DMA Webinar Series

IDTO Bundle

Ron Boenau

Senior Transportation Systems Manager
Special Operations, FTA

February 17, 2015

TODAY'S AGENDA

- DMA Program Overview
- Prototype Design and Demonstration
  - IDTO Bundle Overview
  - Prototype Description and Current Project Status
- Impact Assessment
  - Current Project Status of Impact Assessment
  - Testing Results and Impacts/Benefits from IA
- Stakeholder Q&A
  - We can only answer the questions related to the DMA program.
  - We cannot answer any questions related to the CV Pilots.

DMA Program Overview

Dynamic Mobility Applications Program

- **Vision**
  - Expedite development, testing, commercialization, and deployment of innovative mobility application
    - maximize system productivity
    - enhance mobility of individuals within the system
- **Objectives**
  - Create applications using frequently collected and rapidly disseminated multi-source data from connected travelers, vehicles (automobiles, transit, freight) and infrastructure
  - Develop and assess applications showing potential to improve nature, accuracy, precision and/or speed of dynamic decision
  - Demonstrate promising applications predicted to significantly improve capability of transportation system
  - Determine required infrastructure for transformative applications implementation, along with associated costs and benefits
- **Project Partners**
  - Strong internal and external participation
    - ITS JPO, FTA, FHWA R&D, FHWA Office of Operations, FMCSA, NHTSA, FHWA Office of Safety

DMA Program Approach To Overcoming Two Key Challenges To Application Deployment

- **Challenge 1 (Technical Soundness)**
  Are the DMA bundles technically sound and deployment-ready?
  - Create a “trail” of systems engineering documents (e.g., ConOps, SyRs)
  - Share code from open source bundle prototype development (OSADP website: http://www.itsforge.net/)
  - Demonstrate bundle prototypes (in isolation)
  - Field test integrated deployment concepts from across CV programs

- **Challenge 2 (Transformative Impact)**
  Are DMA bundle-related benefits big enough to warrant deployment?
  - Engage stakeholders to set transformative impact measures and goals
  - Assess whether prototype show impact when demonstrated
  - Estimate benefits associated with broader deployment
  - Utilize analytic testbeds to identify synergistic bundle combinations

DMA Bundles and Applications

FRATIS: Freight Advanced Traveler Information Systems

Apps: Freight-Specific Dynamic Travel Planning and Performance, Drayage Optimization (DR-OPT)

IDTO: Integrated Dynamic Transit Operations

Apps: Connection Protection (T-CONNECT), Dynamic Transit Operations (T-DISP)
Dynamic Ridesharing (D-RIDE)

R.E.S.C.U.M.E.: Response, Emergency Staging and Communications, Uniform Management, and Evacuation

Apps: Incident Scene Pre-Arrival Staging Guidance for Emergency Responders (RESP-STG)
Incident Scene Work Zone Alerts for Drivers and Workers (INC-ZONE)
Emergency Communications and Evacuation (EVAC)

MMITSS: Multimodal Intelligent Traffic Signal System

Apps: Intelligent Traffic Signal System (I-SIG), Transit and Freight Signal Priority (TSP and FSP)
Mobile Accessible Pedestrian Signal System (PED-SIG), Emergency Vehicle Preemption (PREEMPT)

