Georgia Mobility and Accessibility Planner (G-MAP) Replicability Webinar

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

August 14, 2024

Webinar Agenda

- **Purpose of this Webinar**
  - Introduce the system development process and how stakeholders are engaged throughout the process to ensure the system will meet user needs

- **Webinar Content**
  - ITS4US Program Overview (Norah Ocel)
  - Project Introduction (Alan Davis)
  - G-MAP Replicability Features, Functions, and Resources (Natalie Smusz-Mengelkoch)
  - Features and Functions Deep Dive (Randy Guensler and Jon Campbell)
  - Questions and Answers
  - How to Stay Connected (Norah Ocel)

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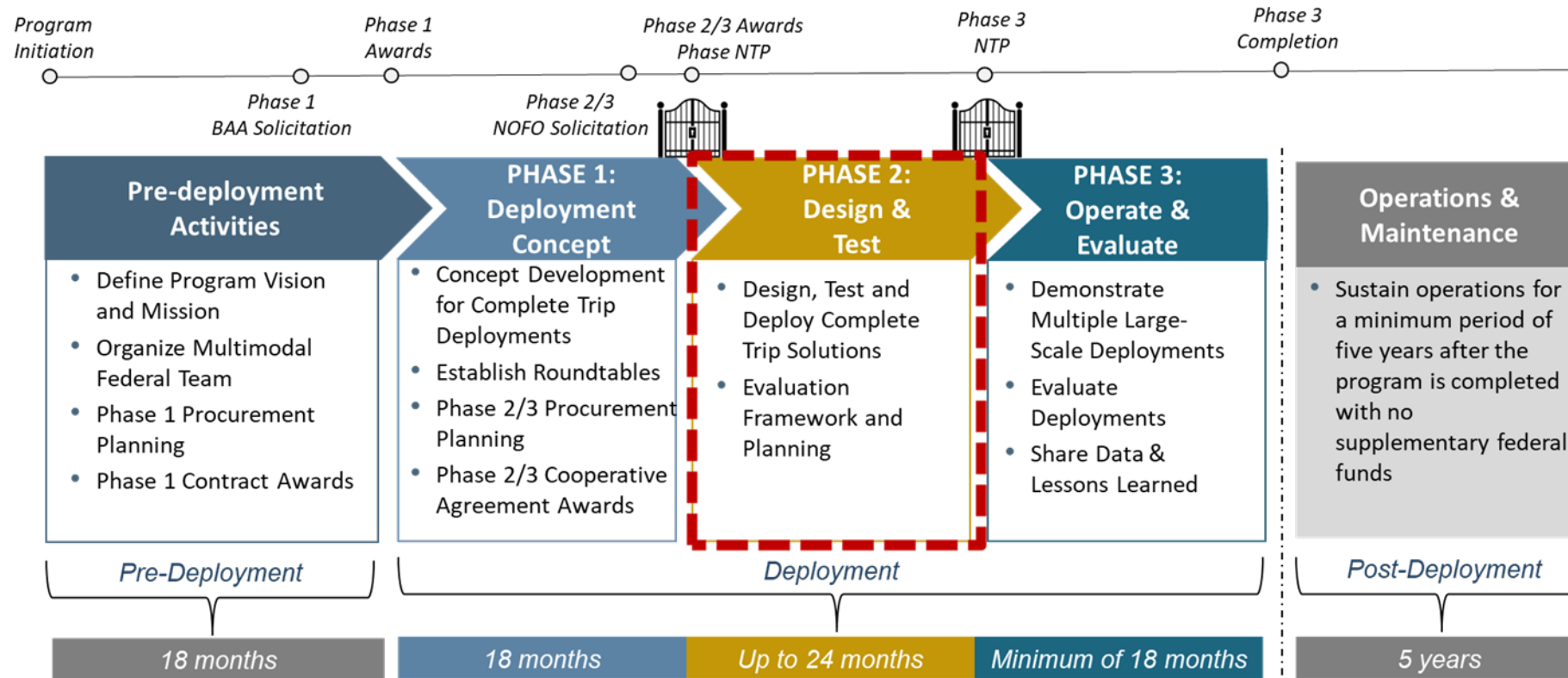
ITS4US Program Overview

- 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
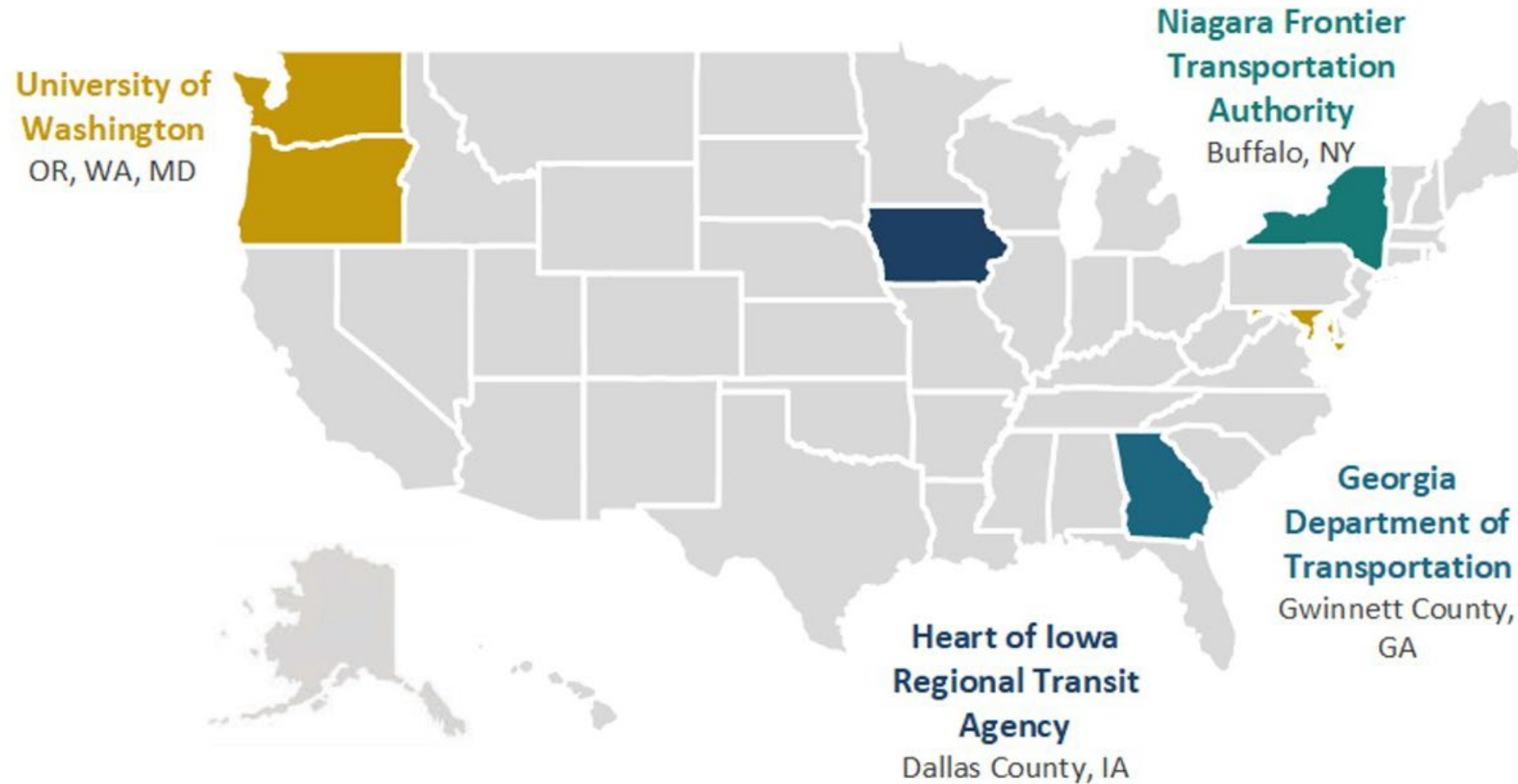
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IT'S TRANSPORTATION FOR ALL OF US

