



U.S. Department of Transportation

## COMPLETE TRIP

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# ITS4US

The logo for ITS4US, where the number '4' is stylized as a blue and white graphic with a dashed orange line and two red location pins, one at the top and one at the bottom.

Buffalo, NY

Phase 1 Integrated Complete Trip  
Deployment Plan Webinar

April 19, 2022

# Agenda

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## ■ 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

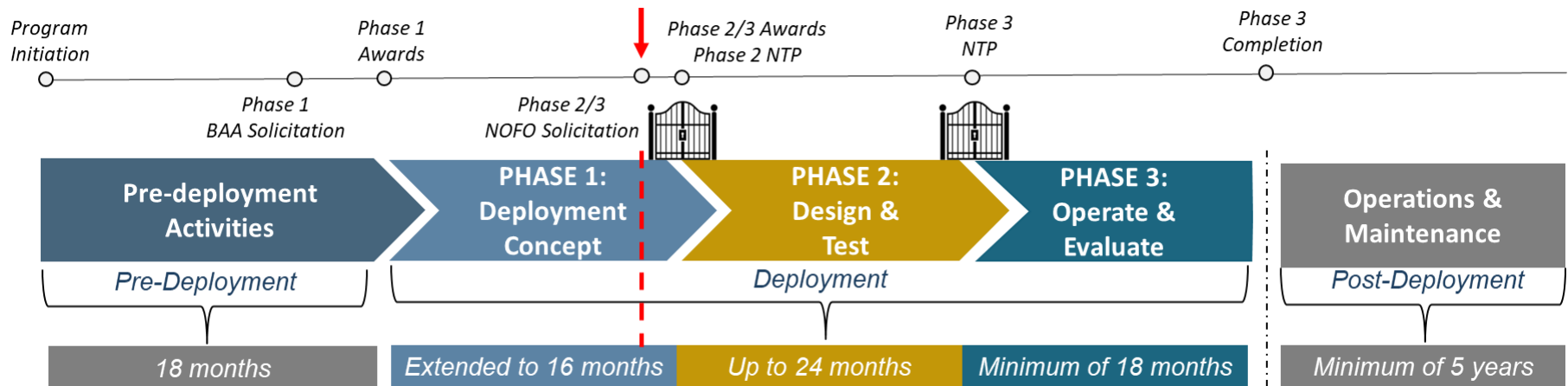
- You are welcome to ask questions via chatbox
- The webinar recording and the presentation material will be posted on the ITS4US website