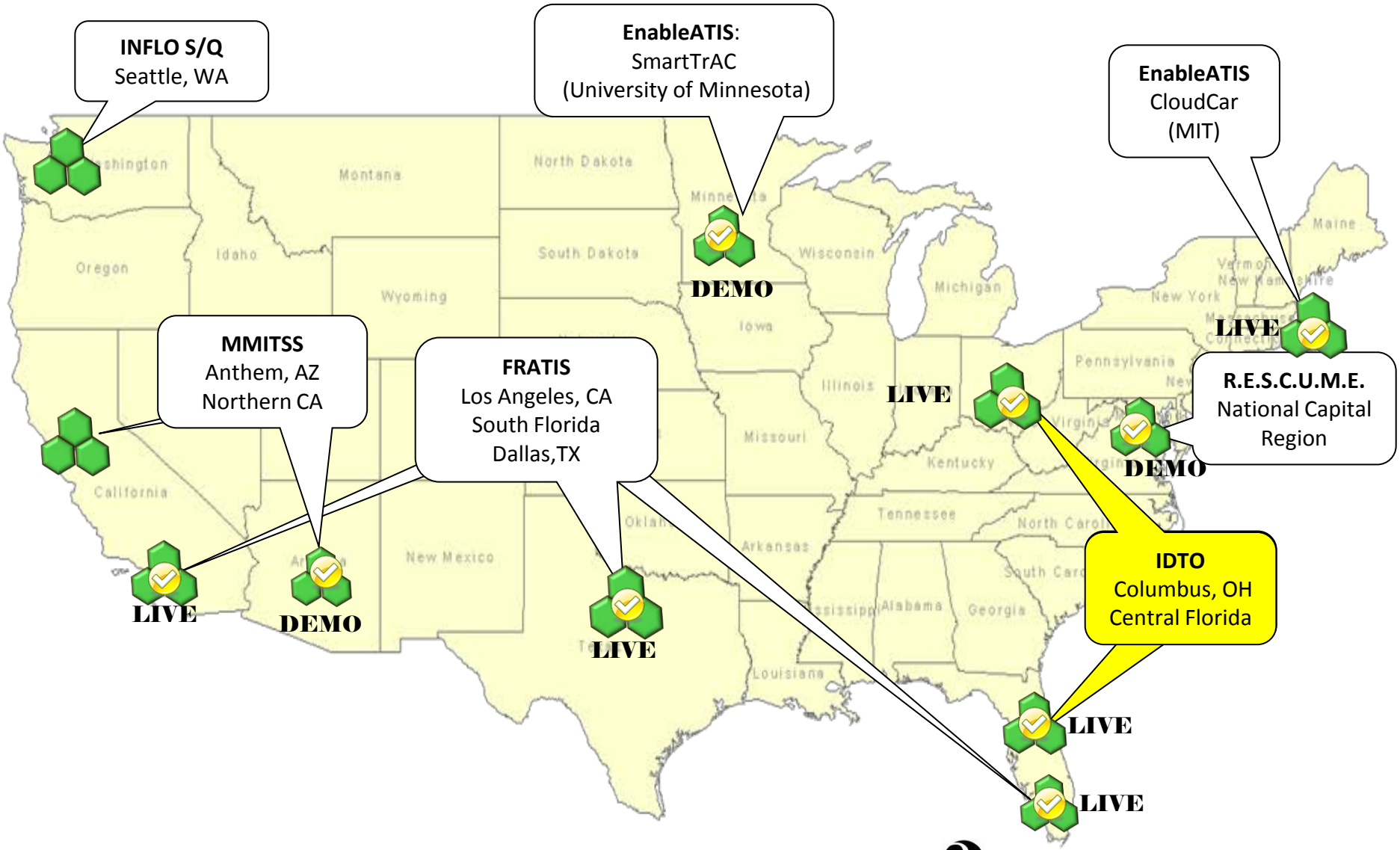
INFLO: Intelligent Network Flow Optimization

Apps: Dynamic Speed Harmonization (SPD-HARM), Queue Warning (Q-WARN)
Cooperative Adaptive Cruise Control (CACC)

Enable ATIS: Enable Advanced Traveler Information Systems

Apps: EnableATIS (Advanced Traveler Information System 2.0)

DMA Prototype Development Activity



IDTO Bundle Overview

IDTO Bundle Description

- The Integrated Dynamic Transit Operations (IDTO) Bundle provides benefits to travelers and transportation service providers by:
  - Bringing together public and private-sector transportation provider information and operations
  - Leveraging the widespread and growing adoption of smartphones as a travel planning and in-trip notification tool.
  - Building on available standards and open-source tools
  - Integrating three travel-related apps that individually offer significant value, and when integrated, provide even greater benefits

T-CONNECT (Connection Protection)	T-DISP (Dynamic Transit Operations)	D-RIDE (Dynamic Rideshare)
• Increases the likelihood of making successful transfers by monitoring inbound and outbound vehicles, as well as travelers, determining if/how a connection can be preserved, and initiating the necessary notifications to these parties to support	• For travelers, T-DISP provides an ability to access real-time information about available travel options in order to best manage their commutes. • For an agency, T-DISP extends demand / response services to support dynamic routing and scheduling	• New, more efficient approach to rideshare concepts including real-time scheduling

IDTO Development Team

Prototype Development Team

- Battelle Memorial Institute
- TranSystems (Transportation Consultants)
- Ohio State University Transit Lab

Demonstration Locations

- Columbus, Ohio & Central Florida (Orlando area)