Vision: Innovative and integrated complete trip deployments to support seamless travel for all users across all modes, regardless of location, income, or disability
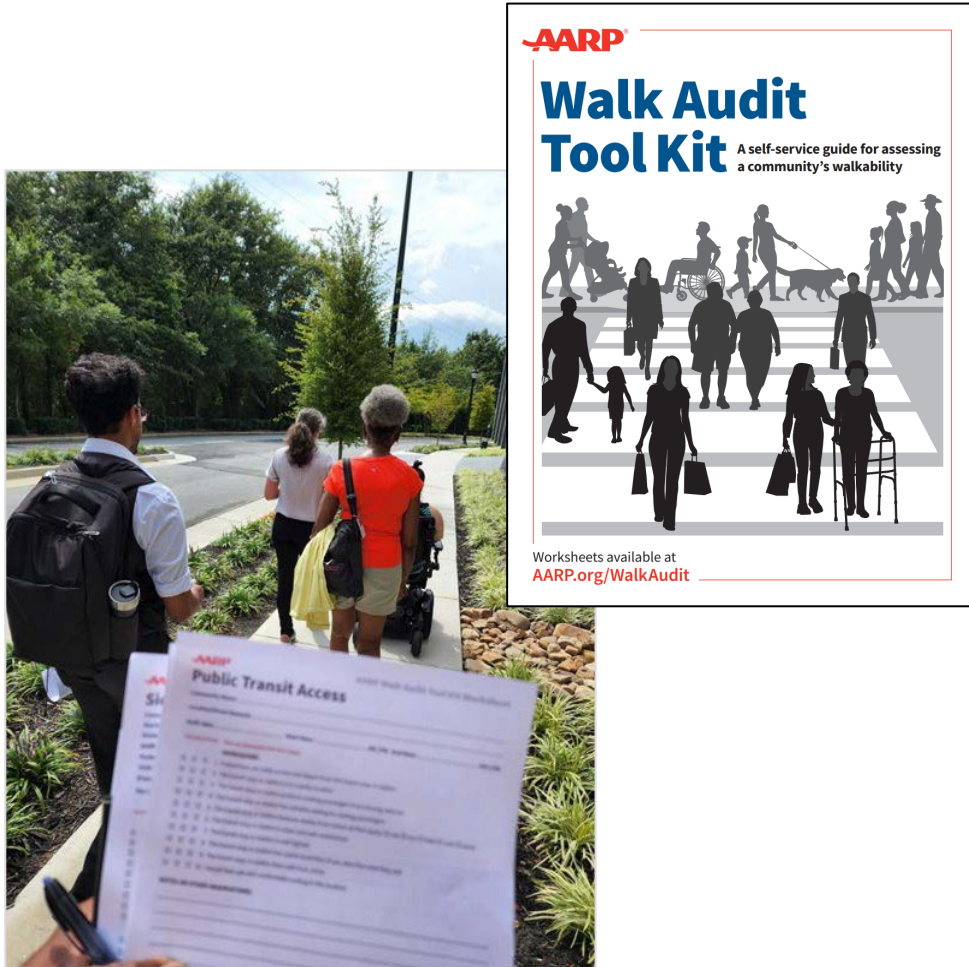
Deployment Phases

ITS4US Deployment Sites

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

Source: USDOT

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ITS4US Team Photo Collage

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Project Introduction

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Existing Mobility Challenges

Worksheets available at
AARP.org/WalkAudit

Guided by AARP Walk Audit

AARP Walk Audit includes questions like:
- Is the sidewalk separated from the street with a barrier or buffer?
- Is the sidewalk surface smooth and consistent?
- Is the sidewalk in good condition, without cracks or raised block?

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Existing Mobility Challenges (continued)

Missing curb ramps, not Americans with Disabilities Act (ADA) compliant.

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Project Site – Gwinnett County, GA