# Program Overview

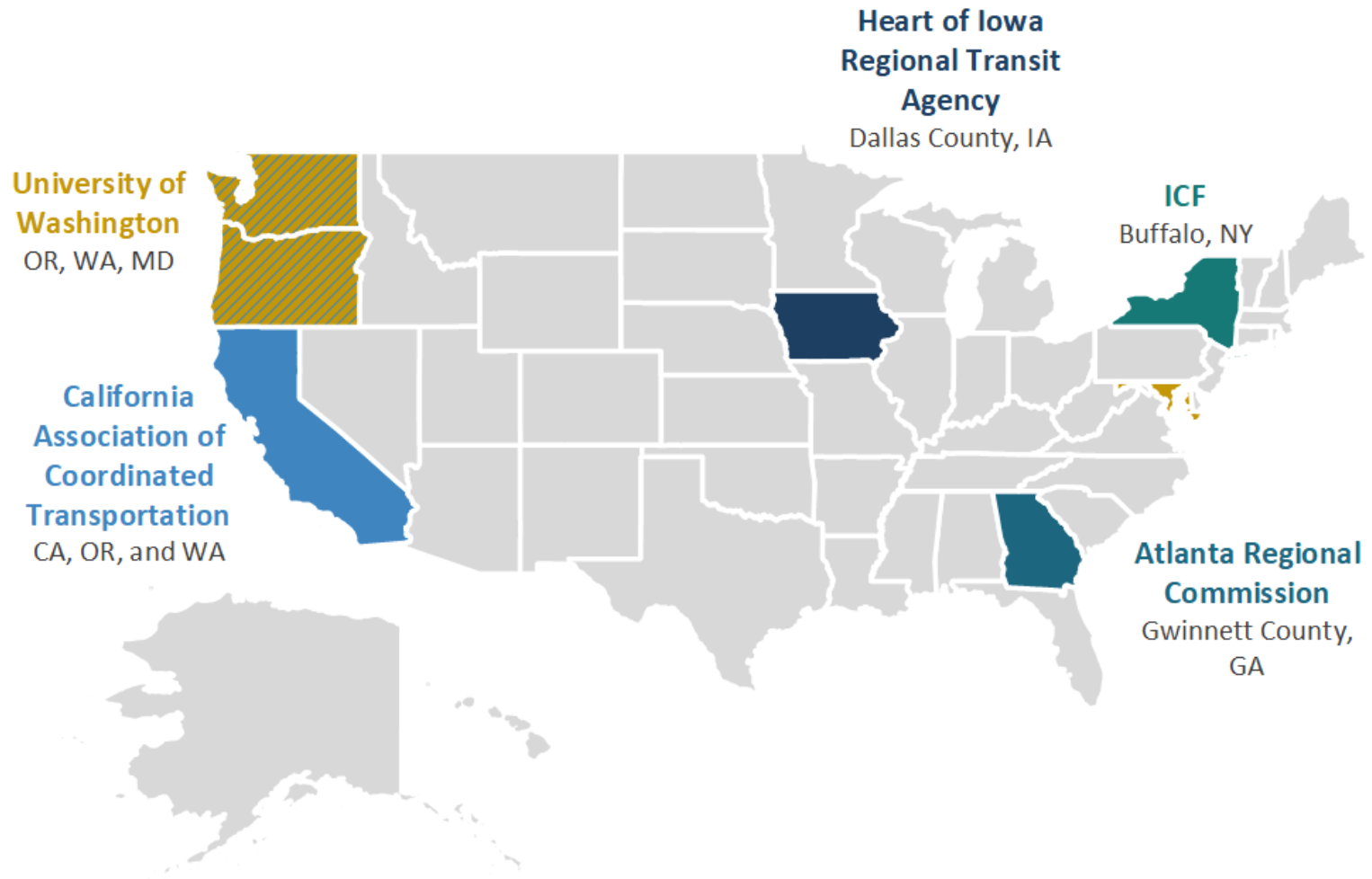
Elina Zlotchenko, Site COR

# 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



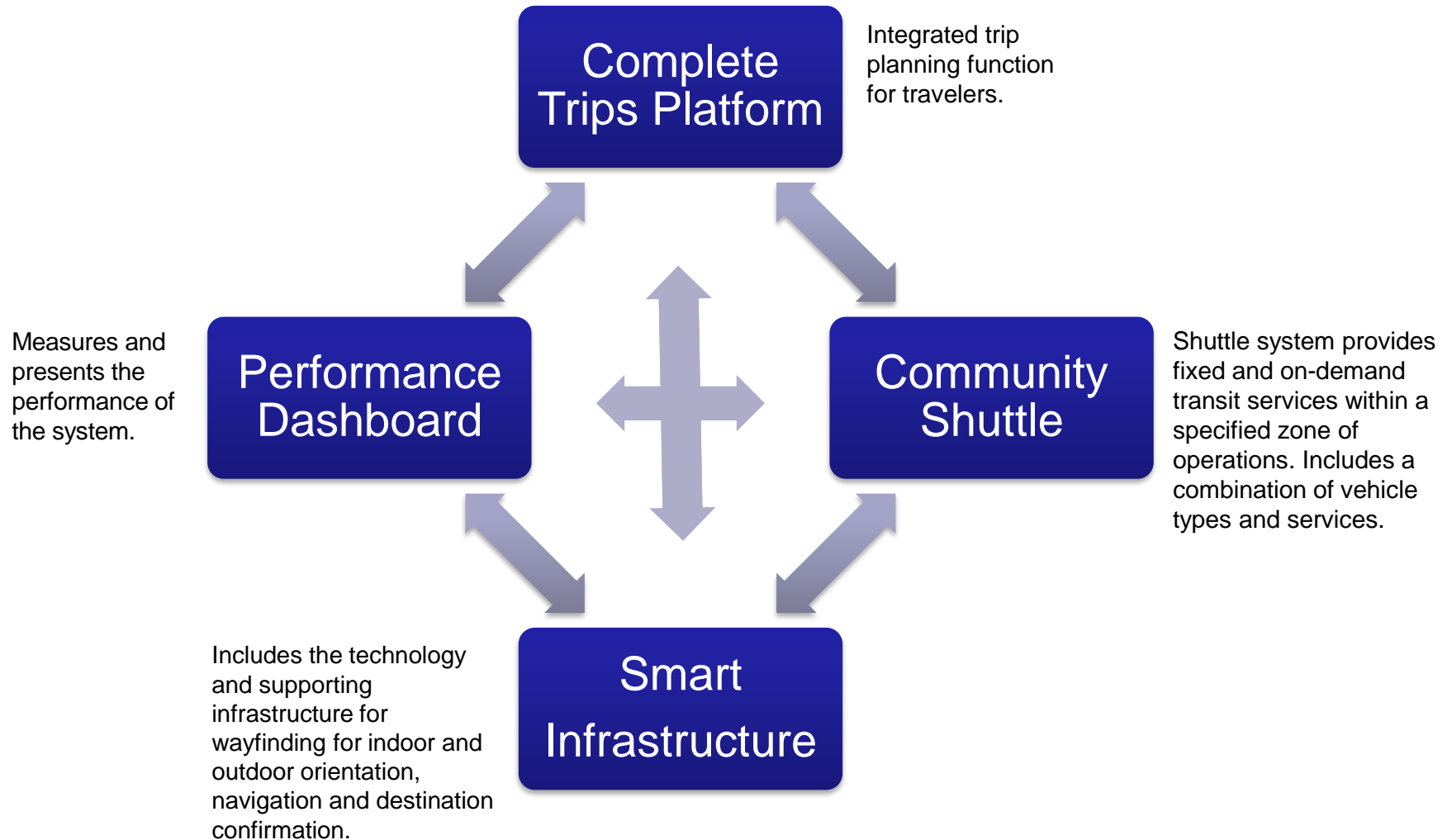
# Complete Trip Phase 1 Awardees



# Summary of Phase 1 Deployment Concept

Deepak Gopalakrishna, ICF

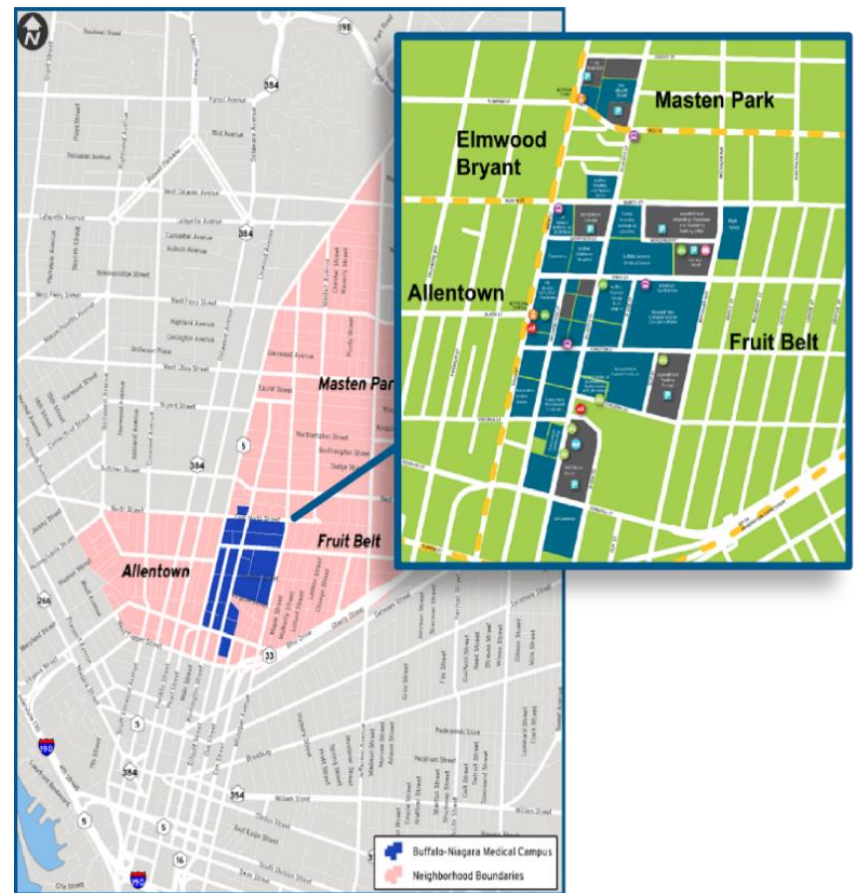
# System Overview



# 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.**



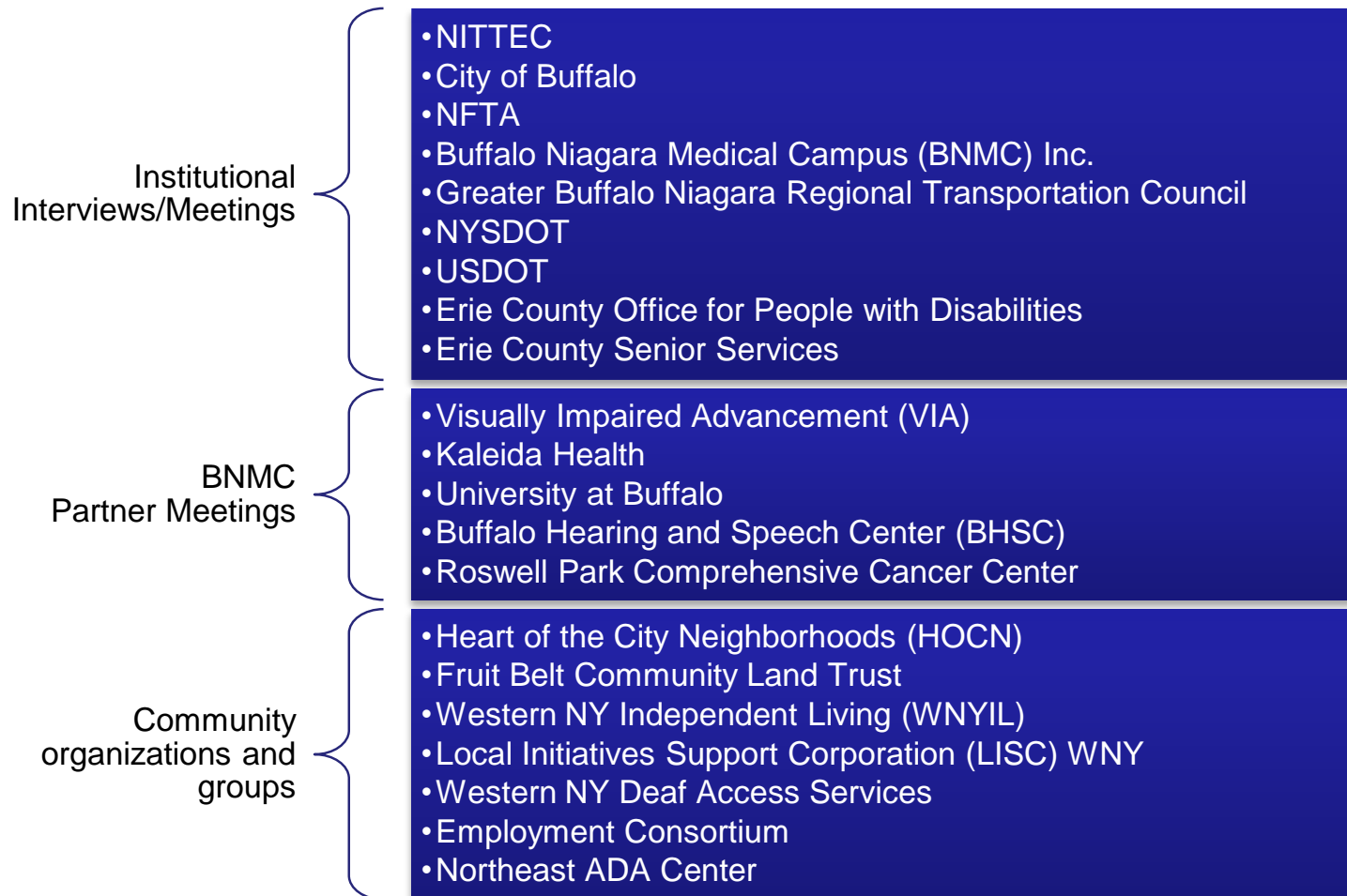


# Target Users

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Target Users	Populations of Interest
Persons with Disability (PWD) <ul style="list-style-type: none"><li>▪ Mobility</li><li>▪ Vision</li><li>▪ Cognitive</li><li>▪ Hearing</li></ul>	General Population (Patients, Visitors and Workers at BNMC Partner agencies)
Low Income	Residents of Fruit Belt, Masten Park, Allentown and across Buffalo using BNMC services, transit facilities and healthcare
Older Adults	
Limited English Proficiency (LEP)	