Demonstration Partners

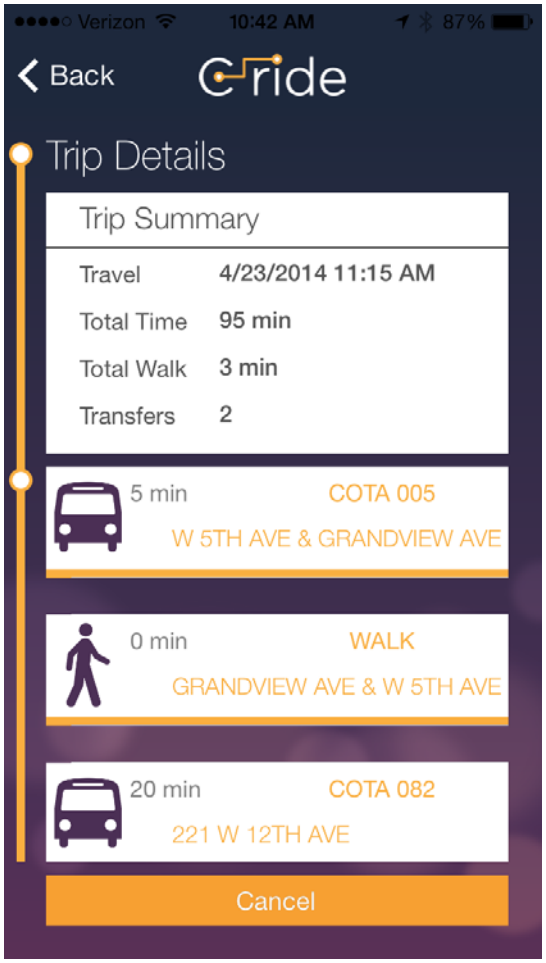
- Central Ohio Transit Authority (COTA)
- The Ohio State University Campus Area Bus Service (CABs)
- Capital Transportation (Private demand response provider)
- LYNX (Orlando transit provider)
- Zimride (Ridesharing service)

IDTO Application Concepts

- Integrate Schedule and AVL Data from Transit / Transportation Service Providers
- Create interface to ‘booking’ tools for demand/response and ride share providers
- Integrate all providers into Smartphone-based travel planning tool
- Traveler enters to/from and time information
- System provides available routes / modes
- User selects and ‘saves’ trip
- System monitors traveler and providers to coordinate transfers
- If necessary, system notifies dispatch to request hold at a stop
- Dispatch accepts/declines
- Traveler is notified in real-time

IDTO Application Concepts

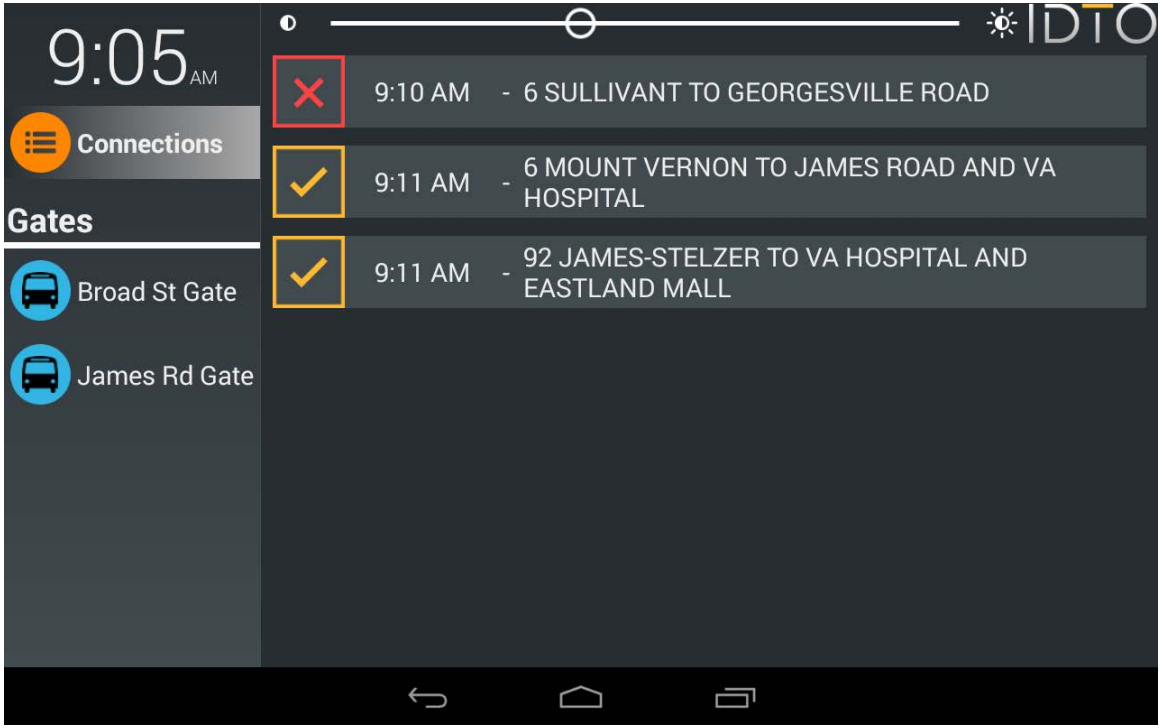
User Interface Example



- Single user interface for traveler to plan trips, both recurring and one-time for all three applications.
- Provides option to use local transit, demand/response services, rideshare, or a combination of all of these modes as part of a trip
- Integrates multiple providers and modes
- Provides status indication of trip start, transfers, and T-Connects
- Available for Web, iOS or Android
- Traveler-Owned Device (downloadable application)