- Richly diverse area

- Major transit hubs

- Suburban land use

- Wide and high-speed roadways

- Inconsistent pedestrian infrastructure

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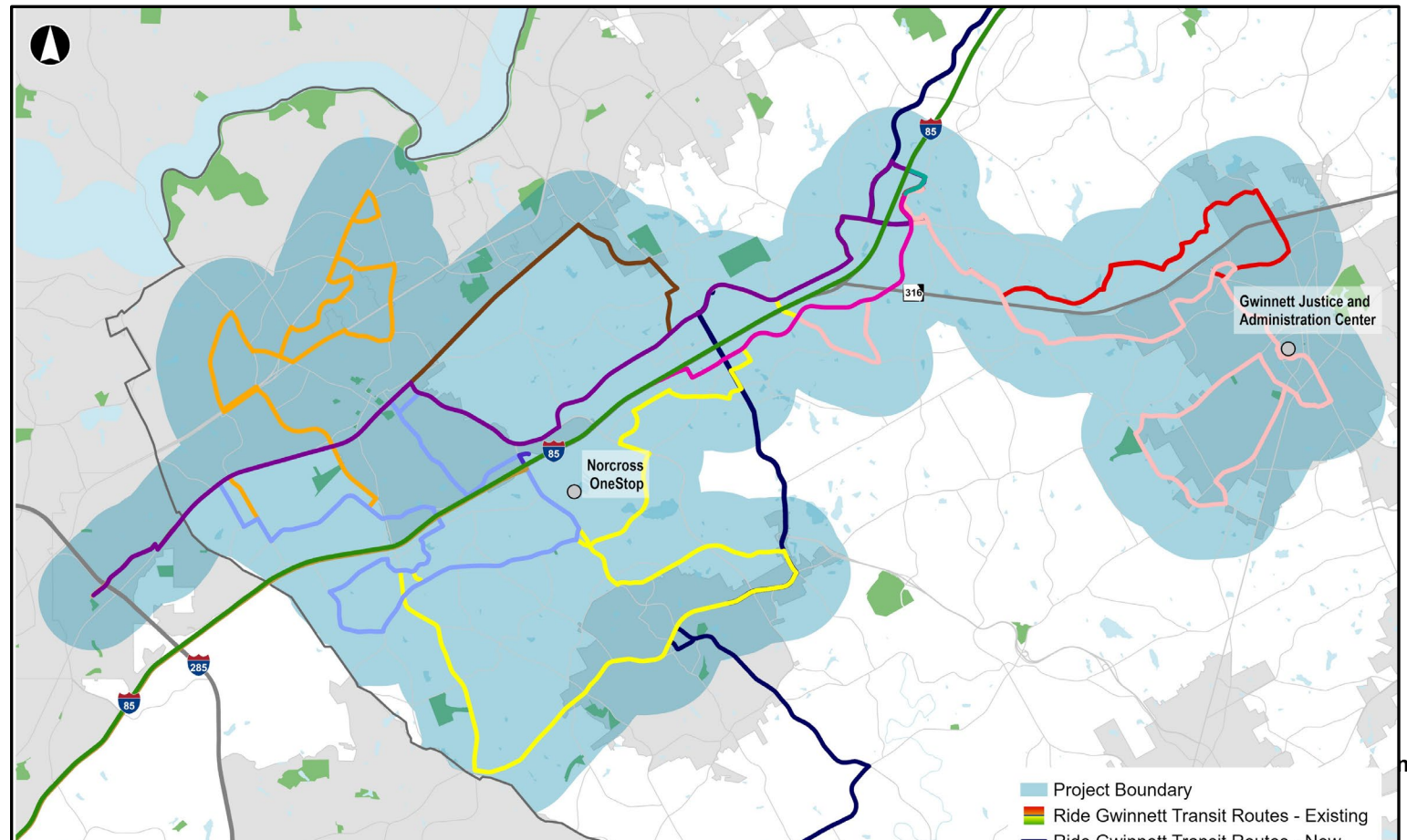
# Georgia Mobility and Accessibility Planner (G-MAP)
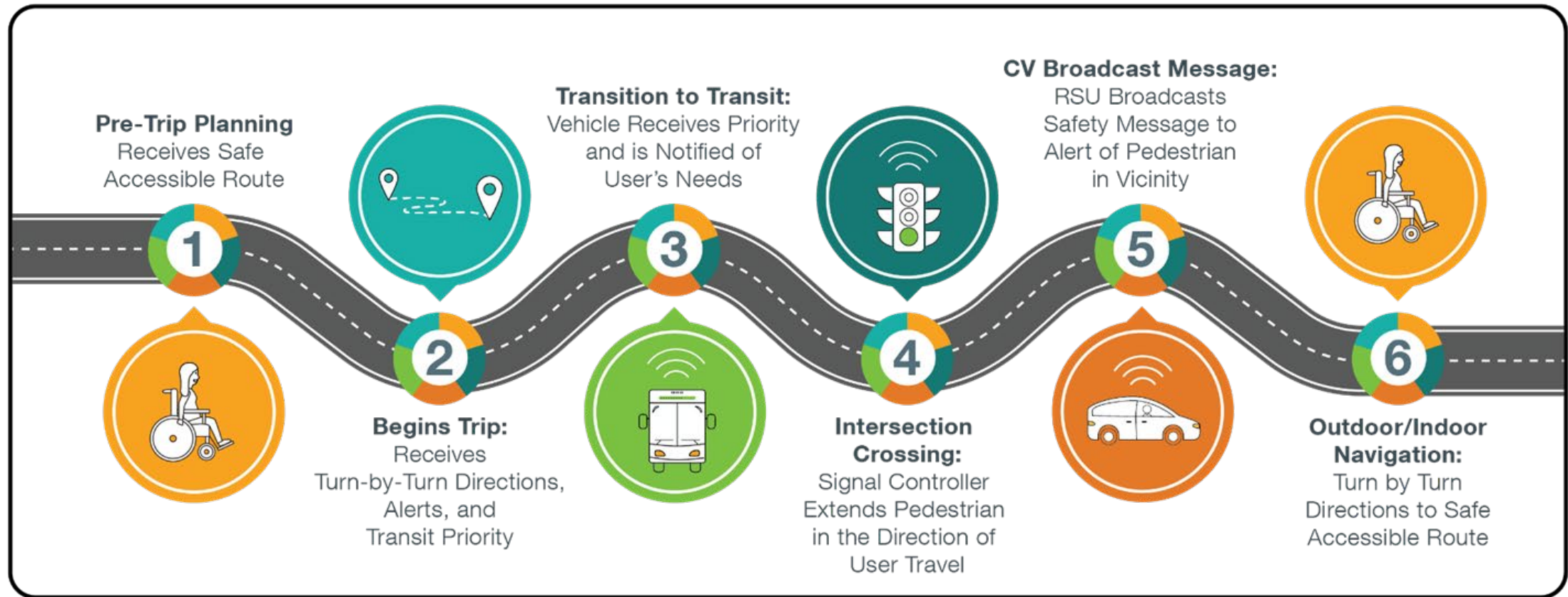
Source: ARC

G-MAP
Replicability Features, Functions, Resources

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Leveraging Existing Systems

- ATL Rider Information and Data Evaluation System (ATL RIDES)