# Stakeholder Engagement – Who We Talked To



# 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

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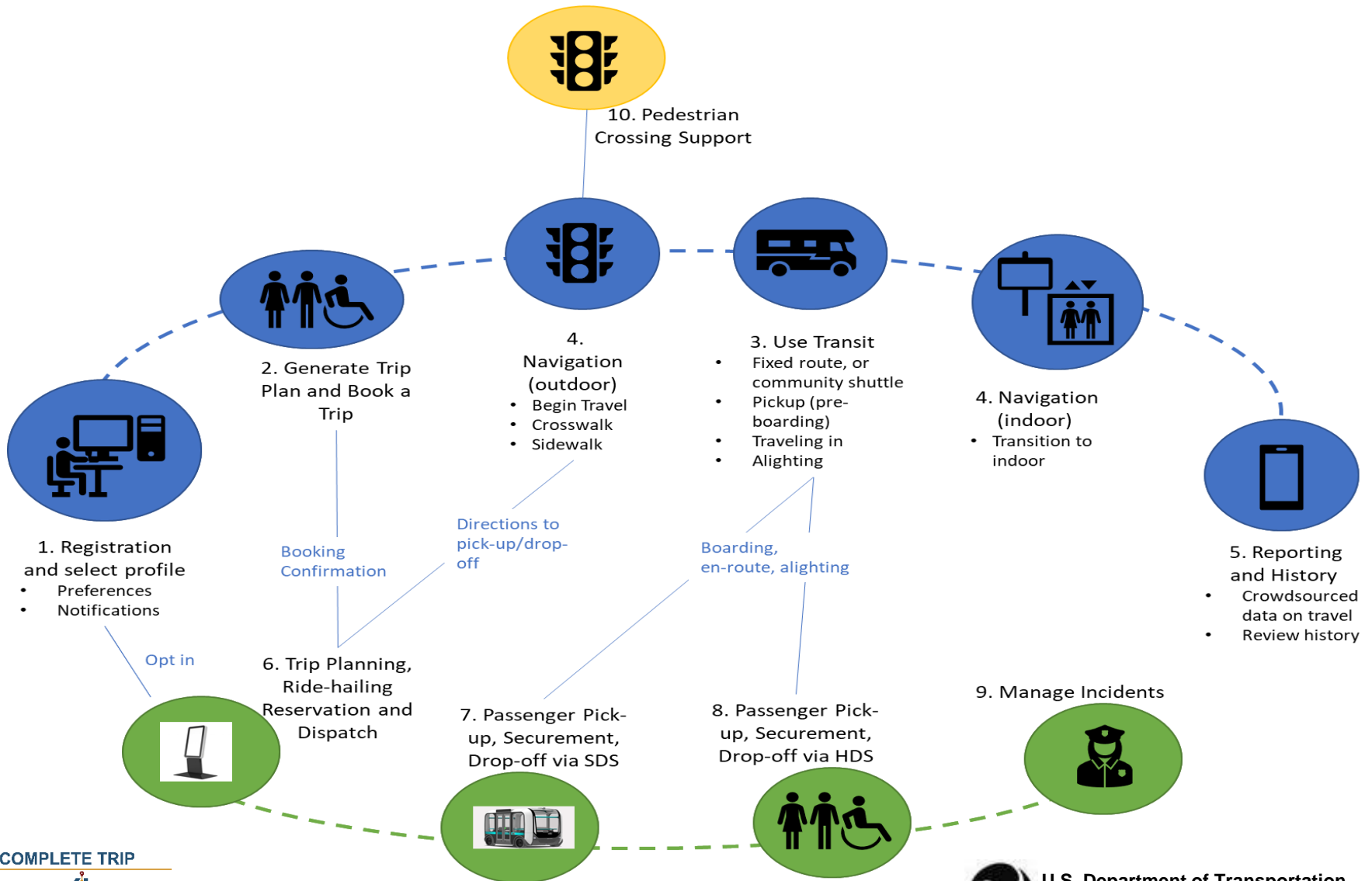
**Consistent, continuous trips** to, from, and within the BNMC area.

**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



# 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



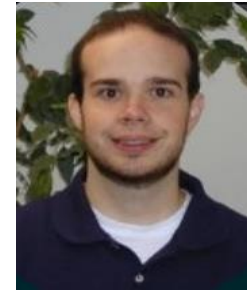
# Summary of Phase 2 and 3 Management and Staffing Approach

Kelly Dixon, GBNRTC  
Robert Jones, NFTA

# Management Approach

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- **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

# Deployment Applications and Services

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.