IDTO Application Concepts

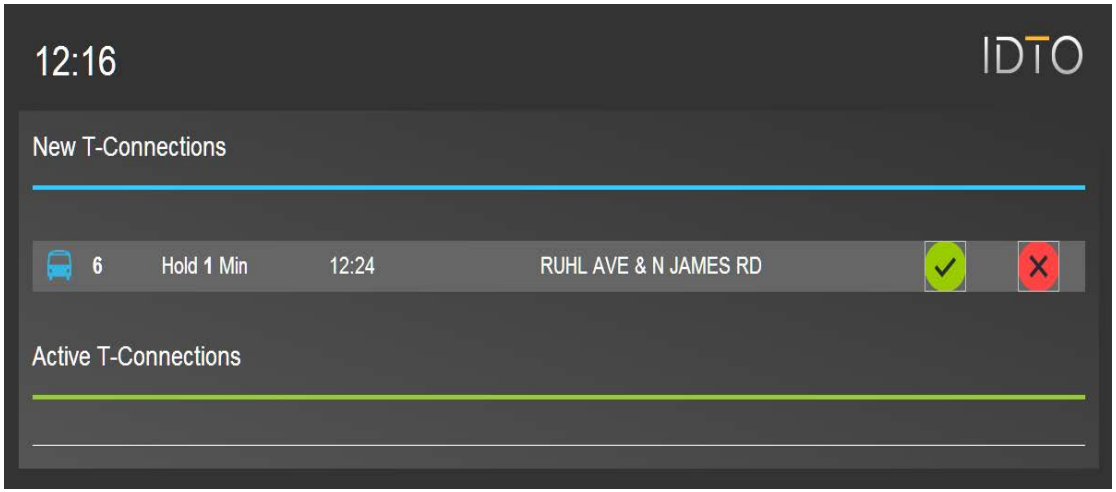
Mobile Data Terminal Example for Transit Driver



- Solution for transit providers lacking CAD/AVL
- Android-based LTE Tablet (Nexus 7) with custom IDTO application
- Provides AVL capabilities in low-cost manner
- Driver protects transfer on behalf of rider
- Interface allows for:
  - Viewing Current Bus Schedules and ETAs
  - Trip Planning: Can I pick up another customer?
  - Transfer Status

IDTO Application Concepts

Dispatcher Interface Example



- Dispatcher Interface is step toward full CAD/AVL integration
- Implemented as web-based portal
- IDTO-specific iPad devices installed at provider
- Simple touch-screen interface displays:
  - Incoming Requests & Approved Transfers
  - Two Actions: Accept or Reject
  - Auto-reject if no response

IDTO Prototype

IDTO Prototype Objectives

Objectives

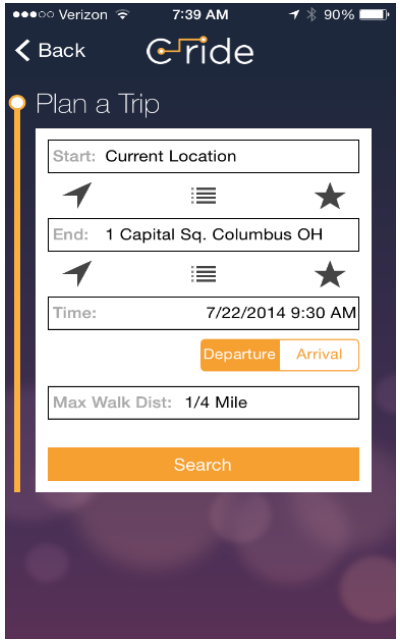
- Provide dynamic scheduling, dispatching, and routing capabilities
- Enable and ‘protect’ multi-modal and multi-agency transfers
- Facilitate dynamic ridesharing
- Integrate all of these features into a single system, for the benefits of both travelers and operators

IDTO Prototype Key Hypotheses

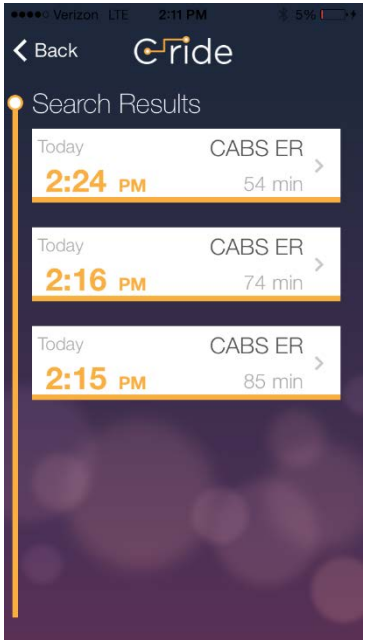
Hypotheses

- Multiple Agencies and multiple modes can be coordinated in a single mobile application
- Given necessary AVL data and policy agreements, connections can be protected

