass Sprint Planning Backlog

Release Schedule
Phase 2
#1 MVP
#2 Data broker and integration
#3 Operational stabilization
Phase 3
#4 Maintenance – Bug fixes, SW updates, new features as needed
Overview of Technical Approach (cont.)

Agile Development Methodology

**Sprint Activities**
- Design Processes
  - Detailed User/System Stories traced to system requirements
  - Interfaces
  - Data schema
  - Security and infrastructure design
- Development Processes
  - Code development
  - Code review
  - Update Code / documentation (incorporating review comments)
  - Build / execute unit and integration test cases (linked to sys req’ts)
- Implementation, Integration and Testing Processes
  - Merge process
  - Integration and system test cases/results
  - Debug / re-test
  - Acceptance testing
- Verification & Validation Processes
  - Sprint Retrospective
  - Sprint Review & Demo
  - Metrics review
  - Product versioning

**SE Activities**
- Systems Engineering Documents
  - Needs / ConOps
  - SyRS
  - System Arch. (SAD)
  - HLD (product backlog) – (SDD)
  - Std APIs / Interfaces
  - OpenTripPlanner (legacy)
- Stakeholder Review (Sprint Planning Meeting)
  - Confirm req’ts
  - Refined user / system stories
  - Refined acceptance criteria
- Development Process SE Artifacts
  - User stories traced to requirements
  - Code traced to user stories
  - Unit/integration tests (STP) traced to user stories/acceptance criteria
- Implementation, Integration and Testing SE Artifacts
  - Test case review (against req’ts / acceptance criteria)
  - STP test cases and results
  - Defect register
  - Code/document repository update
- Stakeholder Review
  - Review demo (review acceptance criteria)
  - Alpha / beta test as available
  - Validate needs are met (signoff)
  - Status – risks and issues

**Release Schedule**
- **Phase 2**
  - #1 MVP
  - #2 Data broker and integration
  - #3 Operational stabilization
- **Phase 3**
  - #4 Maintenance – Bug fixes, SW updates, new features as needed
# Data Generated and Access

## Data Types

- **Structured** – Data formatted with schema defining data entries, their syntax, and semantics. Datafile types including txt, csv, png, mpeg, JSON and others.
- **Semi-Structured** – formatted data where the data entries may be ordered differently, or content may change.
- **Unstructured** – unformatted data where data is unknown when delivered. Crowdsourced input and surveys are examples of unstructured data.
- **Dynamic Velocity** – datasets that are streamed or require real time data acquisition methods.
- **Static Velocity** – datasets that are typically pulled from a source. They may change on a daily, monthly, or other frequency.

## Access Levels

- **Open** – Data that can be used by the public with no or limited licensing restrictions. These may be anonymized or aggregated version of private datasets to protect (PII).
- **Private - Research** – This data will be available for research, but in order to access the data, the users must meet IRB requirements.
- **Private - Operational (Proprietary)** – This data can only be accessed by data stewards and operational personnel for operations uses only.
- **Private - Protected (PII)** – Data that has PII will be restricted to protect the PII. This data should have some operational purpose to justify its storage.
Maintenance and Operations

Sustained operations beyond Phase 3 are expected to be based on the successes and lessons learned demonstrated in Phase 2 and Phase 3 but will vary based on each component.

- **Complete Trip Platform** – app may expand through participation of the 511NY Rideshare program within the State.

- **Community Shuttle** – NFTA and other community partners would need to identify a sustainable model of operational funds for the shuttle operations (e.g., other public and private grant funding or partner contribution).

- **Indoor and outdoor navigation infrastructure** – these would be low-cost equipment that would likely be maintained through BNMC Inc and partner activities.

- **Ped-X Infrastructure** – overtime, greater and greater proportions of signals that upgrade their intersection hardware can support this feature. Maintenance responsibilities and ownership of this will be revised in Phases 2 and 3.
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 Complete 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.
Deployment Safety

- A **three-step approach** is used to ensure safety of all participants:
  - Safety Needs and Hazard Identification
  - Safety Risk Assessment
  - Safety Operational Concept

- In addition, **key stakeholders will form a committee** to identify any hazards and how to mitigate them.
Phase 2 and Phase 3 Deployment Schedule

Kelly Dixon, GBNRTC
Phase 2 Release Overview

- Implementation of a release-based approach with incremental integration of functions and capabilities.

Legend:
- TIH – Traveler Info. Hub
- CTP – Complete Trip Platform
- PED-X – Pedestrian Crossing
- CS – Community Shuttle
- HDS – Human Driven Shuttle
- SDS – Self Driven Shuttle
- MVP – Most Viable Product
- V&V – Validation and Verification
## At-Scale Phase 3 Milestones

<table>
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<tr>
<th>Due Date</th>
<th>Milestones</th>
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| **Notice to Proceed (NTP)** | Proposed 20% at scale deployment  
CTP functionality will be at 100%  
Two facilities equipped for indoor wayfinding  
100 customer accounts  
PMD at 80%  
PED-X intersections at 100%  
Touch Model at 100%  
TIH at 100%  
CS at 100% |
| NTP + 2 months    | Proposed 50% at scale deployment  
250 customer accounts  
PMD at 100% |
| NTP + 4 months    | Proposed 80% at scale deployment  
300 customer accounts |
| NTP + 6 months    | Proposed 100% at scale deployment  
400+ customer accounts |
Phase 2 and Phase 3 Cost Estimate

Robert Jones, NFTA
Cost Estimate

Phase 2
~$5 million

- Testing: 38.5%
- Design and Development: 37.9%
- Stakeholder Engagement and Evaluation: 13.3%
- Project Mgmt. and Program Support: 7.6%

Phase 3
~$3.5 million

- O&M: 73.9%
- Stakeholder Engagement and Evaluation: 17.6%
- Project Mgmt. and Program Support: 8.6%

Total Costs:
- Design and Development: 37.9%
- Stakeholder Engagement and Evaluation: 17.6%
- Project Mgmt. and Program Support: 7.6%
- Testing: 38.5%
- O&M: 73.9%
Cost Distribution

NOTES:

Cost share by NFTA is 20%.

The Other Direct Costs (ODC) includes outreach materials, traveler incentives, vendors and equipment integration (intersections, indoor navigation, shuttles, etc.).
Stakeholder Q&A

- Please keep your phone muted
- Please use chat box to ask questions
- Questions will be answered in the order in which they were received
Stay Connected

For more information please contact:

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(Site COR)
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Visit the Complete Trip - ITS4US Deployment Program Website and FAQs:
https://its.dot.gov/its4us/
https://www.its.dot.gov/its4us/its4us_faq.htm