Understanding the complete trip using TSMO and MOD

Bob Sheehan, ITS JPO
Multimodal ITS Program Manager

MOD
MOBILITY ON DEMAND

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The Mobility on Demand (MOD) Vision

The United States Department of Transportation (USDOT) uses the term Mobility on Demand (MOD) to represent its vision for future mobility. MOD envisions a safe, reliable and carefree mobility ecosystem that supports complete trips for all, both personalized mobility and goods delivery.

USDOT achieves this vision by leveraging innovative technologies and facilitating public private partnerships to allow for a user-centric approach that improves mobility options for all travelers, and delivery of goods and services.

Traveler-centric

Mode-neutral

Technology-enabled

Partnership driven

Defining TSMO

"Integrated strategies to optimize the performance of existing infrastructure through the implementation of multimodal and intermodal, cross-jurisdictional systems, services, and projects designed to preserve capacity and improve security, safety, and reliability of the transportation system"

Definition of Transportation Systems Management and Operations (TSMO) as stated in 2012 Moving Ahead Progress in the 21st Century (MAP-21) legislation

THE COMPLETE TRIP

After his doctor's appointment, Andy decides to take a spontaneous trip to meet a friend at a coffee shop in an unfamiliar part of town. Using ATTRI's **pre-trip concierge**, **wayfinding and navigation**, **robotics and automation**, and **safe intersection crossing** applications, Andy can travel with confidence throughout his trip.

1. Plan and Book a Trip

Andy uses a **pre-trip concierge application** to plan and book his trip from the doctor's office to the coffee shop.

2. Travel to Transit Station

An **automated shuttle** (rideshare service) is dispatched to take Andy to the transit station based on his booked trip. Once there, an **assistive robot** helps Andy to his bus platform.

3. Ride the Bus

While on the bus, Andy receives direction on when to pull the Stop Request cord from his **wayfinding and navigation application**. After he departs the bus, the application provides Andy with turn-by-turn walking directions to the coffee shop.

4. Cross the Street

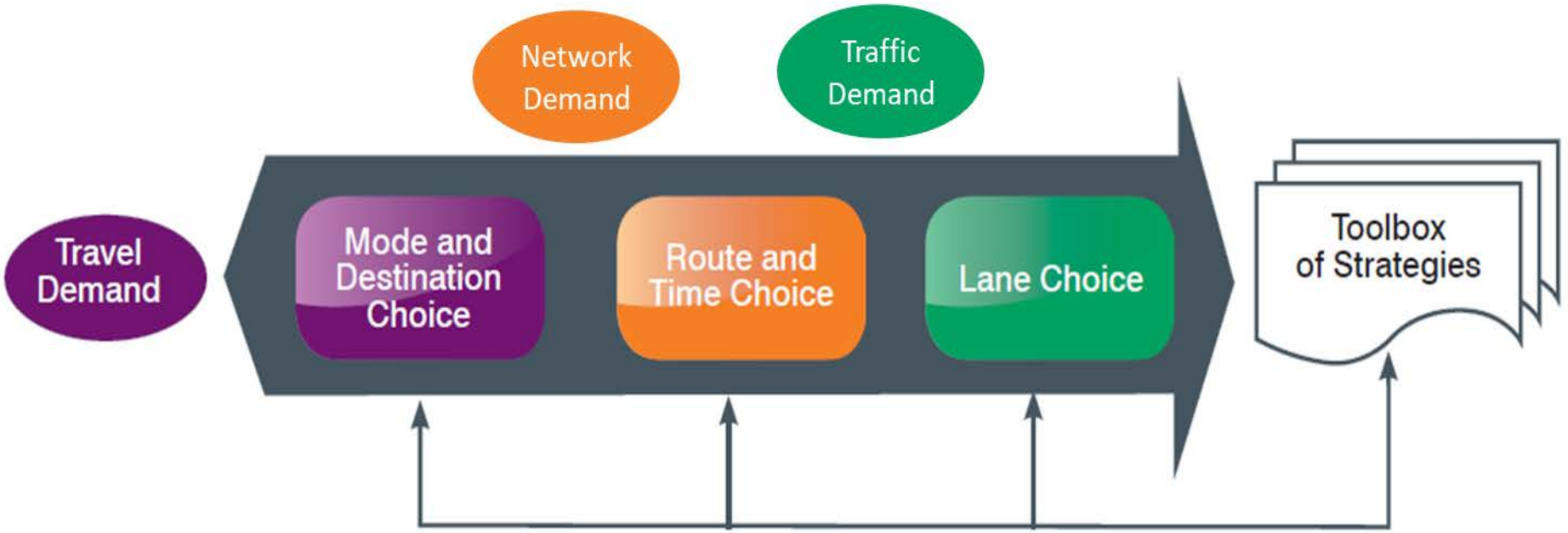
As Andy approaches an intersection, his **safe intersection crossing application** communicates with the traffic signal to ensure sufficient time for him to safely cross the street, and notifies him when it is safe to begin crossing. The application also communicates with nearby cars to notify them of Andy's presence in the intersection.

5. Arrival at Destination

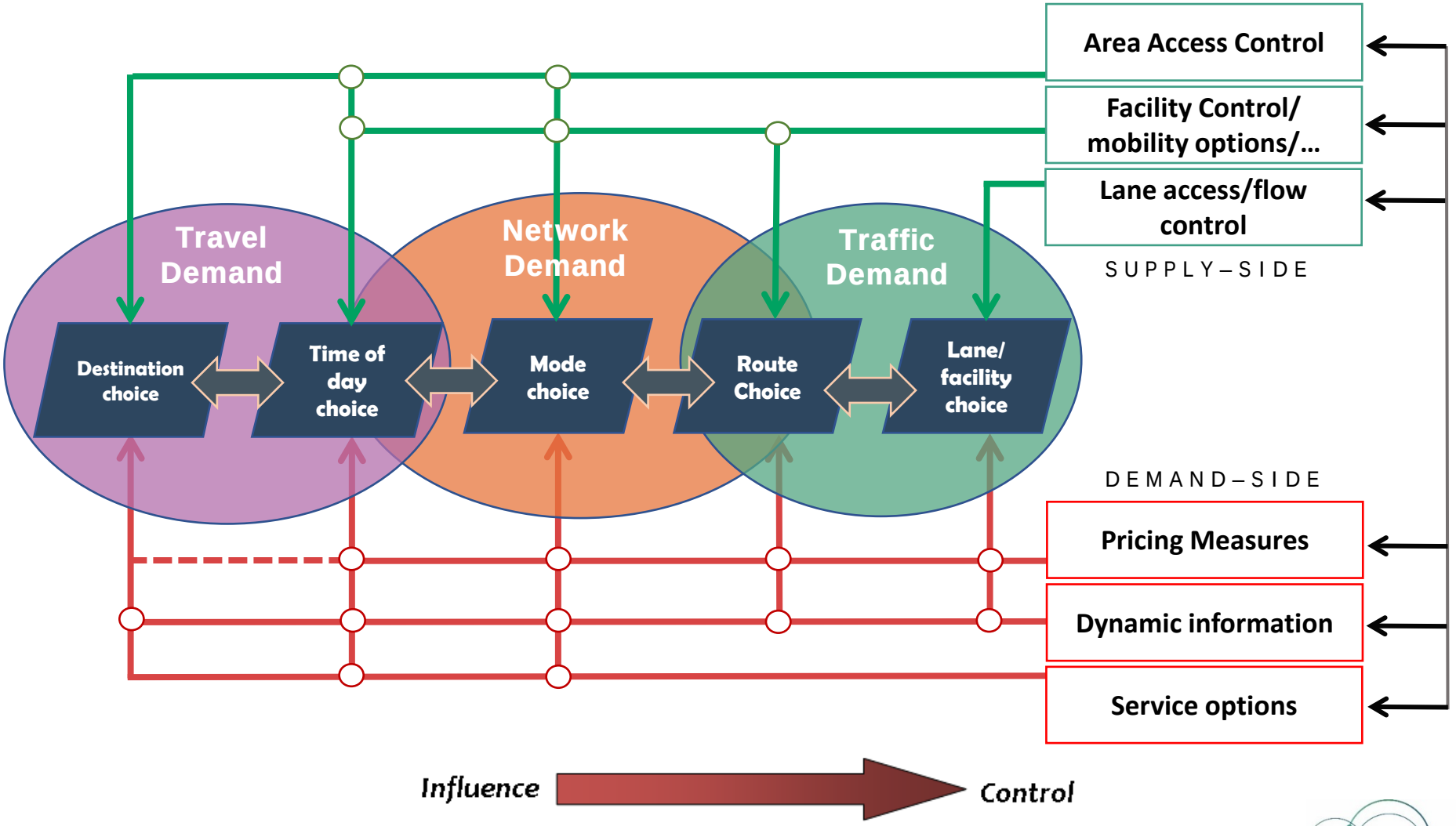
Andy safely arrives at his destination, while the **pre-trip concierge application** plans his return trip home.

User-Focused Mobility

Active Transportation and Demand Management

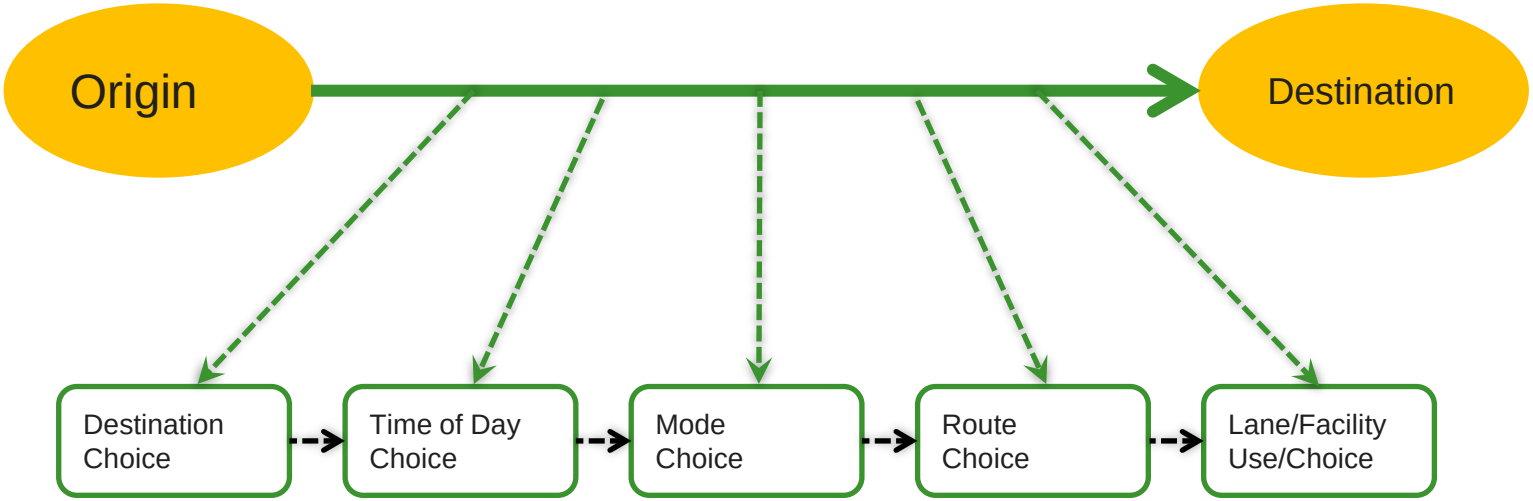


Elaboration of trip chain – tied to complete trip management



Managing Demand Through the Trip-Chain

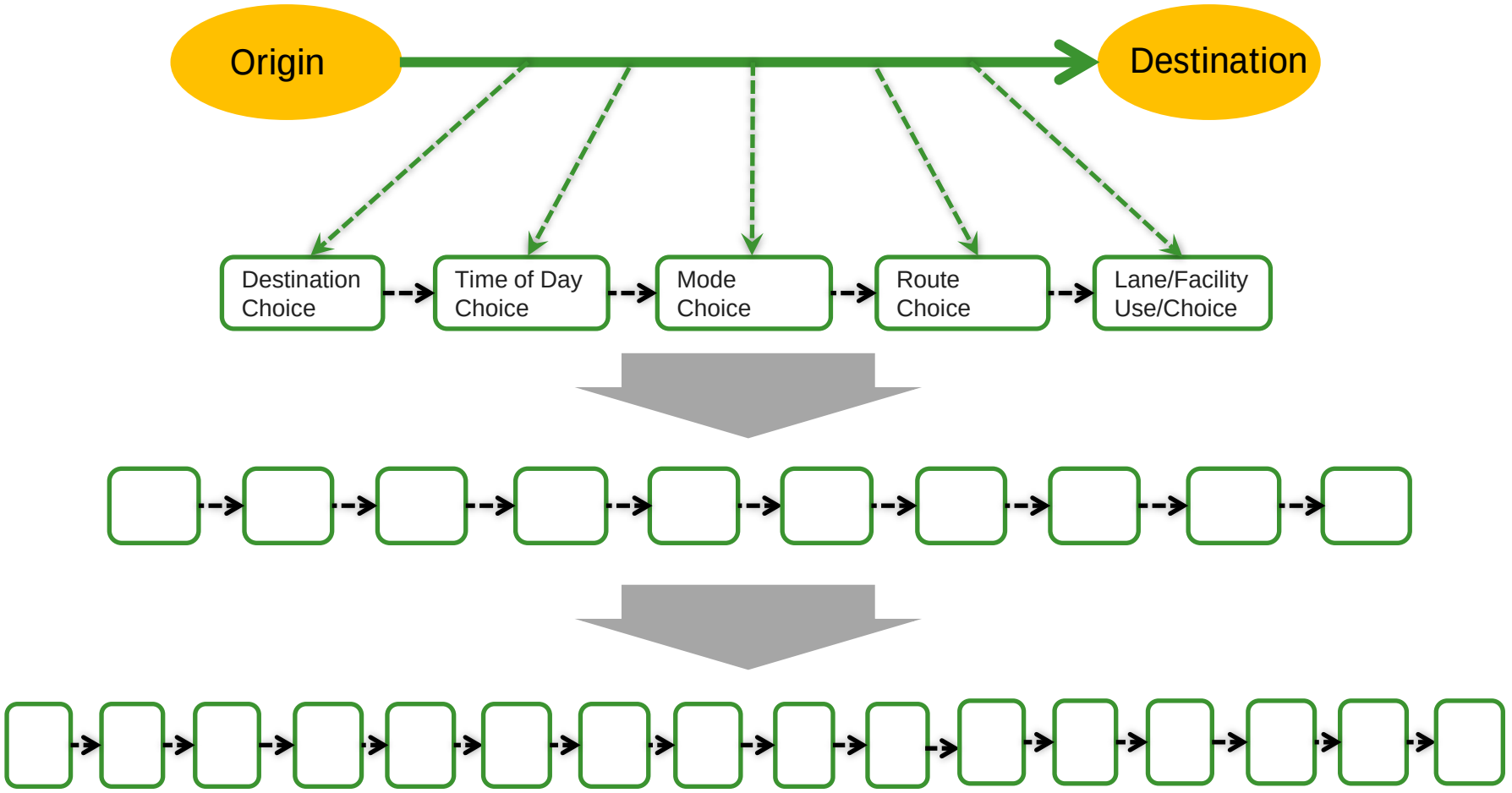
Approaches provide travelers with choices throughout the trip chain leading to network performance optimization and increased efficiency



Key Takeaway: Active management occurs before, during, and at the end of the trip chain

Trip Chain – Level of detail

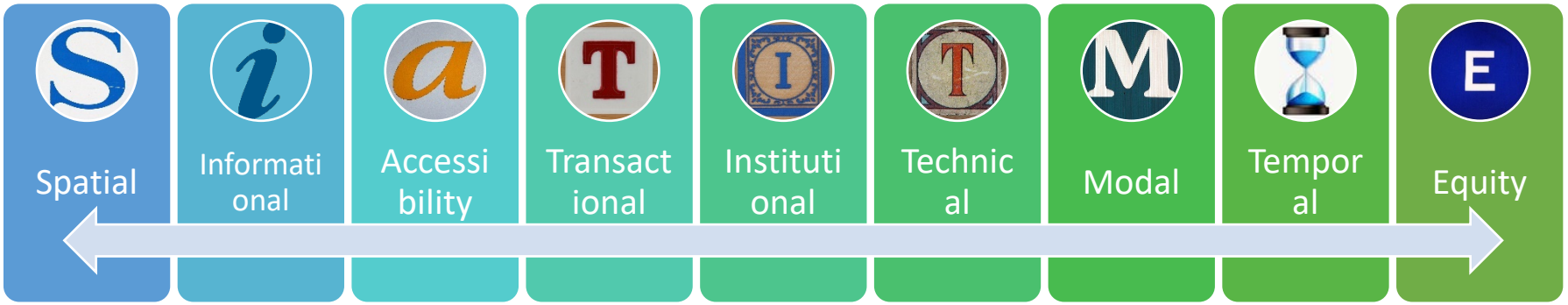
<u>Key Takeaway</u>: There are many links in a complete chain



Trip chain to Complete Trip

Dimensions of User Focused Travel

- Defines complete trips that are user focused
- By creating a standards framework, not only are trip chain needs identified, but the technology components that enable standards to work together will be aligned with standards that are needed to address traveler's needs.



More than corridors…more than regions

CITY CENTER

High-density downtown/CBD employment centers and surrounding neighborhoods

SUBURBAN

Predominantly lower-density residential users with some segregated mixed uses

EDGE CITY

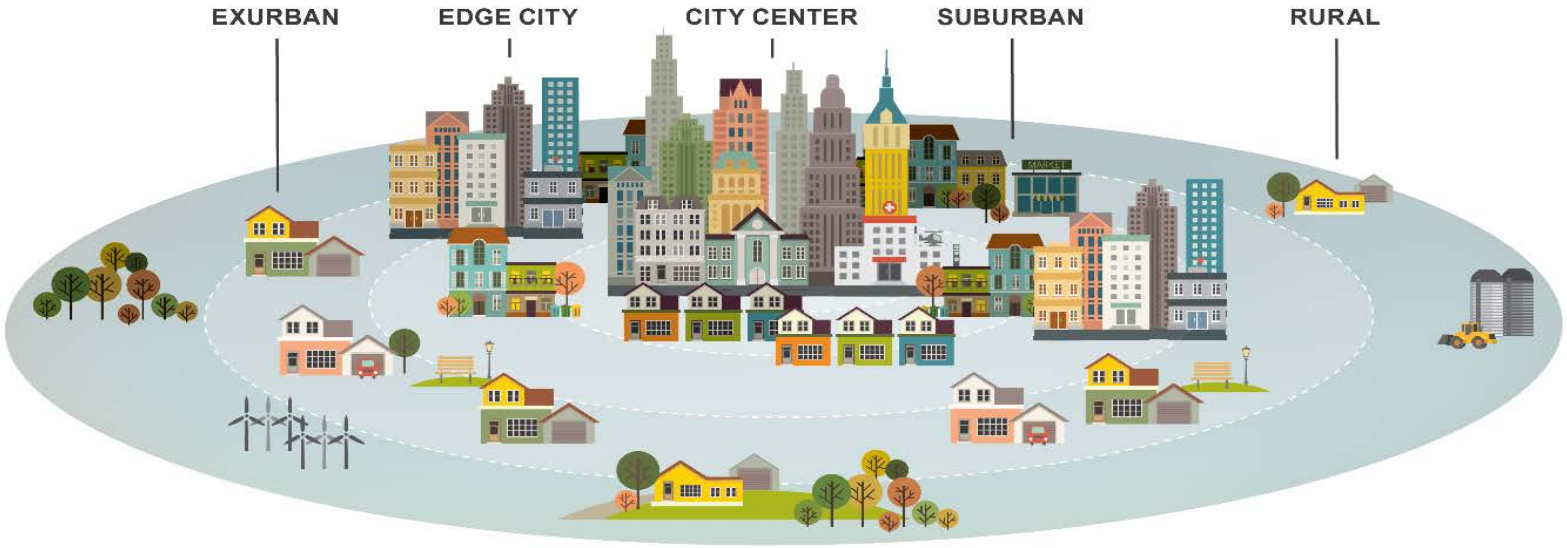
Medium-density employment centers outside of the urban core

EXURBAN

Very low-density residential uses on the urban fringe

RURAL

Typically unincorporated



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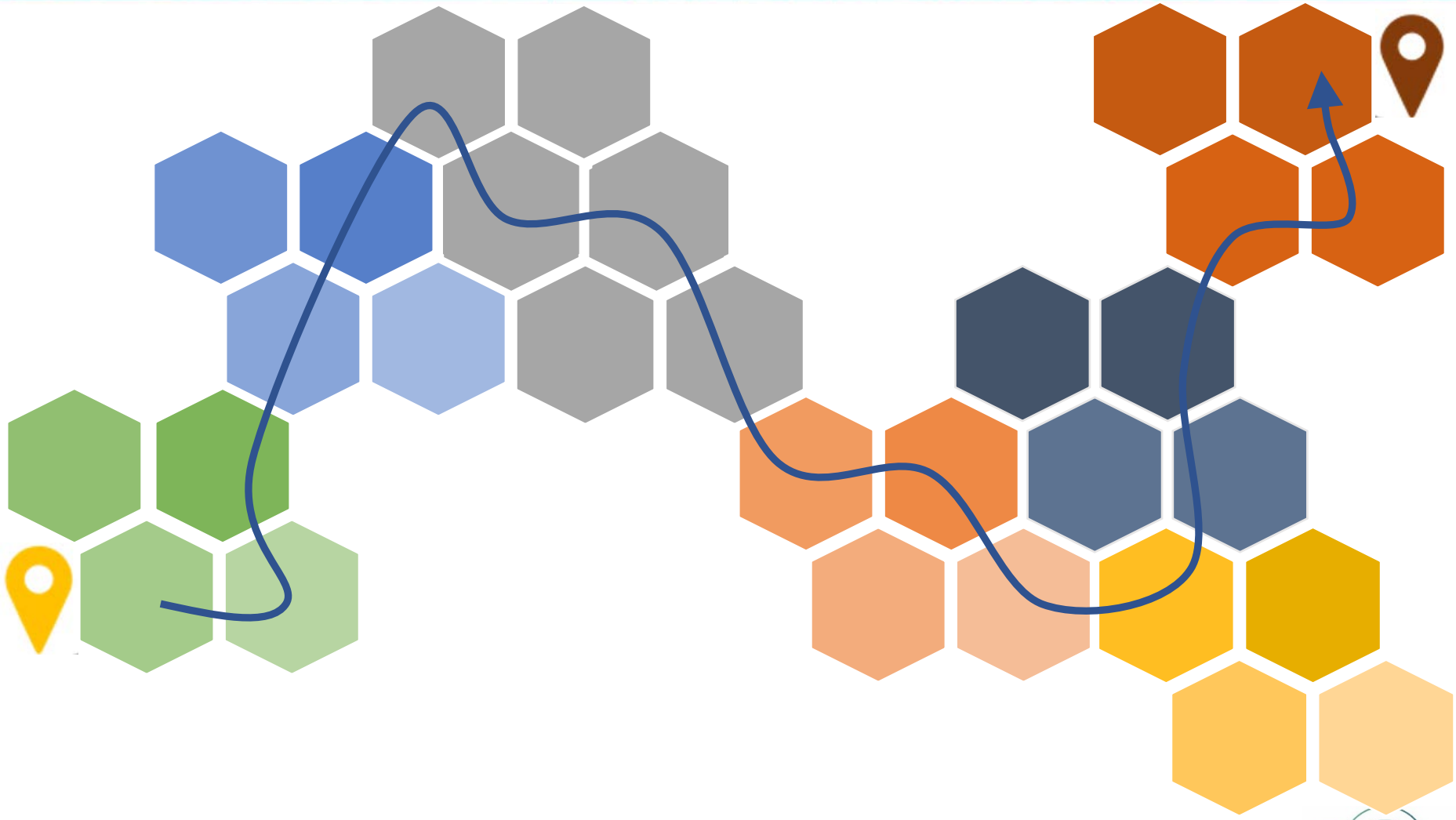
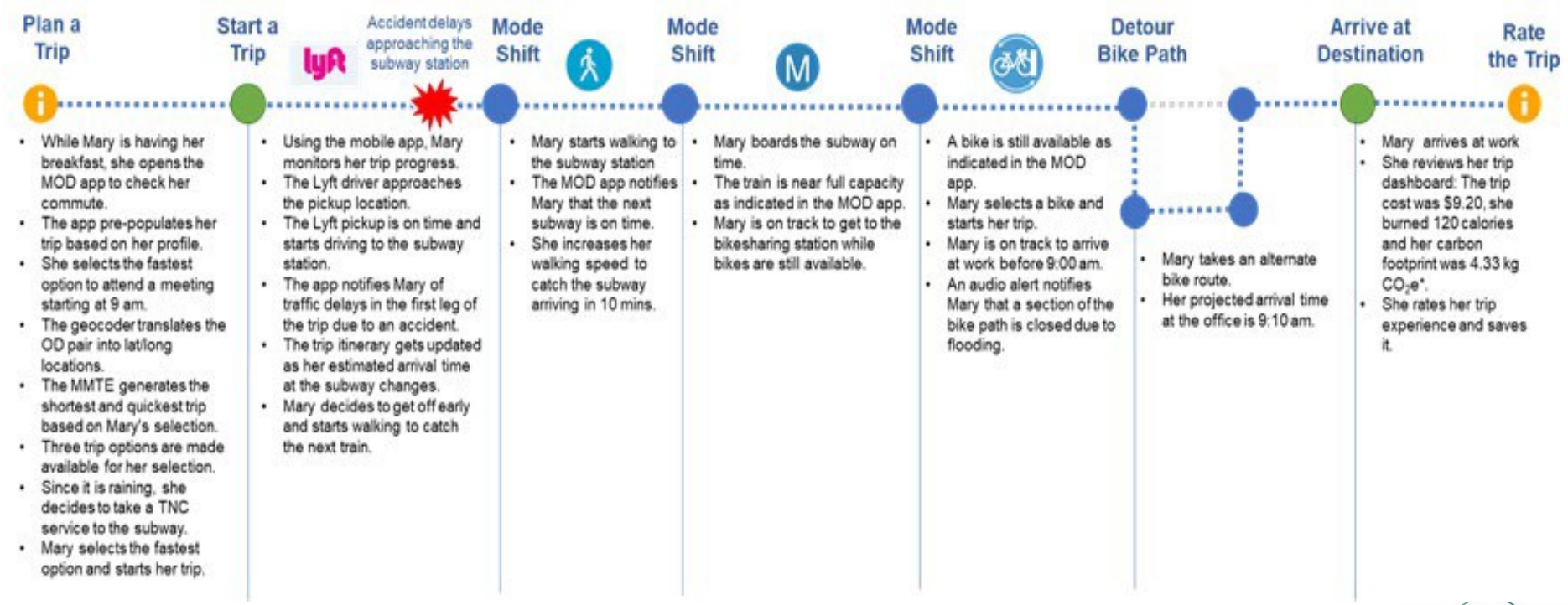
N DEMAND

Many links, many providers, many jurisdictions, many operators



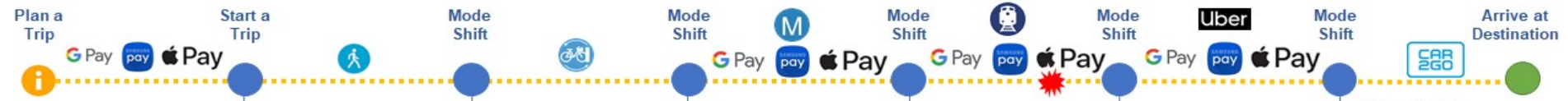
User Journey Map – Example 1

Mary is a recent college graduate who lives in a close-in suburb and works in the downtown of a major metropolitan area. She currently does not own a car and relies on her phone to plan her commute to work everyday. On a rainy day, she uses the MOD app to plan the best way to get to the office before 9 am.



User Journey Map – Example 2

Brian lives in a metropolitan area and does not need a car. This weekend, Brian made plans to visit his parents who live well outside the city, and transit options are limited. There is, however, a commuter train that can take him in the direction of his parents' house, but he will need to plan his options to the train, and then to their house from the train. Brian opens his MOD app and begins his planning.



Plan a Trip

- While Brian is reading his Saturday morning paper, he opens the MOD App to check for options to travel to his parent's house.
- Brian populates his trip information in the app based on his trip requirements.
- The trip planner generates the shortest and quickest trips based on his selections.
- Since it is a beautiful day, Brian decides to walk to a bikeshare service where he can rent a bike and pedal to his train.
- Brian ensures his credit card information is populated to use his e-wallet in order to fund his entire journey.
- Brian books his trip using the MOD app and smartphone e-wallet.

Start a Trip

- Brian leaves his house on time and begins his walk to the bikeshare docks.
- A bike is still available as indicated in the MOD app.
- Brian taps his smartphone against the contactless payment reader to verify his payment.
- Brian selects a bike and starts his trip to the next leg of his journey.

Mode Shift

- Brian pedals toward the subway station where he will board a subway line to the commuter rail station.
- Brian encounters no issues with his trip along the way and arrives at the subway station.
- Brian docks his bike and quickly checks his MOD app to ensure that the subway and the commuter train are still on time.
- Brian then enters the subway station.

Mode Shift

- When Brian arrives at the subway turnstiles, Brian again taps his smartphone against the contactless reader.
- Brian realizes that the contactless reader is out of service and taps his phone against the next reader where his app is scanned successfully, and payment verified.
- The subway arrives on time and Brian boards to complete the next leg of his journey.

Mode Shift

- When Brian exits the subway at the commuter rail station, he checks his app to ensure the train is still on time.
- Brian notices that the train is now running up to 15 minutes late due to switch problems. Since he has extra time, he reviews his trip once again to see if he can find a carshare service at an earlier stop on the same commuter rail line.
- Brian finds a carshare service near an earlier stop and books a car.
- Brian's app also instructs him that he must book a TNC service to get to the carshare from the train station.
- Brian finds a ride using one of the TNC providers and books a car using his e-wallet.
- Brian enters the train where the conductor scans his smartphone to verify payment.