- Connected Vehicle Regional Deployment Program

- Sidewalk Inventory Tools

- Gwinnett Connected Vehicle Technology Master Plan

- Space-Time Memory (STM) Platform

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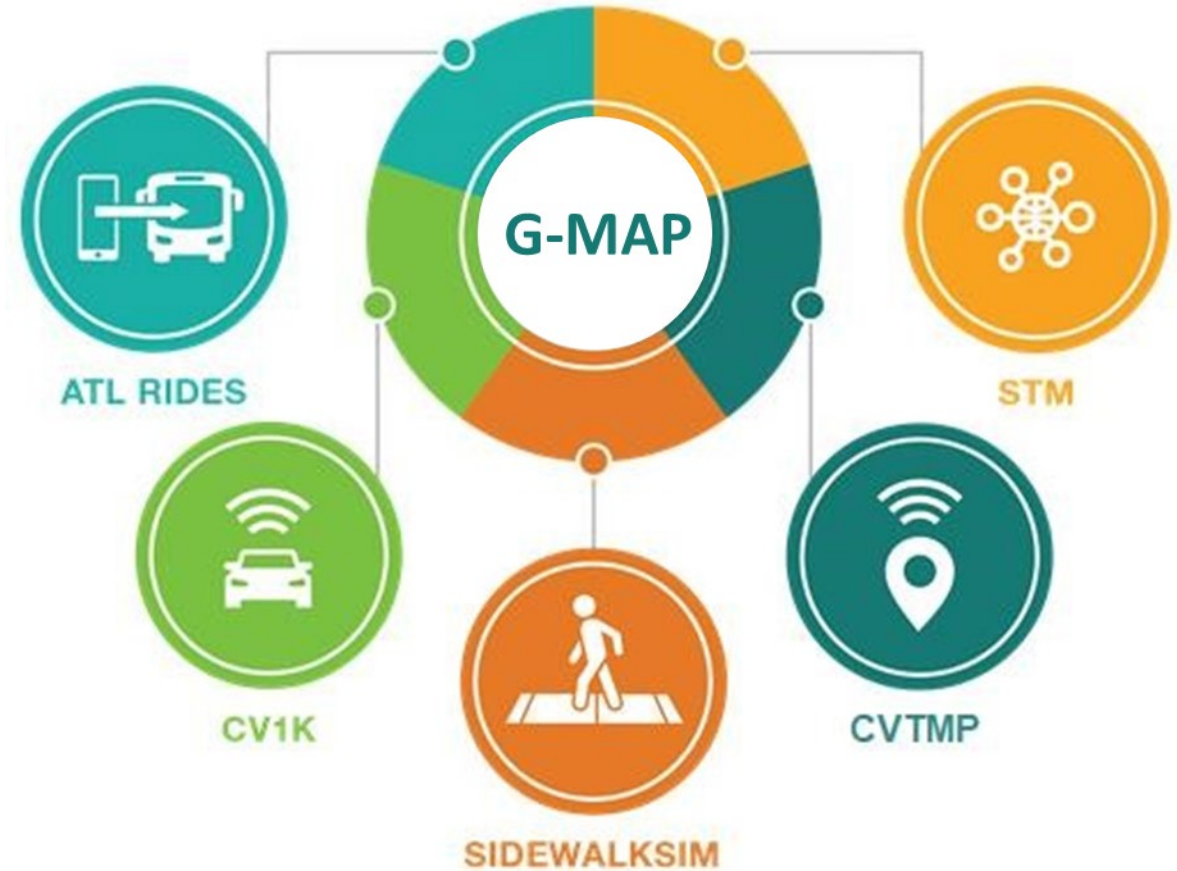
Deploying an Open Approach

- **Open Architecture** – Software designed for modular systems to make adding, upgrading, and swapping components easier.

  Examples Include:

    – Application Program Interfaces (APIs)

    – Software Development Kits (SDKs)

- **Open Source Software (OSS)** – Software with source code available for anyone to inspect, modify, and enhance.

  Examples Include:

    – OpenTripPlanner (OTP)

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Deploying an Open Approach (continued)

- **Open Standards** – Allow for the exchange of data within and between organizations and systems using common formats and shared rules, with outputs such as specifications, schemas and templates
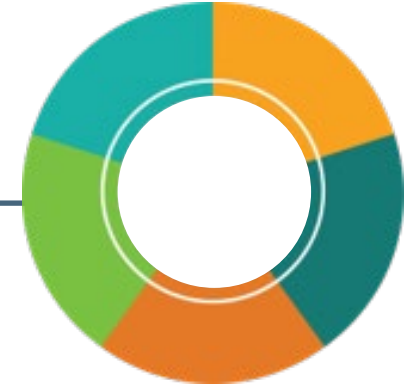
    Examples Include:

    - GTFS and GTFS Realtime for transit data

- **Open Data** – Can be freely used, re-used and redistributed

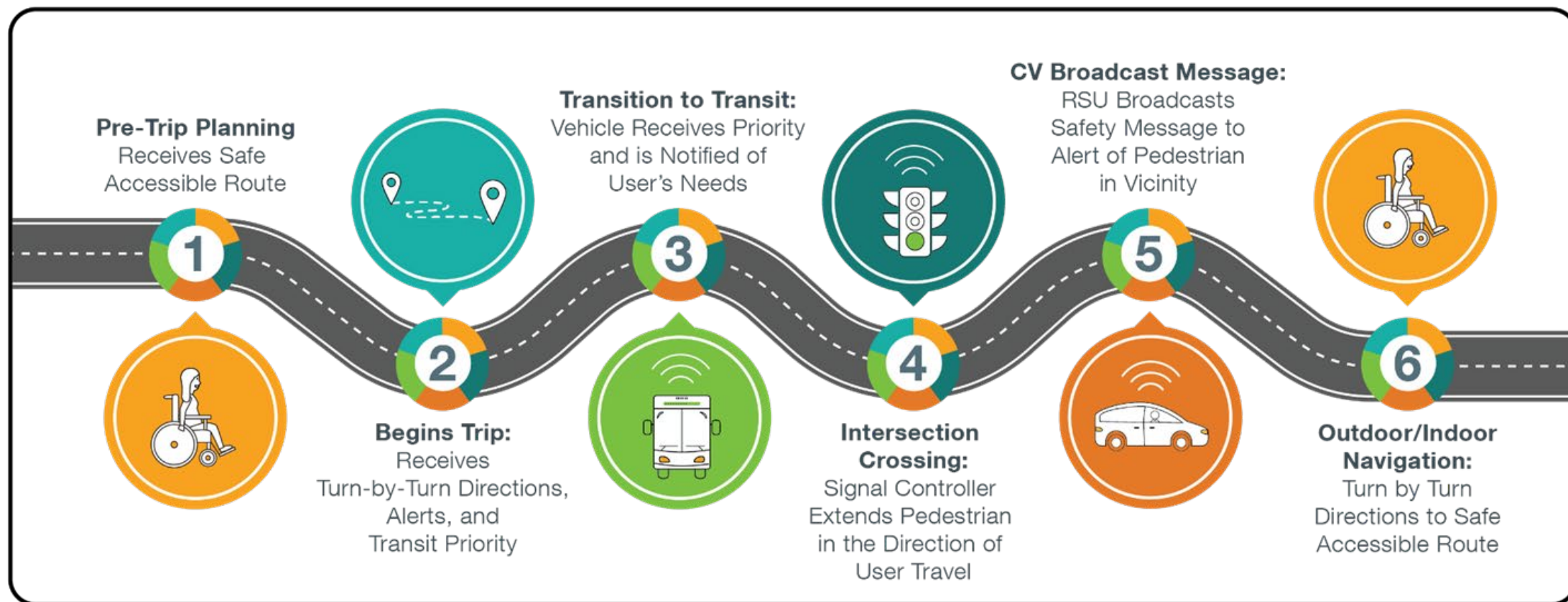   *Examples Include:*

    - Open data collection methods

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Forthcoming Resources

- **Systems Engineering Documentation**

  – Key documents include: ConOps, Systems Requirements, Systems Design Document (forthcoming)