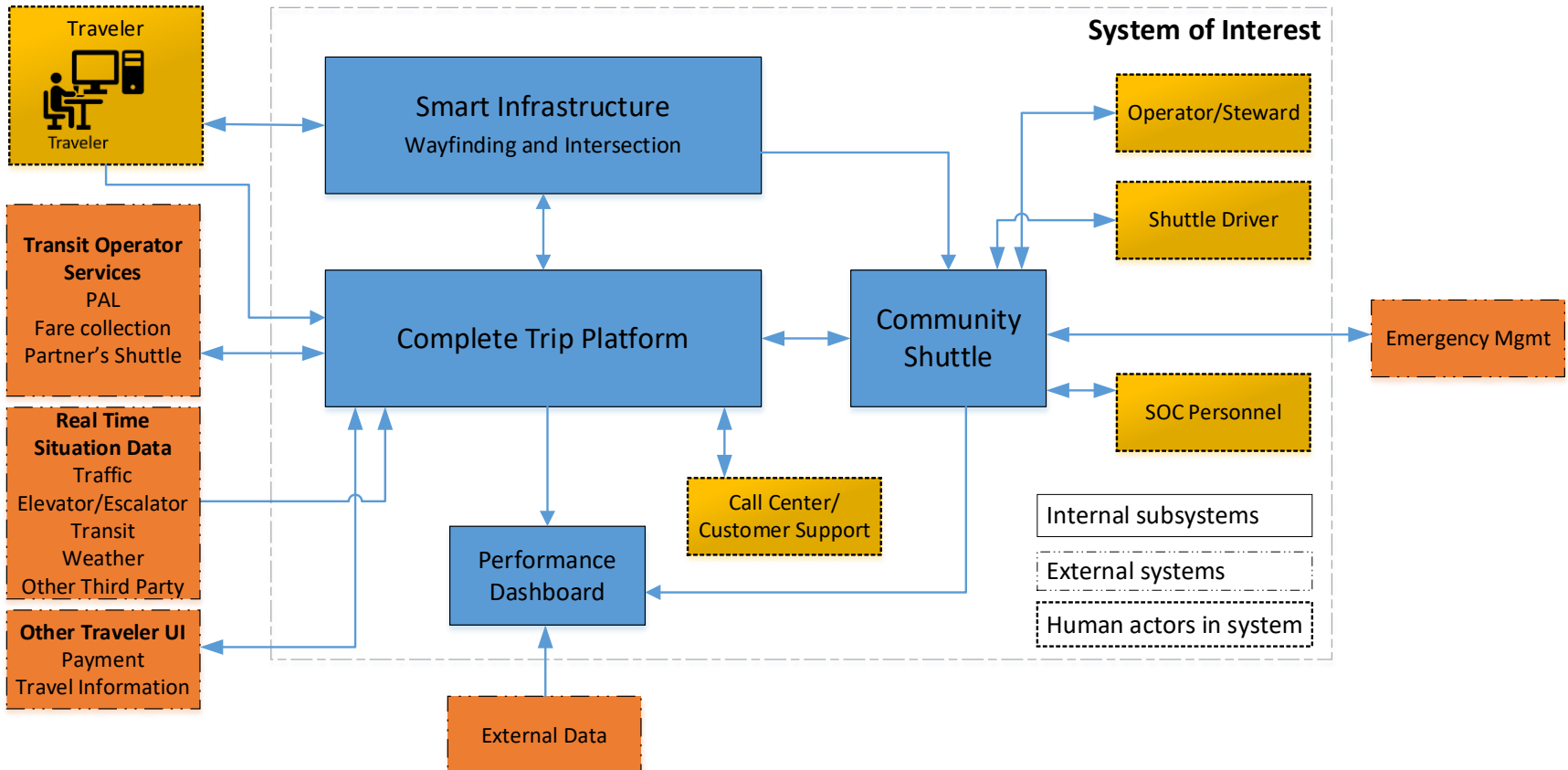
Access to a **new community shuttle (CS) service with human-driven shuttle (HDS) and self-driving shuttle (SDS)** that connects nearby neighborhoods to destinations and services within the deployment area.

Enabling caretakers to **manage and monitor trips** for the travelers who are in their care.