Mode Shift

- Brian exits the commuter train at his intended stop.
- Brian monitors his MOD app and follows the instructions to meet his driver at the specified location.
- Brian meets the driver, enters the vehicle, and they proceed to the carshare location.
- After exiting the TNC vehicle, Brian uses his smartphone and adds an extra tip for the driver in the MOD app.
- Brian thanks his driver and proceeds to the carshare lot to pick up his car.

Mode Shift

- Using his MOD app, Brian identifies his assigned vehicle.
- Brian scans the 2D barcode on the vehicle's window and unlocks the car.
- Brian then enters the vehicle and drives his final leg of his journey and arrives at his parents' house.
- Brian marks his trip as complete in his app, and within minutes receives a summary in his email with the total trip cost as well as other trip details.
- Brian saves his trip in his app for later use if needed.

Timeline Review

Incident Timelines

Interactive timelines quickly reveal how the incident is being managed while showing the relationships between responder notifications and arrival times, lane closures, traffic queues, clearance times, communication logs, CCTV, and dynamic message signs.

Multimodal Management Processes

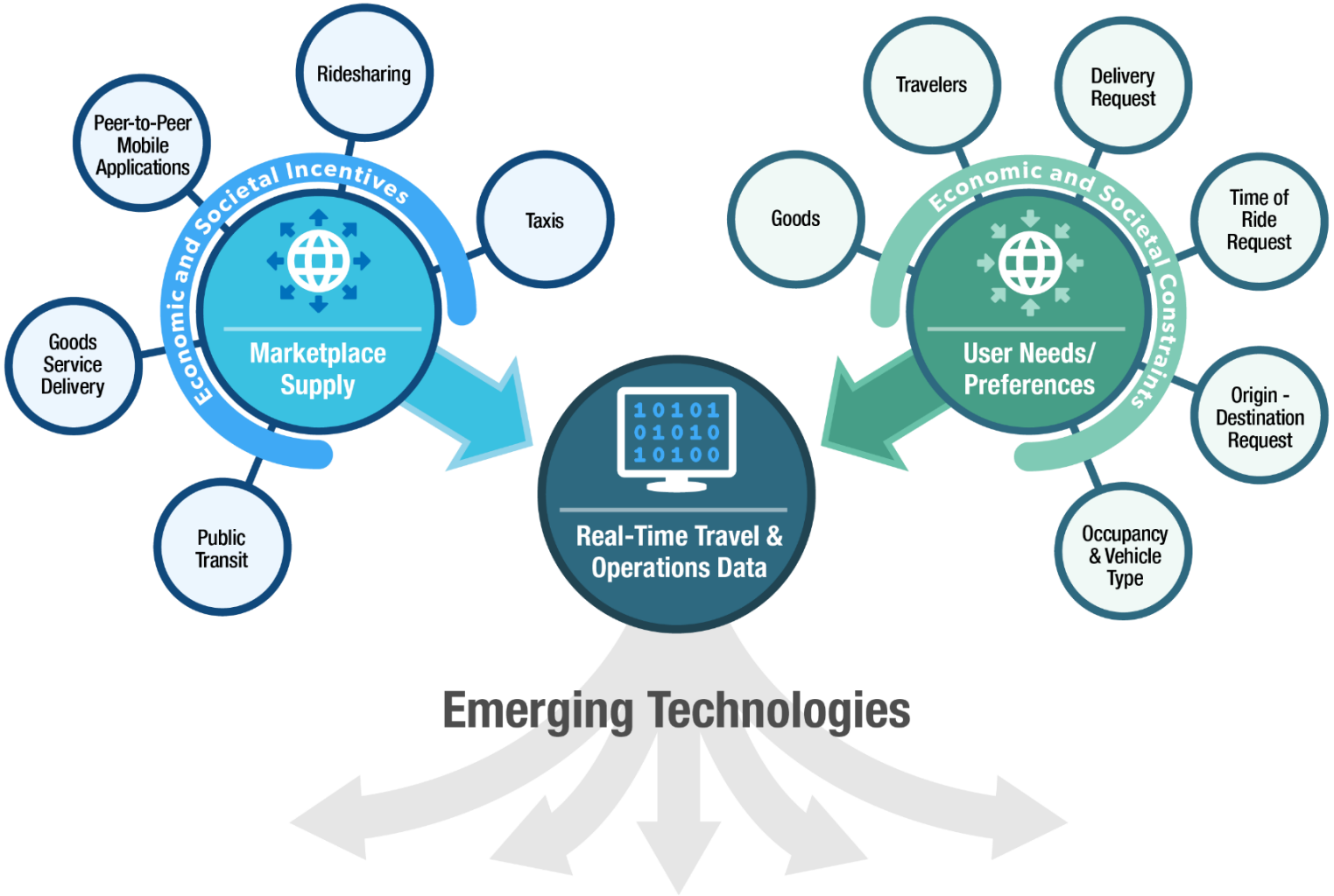
Expand Partnerships / Integrate Stakeholders

Expand Geographic Scope

Expand Capabilities/ Enhance Functionality

- Develop and evolve system for identifying objectives that can vary with time and place
- Coordinate institutional functions to enable expanded data capture, improved data sharing, advanced data fusion and flow.
- Advance technical capabilities to enable higher temporal and spatial resolution in system data and to improve and automate data fusion processes
- Establish institutional functions to manage macro-system decision support (whether it's a *federated, centralized,* or *hybrid* system), and to enable fully coordinated response plans
- Advance technical performance of decision support systems and response and feedback processes

Multimodal Management to Marketplace – Next Chapter



Thank you

Robert Sheehan
USDOT
ITS JPO
robert.sheehan@dot.gov
202-366-6817

Gwo-Wei Torng
FTA
Office of Mobility Innovation
Gwo-Wei.Torng@dot.gov
202-366-2378

Jim Hunt
FHWA
Office of Operations
jim.hunt@dot.gov
202-680-2679

Ralph Volpe
FHWA
Resource Center
ralph.volpe@dot.gov
404-985-1268

TSMO, MOD, MaaS and the Complete Trip

Systems Thinking

Shared Understanding: TSMO, MOD, MaaS

- **Transportation Systems Management and Operations (TSMO):** A set of strategies that focus on operational improvements that can maintain and even restore the performance of the existing transportation system before extra capacity is needed.
- **Mobility on Demand (MOD):** MOD is a concept based on the principle that transportation is a commodity where modes have distinguishable economic values. MOD enables customers to access mobility, goods, and services on demand.
- **Mobility as a Service (MaaS):** A mobility platform in which a traveler can access multiple transportation services over a single digital interface. MaaS primarily focuses on passenger mobility (and in some cases goods delivery) allowing travelers to seamlessly plan, book, and pay for a multimodal trip on a pay-as-you-go and/or subscription basis.
- **MOD Ecosystem:** An integrated and multimodal transportation operations management approach that can interact and/or influence the supply and demand sides of MOD. The supply side is comprised of the professionals, operators, and devices that provide transportation service (e.g., public and private mobility services, goods delivery services, transportation facilities, and information services). The demand side consists of the users of transportation services (e.g., all travelers, couriers, consumers, and modal demand).

- FHWA-JPO-20-792 - Mobility on Demand Planning and Implementation: Current Practices, Innovations, and Emerging Mobility Futures
- Susan Shaheen (UC Berkeley), Adam Cohen (UC Berkeley), Jacquelyn Broader (UC Berkeley), Richard Davis (UC Berkeley), Les Brown (ICF), Radha Neelakantan (ICF), Deepak Gopalakrishna (ICF)

The Complete Trip

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Andy uses a **pre-trip concierge application**.

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Challenges/Opportunities

- Equity and Accessibility
- Sustainability
- Data Management
- Regulatory and Policy Barriers
- Integration (old and new technology, public vs private)

Role of State DOT

- Facilitating Partnerships
- Funding Pilots/Demonstrations
- Alleviating Risk/Bearing Burden
- Clearing Barriers
- Sharing Lessons Learned

Questions?

Jean Ruestman, Administrator
Office of Passenger Transportation
RuestmanJ@Michigan.gov

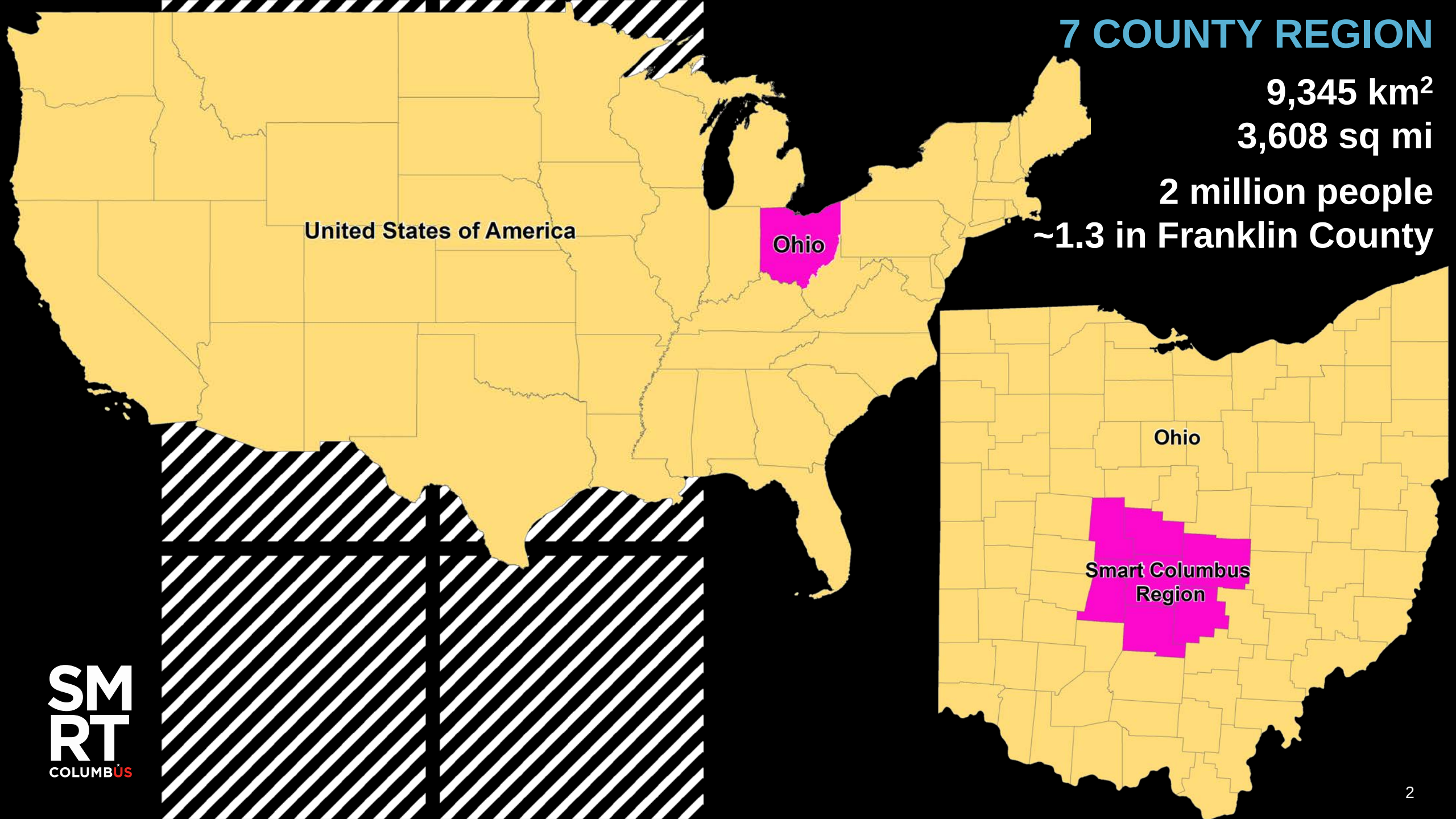
SMRT COLUMBUS

Mobility as a Service – Pivot Project Overview

7 COUNTY REGION

9,345 km²
3,608 sq mi

2 million people
~1.3 in Franklin County



SMART COLUMBUS

SMART COLUMBUS

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SMART COLUMBUS OVERVIEW

“Mobility is the great equalizer of the 21st century.”

– Mayor Andrew J. Ginther

$40 MILLION

78 APPLIED • COLUMBUS WON

VISION:
To empower our residents to live their best lives through responsive, innovative and safe mobility solutions.

MISSION:
To demonstrate how an intelligent transportation system and equitable access to transportation can have positive impacts on every day challenges faced by cities.

OUTCOMES:

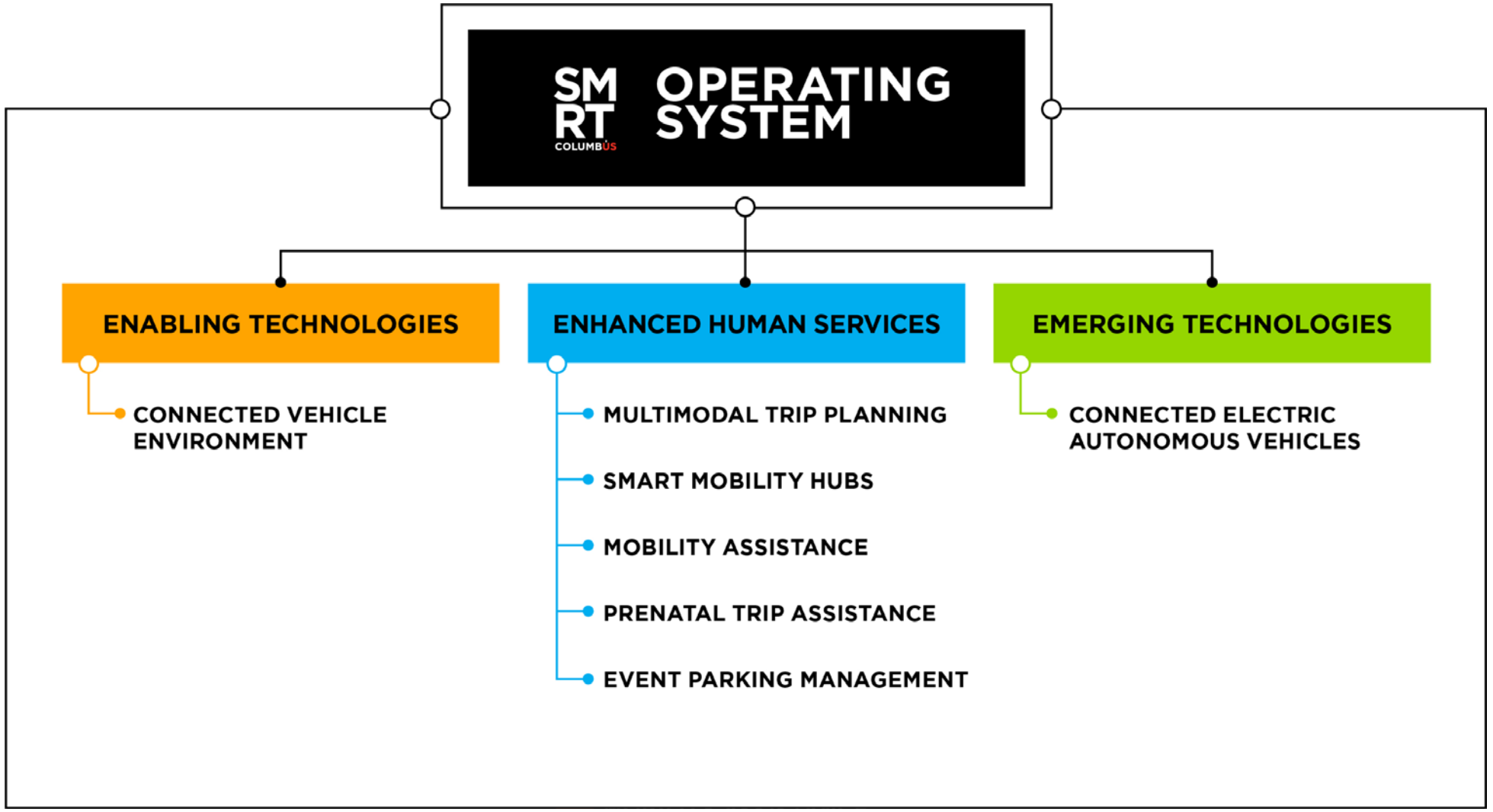
SMART CITY CHALLENGE

THE CITY OF COLUMBUS
ANDREW J. GINTHER, MAYOR

SMART COLUMBUS

U.S. Department of Transportation

USDOT PORTFOLIO



USDOT PORTFOLIO – Infrastructure

Connected Vehicle Environment

- 90+ roadside units
- 1,000-1,200 on-board units
  - 350-500 private vehicles
  - 200 City and County LDV
  - 430 transit vehicles
  - 110 emergency vehicles
  - 14 freight vehicles

Smart Mobility Hubs

- 6 locations
- Facilitate first-mile/ last-mile connections
- Anchored by an interactive kiosk

Connected Electric Autonomous Vehicles

- Smart Circuit Deployment (May Mobility)
  - December 2018-September 2019
  - 6 vehicles
- Linden LEAP (Easy Mile) – 2 vehicles:
  - Passenger Deployment – February 2020
  - Food Pantry Deployment – July 2020

USDOT PORTFOLIO – Software

Operating System

- Big data and complex data exchange
- Analytics and visualization
- Data aggregation, fusion and consumption
- Replicable and scalable

Prenatal Trip Assistance

RIDES 4 BABY

- Research study to improve transportation for moms-to-be
- 143 participants

Mobility Assistance

AbleLink Smart Living Technologies

- Research study with app for turn-by-turn navigation
- Increase independence
- Up to 30 participants

Event Parking Management

PARK CBUS

- Publicly available app (ParkColumbus)
- Probability of on-street parking
- Reserve private lot/garage spaces

Multimodal Trip Planning App

pivot
empowered mobility

- Publicly available app (Pivot)
- Public and private mobility providers

SMART COLUMBUS

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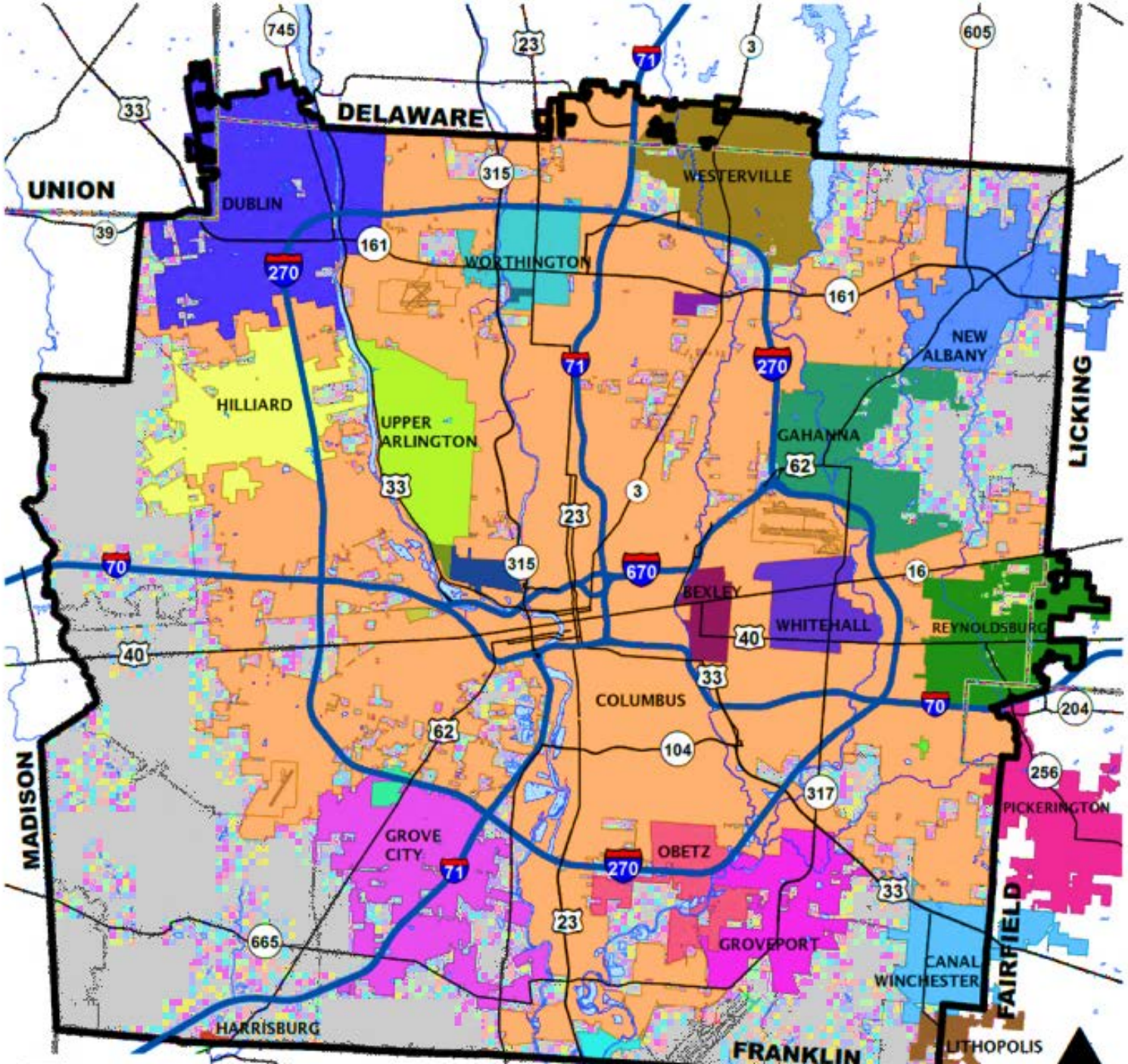
MULTIMODAL TRIP PLANNING APPLICATION OVERVIEW

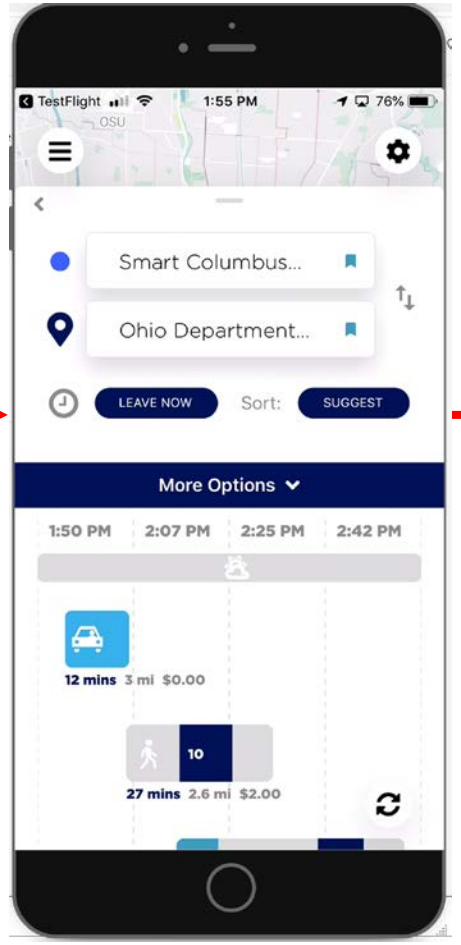
SMART COLUMBUS

GEO

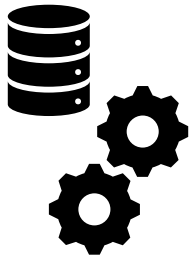


CONCEPT

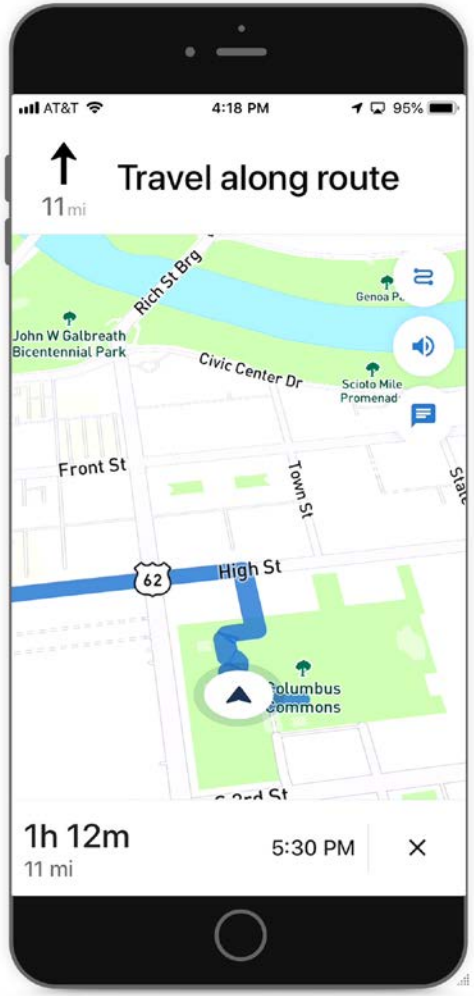
MODE

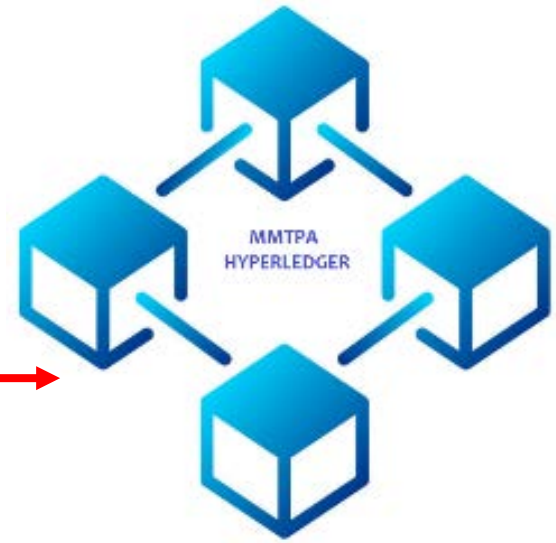


TRIP OPTIMIZATION



MACHINE LEARNING





GOALS AND OUTCOMES

MOBILITY

OPPORTUNITY

CUSTOMER SATISFACTION

- Shift away from single occupancy vehicles
- Encourage and promote alternate modes of transportation
- Provide access to on-demand and multimodal trip planning
- A solution that uses both private and public mobility providers
- A way to plan, book and seamlessly pay for your trip

MOBILITY SERVICE PROVIDER PARTNERS

Uber

COGO BIKE SHARE

Lime

BIRD

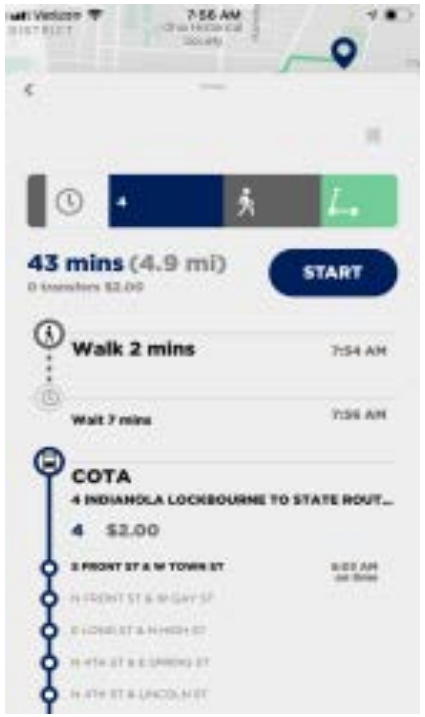
COTA

lyft

YELLOW CAB COLUMBUS 1928

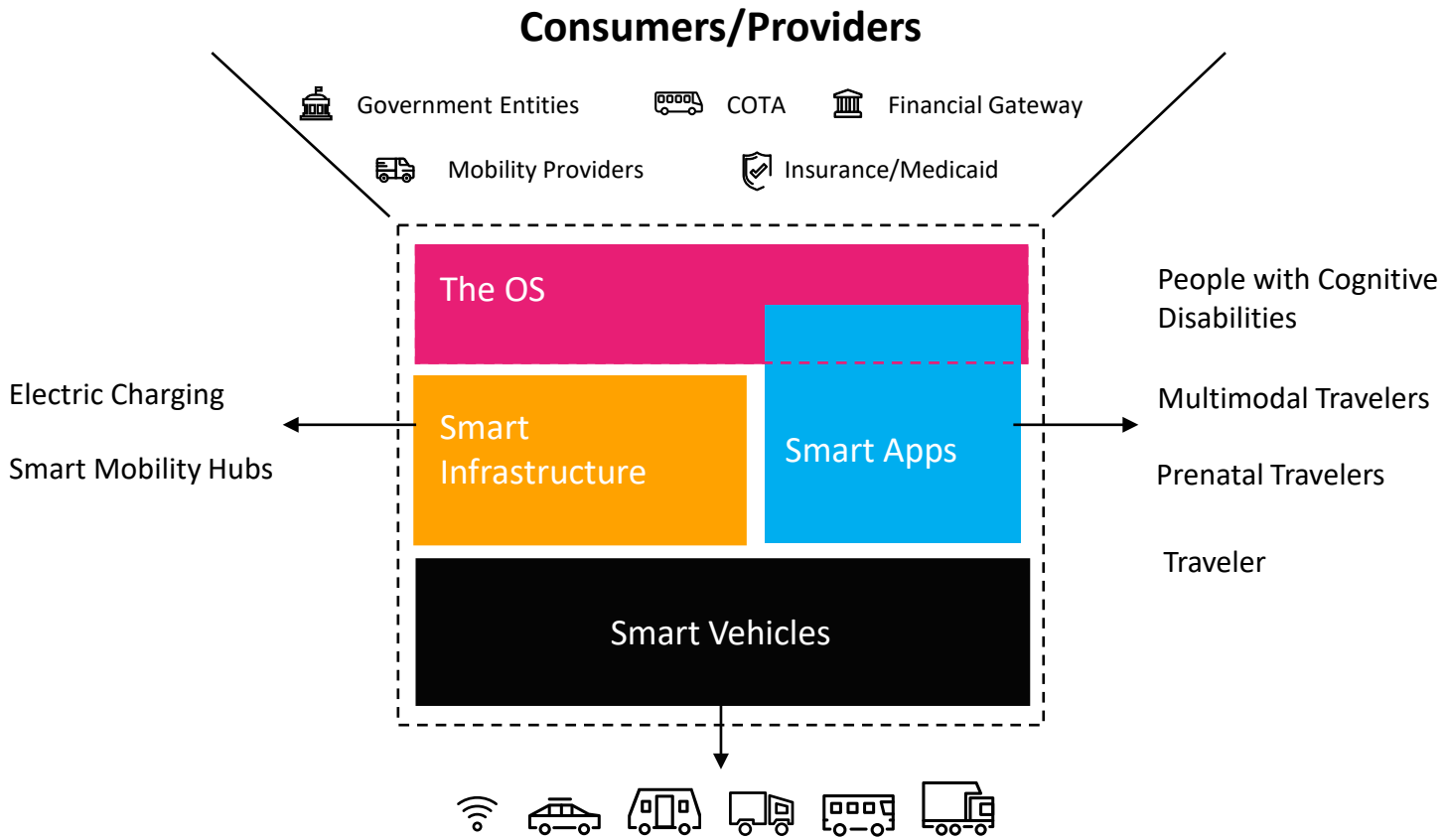
gohio commute
A Smarter Way

PIVOT



RELATIONSHIP TO OTHER PROJECTS

- Common Payment System
- Smart Columbus Operating System
- Smart Mobility Hubs
- Connected, Electric, Autonomous Vehicle