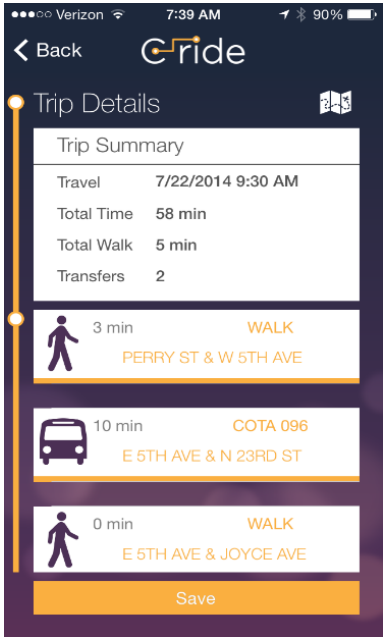
Enter Trip Start / End



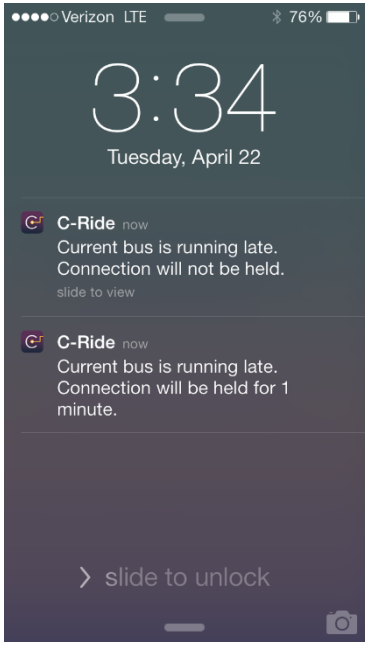
View and Select Route/Providers



View T-CONNECT enabled trip details



Receive real-time status during trip



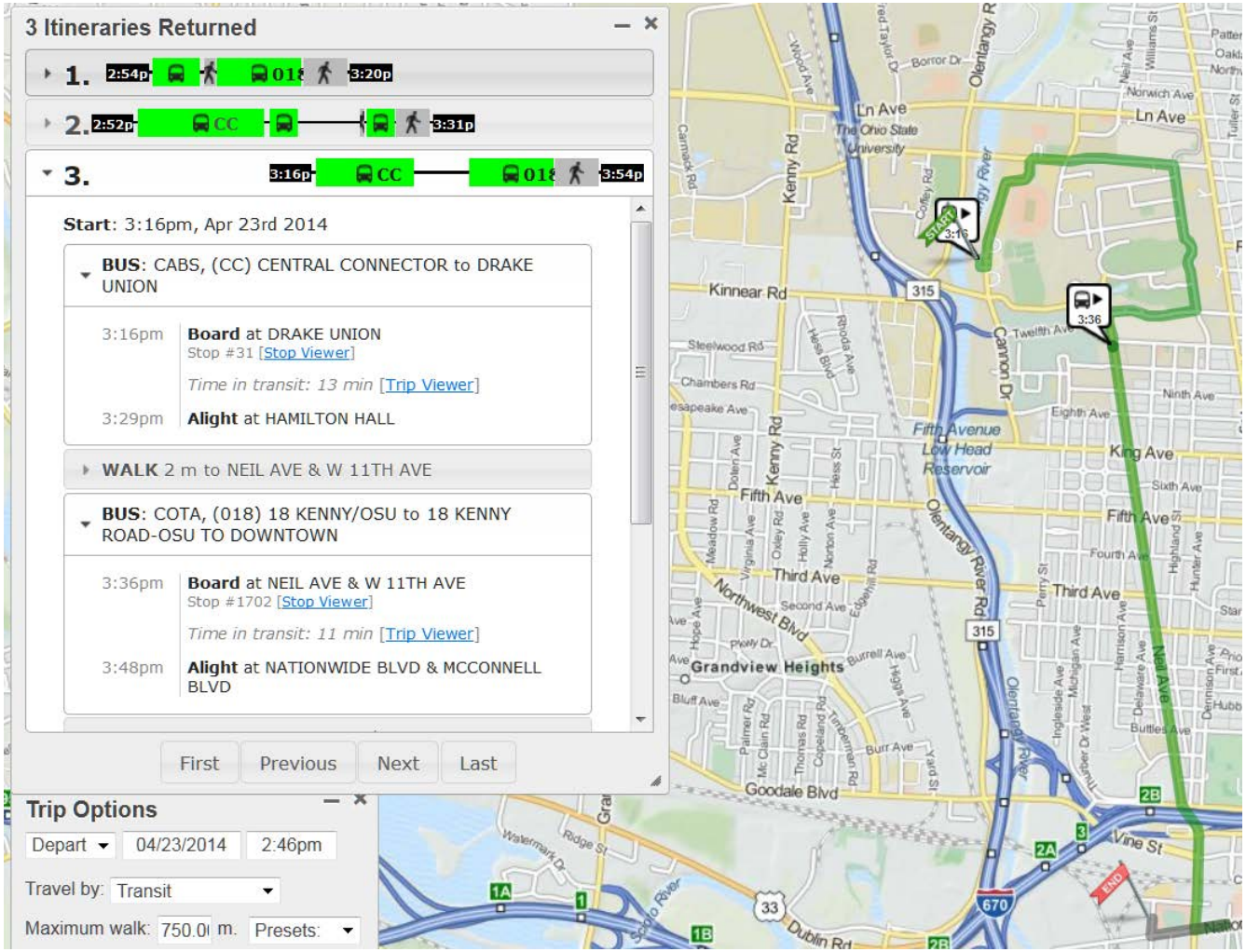
IDTO Demonstration

- Two demonstrations locations
  - Columbus demonstration: April 29, 2014
  - Central Florida demonstration: November 5, 2014

- Objectives