  – USDOT ITS4US Publications

- **Source Code**

  – Sidewalk Inventory Process and Open Street Map (OSM) GitHub Site

  – OpenTripPlanner (OTP) GitHub Site

  – Pedestrian Actuation Request (PED-X) Gateway GitHub Site

  – Data Collection Methods Tech Transfer Documentation

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G-MAP Features and Functions

Pre-Trip Planning
Receives Safe Accessible Route

1

Begins Trip:
Receives Turn-by-Turn Directions, Alerts, and Transit Priority

2

Transition to Transit:
Vehicle Receives Priority and is Notified of User's Needs

3

Intersection Crossing:
Signal Controller Extends Pedestrian in the Direction of User Travel

4

CV Broadcast Message:
RSU Broadcasts Safety Message to Alert of Pedestrian in Vicinity

5

Outdoor/Indoor Navigation:
Turn by Turn Directions to Safe Accessible Route

6

Source: ARC

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G-MAP
Features and Functions
Replicability Deep Dive

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Step 1 – Pre-Trip Planning Account Set-Up

Step 1 – Pre-Trip Planning
Mobility Mode Assignment

- Each user is assigned to a mobility mode based on their account set up

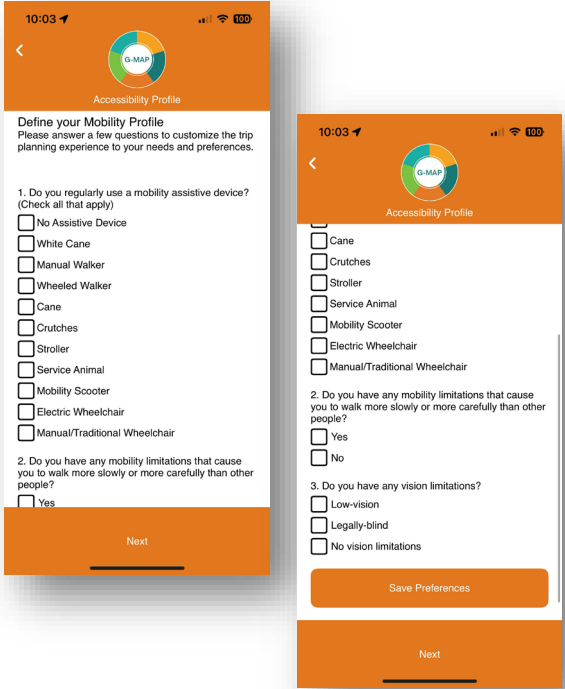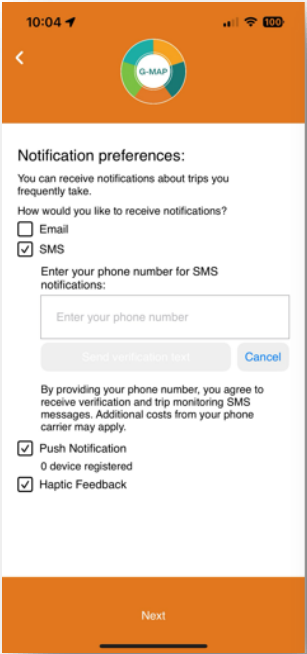| Eight Primary Categories |
| --- |
| Person walking who has no mobility limitations |
| Person walking who has minor mobility limitations |
| Person walking with a mobility device (cane, walker, etc.) or pushing a stroller |
| Person using a manual wheelchair |
| Person using an electric wheelchair |
| Person using a mobility scooter |
| Person walking with low vision |
| Person walking who is blind or has major vision limitations |

- Ten mode/vision interaction categories
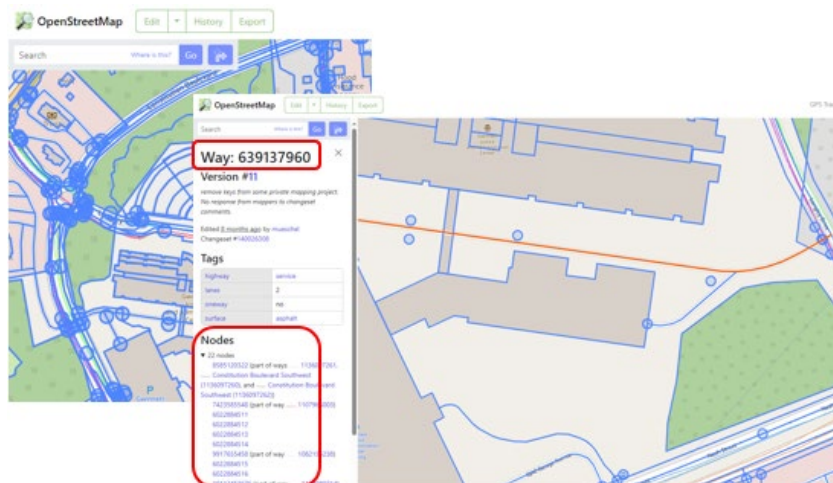- Users are assigned to categories via questions in G-MAP signup

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Account Set-Up: Mobility Profile

| User Account Set-Up	Features and Functionality	Replicability Dependencies
	G-MAP user defines: 1. If they regularly use a mobility assistive device, i.e., white cane, manual wheelchair, electric scooter, etc. 2. If they have mobility limitations that causes them to move slower than others. 3. If they have any vision limitations. Mobility mode is assigned based on logic via a decision tree and account set up responses.	**Regionally:** ATL RIDES is deployed throughout the region and can be expanded to include this functionality. Minimal effort required. **Nationwide:** Existing applications that leverage OpenTripPlanner (OTP) as their platform can easily replicate this functionality.

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Account Set-Up: Notifications

User Account Set-Up	Features and Functionality	Replicability Dependencies
	Account Set-Up – Notifications: Allows user to define how they want to receive alerts and notifications, i.e., email, SMS, push notification, haptic feedback.	Same as previous, but email/SMS notifications require SaaS messaging services in addition to the base OTP system.