SMRT COLUMBUS

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PIVOT OVERVIEW

WHAT MAKES PIVOT UNIQUE

- Aggregates data from scooters, bike-share, ride-hailing, ride-sharing, and public transportation to present customized multimodal (or single mode) trips to the user based on the user's preferences
- Google and Transit App provide different mode options, but not a seamless trip with mixed-mode travel
- Open source platform that can be adapted by other states, cities, and agencies, and is flexible enough to change and accommodate the needs of various organizations (Open Trip Planner)
- Neutral, standards driven multimodal platform

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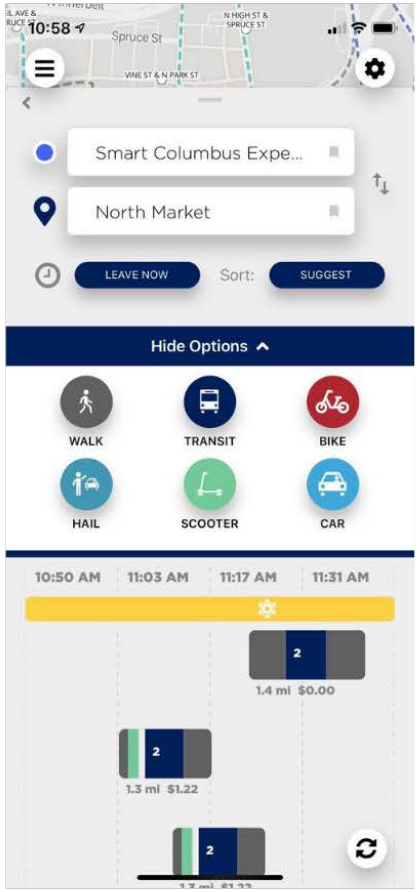
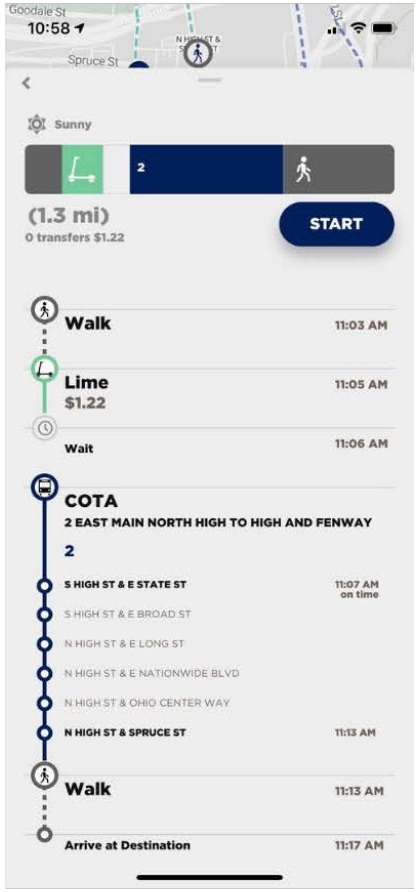
THE ROLE OF DATA

Modes

Trip Optimization

Pivot Trip Plan





Machine Learning Trip History

THE ROLE OF DATA

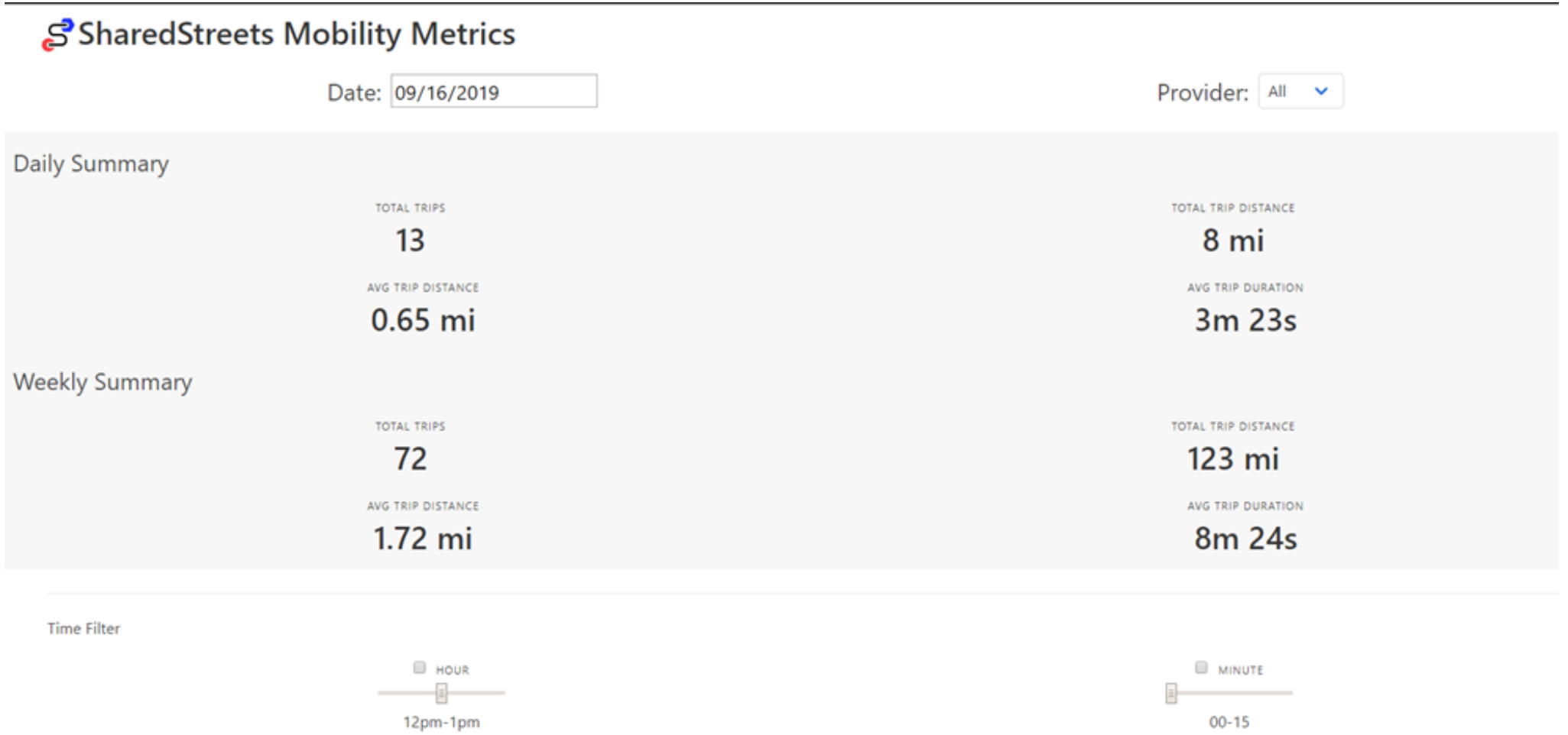
Data Used for Pivot Trip Optimization

- Historic INRIX (3 years)
- Live INRIX
- User Feedback
- Historic trip information from Pivot
- Weather

Future Data to be Used in Pivot Trip Optimization

- SharedStreets telemetry data (Uber and Lyft historic speeds)
- Connected Vehicle Environment
- Signal phase and timing
- Waycare
- OHGO

THE ROLE OF DATA



SHARED STREET DATA

Trip Volume

◉ Streets ○ Bins

Trip Volume measures the number of vehicles that moved over a street or zone, filtered to protect individual privacy

Export

Pick Ups

◉ Streets ○ Bins

Pickups measures the total number of trips that began within a zone

Export

MTECH Solutions

PLAN YOUR TRIP

Profile Menu

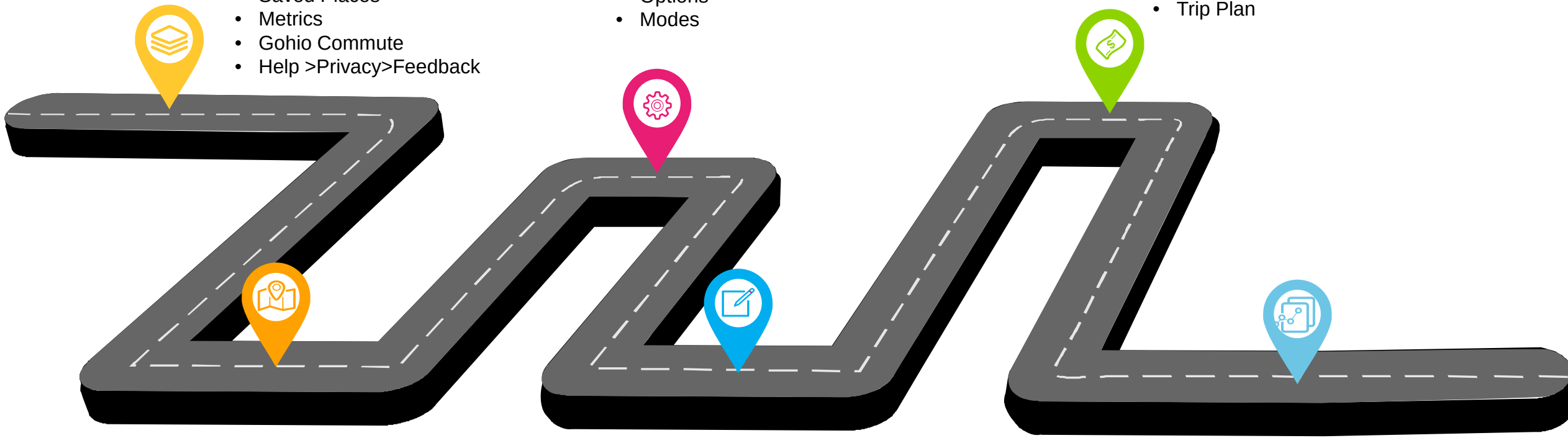
- Registration
- Saved Places
- Metrics
- Gohio Commute
- Help >Privacy>Feedback

Settings

- Wheelchair Accessibility
- Options
- Modes

Deep Linking Tools

- Nearby Rides
- Trip Plan



Main Map

- Stops, Routes, & Rentals
- Alerts
- Scheduled Trips
- Bus Stop Data

Plan!

- Location on Map
- Geocoder
- Weather
- Review Options & Sort

Book!

- Vertical/Horizontal Navigation
- Turn by Turn Directions
- Voice

DEVELOPMENT LESSONS LEARNED

- Stakeholder engagement
  - Mobility providers
  - Users
- CPS challenges
  - Business
  - Legal
- Product development
  - Flexible/Agile
  - Balance Waterfall
- Accommodating new modes
  - Scooters
  - ebikes

LESSONS LEARNED

1. Be flexible
2. Iterative Development/Testing:
    a) Impact to schedule
    b) Reduce fixing on the fly:
    c) Agile not unorganized (hybrid approach)
3. Stakeholder Collaboration:
    a) City/systems engineering/development team collaboration
    b) Engage all testers early in the process and maintain consistency
    c) Role of the beta testing group
4. Importance of documentation:
    a) Results
    b) Prioritizing bugs, enhancements and fixes

LESSONS LEARNED

Keep Comms team involved

Keep Partners in the Loop

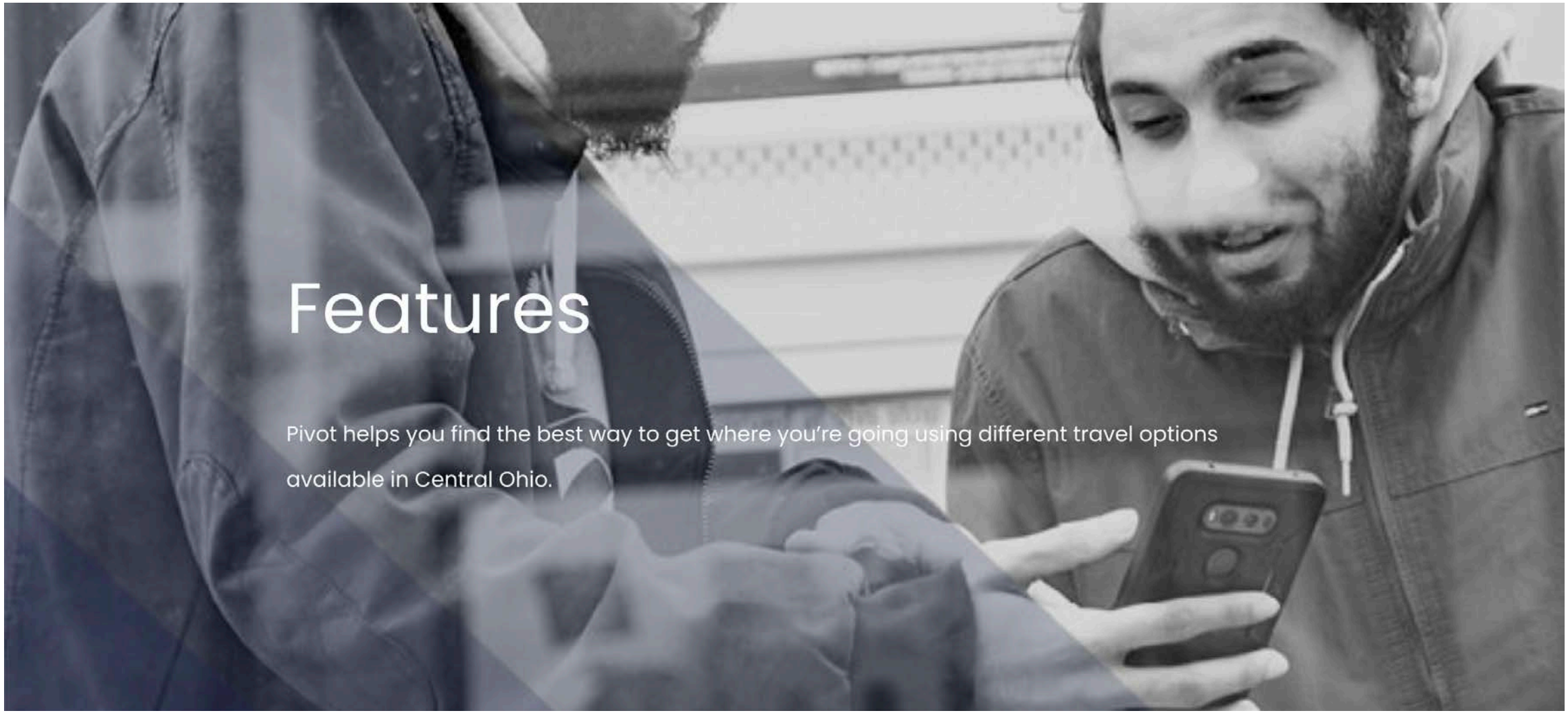
Leverage stakeholders' communication channels

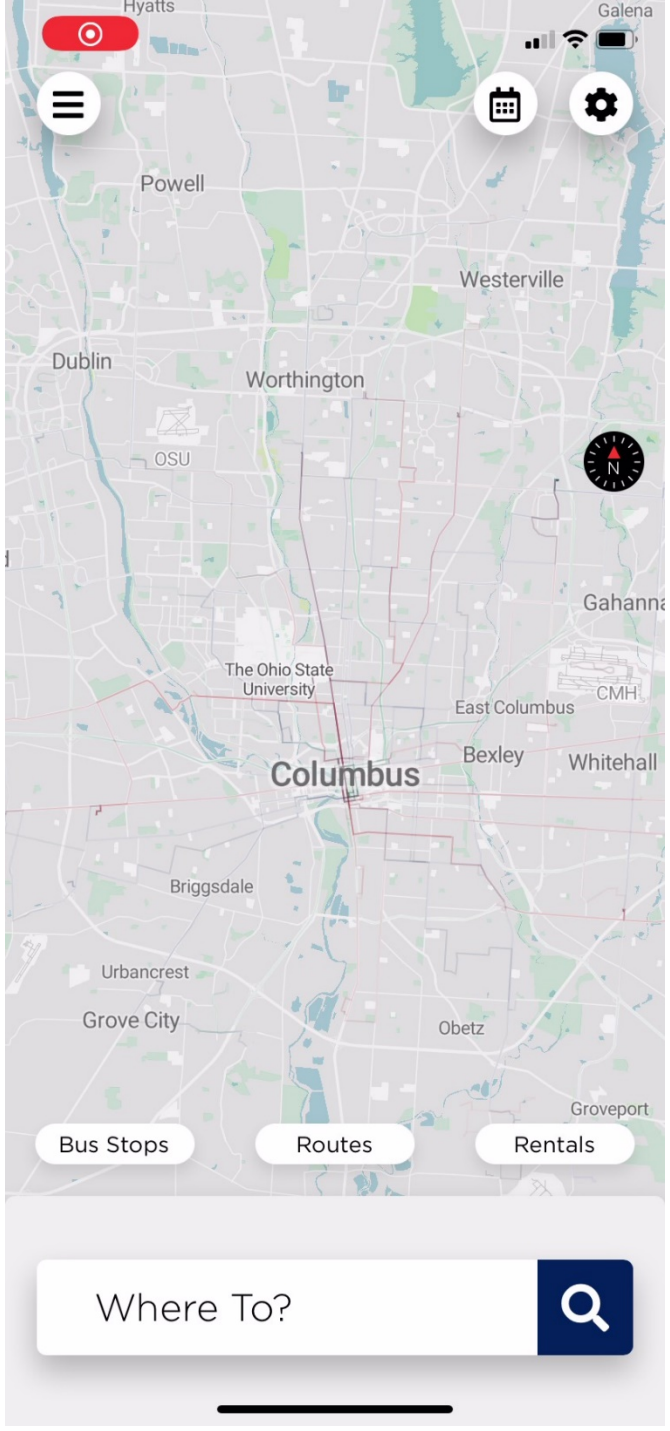
Testimonials

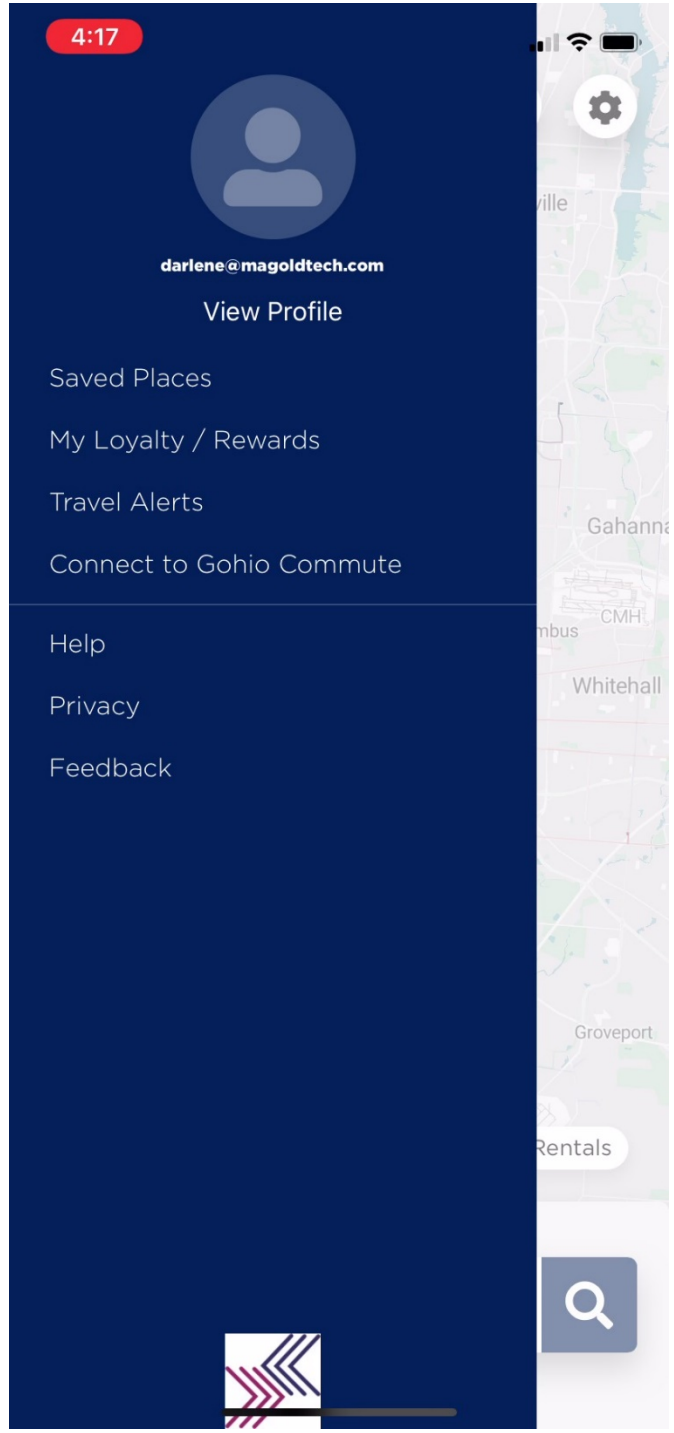
Co-creation

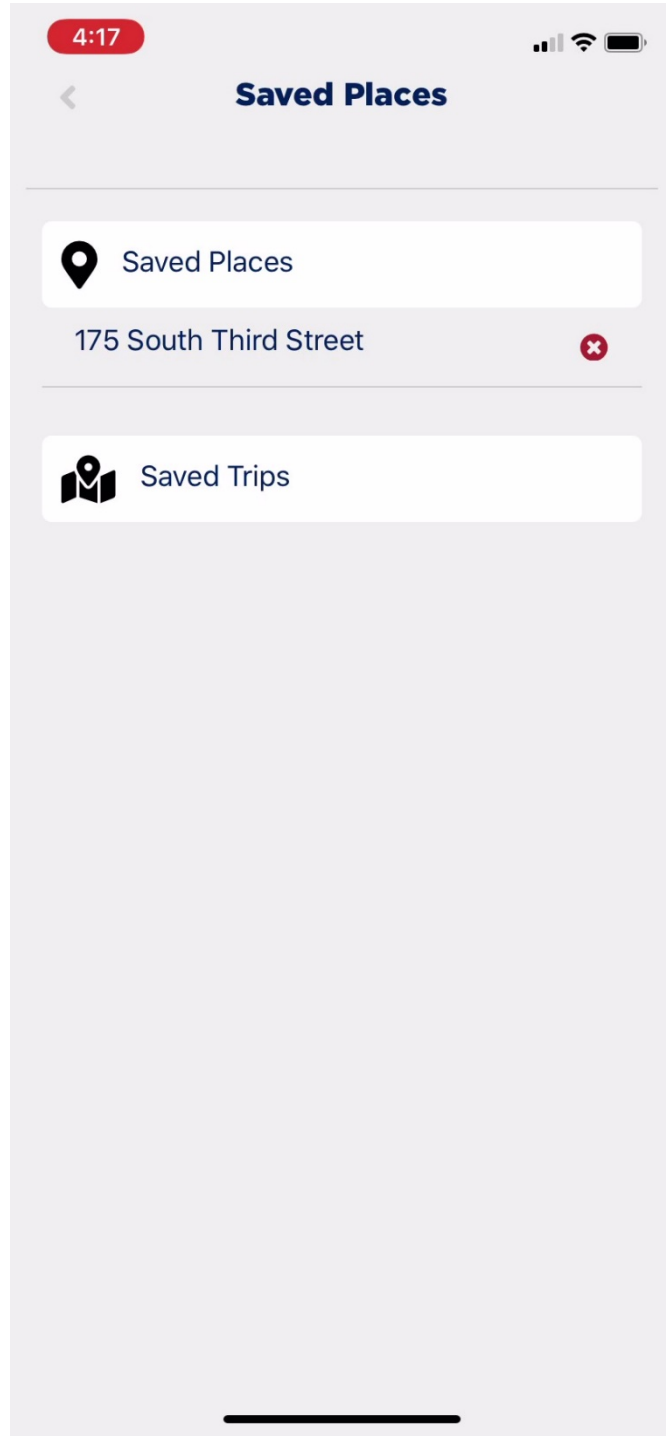
COVID

APP SNAPSHOTS




Hyatts
Galena
Powell
Westerville
Dublin
Worthington
OSU
Gahanna
The Ohio State University
CMH
East Columbus
Bexley
Whitehall
Columbus
Briggsdale
Urbancrest
Grove City
Obetz
Groveport
Bus Stops
Routes
Rentals
Where To?