  - Show searching for and scheduling a multi-agency and/or multi-modal trip (T-DISP)
  - Show searching for trips using traveler's current location
  - Show notifications including a trip start notification and connection held notification (T-Connection request accepted)

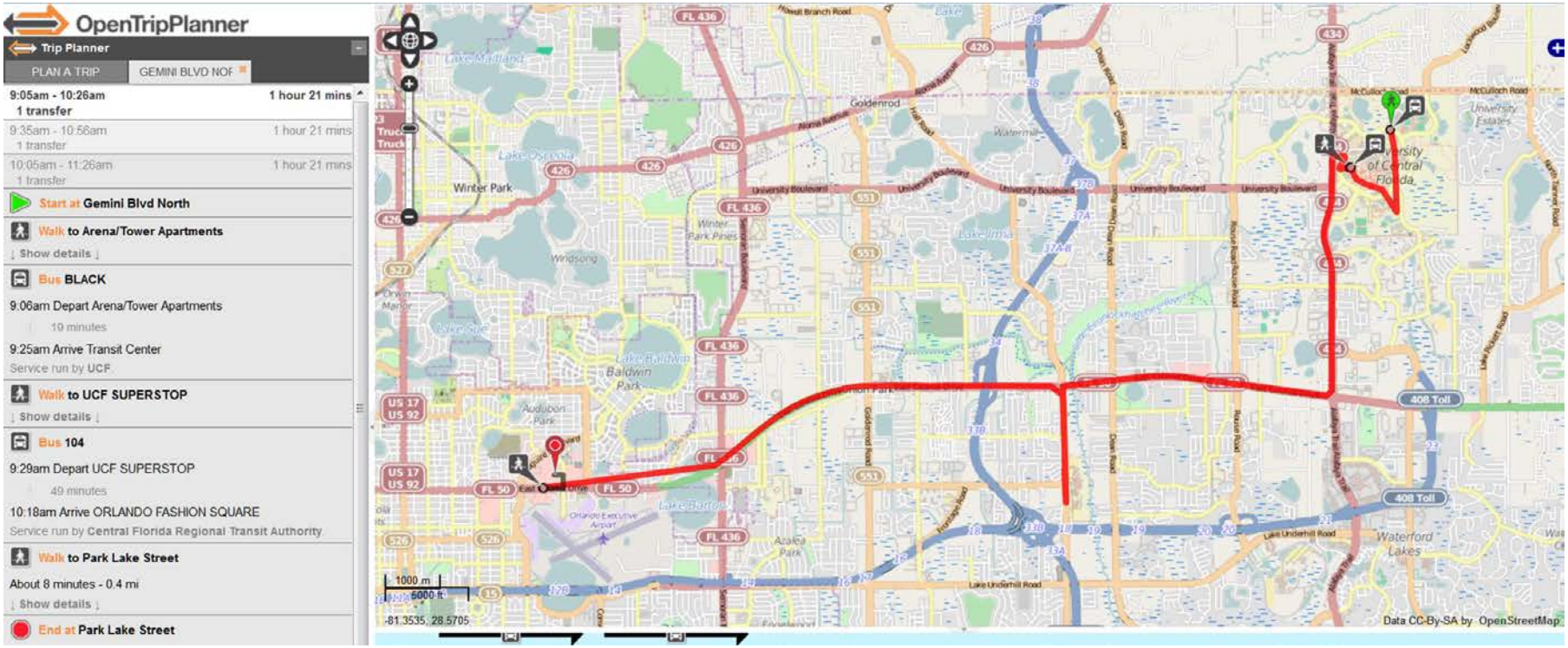
- Scenarios tested
  - Trips that include T-connection
  - Trips without T connection
  - T-Connection requested on behalf of rider via incoming vehicle mobile data terminal (MDT)