# At-Scale Deployment Summary

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

# High Level Context Diagram

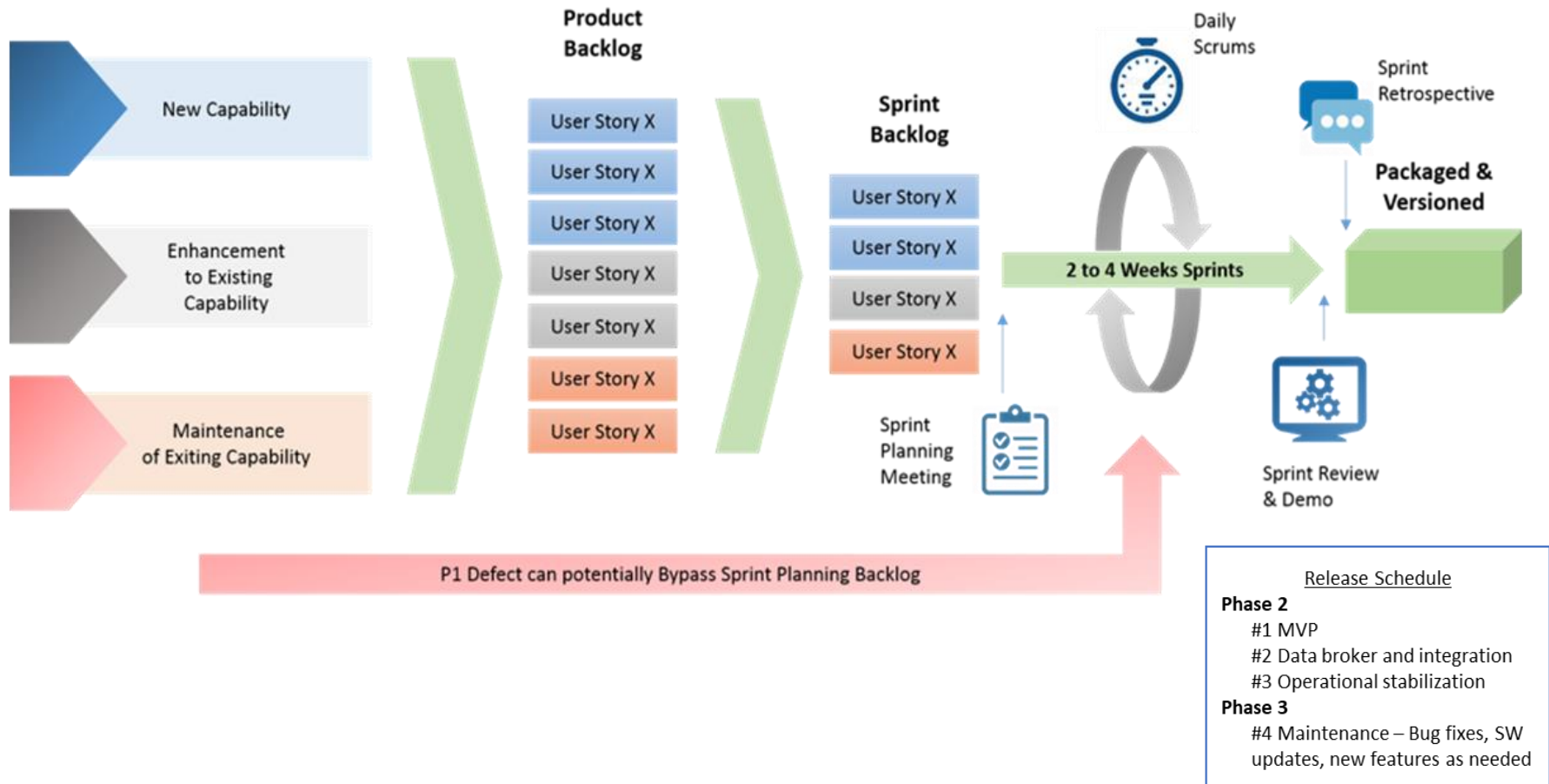


# Overview of Technical Approach



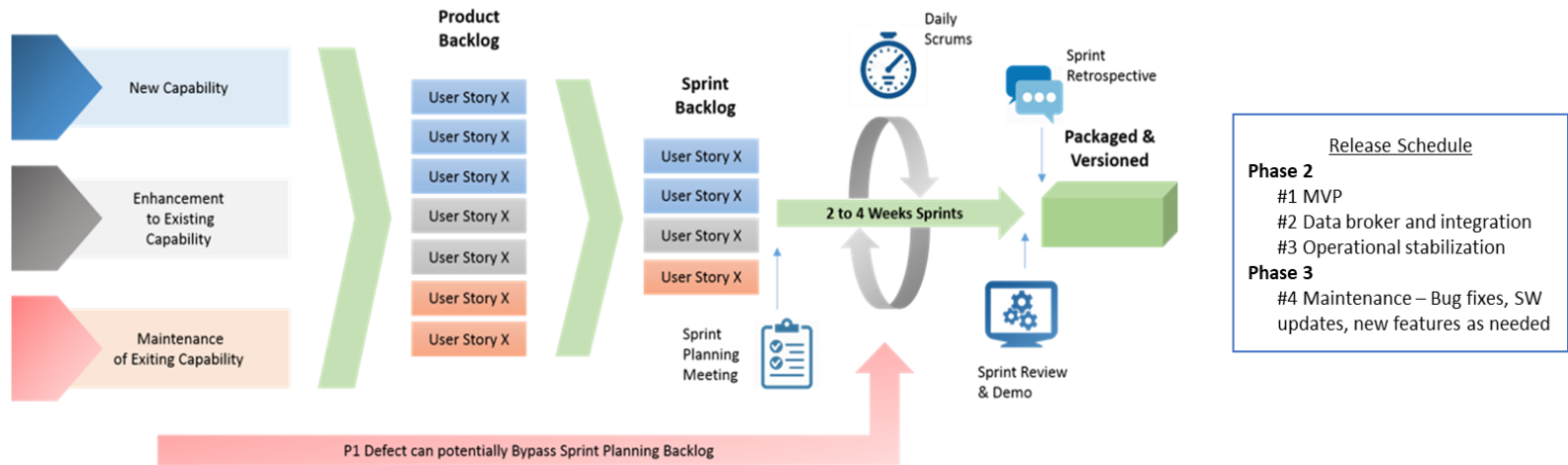
# Overview of Technical Approach (cont.)

## Agile Development Methodology



# Overview of Technical Approach (cont.)

## Agile Development Methodology



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

Sprint Activities	Design Processes	Development Processes	Implementation, Integration and Testing Processes	Verification & Validation Processes
	<ul style="list-style-type: none"> <li>Detailed User/System Stories traced to system requirements</li> <li>Interfaces</li> <li>Data schema</li> <li>Security and infrastructure design</li> </ul>	<ul style="list-style-type: none"> <li>Code development</li> <li>Code review</li> <li>Update Code / documentation (incorporating review comments)</li> <li>Build / execute unit and integration test cases (linked to sys req'ts)</li> </ul>	<ul style="list-style-type: none"> <li>Merge process</li> <li>Integration and system test cases/results</li> <li>Debug / re-test</li> <li>Acceptance testing</li> </ul>	<ul style="list-style-type: none"> <li>Sprint Retrospective</li> <li>Sprint Review &amp; Demo</li> <li>Metrics review</li> <li>Product versioning</li> </ul>

SE Activities	Systems Engineering Documents	Stakeholder Review (Sprint Planning Meeting)	Development Process SE Artifacts	Implementation, Integration and Testing SE Artifacts	Stakeholder Review
	<ul style="list-style-type: none"> <li>Needs / ConOps</li> <li>SyRS</li> <li>System Arch. (SAD)</li> <li>HLD (product backlog) – (SDD)</li> <li>Std APIs / Interfaces</li> <li>OpenTripPlanner (legacy)</li> </ul>	<ul style="list-style-type: none"> <li>Confirm req'ts</li> <li>Refine user / system stories</li> <li>Refine acceptance criteria</li> </ul>	<ul style="list-style-type: none"> <li>User stories traced to requirements</li> <li>Code traced to user stories</li> <li>Unit/integration tests (STP) traced to user stories/ acceptance criteria</li> </ul>	<ul style="list-style-type: none"> <li>Test case review (against req'ts / acceptance criteria)</li> <li>STP test cases and results</li> <li>Defect register</li> <li>Code/document repository update</li> </ul>	<ul style="list-style-type: none"> <li>Review demo (review acceptance criteria)</li> <li>Alpha / beta test as available</li> <li>Validate needs are met (signoff)</li> <li>Status – risks and issues</li> </ul>



# 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. Crowdsourcing 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

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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

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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