4:17
darlene@magoldtech.com
View Profile
Saved Places
My Loyalty / Rewards
Travel Alerts
Connect to Gohio Commute
Help
Privacy
Feedback
Gahanna
CMH
Whitehall
Groveport
Rentals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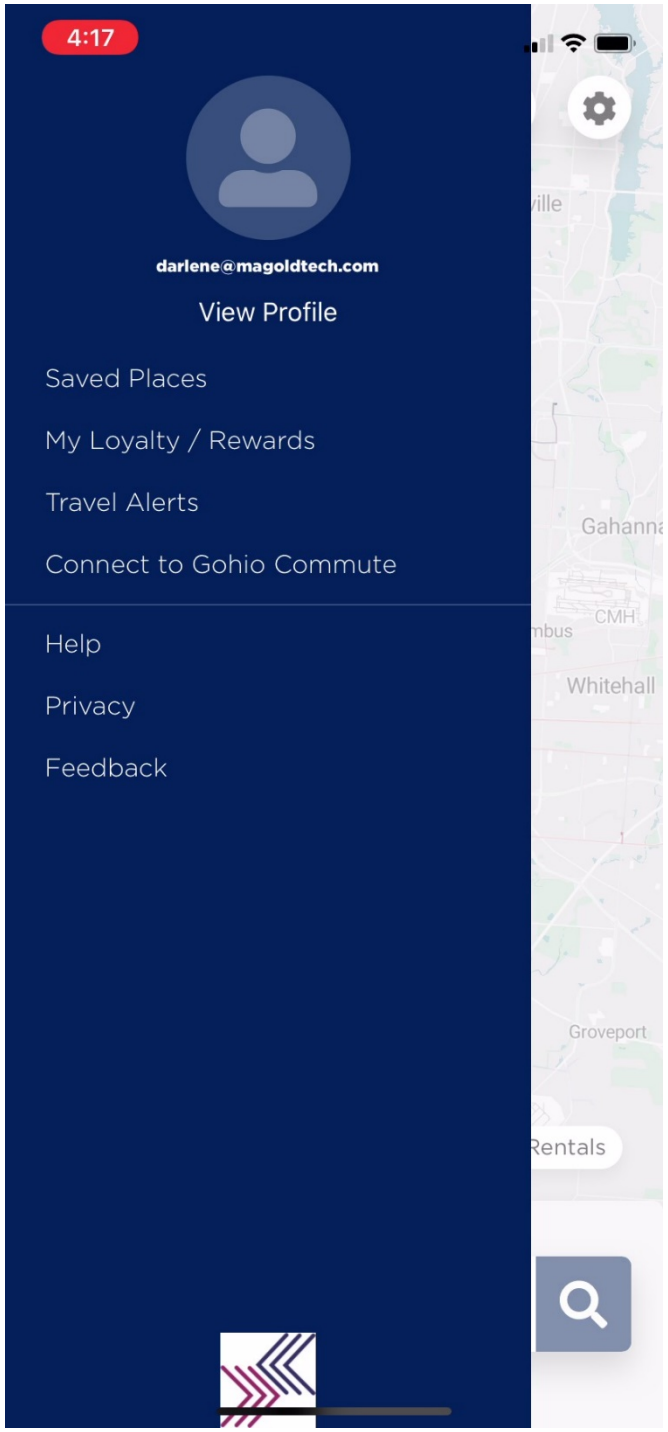
Saved Places
Saved Places
175 South Third Street
Saved Trips


4:17
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View Profile
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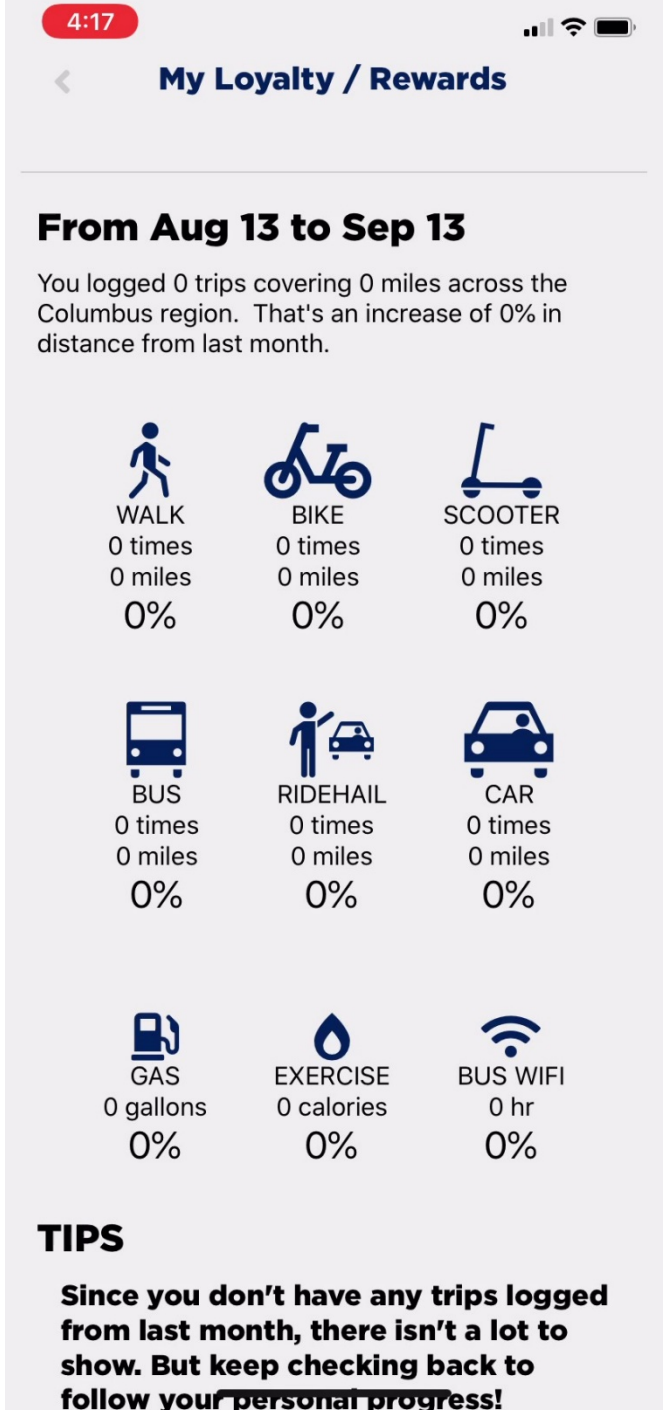
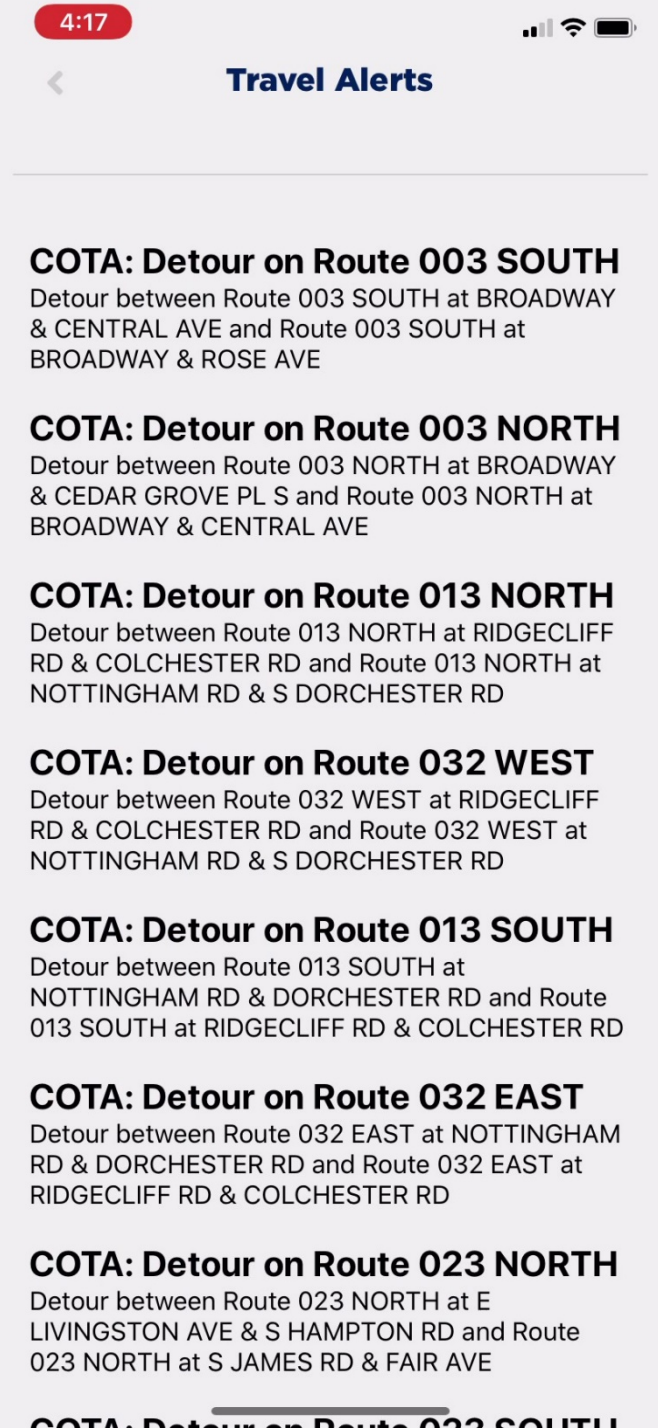
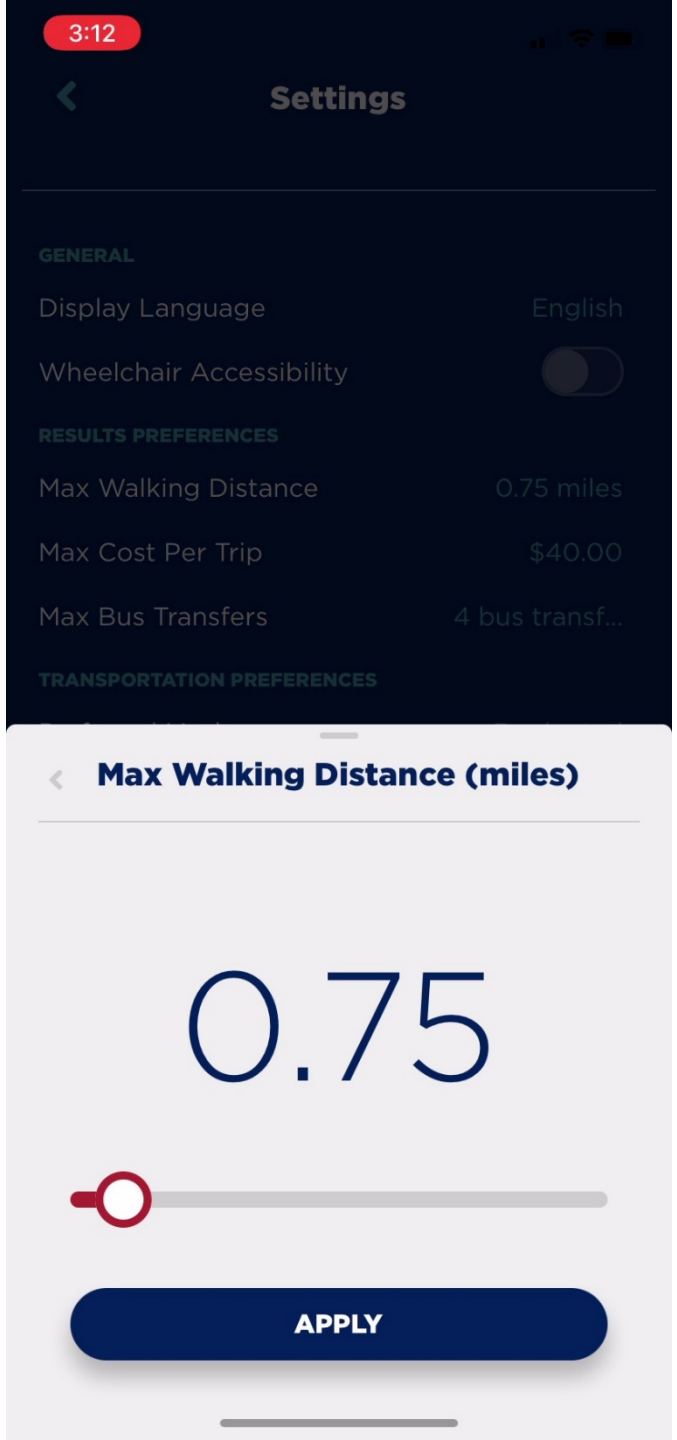
Connect to Gohio Commute
Help
Privacy
Feedback
Gahanna
CMH
Whitehall
Groveport
Rentals


4:17
My Loyalty / Rewards
From Aug 13 to Sep 13
You logged 0 trips covering 0 miles across the Columbus region. That's an increase of 0% in distance from last month.
WALK
0 times
0 miles
0%
BIKE
0 times
0 miles
0%
SCOOTER
0 times
0 miles
0%
BUS
0 times
0 miles
0%
RIDEHAIL
0 times
0 miles
0%
CAR
0 times
0 miles
0%
GAS
0 gallons
0%
EXERCISE
0 calories
0%
BUS WIFI
0 hr
0%
TIPS
Since you don't have any trips logged from last month, there isn't a lot to show. But keep checking back to follow your personal progress!


4:17
Travel Alerts
COTA: Detour on Route 003 SOUTH
Detour between Route 003 SOUTH at BROADWAY & CENTRAL AVE and Route 003 SOUTH at BROADWAY & ROSE AVE
COTA: Detour on Route 003 NORTH
Detour between Route 003 NORTH at BROADWAY & CEDAR GROVE PL S and Route 003 NORTH at BROADWAY & CENTRAL AVE
COTA: Detour on Route 013 NORTH
Detour between Route 013 NORTH at RIDGECLIFF RD & COLCHESTER RD and Route 013 NORTH at NOTTINGHAM RD & S DORCHESTER RD
COTA: Detour on Route 032 WEST
Detour between Route 032 WEST at RIDGECLIFF RD & COLCHESTER RD and Route 032 WEST at NOTTINGHAM RD & S DORCHESTER RD
COTA: Detour on Route 013 SOUTH
Detour between Route 013 SOUTH at NOTTINGHAM RD & DORCHESTER RD and Route 013 SOUTH at RIDGECLIFF RD & COLCHESTER RD
COTA: Detour on Route 032 EAST
Detour between Route 032 EAST at NOTTINGHAM RD & DORCHESTER RD and Route 032 EAST at RIDGECLIFF RD & COLCHESTER RD
COTA: Detour on Route 023 NORTH
Detour between Route 023 NORTH at E LIVINGSTON AVE & S HAMPTON RD and Route 023 NORTH at S JAMES RD & FAIR AVE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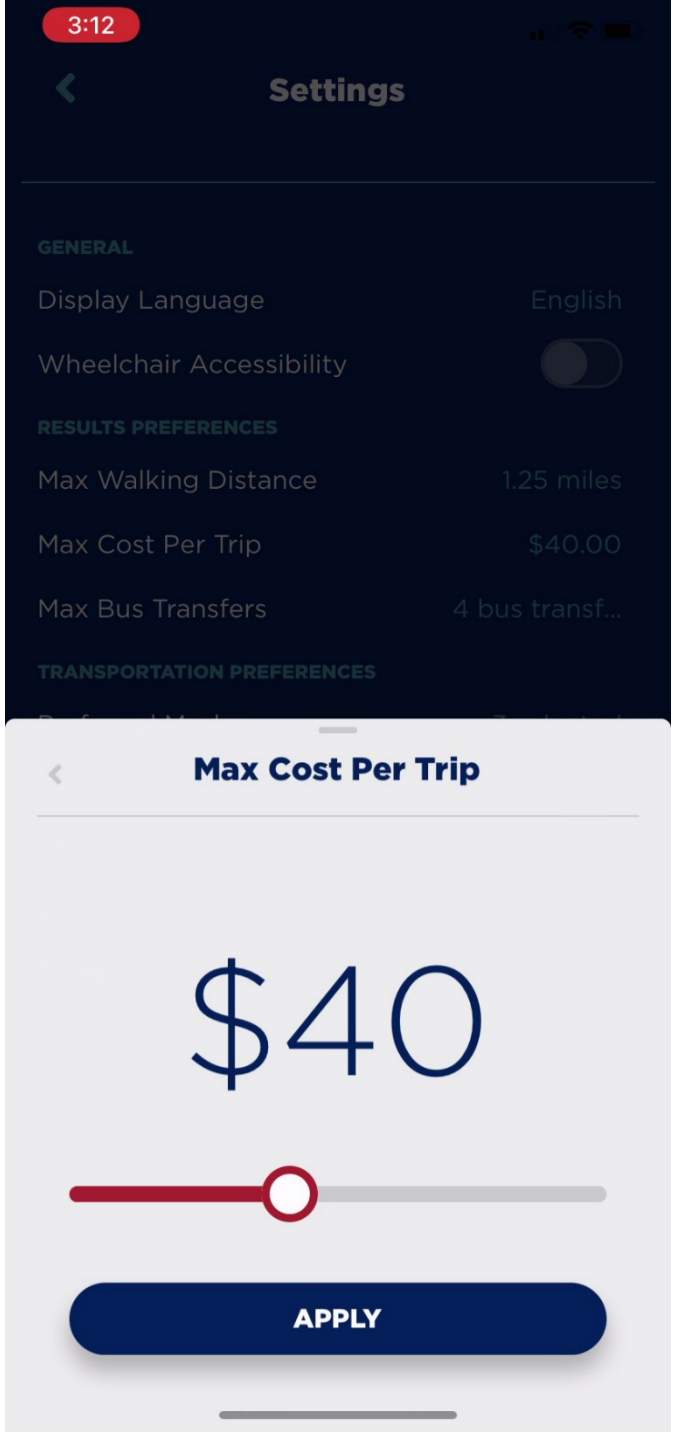
Settings
GENERAL
Display Language
English
Wheelchair Accessibility
RESULTS PREFERENCES
Max Walking Distance
0.75 miles
Max Cost Per Trip
$40.00
Max Bus Transfers
4 bus transf...
TRANSPORTATION PREFERENCES
Max Walking Distance (miles)
0.75
APPLY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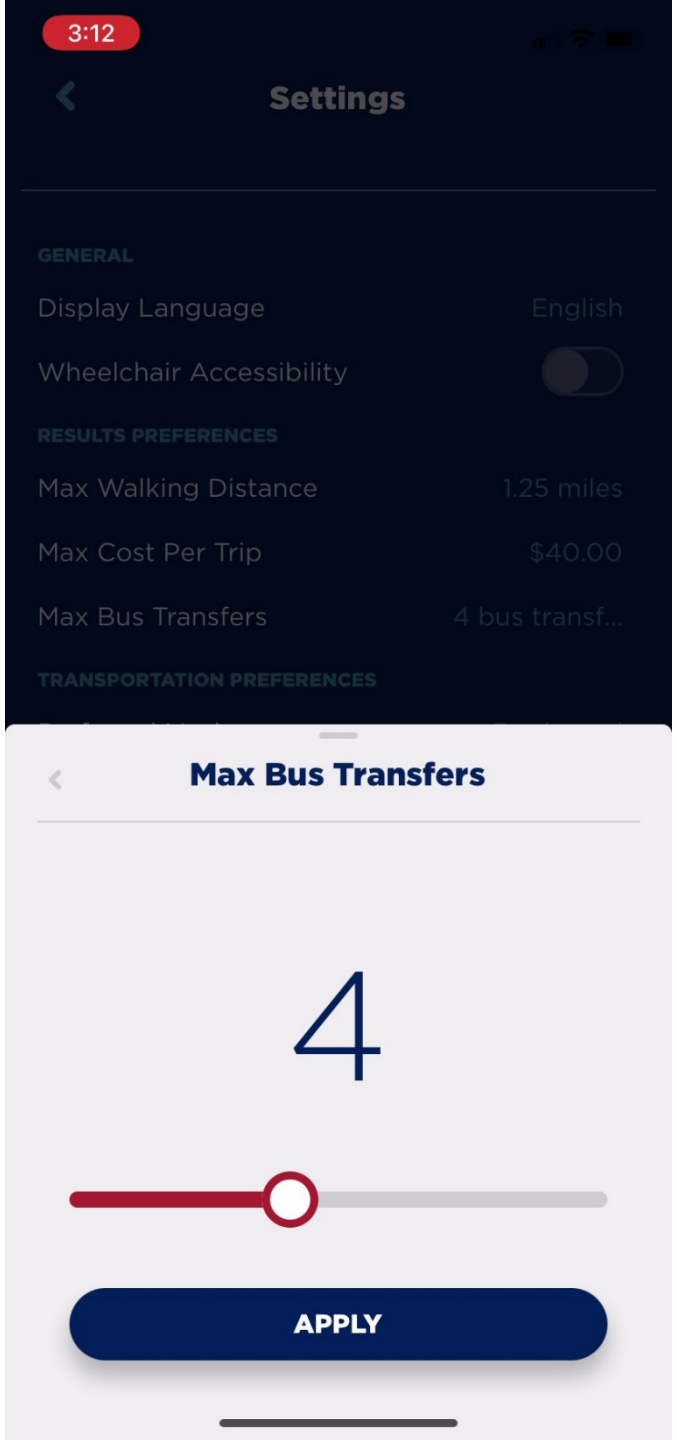
Settings
GENERAL
Display Language
English
Wheelchair Accessibility
RESULTS PREFERENCES
Max Walking Distance
1.25 miles
Max Cost Per Trip
$40.00
Max Bus Transfers
4 bus transf...
TRANSPORTATION PREFERENCES
Max Cost Per Trip
$40
APPLY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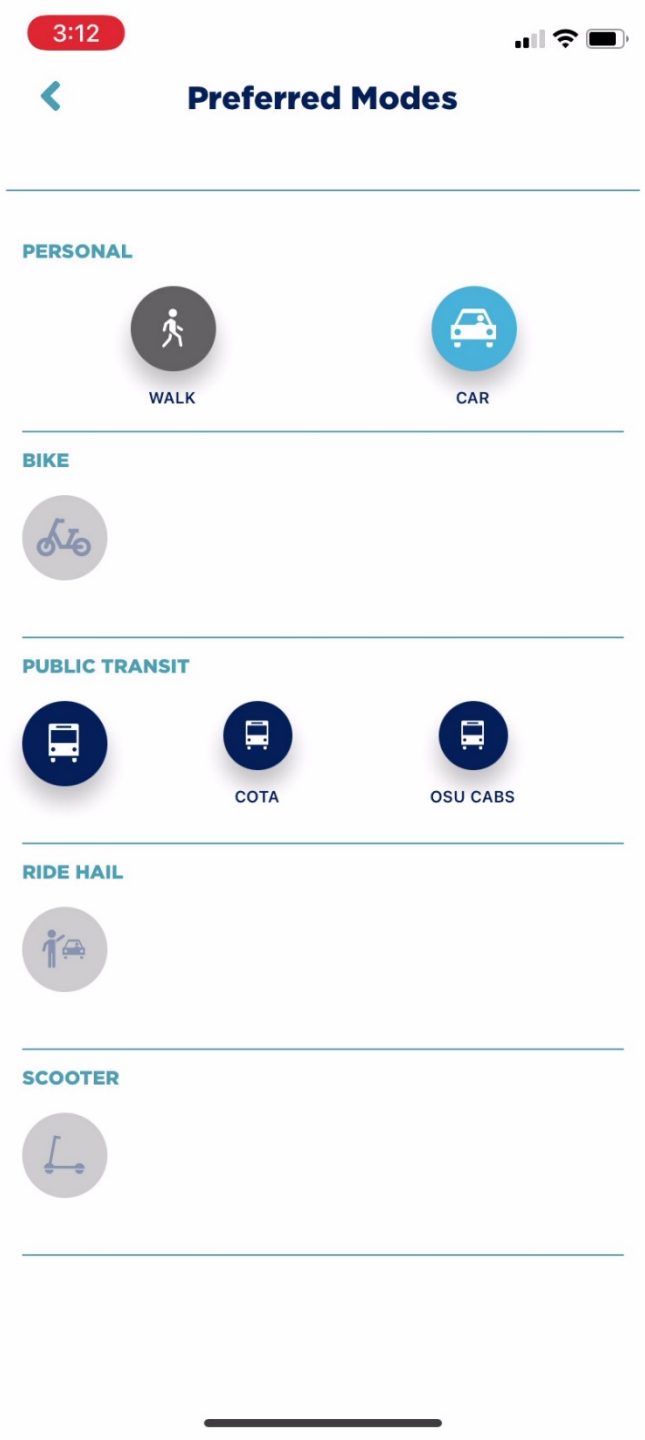
GENERAL
Display Language
English
Wheelchair Accessibility
RESULTS PREFERENCES
Max Walking Distance
1.25 miles
Max Cost Per Trip
$40.00
Max Bus Transfers
4 bus transf...
TRANSPORTATION PREFERENCES
Max Bus Transfers
4
APPLY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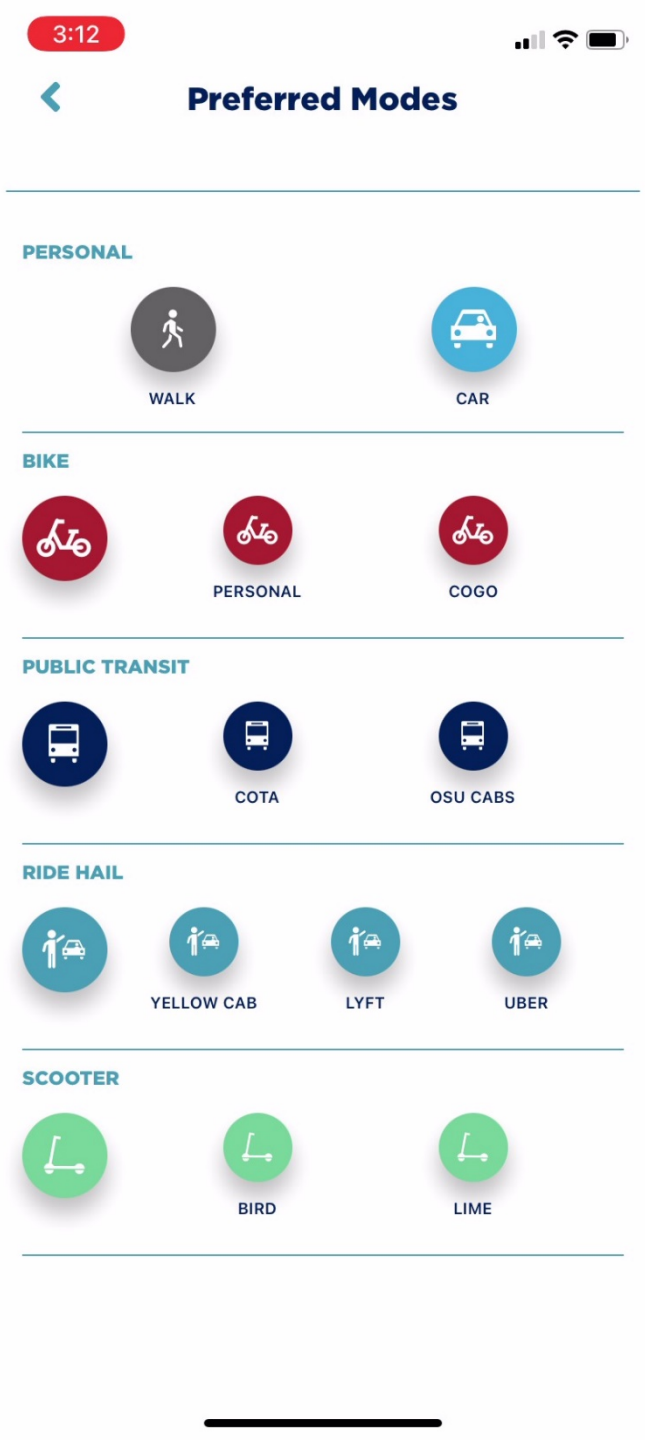
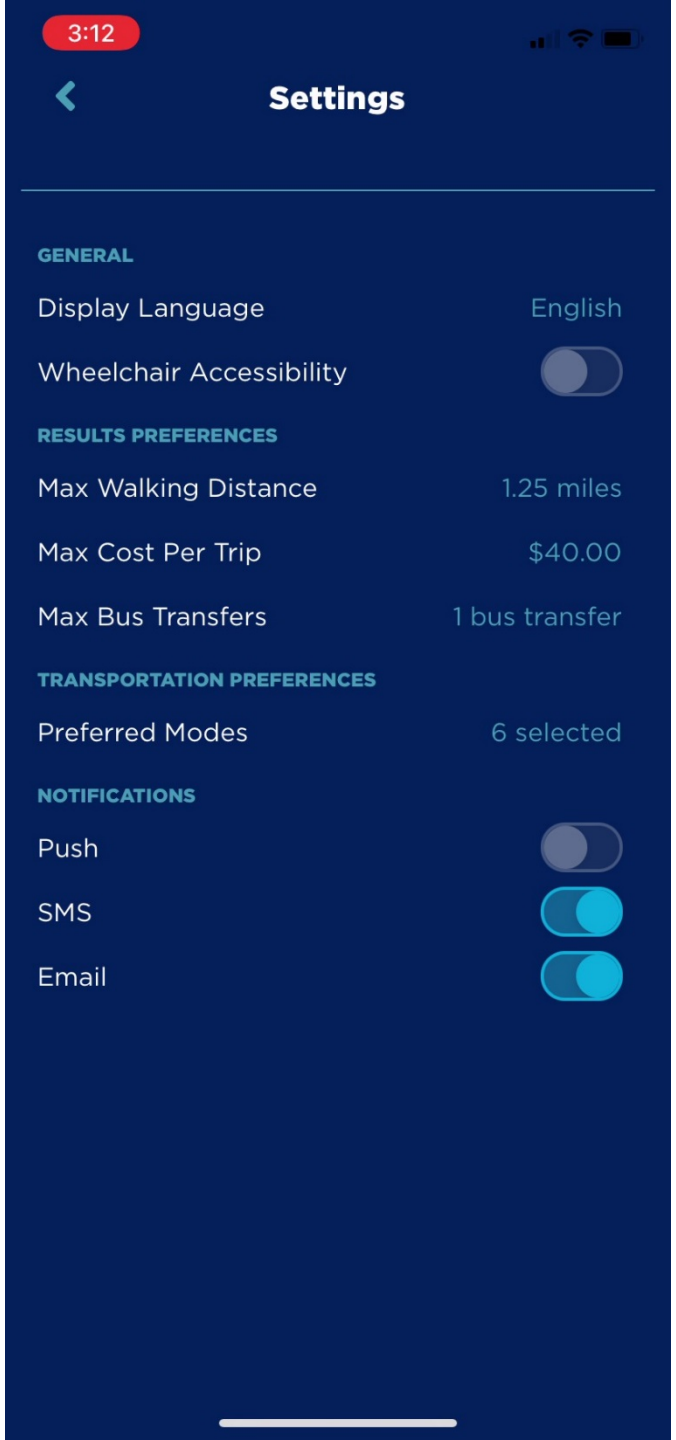
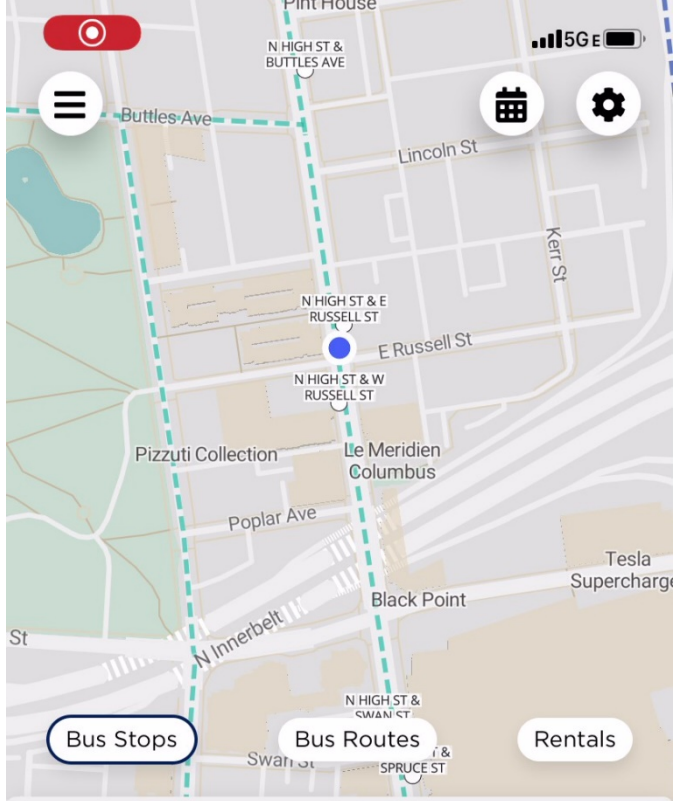
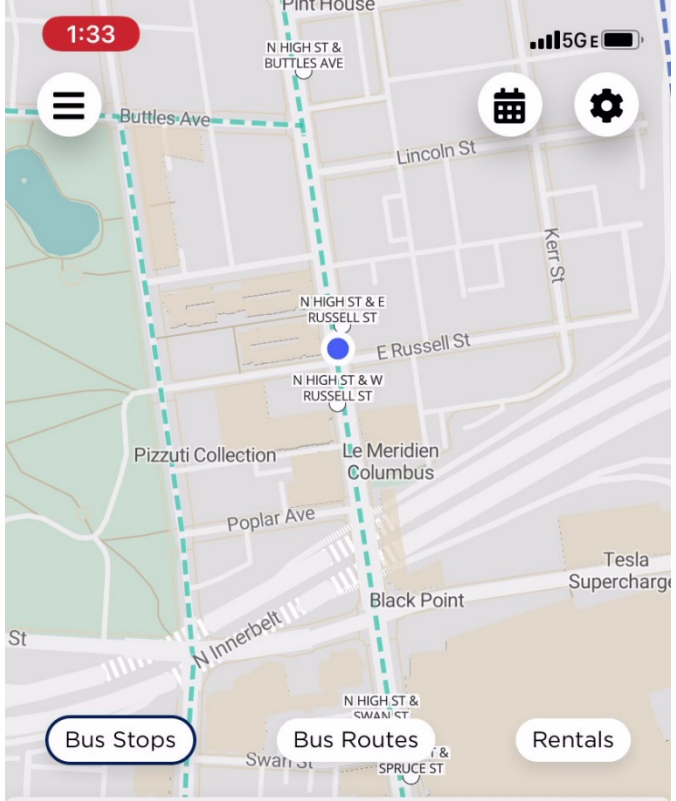
Preferred Modes
PERSONAL
WALK
CAR
BIKE
PUBLIC TRANSIT
COTA
OSU CABS
RIDE HAIL
SCOOTER