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Step 2 – Begins Trip
# Pedestrian Inventory and Link Impedances

Field Data Collection Methods

- Multi-view vehicle-based video for all streets

- Multi-view wheelchair-based video of all sidewalks

- Flythrough video inspections (asset design and condition)

- Machine vision processing

- All methods are standardized
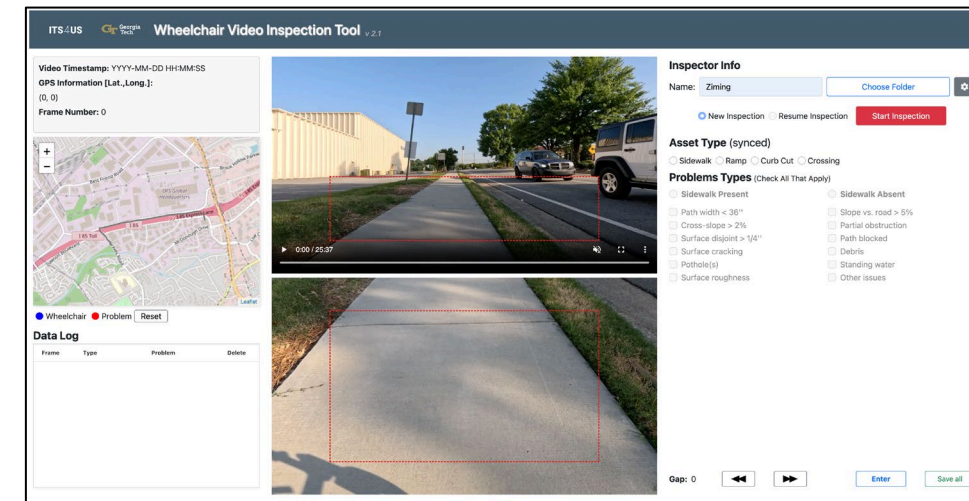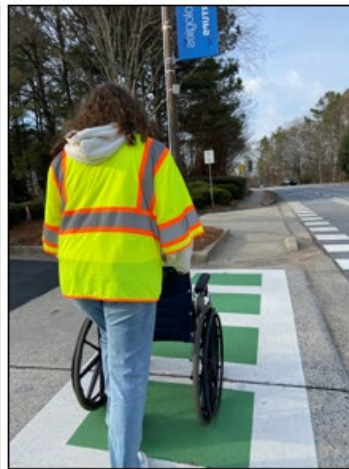
Enhanced Pedestrian Inventory

- Decompose OSM ways into logical links and add missing links

- Standard methods include ten sequential steps to generate all links
  and crossings to which impedance (time and other costs) will be assigned for OTP

ITS4US - Ramps and Curb cuts within Demo Zone
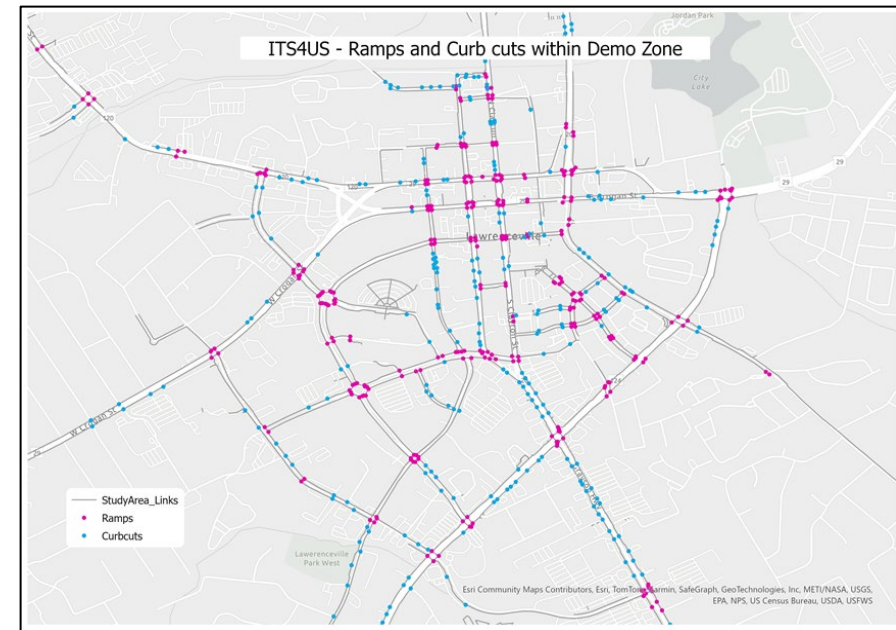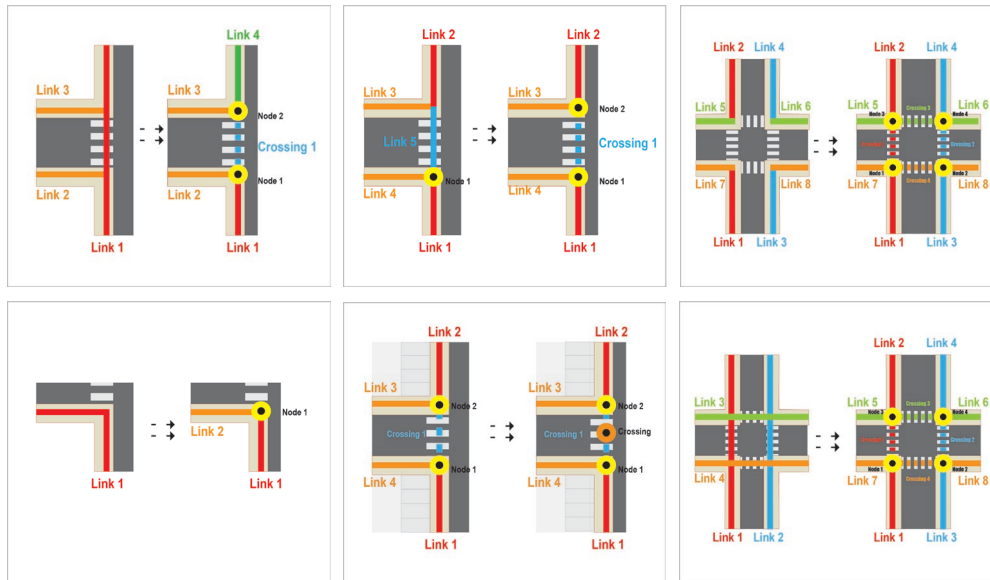
- Final network replicated in Neptune system

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Enhanced Pedestrian Inventory (continued)
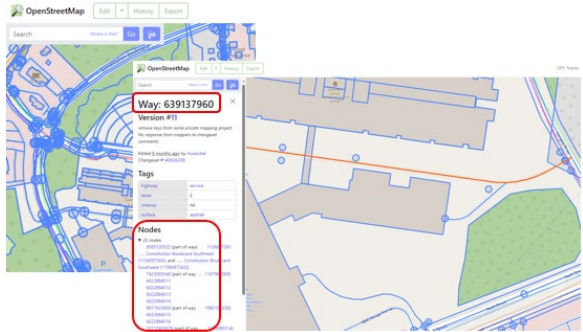
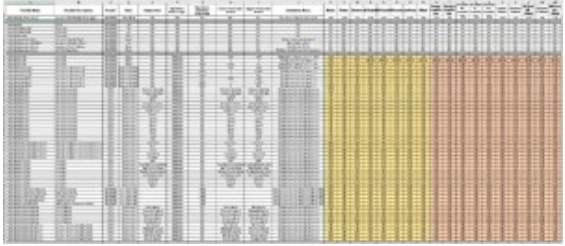| Begins Trip	Features and Functionality	Replicability Dependencies
	Enhanced Pedestrian Inventory: Processes developed by GA Tech uses video-based data collection, video inspections, and machine vision techniques to identify pedestrian assets and assign values that are used to calculate link impedance. Note: Video and data also provide agencies with a much better understanding of their asset inventory and accessibility needs.	**Regionally:** GA Tech has developed sub-inventories in the City of Atlanta, Cobb, Clayton, and now Gwinnett Counties. Any historic data will need to be revisited and updated to match the new and more extensive replicable standards developed for G-MAP. **Nationwide:** A pedestrian asset inventory that meets the new standards is needed to expand G-MAP service. Alternatively, agencies could leverage their existing inventory and develop a modified way to calculate link impedance.