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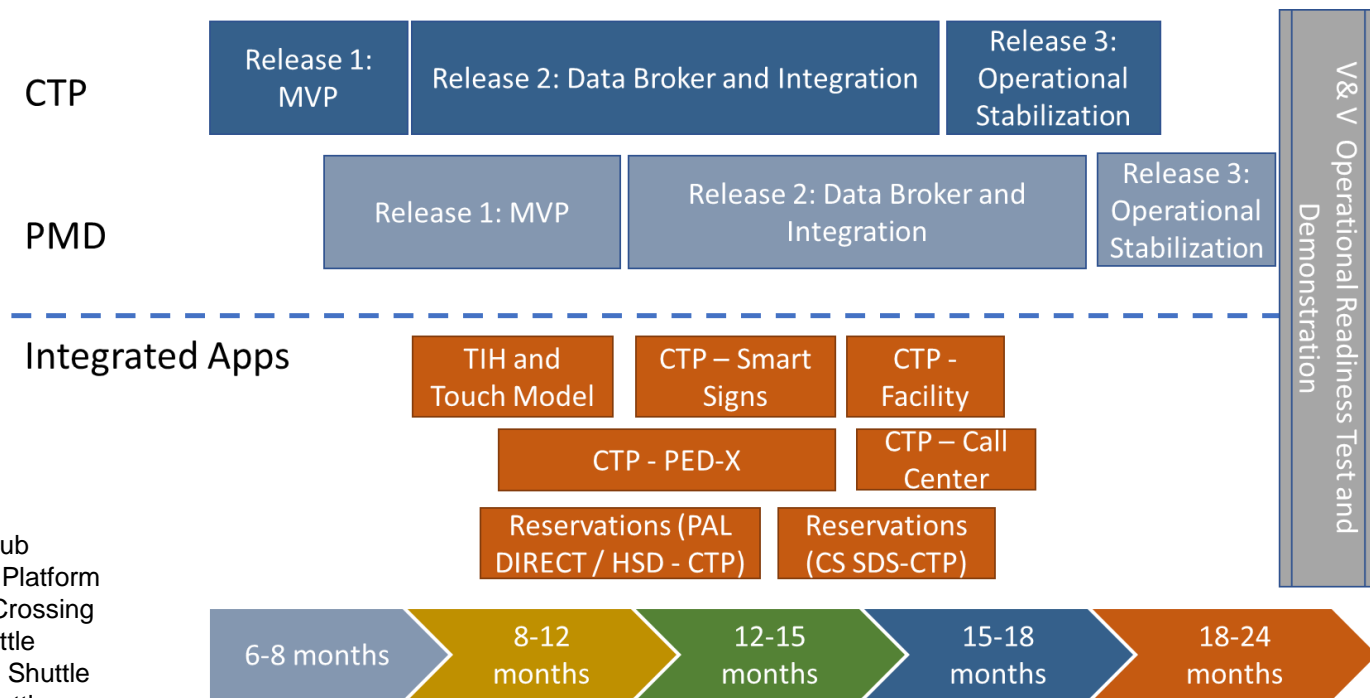
- A **three-step approach** is used to ensure safety of all participants:
  - Safety Needs and Hazard Identification
  - Safety Risk Assessment
  - Safety Operational Concept
- In addition, **key stakeholders will form a committee** to identify any hazards and how to mitigate them.

# 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  
 HSD – Human Driven Shuttle  
 SDS – Self Driven Shuttle  
 MVP – Most Viable Product  
 V&V – Validation and Verification

# At-Scale Phase 3 Milestones

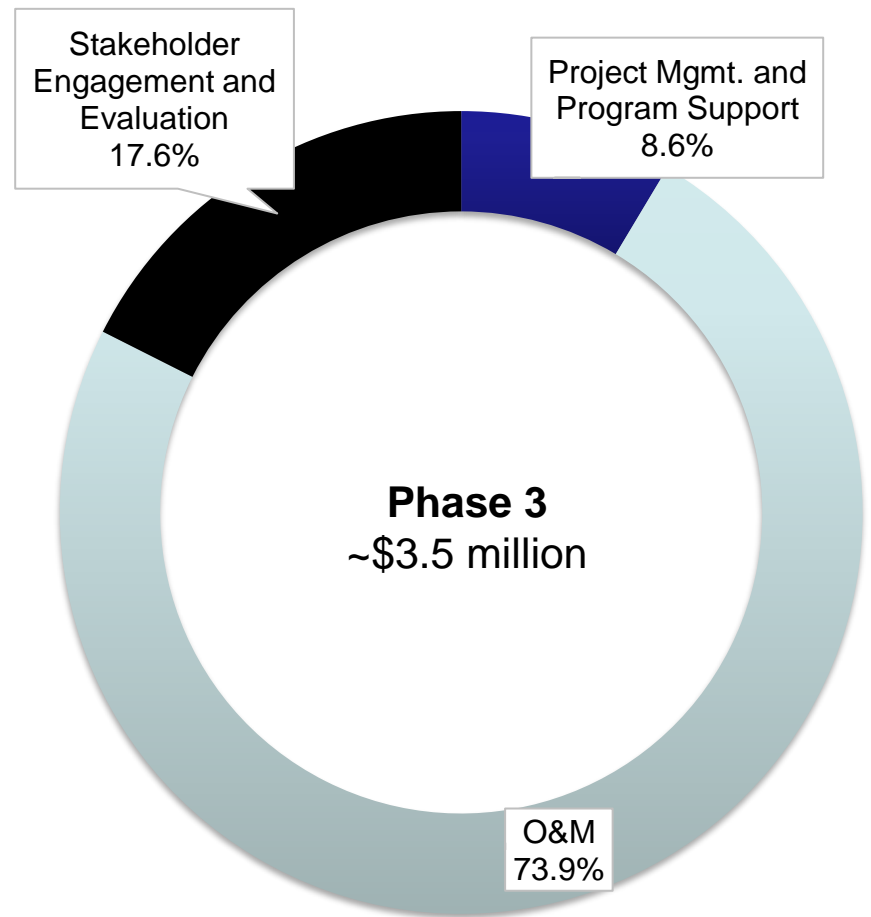
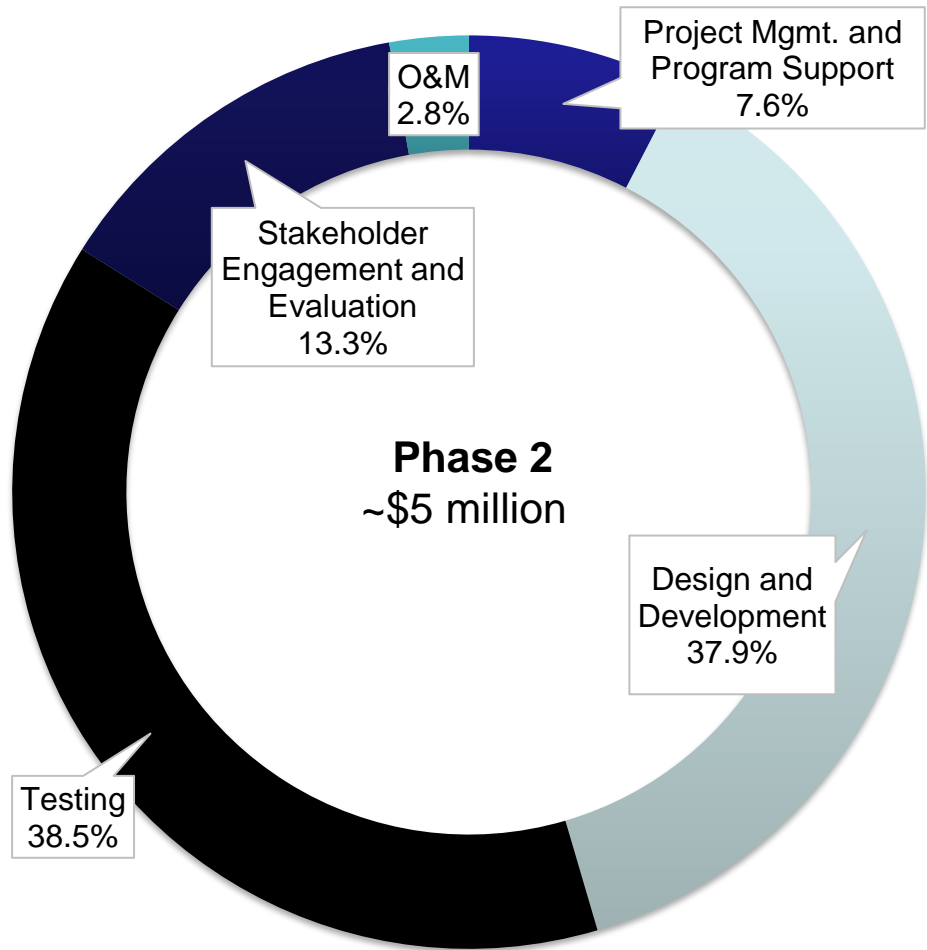
Due Date	Milestones
<b>Notice to Proceed (NTP)</b>	<b>Proposed 20% at scale deployment</b> CTP functionality will be at 100% Two facilities equipped for indoor wayfinding 100 customer accounts PMD at 80% PED-X intersections at 100% Touch Model at 100% TIH at 100% CS at 100%
<b>NTP + 2 months</b>	<b>Proposed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