3:12
Preferred Modes
PERSONAL
WALK
CAR
BIKE
PERSONAL
COGO
PUBLIC TRANSIT
COTA
OSU CABS
RIDE HAIL
YELLOW CAB
LYFT
UBER
SCOOTER
BIRD
LIME

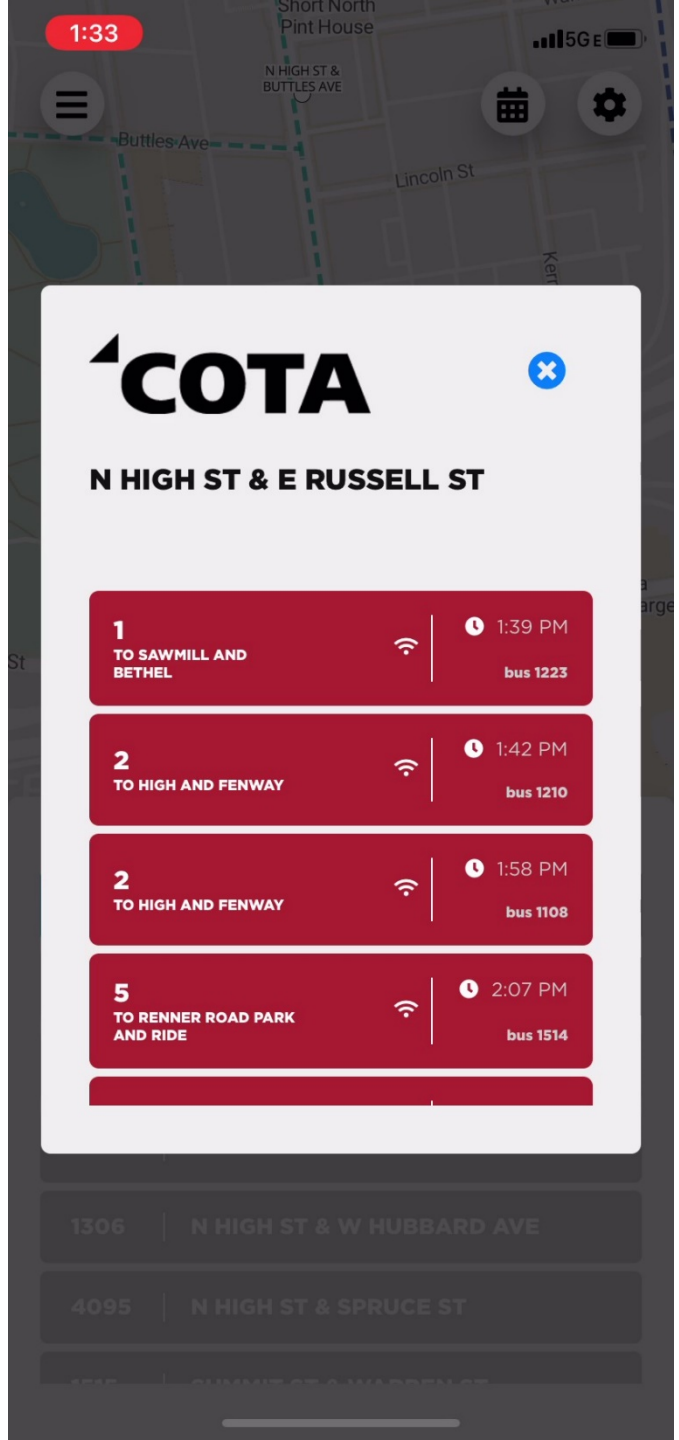

3:12
Settings
GENERAL
Display Language
English
Wheelchair Accessibility
RESULTS PREFERENCES
Max Walking Distance
1.25 miles
Max Cost Per Trip
$40.00
Max Bus Transfers
1 bus transfer
TRANSPORTATION PREFERENCES
Preferred Modes
6 selected
NOTIFICATIONS
Push
SMS
Email

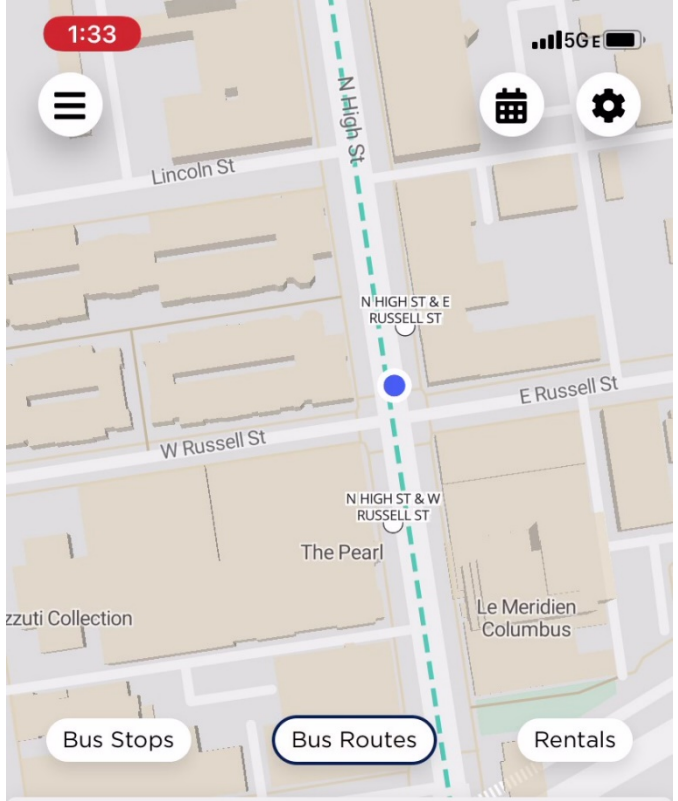


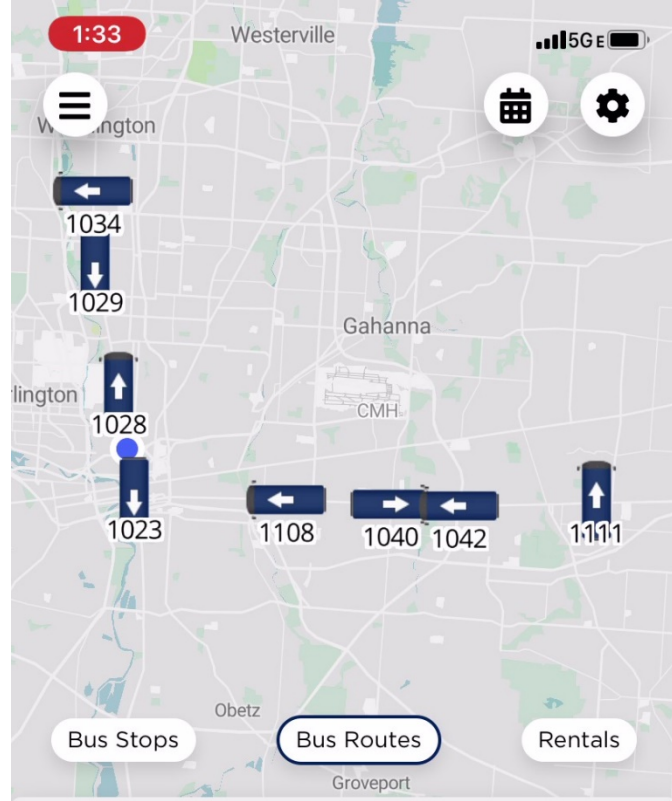
1178	N HIGH ST & E RUSSELL ST
1308	N HIGH ST & W RUSSELL ST
8136	N HIGH ST & WARREN ST
4096	N HIGH ST & SWAN ST
1306	N HIGH ST & W HUBBARD AVE
4095	N HIGH ST & SPRUCE ST



1178	N HIGH ST & E RUSSELL ST
1308	N HIGH ST & W RUSSELL ST
8136	N HIGH ST & WARREN ST
4096	N HIGH ST & SWAN ST
1306	N HIGH ST & W HUBBARD AVE
4095	N HIGH ST & SPRUCE ST

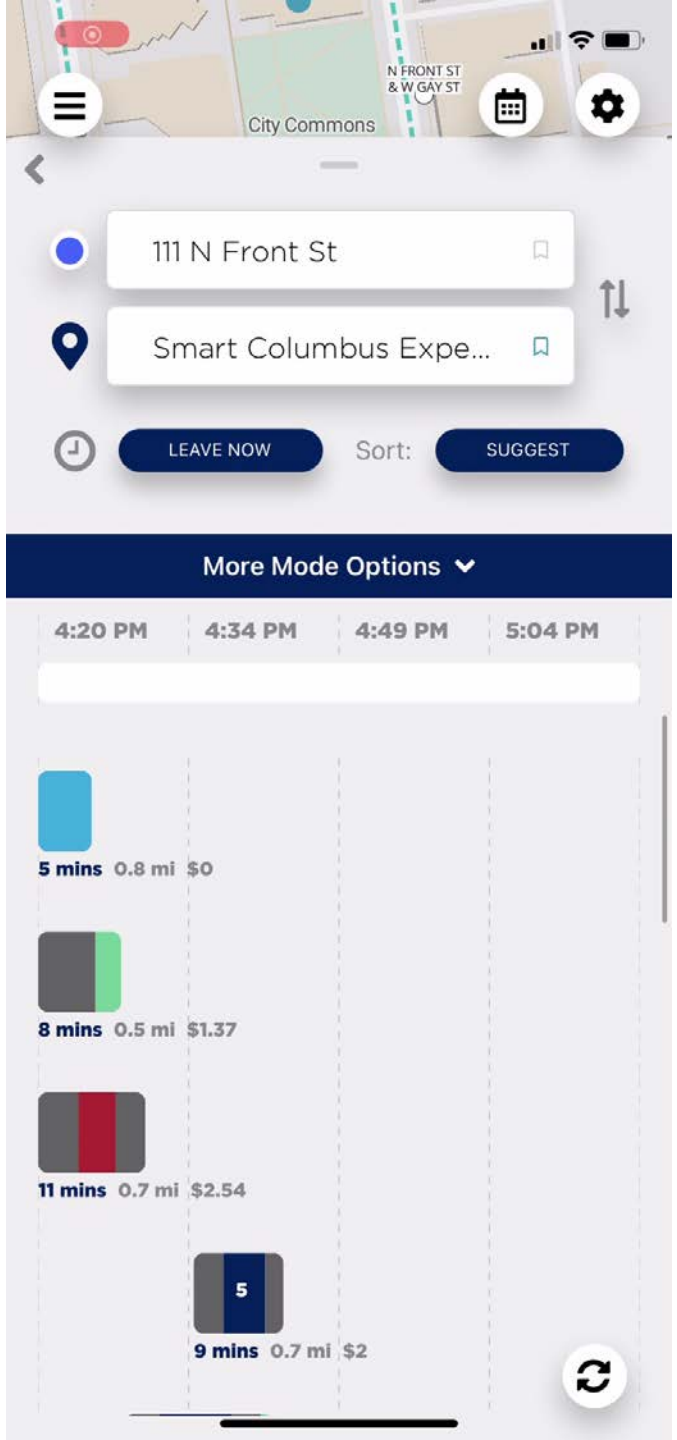


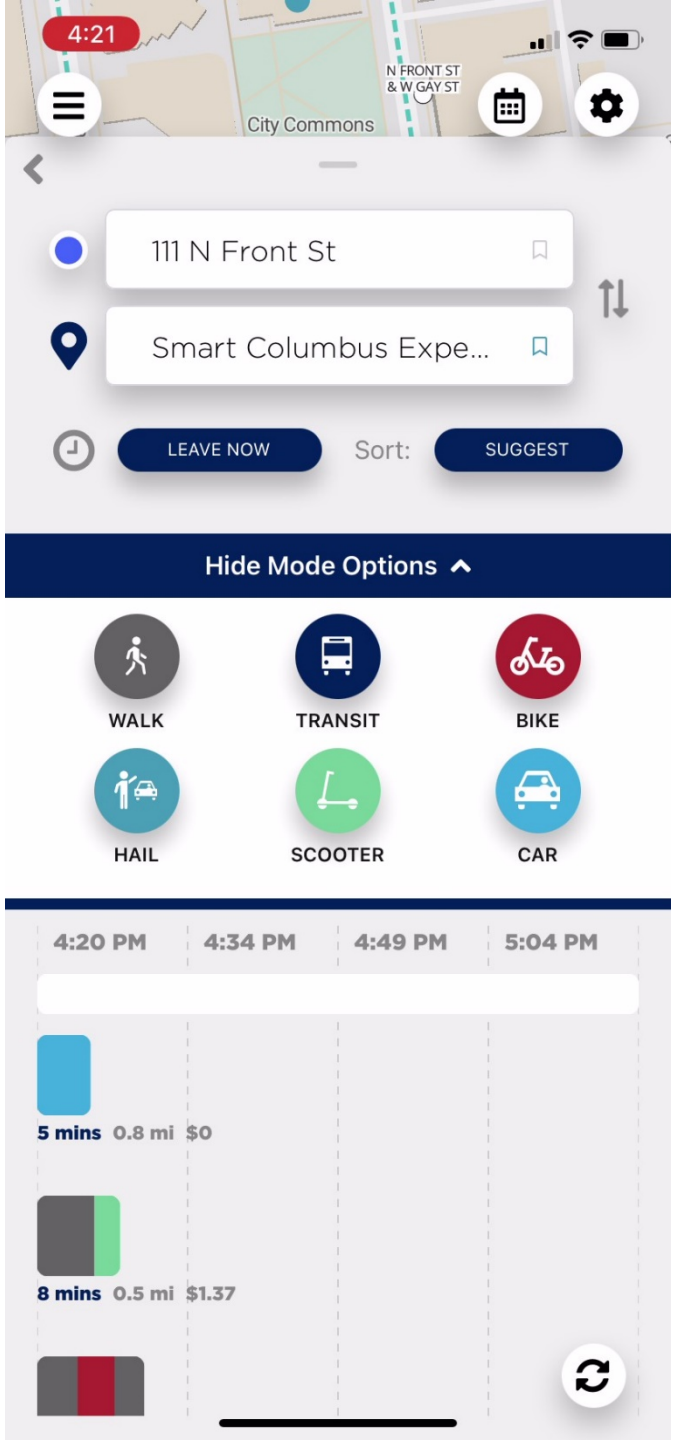


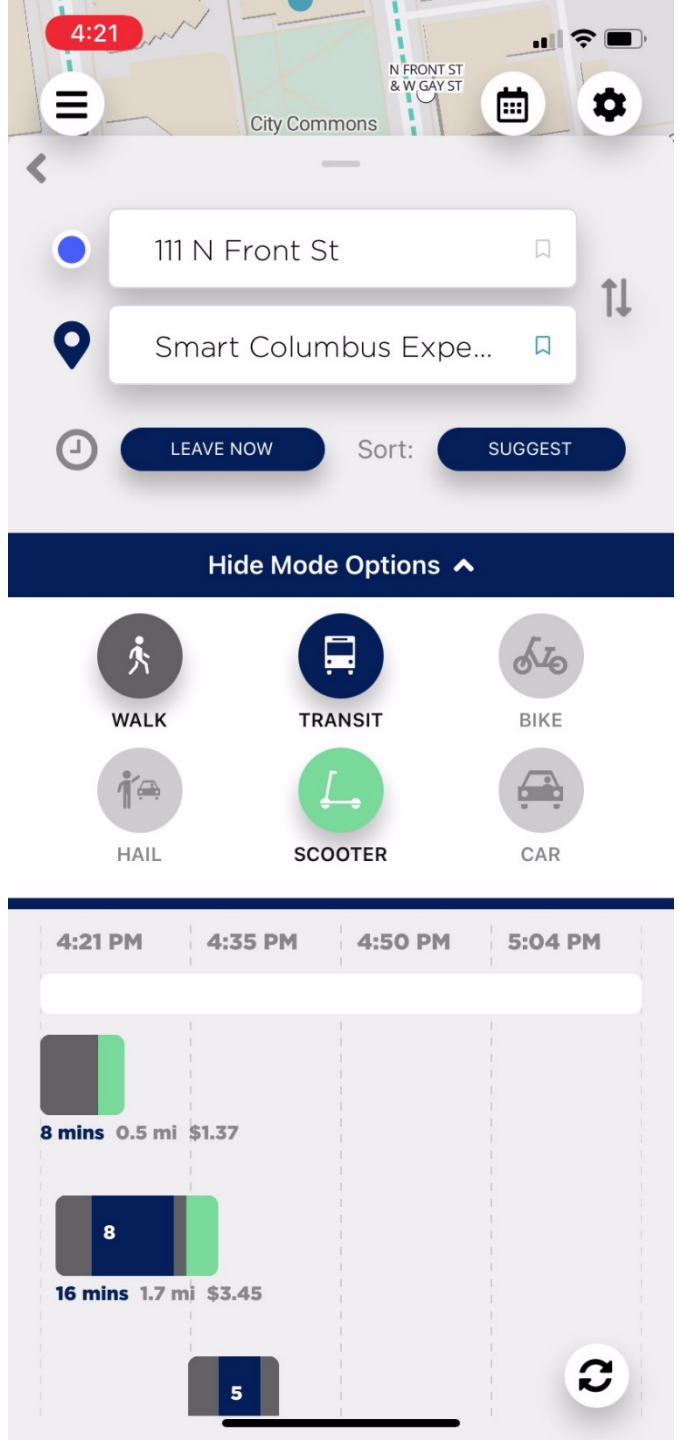


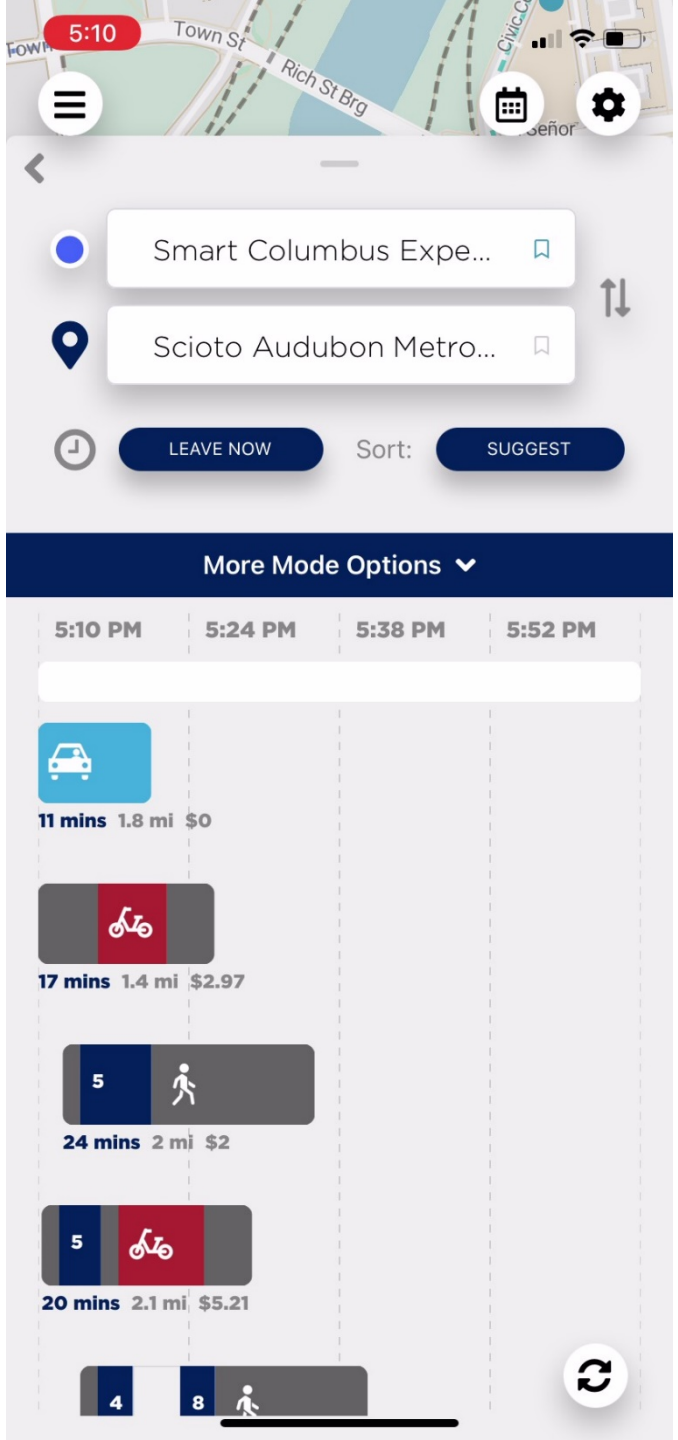
1 - KENNY/LIVINGSTON
2 - E MAIN/N HIGH
3 - NORTHWEST/HARRISBURG
4 - INDIANOLA/LOCKBOURNE
5 - W 5TH AVE/REFUGEE
6 - CLEVELAND/SULLIVANT

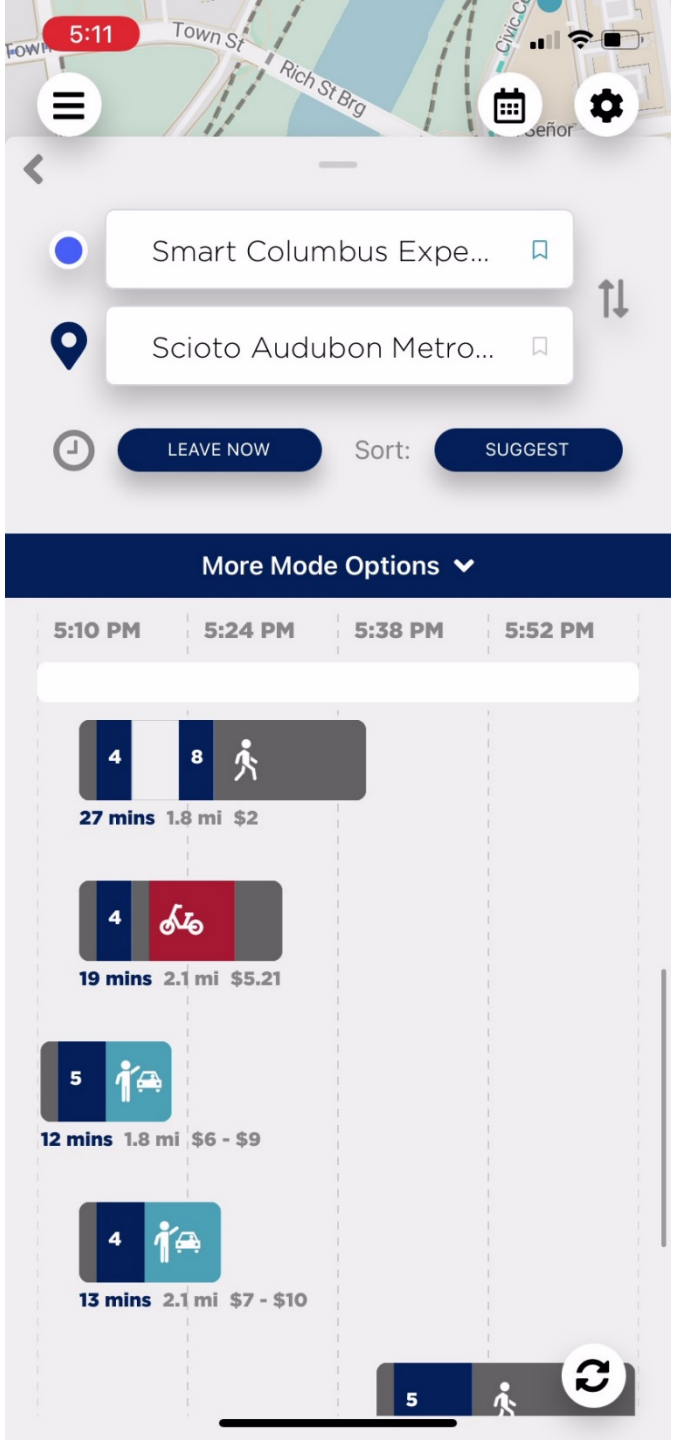
1 - KENNY/LIVINGSTON
2 - E MAIN/N HIGH
3 - NORTHWEST/HARRISBURG
4 - INDIANOLA/LOCKBOURNE
5 - W 5TH AVE/REFUGEE
6 - CLEVELAND/SULLIVANT

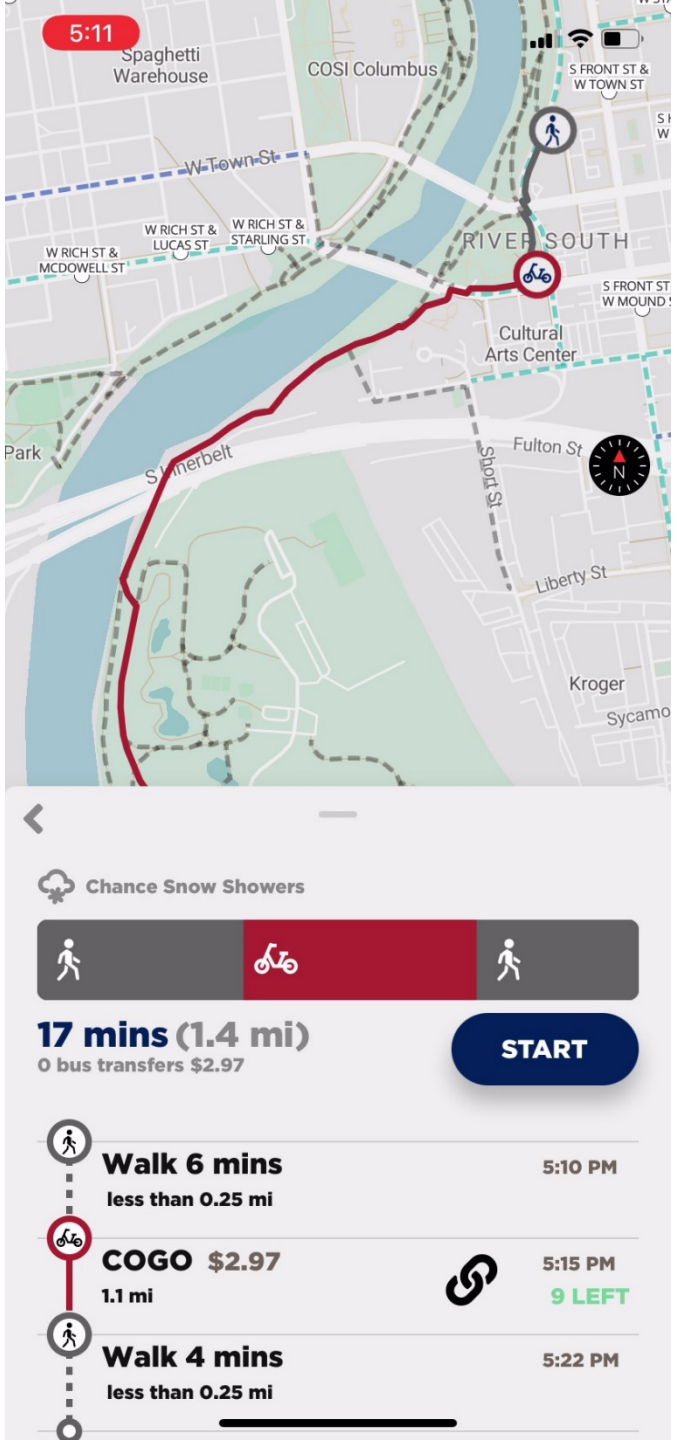

City Commons
N FRONT ST & W GAY ST
111 N Front St
Smart Columbus Expe...
LEAVE NOW
Sort:
SUGGEST
More Mode Options
4:20 PM
4:34 PM
4:49 PM
5:04 PM
5 mins 0.8 mi $0
8 mins 0.5 mi $1.37
11 mins 0.7 mi $2.54
5
9 mins 0.7 mi $2