Impedance Assignment

- Link feature impedance
  - Link is missing (width = 0)

- Link defect impedance
  - Link completely blocked

- Crossing link impedance
  - Associated ramp is missing (width=0)

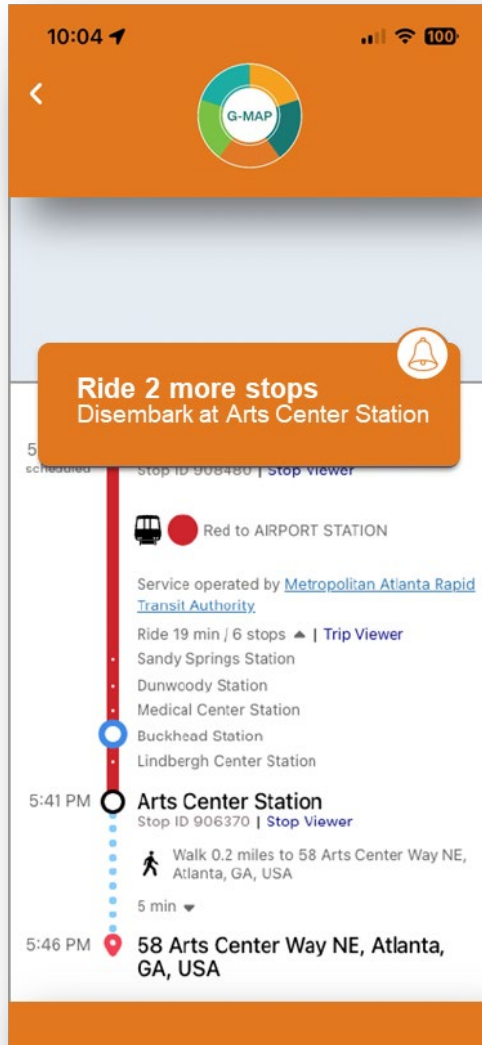- Impedance is so large that a wheelchair user will be diverted across the street at a prior road crossing

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Ingests Pedestrian Inventory

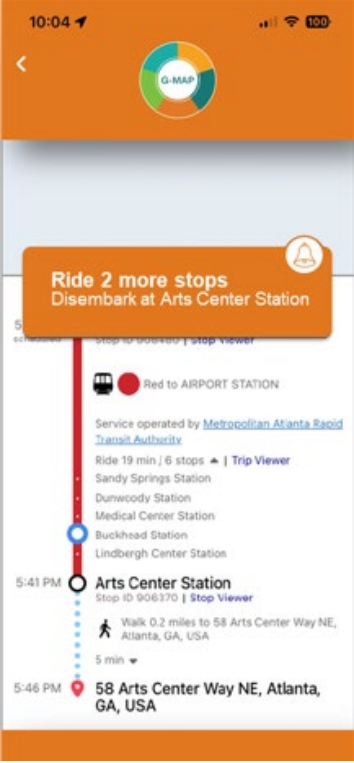| Begins Trip	Features and Functionality	Replicability Dependencies
	Refine and Ingest the Ped Network: The Complete Paths Inventory is structured using the OpenStreetMap (OSM) way/node structure. Long pedestrian ways in OSM are decomposed into individual links for impedance assignment. Enhanced pedestrian inventory characteristics associated with the refined network are stored in an AWS Neptune Database and used to assign link impedance for OTP routing.	**Regionally/Nationally:** Ways are decomposed into logical pedestrian links, updates to the OSM network (e.g., addition of new sidewalks) need to be integrated into the Neptune system for impedance assignment and routing. If OSM is used in an iterative fashion over time changes in the OSM network would need to be monitored to ensure that these changes are accurate and meet standards. Network instances will need to be captured, reviewed manually or with machine learning algorithms, and stored.

Impedances Calculated for Accessible Routing

Begins Trip	Features and Functionality	Replicability Dependencies
	Impedances Calculated for Accessible Routing: Link impedance for each mobility mode (18 categories) is assigned to each network link used in OTP routing. Hence, a route for a wheelchair may be different than a route for a user that has low vision (different link impedance values). OTP generates routes based on user needs.	**Regionally:** G-MAP impedances are based on characteristics and OSM approach defined above. Those areas with existing enhanced pedestrian inventory would require minimal effort to expand. **Nationally:** G-MAP impedances are based on characteristics and OSM approach defined above. Alternatively, an agency could develop their own method of calculating impedances based on existing pedestrian inventory or another ITS4US project.

G-MAP: Step 3 – Transition to Transit

Ride Request

Transition to Transit	Features and Functionality	Replicability Dependencies
	Ride Request: Remotely requests service from transit vehicles while users are waiting to board such that the bus operator is aware the person is waiting to board. Sends alerts to transit vehicles when users need additional time to board.	**Regionally/Nationally:** G-MAP is integrated with the Gwinnett County enterprise transit management software (ETMS) through an open API. A replicating agency would need to configure a message through their ETMS and operating procedures for their transit operators.

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Enhanced Transit Signal Priority (TSP)

Transition to Transit	Features and Functionality	Replicability Dependencies
	Enhanced TSP: If the G-MAP user is a person that needs additional time to board/alight the vehicle, TSP is provided to the G-MAP user's bus if they are behind schedule.	**Regionally:** G-MAP leverages the existing Gwinnett County TSP system (connected vehicle based) and ETMS data as well as an API to trigger enhanced TSP. Regional partners leveraging the same systems could efficiently replicate. **Nationally:** A replicating agency could leverage the G-MAP API enhanced TSP trigger. The G-MAP API would need to be consumed by the TSP system and the system would need to be configured to provide enhanced TSP.

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G-MAP: Step 4 – Intersection Crossing Pedestrian Crossing

(4) **Intersection Crossing**

Signal controllers will extend the pedestrian crossing time at intersection crosswalks along your travel route.

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Remote Pedestrian Crossing Actuation

Intersection Crossing	Features and Functionality	Replicability Dependencies
	Remote Pedestrian Crossing Actuation (PED-X): G-MAP user will be detected when they arrive at the intersection and the ped crossing request will be actuated without the need to push the button.	**Regionally:** G-MAP is integrated with Gwinnett County traffic management software (MaxTime). A G-MAP API sends a request to a Gwinnett County proxy server which sends a trigger to the local controller to initiate a ped call (and ped 2 extension call) in the direction of travel. **Nationally:** A replicating agency could leverage the G-MAP API and NTCIP standard approach for implementing the remote actuation and ped phase extension. The API and proxy server will be posted as open source code.