# Phase 2 and Phase 3 Cost Estimate

Robert Jones, NFTA

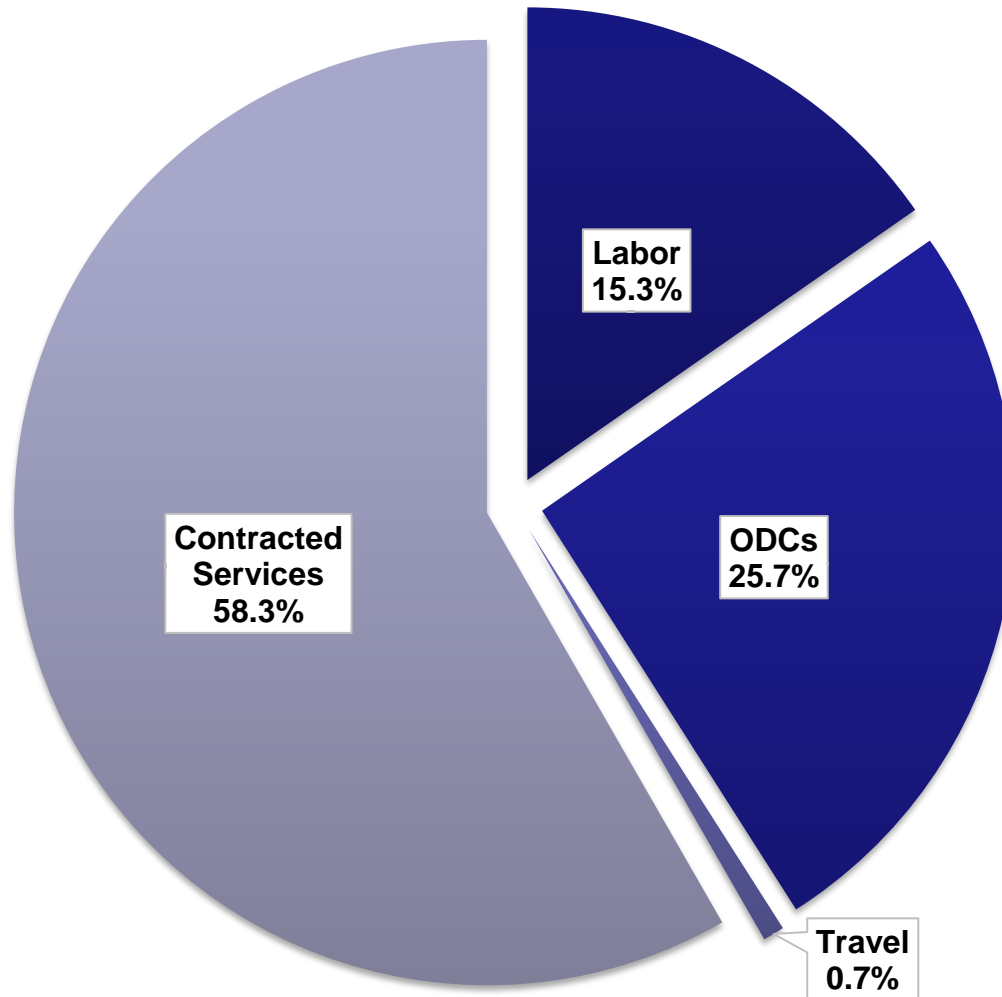


# Cost Estimate



# Cost Distribution

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## 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

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- 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

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**For more information please contact:**

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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](https://www.its.dot.gov/its4us/its4us_faq.htm)