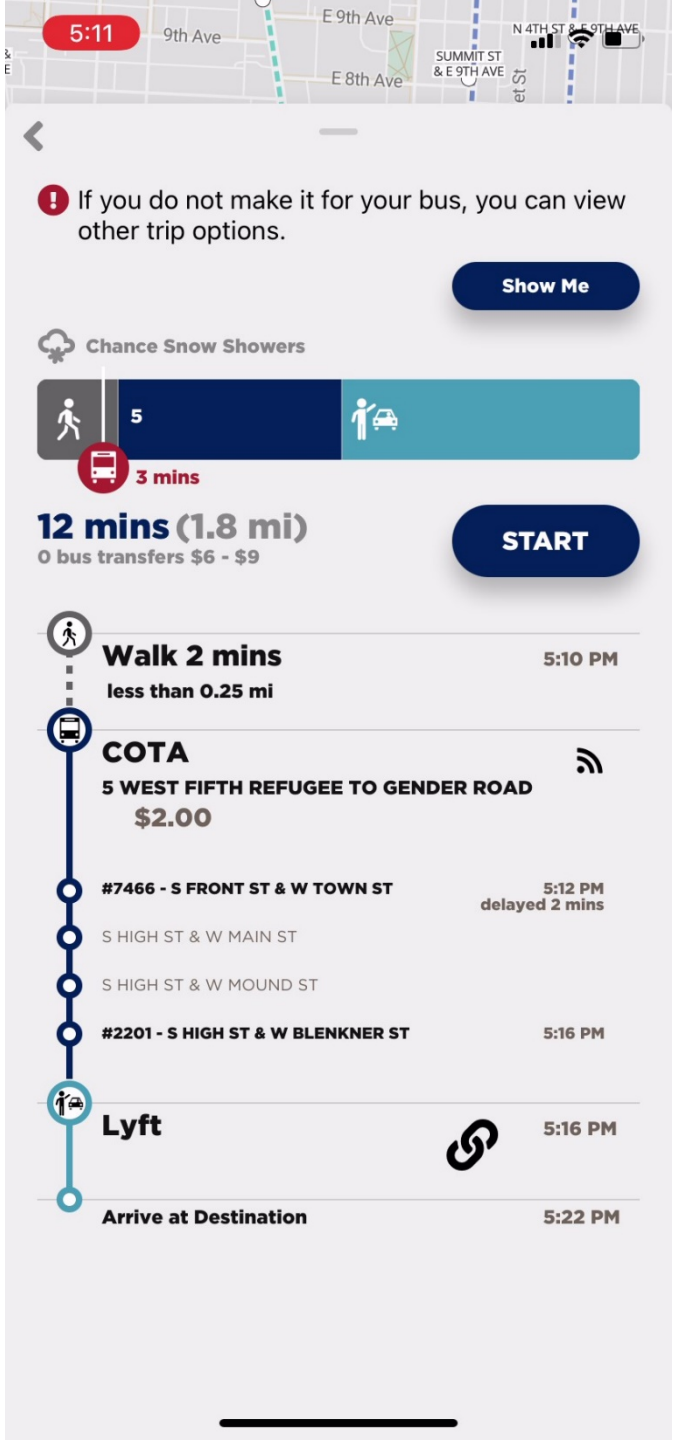

4:21
City Commons
N FRONT ST & W GAY ST
111 N Front St
Smart Columbus Expe...
LEAVE NOW
Sort:
SUGGEST
Hide Mode Options
WALK
TRANSIT
BIKE
HAIL
SCOOTER
CAR
4:20 PM
4:34 PM
4:49 PM
5:04 PM
5 mins 0.8 mi $0
8 mins 0.5 mi $1.37

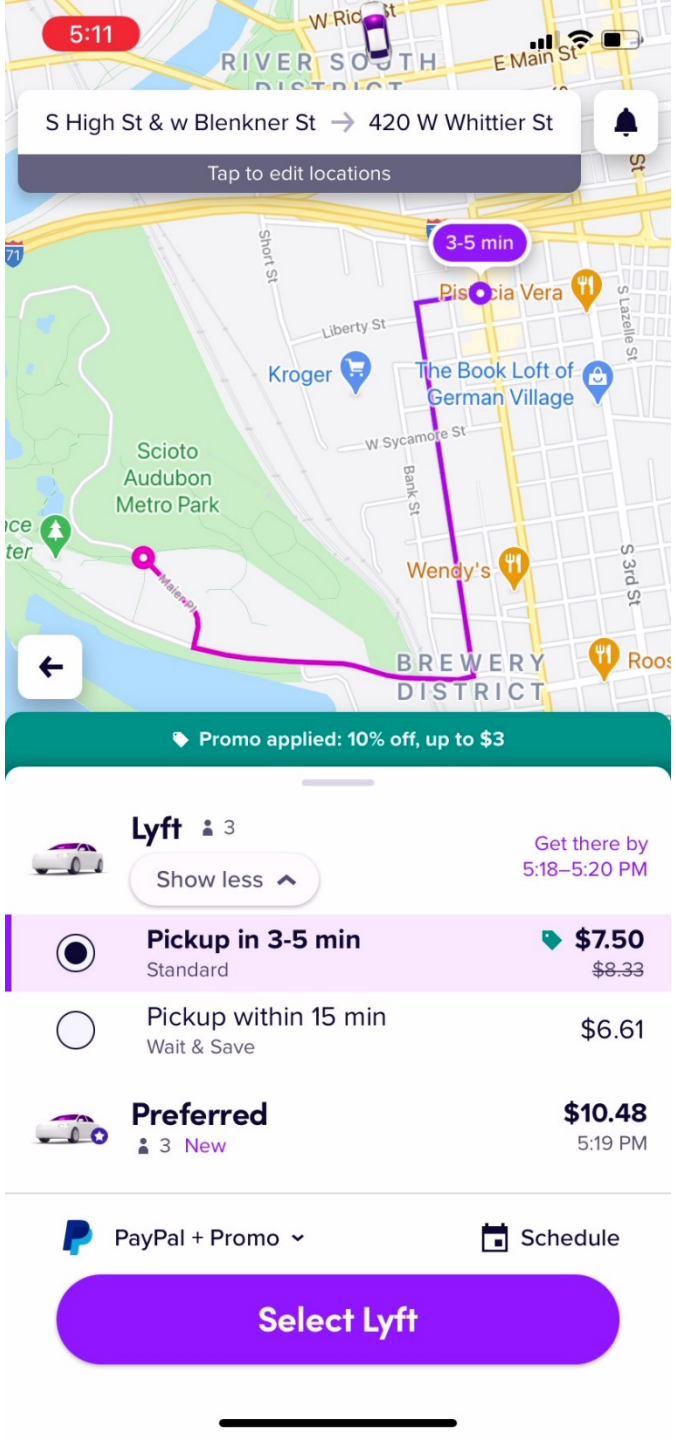

4:21
City Commons
N FRONT ST & W GAY ST
111 N Front St
Smart Columbus Expe...
LEAVE NOW
Sort:
SUGGEST
Hide Mode Options
WALK
TRANSIT
BIKE
HAIL
SCOOTER
CAR
4:21 PM
4:35 PM
4:50 PM
5:04 PM
8 mins 0.5 mi $1.37
8
16 mins 1.7 mi $3.45
5

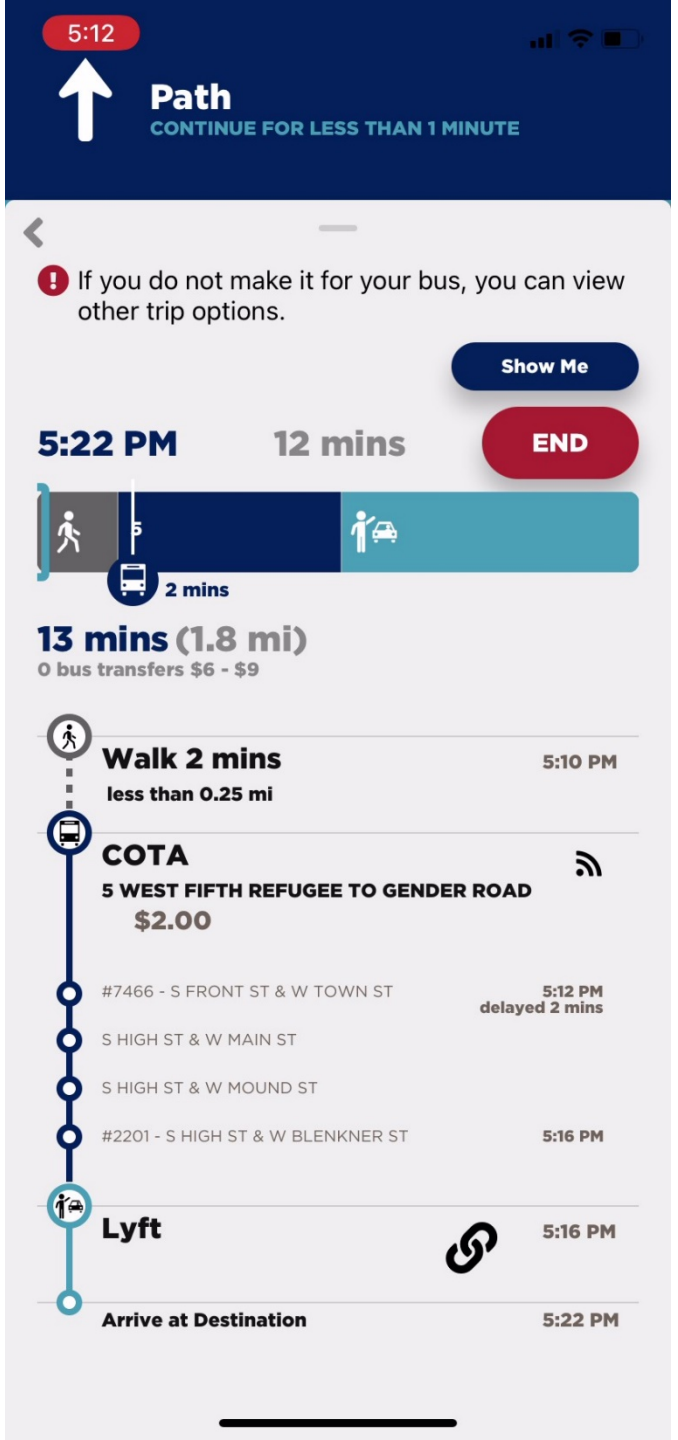

5:10
Town St
Rich St Brg
Smart Columbus Expe...
Scioto Audubon Metro...
LEAVE NOW
Sort:
SUGGEST
More Mode Options
5:10 PM
5:24 PM
5:38 PM
5:52 PM
11 mins 1.8 mi $0
17 mins 1.4 mi $2.97
24 mins 2 mi $2
20 mins 2.1 mi $5.21


5:11
Town St
Rich St Brg
Smart Columbus Expe...
Scioto Audubon Metro...
LEAVE NOW
Sort:
SUGGEST
More Mode Options
5:10 PM
5:24 PM
5:38 PM
5:52 PM
27 mins 1.8 mi $2
19 mins 2.1 mi $5.21
12 mins 1.8 mi $6 - $9
13 mins 2.1 mi $7 - $10


5:11
Spaghetti Warehouse
COSI Columbus
W Town St
RIVER SOUTH
Cultural Arts Center
Fulton St
Liberty St
Kroger
Chance Snow Showers
17 mins (1.4 mi)
0 bus transfers $2.97
START
Walk 6 mins
less than 0.25 mi
5:10 PM
COGO $2.97
1.1 mi
5:15 PM
9 LEFT
Walk 4 mins
less than 0.25 mi
5:22 PM


5:11
9th Ave
E 9th Ave
E 8th Ave
SUMMIT ST & E 9TH AVE
N 4TH ST & E 9TH AVE
If you do not make it for your bus, you can view other trip options.
Show Me
Chance Snow Showers
5
3 mins
12 mins (1.8 mi)
0 bus transfers $6 - $9
START
Walk 2 mins
less than 0.25 mi
5:10 PM
COTA
5 WEST FIFTH REFUGEE TO GENDER ROAD
$2.00
#7466 - S FRONT ST & W TOWN ST
5:12 PM
delayed 2 mins
S HIGH ST & W MAIN ST
S HIGH ST & W MOUND ST
#2201 - S HIGH ST & W BLENKNER ST
5:16 PM
Lyft
5:16 PM
Arrive at Destination
5:22 PM


5:11
RIVER SOUTH DISTRICT
E Main St
S High St & w Blenkner St → 420 W Whittier St
Tap to edit locations
3-5 min
Short St
Liberty St
Kroger
The Book Loft of German Village
S Lazelle St
W Sycamore St
Bank St
Scioto Audubon Metro Park
Wendy's
S 3rd St
BREWERY DISTRICT
Promo applied: 10% off, up to $3
Lyft 3
Show less
Get there by 5:18–5:20 PM
Pickup in 3-5 min
Standard
$7.50
$8.33
Pickup within 15 min
Wait & Save
$6.61
Preferred
3 New
$10.48
5:19 PM
PayPal + Promo
Schedule
Select Lyft


5:12
Path
CONTINUE FOR LESS THAN 1 MINUTE
If you do not make it for your bus, you can view other trip options.
Show Me
5:22 PM
12 mins
END
2 mins
13 mins (1.8 mi)
0 bus transfers $6 - $9
Walk 2 mins
less than 0.25 mi
5:10 PM
COTA
5 WEST FIFTH REFUGEE TO GENDER ROAD
$2.00
#7466 - S FRONT ST & W TOWN ST
5:12 PM
delayed 2 mins
S HIGH ST & W MAIN ST
S HIGH ST & W MOUND ST
#2201 - S HIGH ST & W BLENKNER ST
5:16 PM
Lyft
5:16 PM
Arrive at Destination
5:22 PM

SMART COLUMBUS

pivot

empowered mobility

LEARN MORE

SIGN UP FOR OUR E-NEWSLETTER

CONTACT:

SmartColumbus@columbus.gov

columbus.gov/smartcolumbus

@SmartCbus

SMRT COLUMBUS

Mandy K. Bishop, PE, SI
Deputy Director of Public Service/
Smart Columbus Program Manager
City of Columbus
mkbishop@columbus.gov
Twitter: @mandy614njnerd

THANK YOU

Transportation Demand Management (TDM) in Tennessee

February 19, 2021

TDOT Long Range Planning Division

Congestion Mitigation and Air Quality (CMAQ) Improvement Program

Eligible CMAQ Project Categories

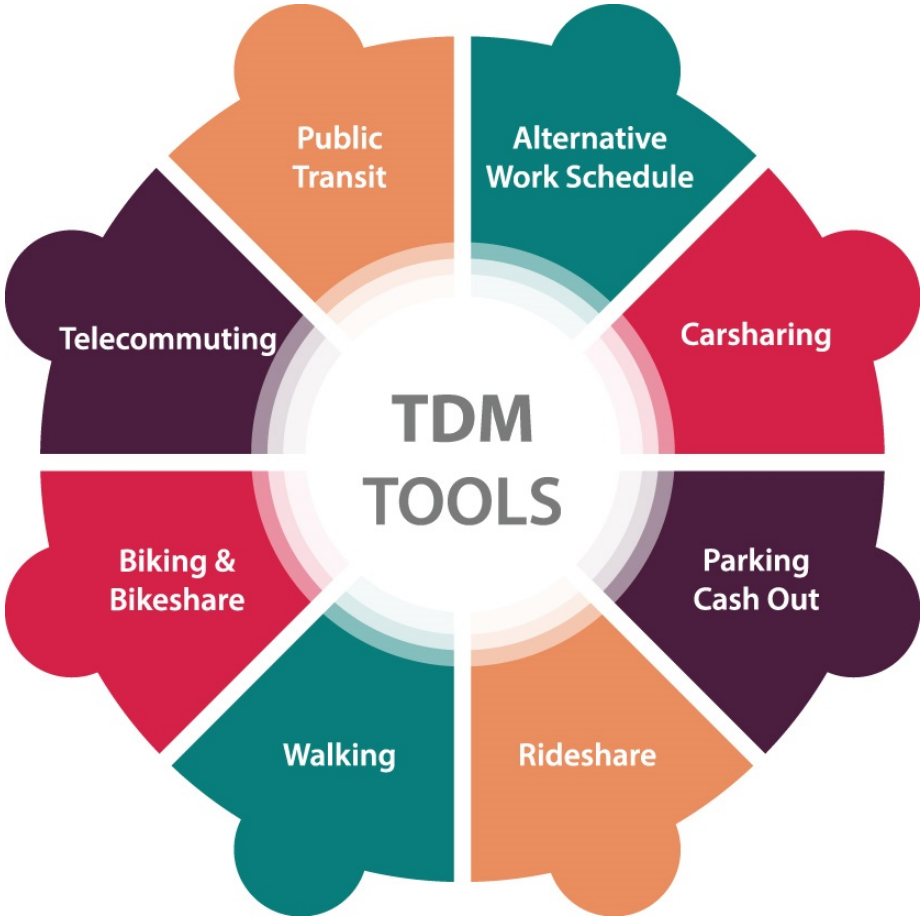
2013 CMAQ Interim Guidance – Eligibility Categories	
VII.F.1	Diesel Engine Retrofits and Other Advanced Truck Technologies
VII.F.2	Idle Reduction
VII.F.3	Congestion Reduction/Traffic Flow Improvements
VII.F.4	Freight/Intermodal
VII.F.5	Transportation Control Measures
VII.F.6	Transit Improvements
VII.F.7	Bicycles and Pedestrian Facilities
VII.F.8	Transportation Demand Management
VII.F.9	Public Outreach and Education
VII.F.10	Transportation Management Associations
VII.F.11	Carpooling/Vanpooling
VII.F.12	Car Sharing
VII.F.13	Extreme Low-Temperature Cold-Start Programs
VII.F.14	Training
VII.F.15	Inspection and Maintenance Programs
VII.F.16	Innovative Projects
VII.F.17	Alternative Fuels and Vehicles

https://www.fhwa.dot.gov/environment/air_quality/cmaq/policy_and_guidance/2013_guidance/cmaq2013.pdf

Transportation Demand Management

- Information, encouragement & incentives to help people become aware of all transportation options
- Counterbalance the incentives to drive that are prevalent in subsidies of parking and roads
- Traditional and innovative technology-based services to help people use transit, ridesharing, walking, biking, & telework.

- Mobility Lab



Statewide TDM Plan

- Decrease reliance on single-occupant vehicles
- Increase customer access to available programs and services
- Streamline the administration, marketing, and evaluation of TDM programs
- Increase awareness and state support for TDM programs and initiatives

Existing TDM and Transit Grantees in TN

Region 4 / Memphis	Region 3 / Nashville	Region 2 / Chattanooga	Region 1 / Knoxville
MATA	WeGo Public Transit	GreenTrips EVERY TRIP COUNTS	Smart Trips
Memphis Area Rideshare Program midsouthcleanair.org	vanstar A BETTER COMMUTE	CARTA	kat Knoxville Area Transit
EXPLORE BIKE SHARE	Walk Bike Nashville		
COMMUTE OPTIONS	MoveVU		
	Nashville Connector Plan a better commute		
	tma transportation management association		

Innovative Projects

Swipe and Ride Program

- Free transit pass for state employees who work in Metro Nashville & Memphis areas
- Development of database and dashboard to help us track ridership and participation trends.
- Targeted outreach and marketing initiatives as state employees return to the office later this year.

Looking Forward

- Improve statewide and regional collaboration between existing and new TDM programs and transit agencies.
- Develop TDM focused policy guidelines.
- Establish CMAQ funding priorities for transit and TDM strategies.
- Increase involvement in outreach efforts with Tennessee's largest employers.

Brianna Benson | *Air Quality Planning Supervisor*

Brianna.Benson@tn.gov

615-532-8589

Thank you!

Achieving Transportation System Management and Operations Goals by Behavior Nudging in Mobility-on-Demand

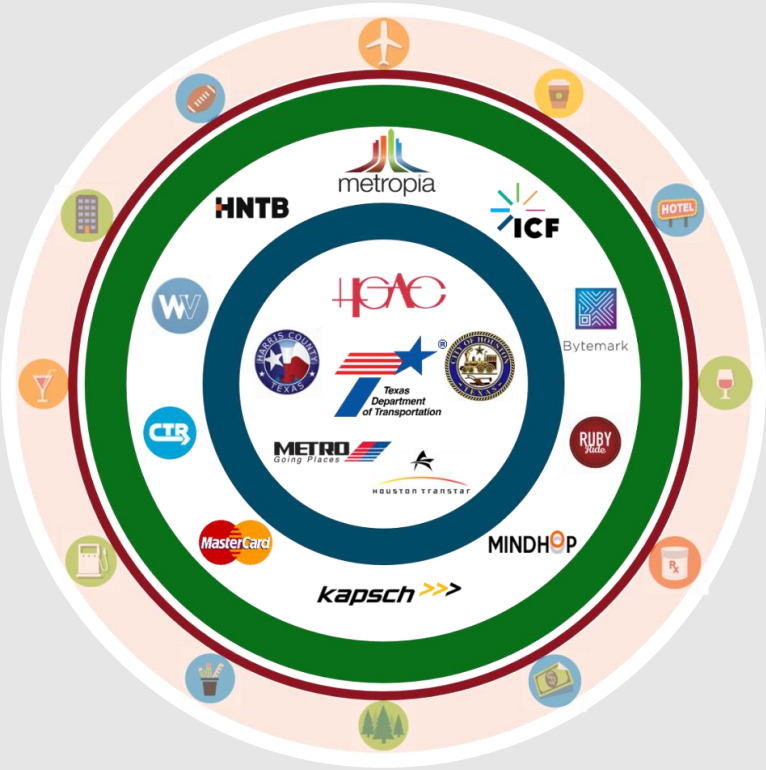
TxDOT's Houston ConnectSmart (ATCMTD) Program

Yi-Chang (YC) Chiu, PhD., Founder, Metropia, Inc.

Professor, The University of Arizona

TxDOT's Houston ConnectSmart Grant

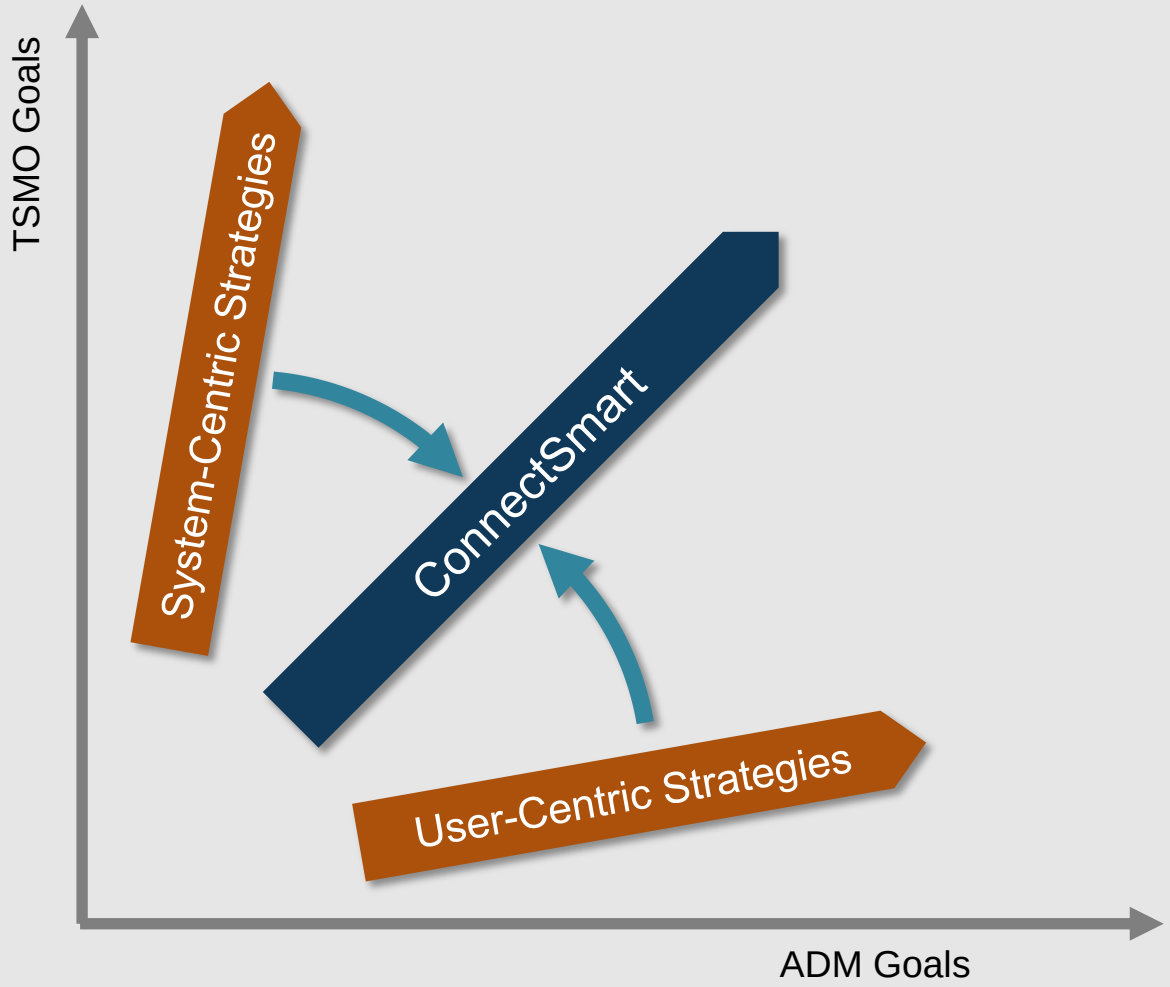
- 2016 ATCMTD recipient
  - Three-year technology deployment and implementation
  - Kick-off in late 2019



- Platform and mobile app service area:
  - Houston metropolitan region, 8 counties
  - Ancillary services deployed in two pilot areas

- Timeline:
  - Phase 1: develop platform, integrate traffic data, refine mobility app functionalities, and develop marketing/outreach plan
  - Phase 2: implement, roll out, and continue marketing/outreach
  - Phase 3: evaluate, expand, and continue marketing/outreach

Why ConnectSmart?



How Does ConnectSmart Work?

- Real time conditions
- Traveler information
- Traffic control and restriction
- ITS components

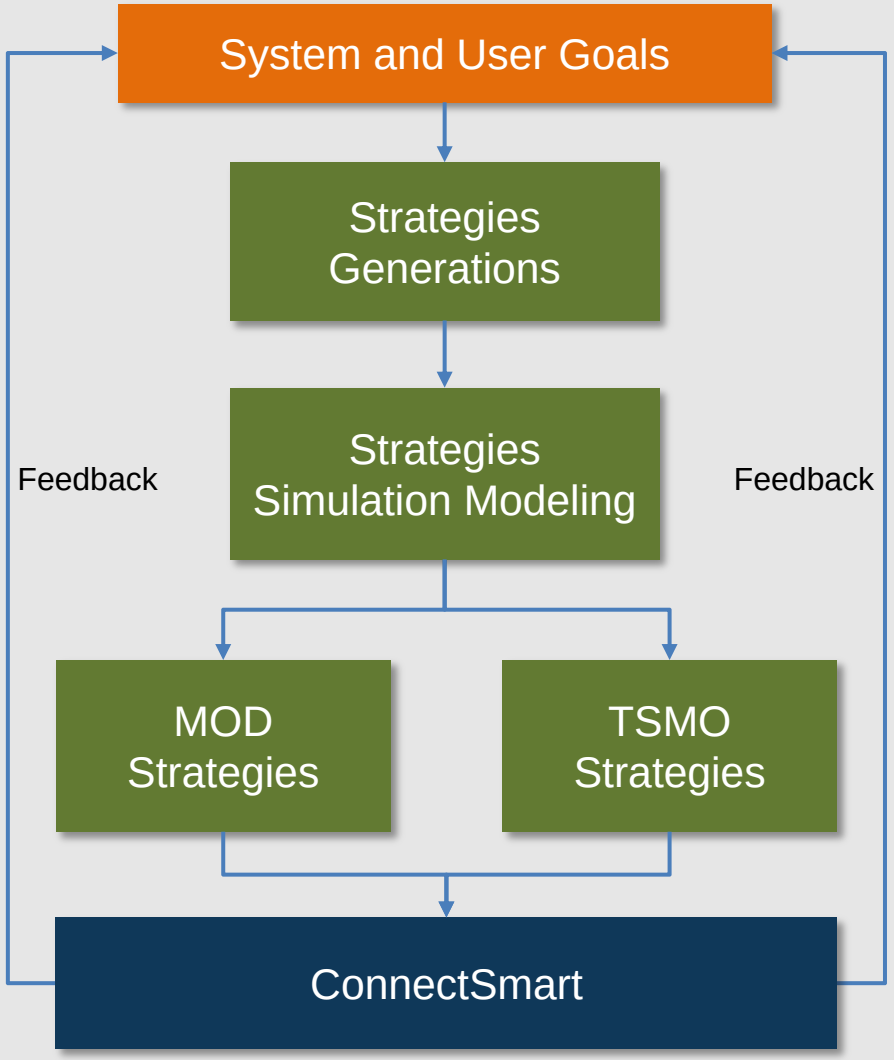
connect smart
Platform
(and Mobile App)

- Providing a service to travelers
- Understand traveler's behavior
- Marketing and awareness
- Partnerships

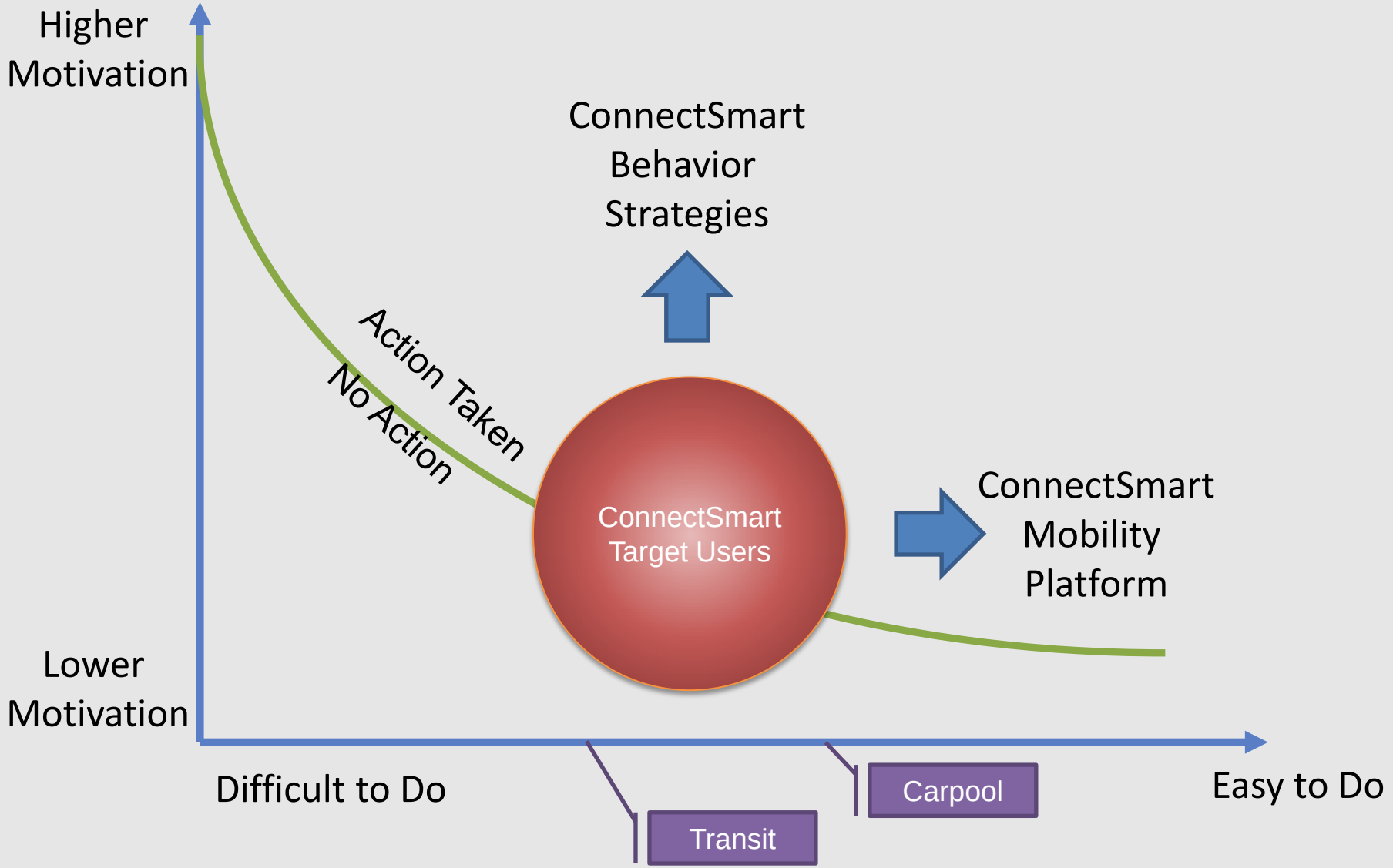
How Does ConnectSmart Work?