IDTO DEMONSTRATION - COLUMBUS



- Scheduled OSU CABS to COTA route
- Departure / Arrival Times and Walk distance included

IDTO DEMONSTRATION – CENTRAL FLORIDA



- Scheduled UCF Shuttle to LYNX route
- Also demonstrated (not shown), SunRail train to LYNX route
- Departure / Arrival Times and Walk distance included

IDTO Code/Data Availability

IDTO Source Code

- Available on Open Source Application Development Portal (OSADP)
  - http://osadp.fhwa.dot.gov/
  - FHWA/DOT software repository and collaboration environment
- In the process of being approved
- Projected date: March 2015

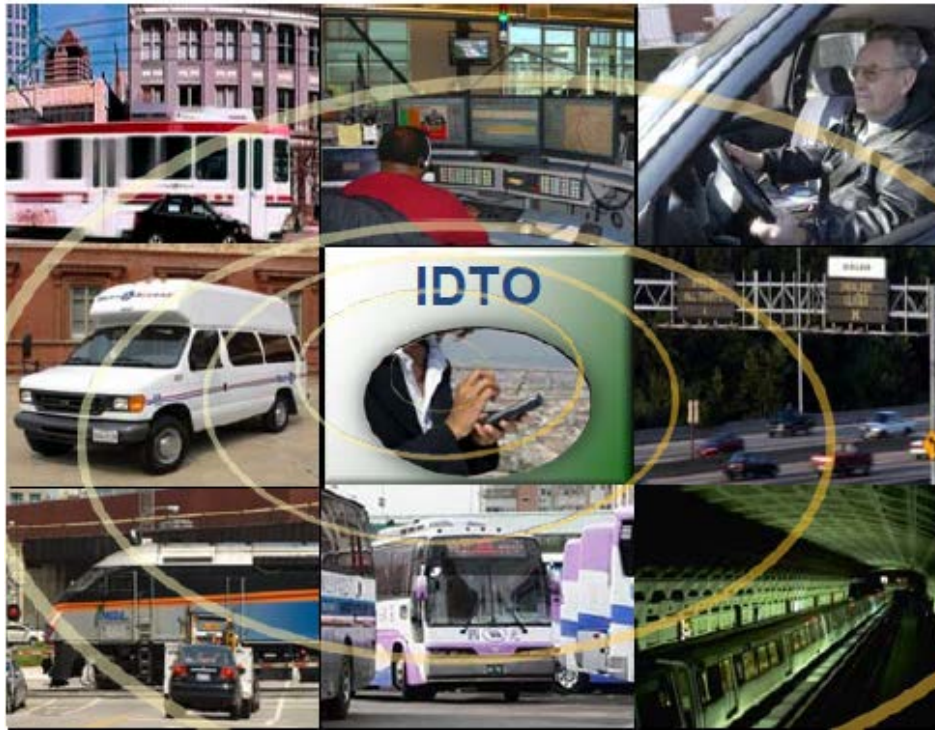
IDTO Data

- Available via the Research Data Exchange (RDE)
  - https://www.its-rde.net/home
  - FHWA/DOT transportation data sharing system
- IDTO is in the process of being prepared and packaged for publication
- Projected date: Spring 2015

IDTO Future Enhancements

- Use Bluetooth LE sensors on vehicles to determine when a traveler gets on and off
- Sensor technology will give app real-time knowledge of when passengers board-- no longer need to make assumptions for connections
- Link technology with Farebox systems

One integrated vision of IDTO



IDTO Impact Assessment

IDTO Impact Assessment Description

- **Assessment Team** (Volpe Center)
- **Objectives:**
  - Assess impacts of IDTO on:
    - Service quality for transit riders (travel time, waiting time, transfer time, access to transit vehicles and destinations)
    - Transit service effectiveness (moving passengers through the system, utilizing vehicles and staff)
    - Cooperation among transit agencies (planning, information sharing, optimizing services)
  - Estimate benefits linked to impacts within the demonstration (travel time savings, reliability gains, changes to operating costs)
  - Project region-wide benefits for full-scale IDTO use