Remote Pedestrian Crossing Actuation
(continued)

Intersection Crossing	Features and Functionality	Replicability Dependencies
	Pedestrian Phase Extension: If needed, the G-MAP user is provided additional time to cross the intersection.	Same as previous.

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G-MAP: Step 5 – CV Broadcast Message Broadcast Personal Safety Message (PSM)
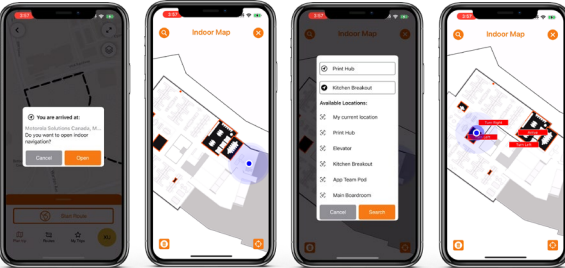
Broadcast Personal Safety Message

| CV Broadcast Message	Features and Functionality	Replicability Dependencies
	Broadcast Personal Safety Message (PSM): Pedestrian crossing actuation initiates the PSM to be broadcast at the intersection. This feature was not developed by the ST-CTN project.	**Regionally/Nationally:** This functionality is leveraged from Gwinnett County's existing CV system. The PSM broadcast is initiated with the actuation of the pedestrian phase.

G-MAP: Step 6 – Outdoor/Indoor Navigation Integrated Indoor Navigation
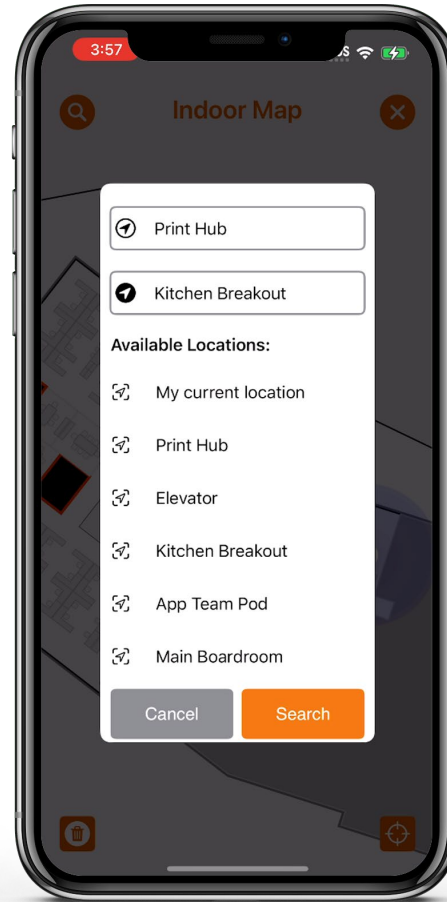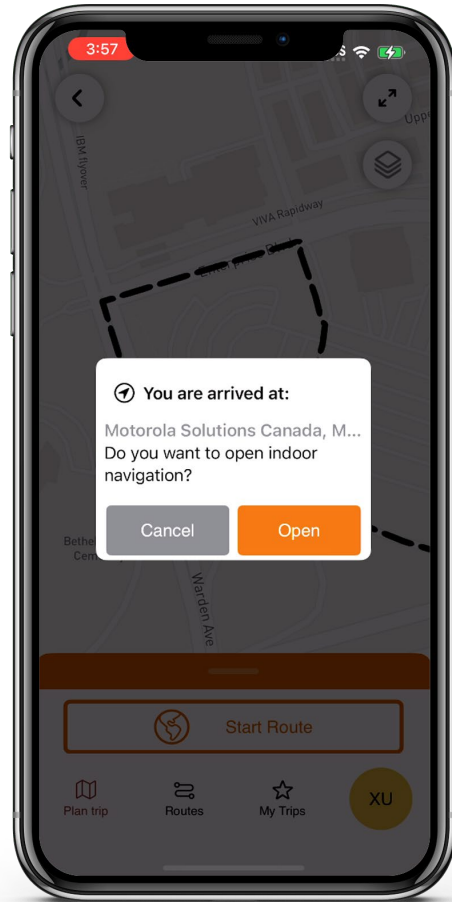
Integrated Indoor Navigation

Outdoor/Indoor Navigation	Features and Functionality	Replicability Dependencies
	Integrated Indoor Navigation: Indoor navigation is provided through the use of Bluetooth Low Energy (BLE) beacons installed at a facility and a proprietary indoor navigation system's Software Development Kit (SDK). G-MAP users are provided with accessible indoor navigation based on their needs.	**Regionally/Nationally:** The integration of indoor navigation with the G-MAP app will be available via the OSS but depends on a proprietary indoor navigation SDK. Added functionality includes the handoff between the OTP routing and indoor navigation and turn-by-turn directions inside the building. The functionality requires the installation of BLE beacons, mapping of the facility, and a management software to update indoor facility status, i.e., elevator is out, etc.

Learn More / Resources
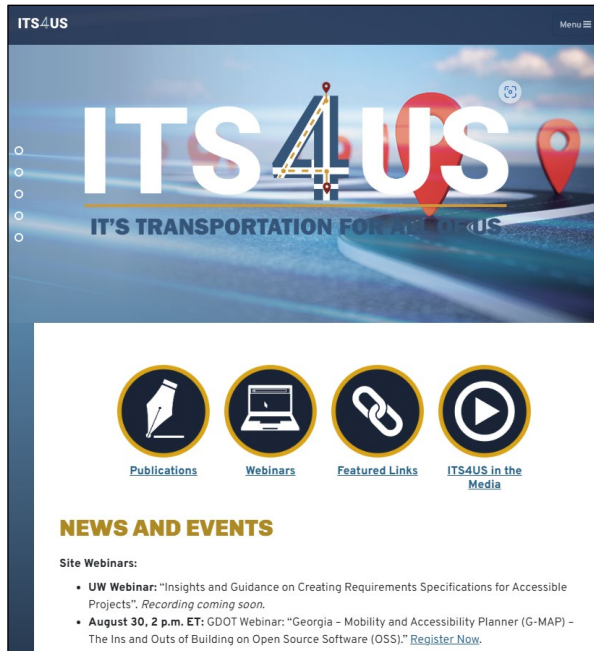
USDOT Website:
USDOT ITS4US

Deployment Website:
Home Page - ITS4US Deployment Program Project (georgia-map.com)

Stay Connected (Program / Site)

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Visit the ITS4US Deployment Program Website:

https://its.dot.gov/its4us/

ITS4US Deployment Program Video

https://youtu.be/pztl1lRyXAc

Visit the Georgia-MAP

https://georgia-map.com/

Questions?

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