- Agencies set regional system goals
- Strategies evaluation via modeling
  - Generate and analyze ADM and TSMO strategies
  - Understand and evaluate strategy's contributions
  - Inform implementation priorities

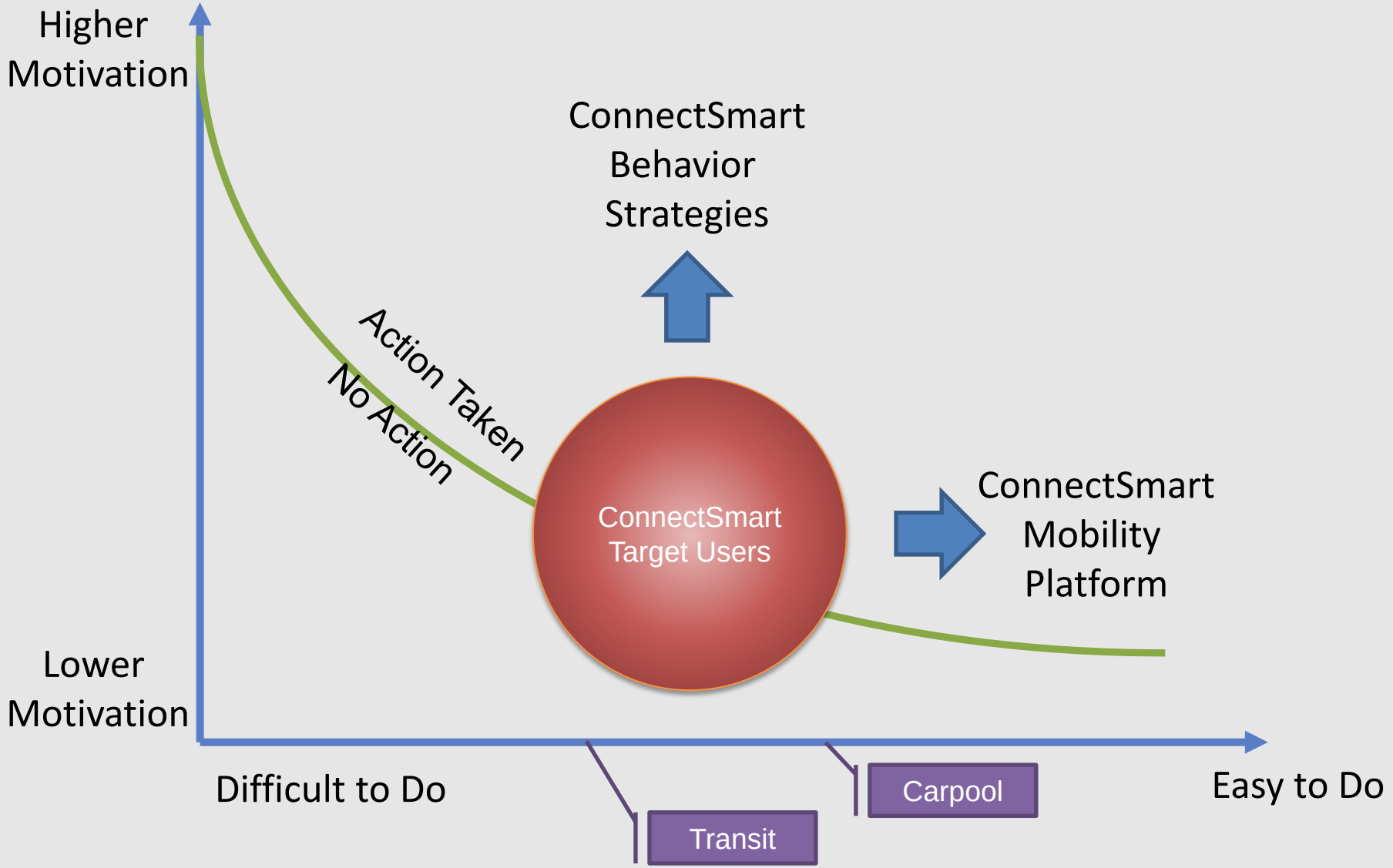
- ConnectSmart implements both TSMO and ADM strategies with behavior change targets



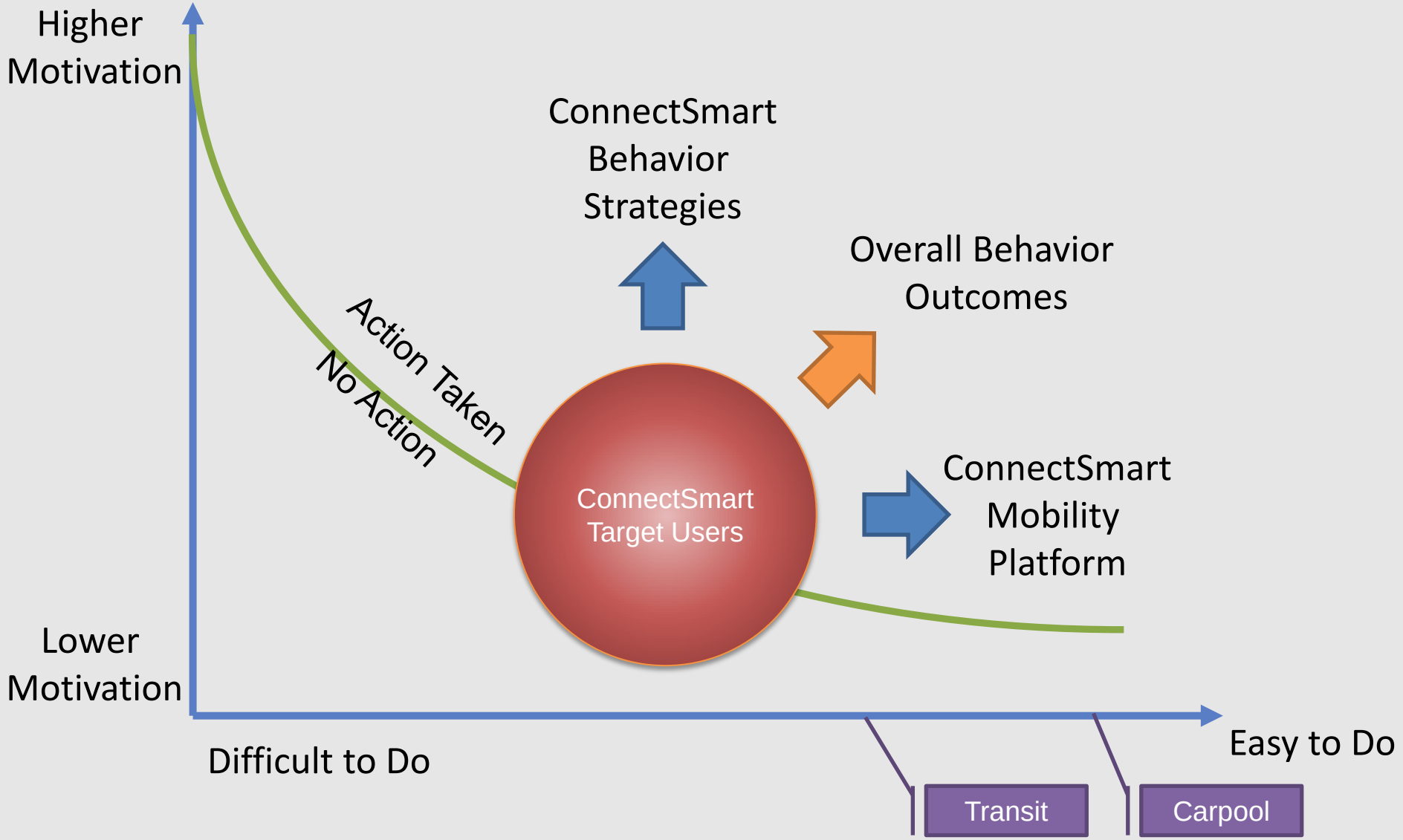
Behavior Nudging Framework



Behavior Nudging Framework

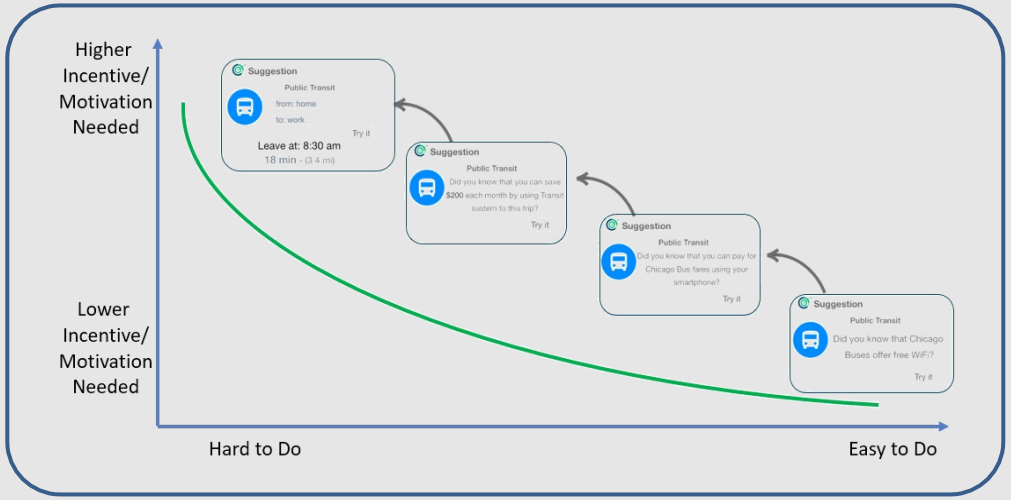


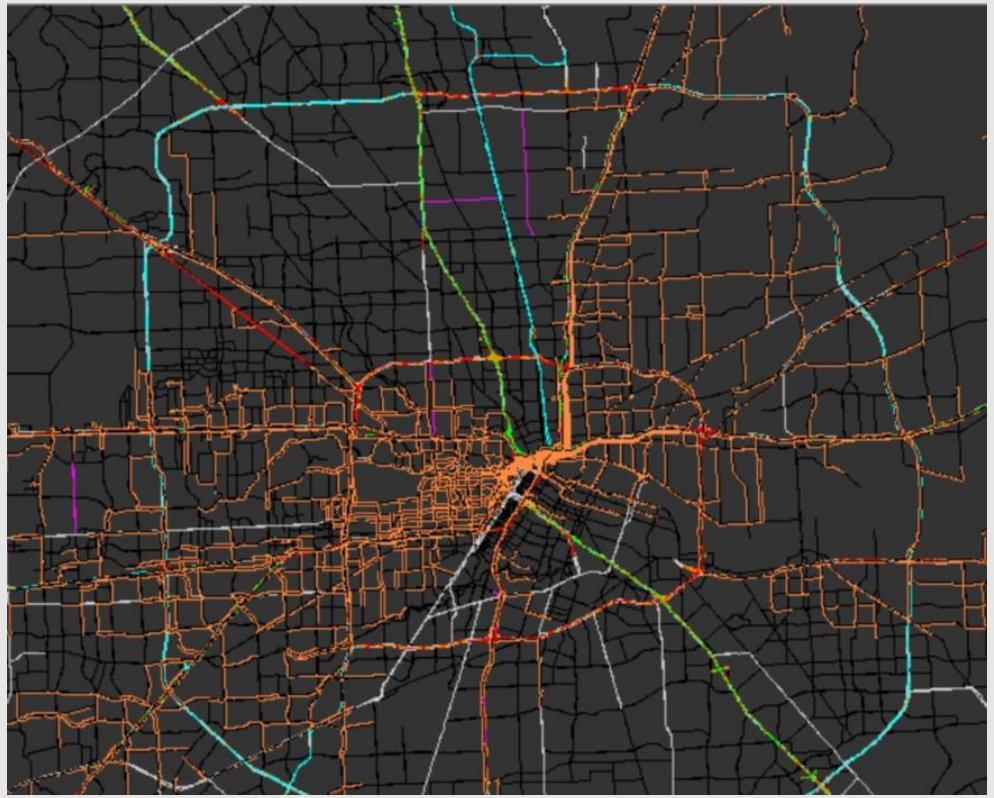
Behavior Nudging Framework



Behavior Nudging Strategies

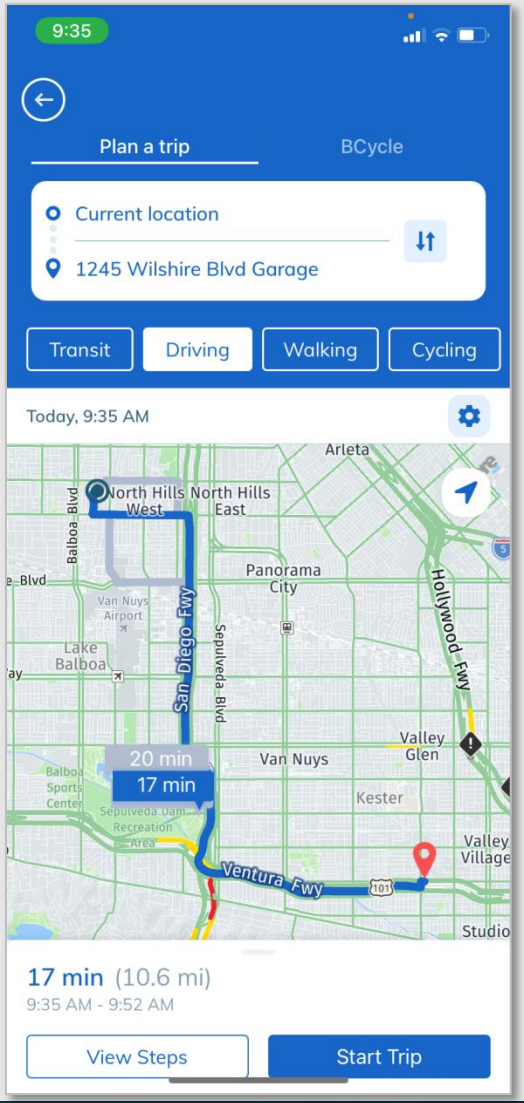
- Mobility Options Discovery and Engagement
  - Select Link Analysis for O-D specific pain points and mobility strategies exploration
  - Baby-steps to break big asks to smaller achievable tasks

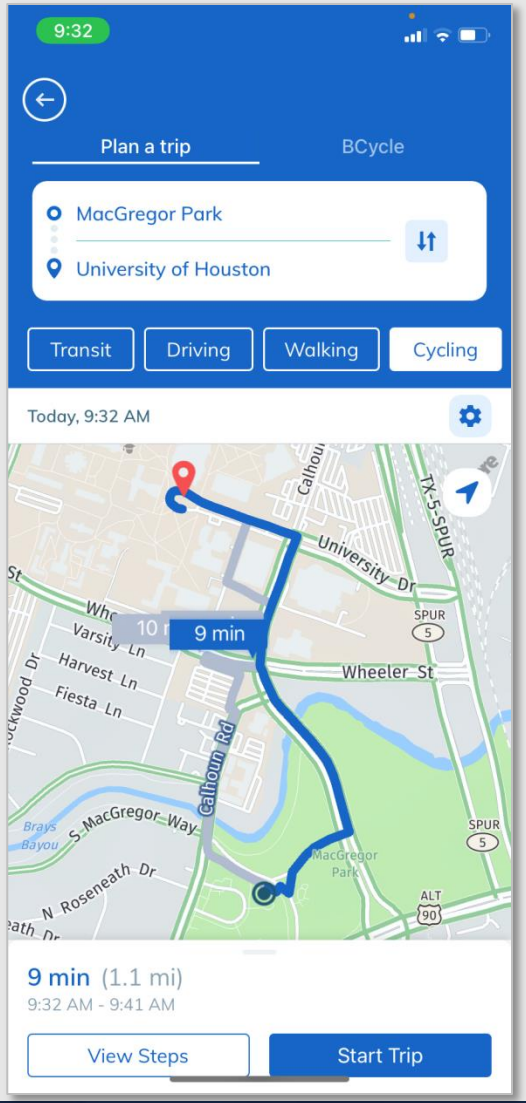


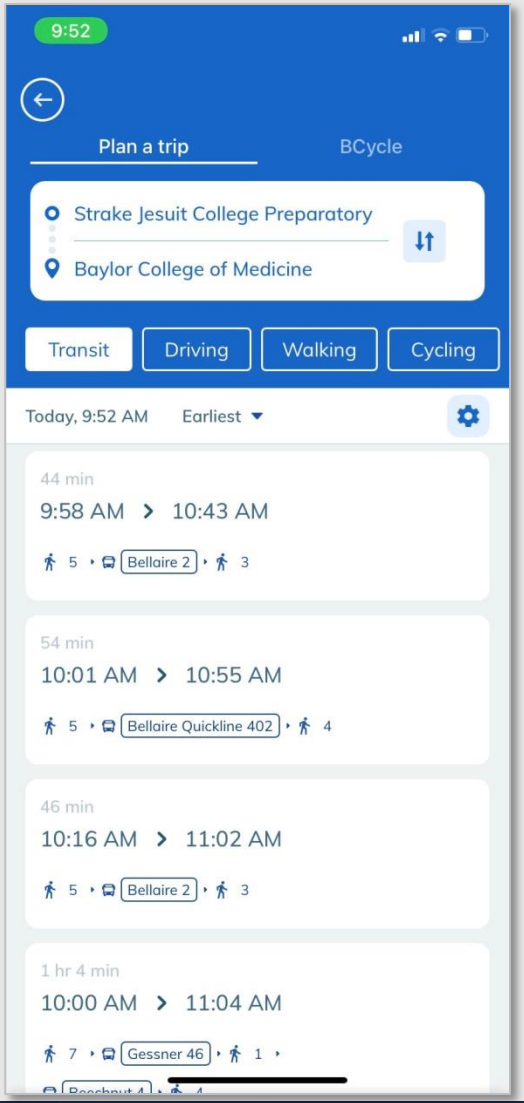


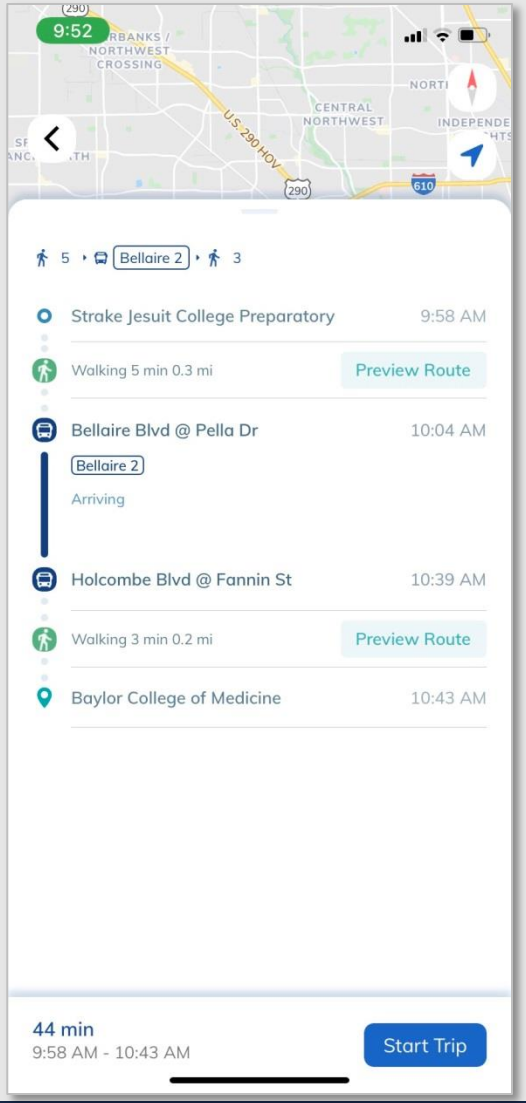
ConnectSmart Key Capabilities

Multi-modal Trip Planner

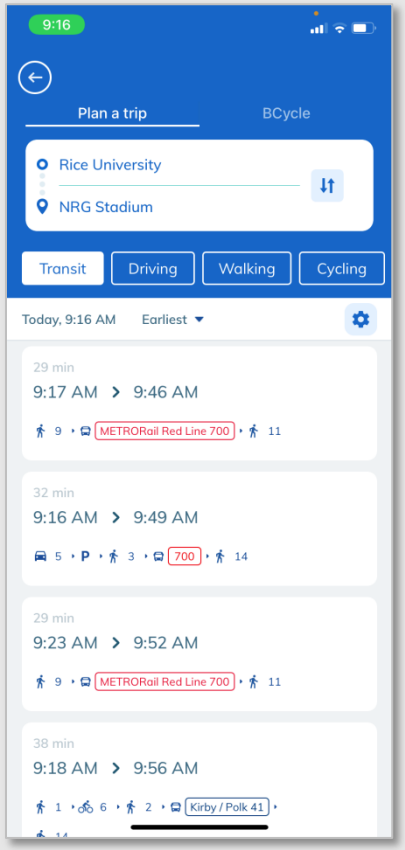


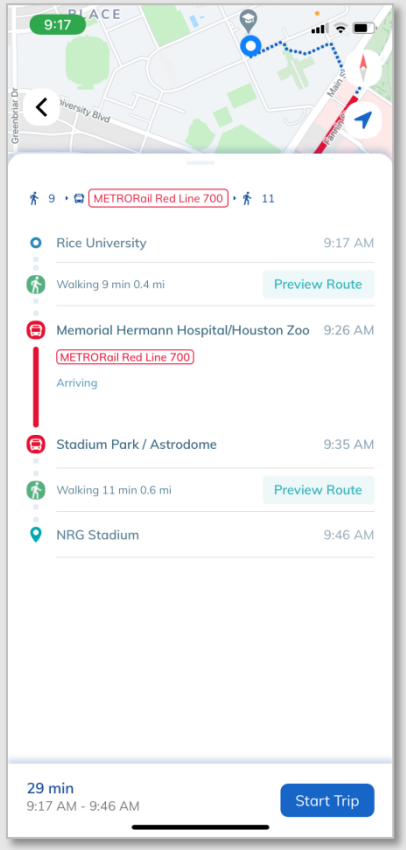




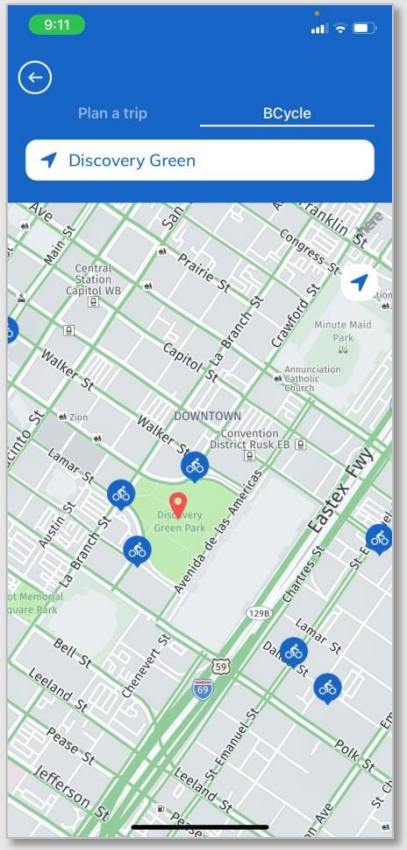


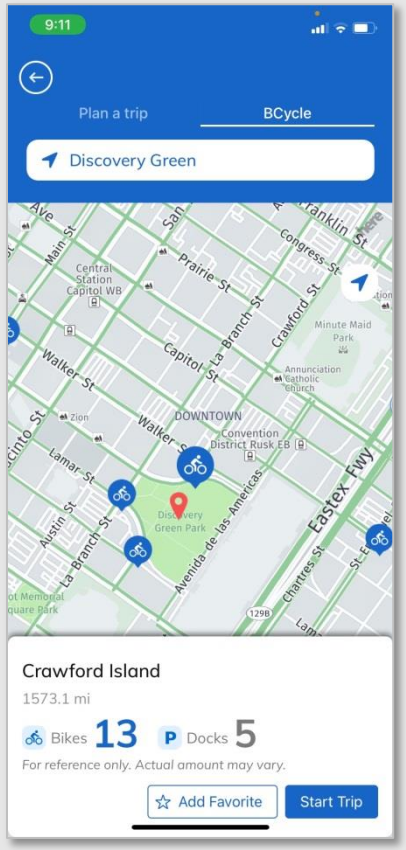
Transit and Bikeshare Integration





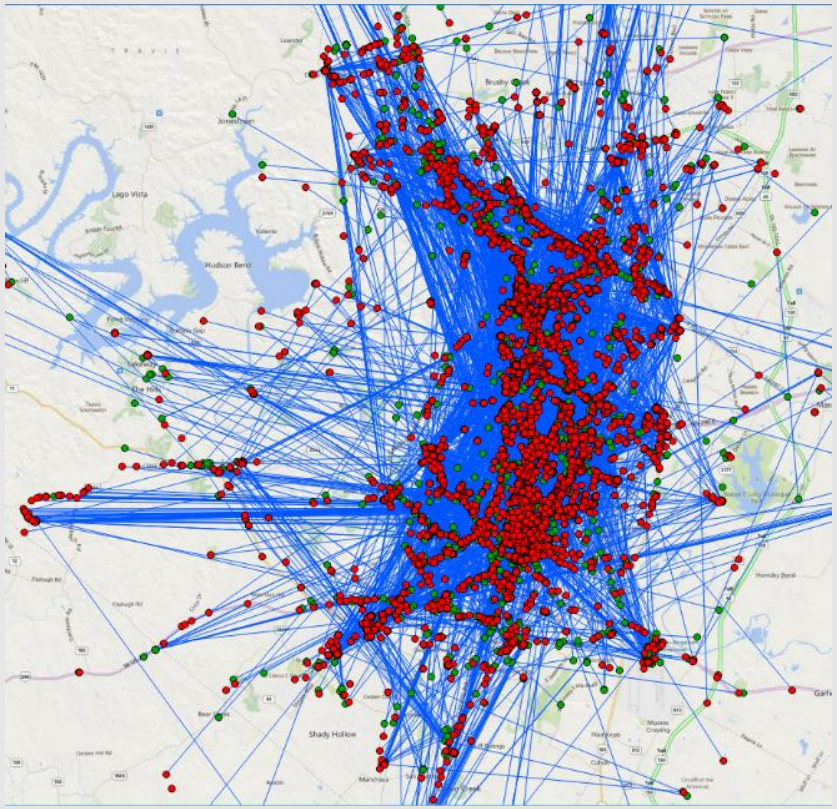
Transit Integration

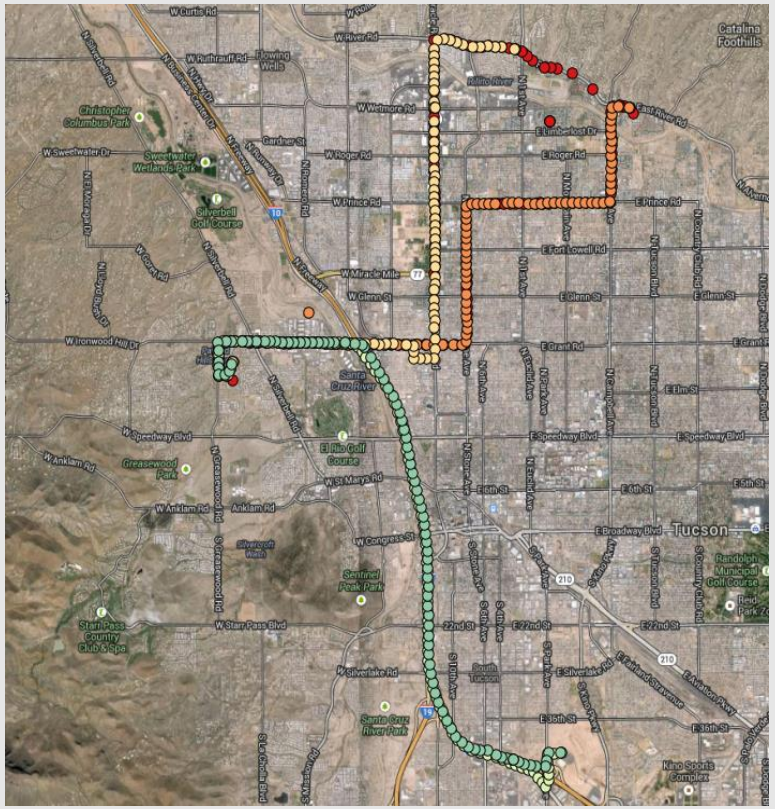


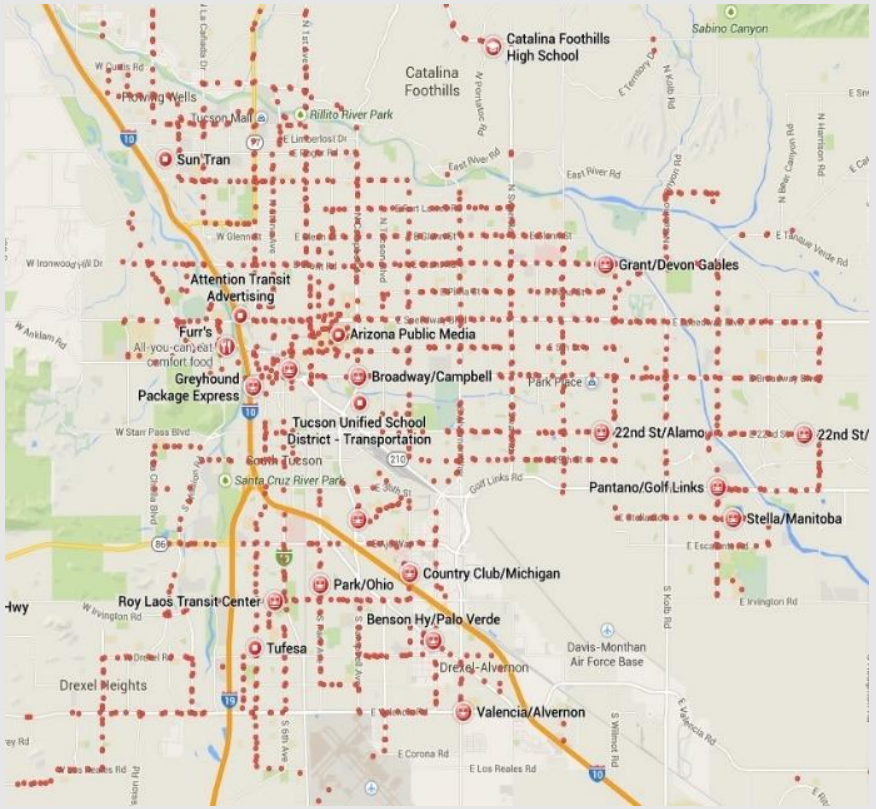


BCycle Integration

Location-based Data







Other Transportation Service Capabilities

- Carpool pre-matching
- Transit hailing
- Demand responsive transit
- Dashboards for agencies and transport providers
- Among other proposed transportation/mobility services

Going Beyond

- ConnectSmart serves as the springboard for:
  - Future mobility management methods
  - Future regional comprehensive public-private collaborations

- Commuter awareness and behavior change is the key for success

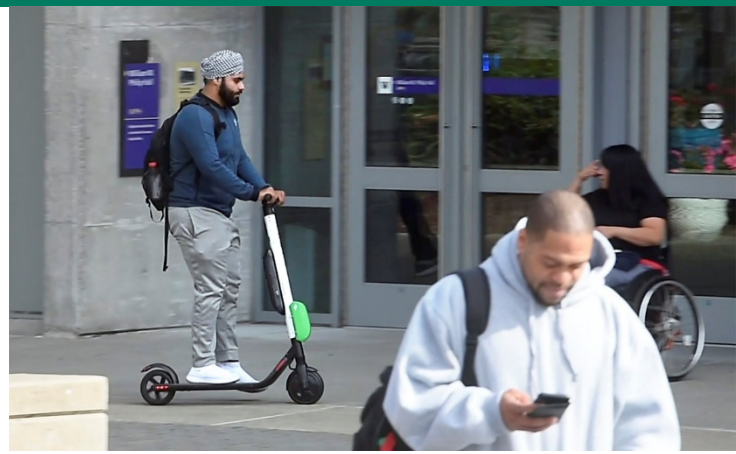
- ConnectSmart is designed and developed with the following in mind:
  - Inclusivity, scalability, adaptability, and robustness for future application and expansion

Thank you!