Key Hypotheses, Performance Measures and Transformative Targets

- **Key Hypotheses:**
  - IDTO reduces average transit travel times through improved connections
  - IDTO improves the reliability of transit trips
  - IDTO increases passenger throughput

- **Performance Measures:**
  - Travel time for IDTO users
  - Travel time for passengers affected by IDTO usage
  - Range of travel times for trips taken by IDTO users
  - Passengers per vehicle per hour

- **Transformative Targets:**
  - Reduced passenger waiting times
  - 90% of feasible protected connections completed
  - Reduced transaction times from request to confirmation of trip status

METHODOLOGY

- **Planned Approach:**
  - Evaluate vehicle and transaction data by location for demand, effectiveness, usage patterns
  - Conduct interviews with participating organizations to gauge effectiveness and inter-organizational cooperation/collaboration
  - Estimate differences in travel times and reliability for IDTO users versus non-users
  - Project impacts across regions by scaling observations from the demonstration to a hypothetical full-scale use of IDTO
- **Limitations to Planned Approach**
  - Most hypotheses cannot be measured with existing data.
  - Critically, we cannot isolate circumstances under which IDTO offers strong value (e.g., when T-CONNECT reduces transfer time and net travel time relative to alternative strategies).

ADDITION OF STATISTICAL TOOL

- Volpe will expand the analysis by developing and implementing a statistical analysis tool.

- The statistical analysis tool is designed to address unmeasurable hypotheses by:
  - Linking known factors in the demonstration to plausible assumptions for missing data and components
  - Evaluating system performance and user outcomes under a range of scenarios

KEY IMPACT ASSESSMENT FINDINGS

- All current findings are limited due to data constraints

- T-CONNECT:
  - Some users indicated that there is high value added by knowing when connecting vehicles will arrive, and whether a connection is feasible
  - The value of information on connections led to new travel patterns (travel quality dependent upon information via T-CONNECT), repeat usage, and a limited number of protected connections

- T-DISP:
  - There was demand for the trip-planning features of T-DISP
  - No demand-response service in the demonstration

- D-RIDE:
  - No rideshare service in the demonstration

KEY IMPACT ASSESSMENT FINDINGS

- Conditions where IDTO offers value:
  - Hypothesis: under peak demand, during system disruptions
  - Observed: data limited to qualitative information on adjusted travel patterns that optimize based on information about connecting vehicles

- How IDTO is used:
  - Most frequently: trip planning
  - Most advanced: persistent (limited) demand for T-CONNECT during trips from work to home

KEY IMPACT ASSESSMENT FINDINGS

- Institutional Observations:
  - Data access can be more difficult than expected
  - Elements of data may diverge from plans due to institutional concerns
  - Risk of participating organizations withdrawing from demonstration/operation

- Other Observations:
  - T-CONNECT can offer value; the challenge is finding circumstances where a benefit can be provided beyond what the system is already producing
  - Information can matter to users
  - Agencies see a benefit, and are willing to work with outside groups and to share information to realize the benefit
  - Agencies desire increased collaboration to increase efficiency

IDTO Lessons Learned

- IDTO can serve as a single-source for accessing available transportation options in a region
- IDTO utilizes information that most agencies/providers already publish to the internet, some ‘standard’, most not.
- However, it requires flexibility / changes in policy to support T-CONNECT
- Also needs to consider user privacy concerns
- Full integration with CAD/AVL systems a necessary next step
- As is truly creating standards for the data exchange

IMPLICATIONS FOR DEPLOYMENT

- Agency / Partner Cooperation
  - Requires commitment to share data and to interact with the 3rd party IDTO "provider"
- Traveler Participation
  - Passenger apprehension sharing location data
- Availability of Key Information
  - IDTO is dependent of having both "static" Schedule Information as well as current 'Arrival Time'/AVL data
- Standardization of the Information
  - Industry initiatives such as the General Transit Feed Specification (GTFS) allow for a common format to enable agencies to share information, however..
    - GTFS is not a 'standard' and as such, may not be a long term solution
    - GTFS-Realtime is a step towards obtaining current Arrival Time information, but is not optimal for this purpose
- Transferability / Scalability
  - IDTO was designed with the requirement that it support deployment in more than one region and with varying types of transportation modes and operators.

Stakeholder Q&A

CONTACTS

DMA Program

Kate Hartman, DMA Program Manager, ITS Joint Program Office
(202) 366-2742, Kate.Hartman@dot.gov

Webinar Speaker

Ron Boenau, (202) 366-0195, Ronald.Boenau@dot.gov

DMA Website

http://www.its.dot.gov/dma/

Battelle Memorial Institute: Tom Timcho (Project Manager)

Volpe Center: Lee Biernbaum (Project Manager), Sean Puckett (Primary Investigator), Greg Bucci (Economist)