TxDOT Houston ConnectSmart Program

WALK. ROLL. CONNECT.

Getting you where you want to go



We're All Traffic:
Active Transportation in TSMO

TSMO and MOD Integration Peer Exchange
Feb. 19, 2021

WSDOT

“Small but mighty”: ATD=3.0 FTE

- **Active Transportation Plan**: Level of Traffic Stress analysis/findings, policy discussion, action/implementation plan
- **Pedestrian Safety Action Plan**: FHWA EDC-4, Safe Transportation for Every Pedestrian. bit.ly/WSDOT-STEP-2018-Plan
- **Speed Management for Injury Minimization**: Multi-agency, multidisciplinary work group developing policy framework jurisdictions can adapt and adopt
- **SRTS and Ped/Bike Program grants**: 2021-23 report now with legislature to decide $$
- **Bicyclist/pedestrian data**: Short-duration counts; permanent counters; researching methodologies including crowdsourced
- **Research:** Most recent: FHWA-funded report on multimodal network connectivity, methodologies for siting highway crossings for pedestrian route directness and safety
- **Internal**: Input on Design Manual and Traffic Manual updates; MAP21 safety performance measures; Traffic System Management/Operations (TSMO); Highway System Plan coordination; ADA coordination; asset management; convened “invisible teams” across regions/divisions to share information, build understanding and capacity
- **External**: Cooper Jones Active Transportation Safety Council; AASHTO Council on Active Transportation, Nonmotorized Design Technical Subcommittee; APBP Diversity, Equity and Inclusion Task Force; lots of presentations; more

TSMO and Active Transportation

- The Active Transportation Plan (ATP) serves as a **statewide needs assessment** required under state law (RCW 47.06.100) to address:
  - **statewide strategy**
  - **integration** of bicycle and pedestrian pathways with **other road users**
  - **coordination** with local and regional government
  - the role of such facilities in **reducing traffic congestion**

TSMO goal: Maximize the safety and efficiency of existing and planned infrastructure and systems (for whom?)

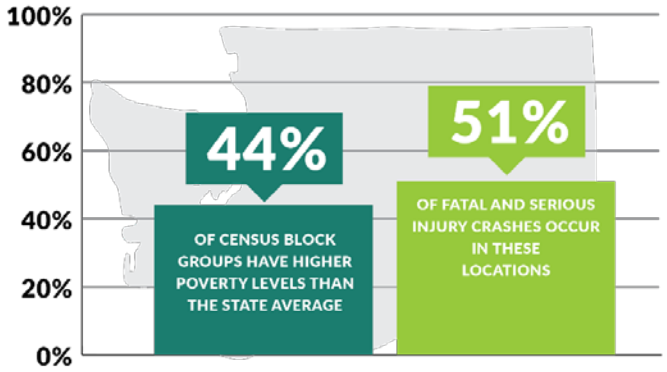
- Regards existing capacity as an asset that needs to be managed and preserved
- Maximizes safety performance of existing system
- Utilizes strategies that are multimodal, intermodal and cross-jurisdictional
- Focuses on reliability
- Implements quickly at relatively low cost
- Aims to defer roadway expanding projects

Chicken and Egg

- We didn't count cars, then build roads.
- We said, "People need to get places. Let's make that easier, safer, more convenient."
- We did GREAT at that.
- For drivers….
- So great that now we have to talk about TSMO to deal with the "success".
- Let's unleash the power of induced demand for walking, bicycling and transit the way we did for driving.

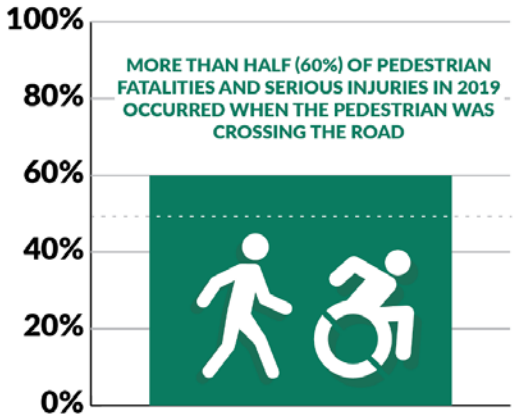
Equity: The data

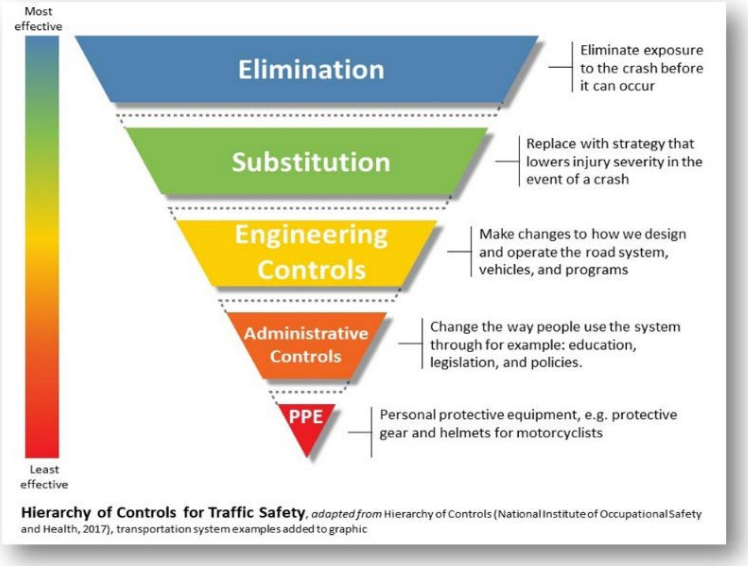
- **History:** Effects of transportation and land use decisions
  - Very clear patterns in data
  - Redlining and roads: Disparities in walk/bike infrastructure, road design, highway locations, exposure to pollution
- **Demographics**
  - ~25% of Washingtonians don't drive
  - More fatal/serious crashes in census tracts w/higher levels of poverty and Black, Indigenous, people of color

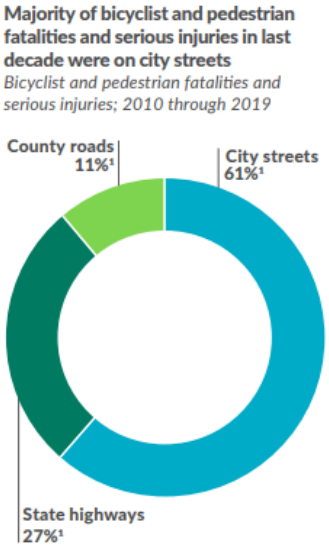


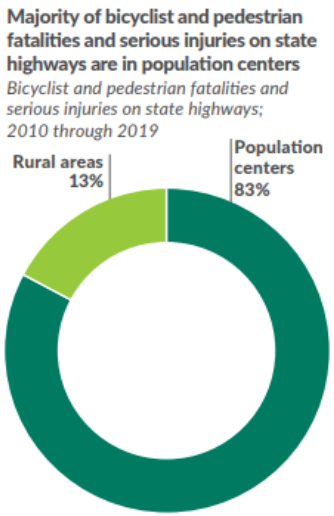
Safety: The data

- Pedestrian crossings
- Driver speed
- Population centers
- Target Zero: Safe Systems Approach





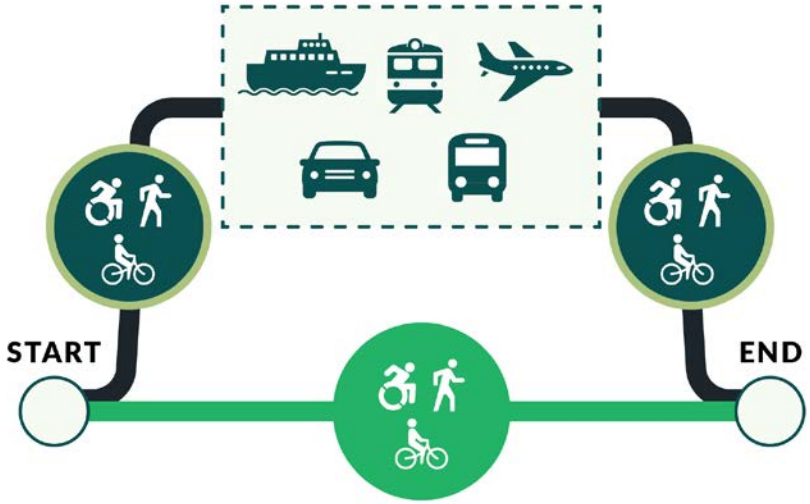




Core concepts in plan's focus on facilities

- **It's about the network!**
- Level of traffic stress: **objective, quantitative set of design and operations factors** to define gaps.
- **Focus on population centers** lets us address critical safety needs and tap into latent demand where potential is highest.
- **Latent demand** unleashed when you can get all the way to your destination; importance of **route directness and crossing availability** in the context of **travel need**.
- **"USER COUNT" is not a synonym for active transportation demand!**

- Use of demographic information helps us address **disproportionate serious injuries and deaths** by applying **equity factors + safety + demand** in evaluation and future prioritization.



Level of Traffic Stress

- Examine roadway and intersection Level of Traffic Stress to determine suitability for walking and biking: Roadway width (number of lanes), posted speed limit, traffic volume, shoulder width, bike lanes/sidewalks; calculated differently for in-town vs rural, calculated separately for pedestrians and bicyclists
- Note on data limitations: Is there a sidewalk? Does that signal have a pedestrian head or detect bicyclists?
- Analytical process:
  1. Calculate Level of Traffic Stress 1 (suitable for all ages/abilities) to 4
  2. Identify network gaps (LTS 3 or 4)
  3. Evaluate gaps using safety, equity and demand criteria to identify highest need

ATP goals

- **Networks:** Connect comfortable and efficient walking and rolling networks so people can reach their destinations and other forms of transportation and have everyday access to physical activity.
- **Safety:** Eliminate deaths and serious injuries of people walking and rolling.
- **Opportunity:** Eliminate disparities in access to safe active transportation connections for people and communities most dependent on walking, bicycling and transit.
- **Participation:** Increase the percentage of everyday short trips made by walking or bicycling.
- **Partnership:** Collaborate with local, regional, state, tribal and federal partners to complete and improve the network across boundaries.

Evaluation criteria

Safety

- History of driver crashes with bicyclists or pedestrians that result in death or serious injury
- Systemic safety: based on roadway characteristics that contribute to crash potential (LTS)
- Connections to and between destinations (including intermodal links and trails)

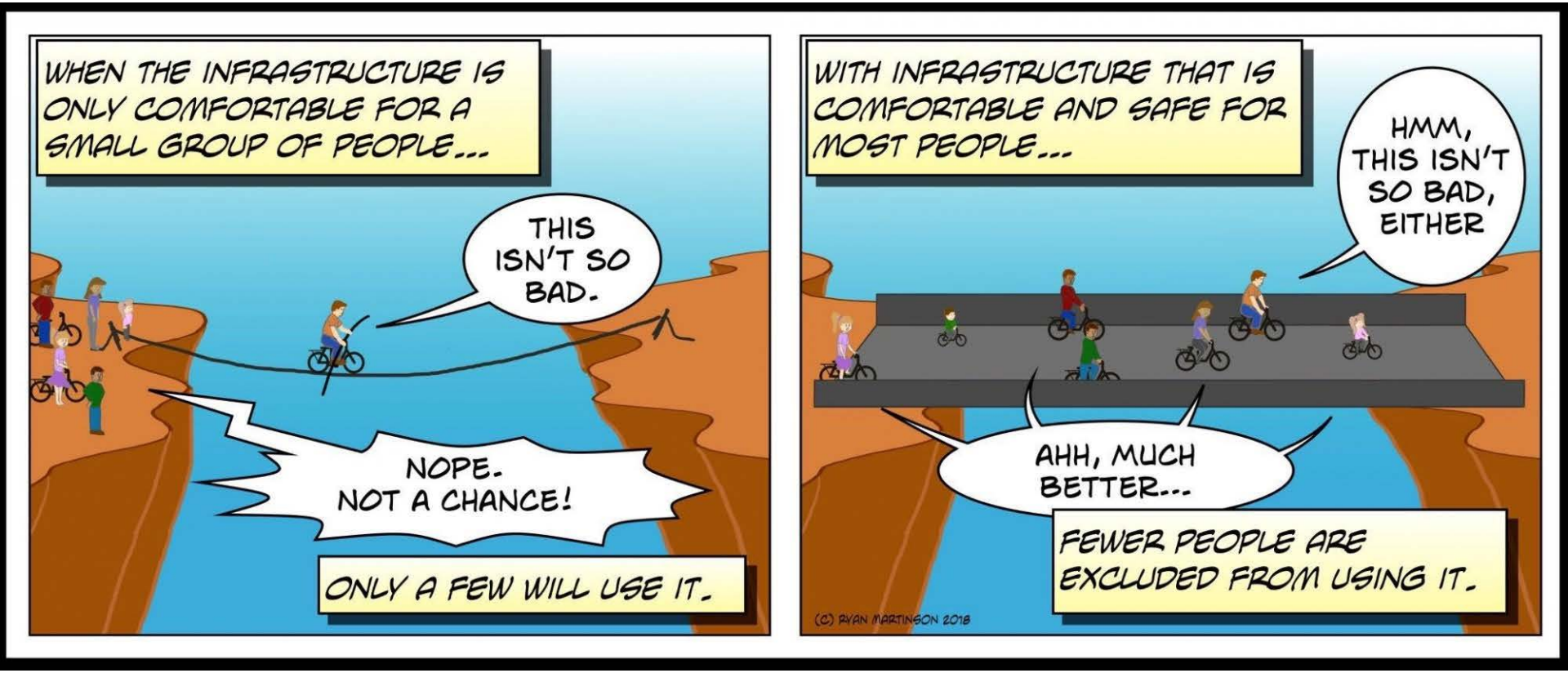
Equity

- Places with relatively high numbers of people living in poverty
- Places with relatively high numbers of Black, Indigenous, people of color
- Places with relatively high numbers of people with a disability

Potential Demand

- Potential demand based on population density, density of jobs, proximity to schools, bus stops/intermodal connections, and other destinations

It's about the network



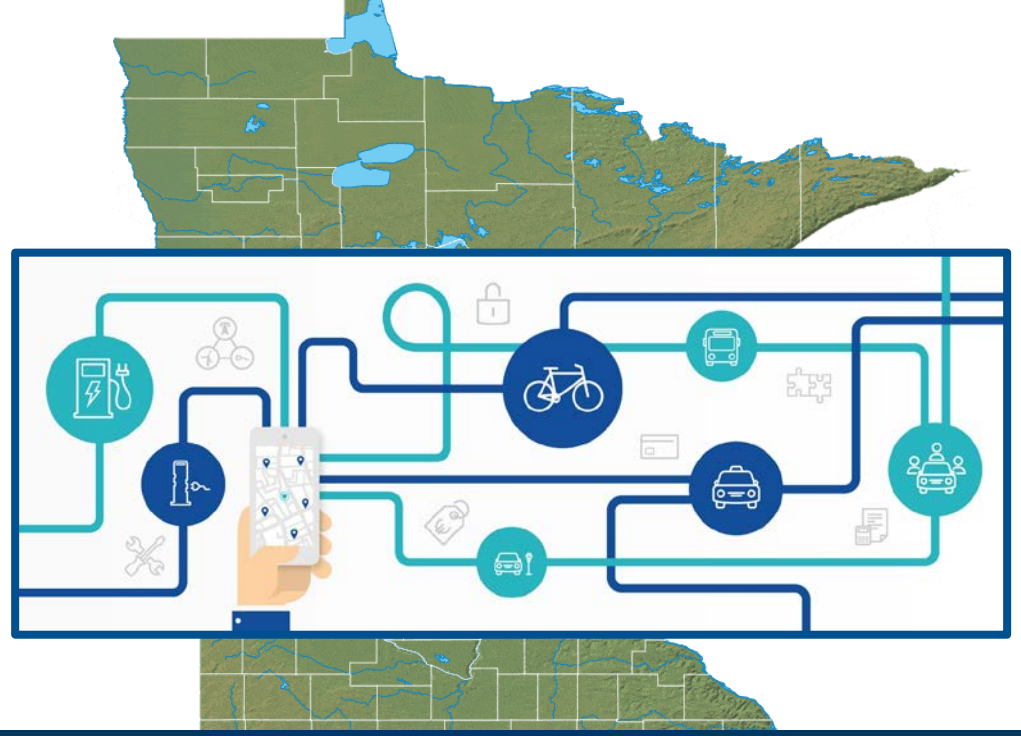
It's about *accessible* active transportation

"… the curb-cut effect illustrates the outsize benefits that accrue to everyone from policies and investments designed to achieve equity."

– Angela Glover Blackwell, "The Curb-Cut Effect", Stanford Social Innovation Review

Stay in touch

- **Barb Chamberlain**
  Active Transportation Division Director
  (360) 704-6386
  barb.chamberlain@wsdot.wa.gov
  @BarbChamberlain
- **Walk + Roll E-News:** Subscribe at http://bit.ly/WSDOTactive-enews



Mobility-as-a-Service at Minnesota DOT

Elliott McFadden| Greater Minnesota Shared Mobility Coordinator

4/5/2021

DEPARTMENT OF TRANSPORTATION

What MaaS looks like

- Mobility as a Service vision: a single platform that provides access to all shared mobility options, allows trip planning, fare payment, and real time updates on trip information
- Integration of transit planning and ticketing with private shuttles and buses, taxis, TNCs, bike and scooter share, van pool, carshare, shared CAV, and new emerging shared mobility technologies
- Regional MaaS Pilot will focus on 7 transit systems plus private providers in Southern Minnesota

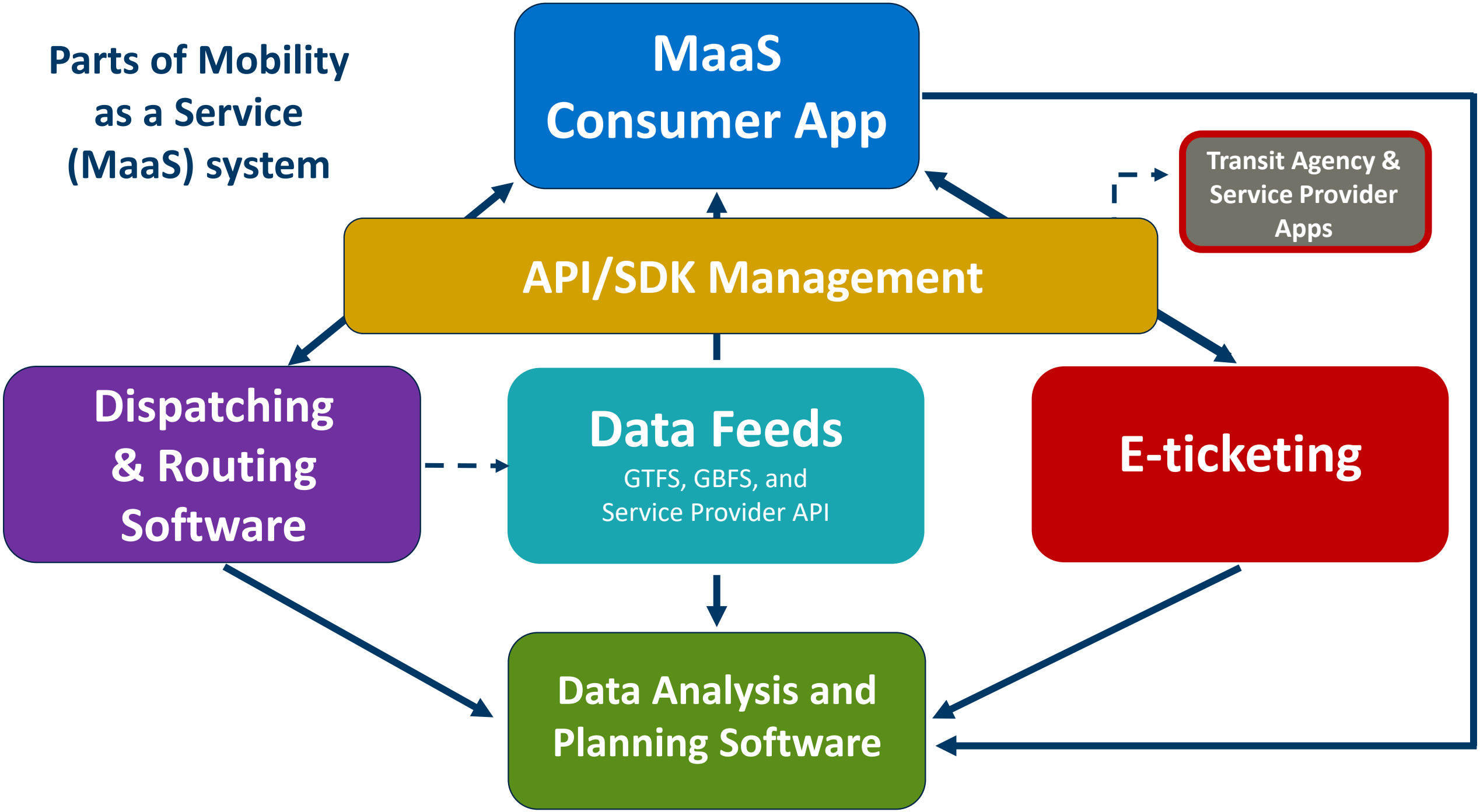
About the AIM Grant

- $14 million grant fund to support innovation throughout the transit industry by promoting forward-thinking approaches to improve transit system design, service, and financing
- Up to 12 months of development to launch, 12 months of field testing
- 80/20 funding
- Application in May 2020
  Award announcement August 2020

Federal Transit Administration

AIM ACCELERATING INNOVATIVE MOBILITY

Parts of Mobility as a Service (MaaS) system

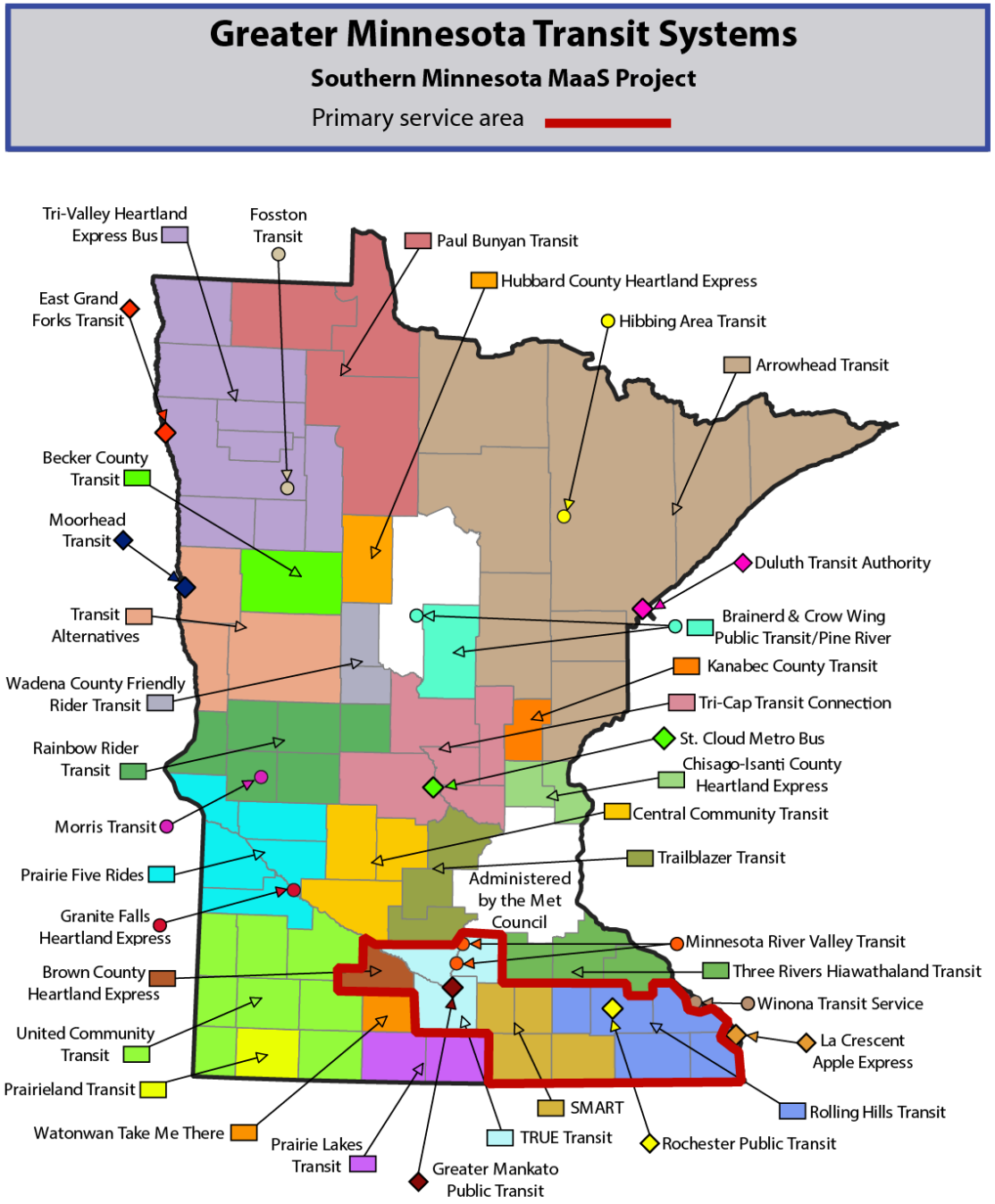


Data Standards

Planned data spec implementation

- GTFS/GTFS-Flex data feeds for all participating transit *(required)*
- Development and testing of Demand Response Transactional (DRT) Data Spec in partnership with SUMC/AARP workgroup *(required)*
- General OnDemand Feed Specification (GOFS) in partnership with MobilityData workgroup
- Adaptation of General Bike Share Feed Spec (GBFS) to carsharing application

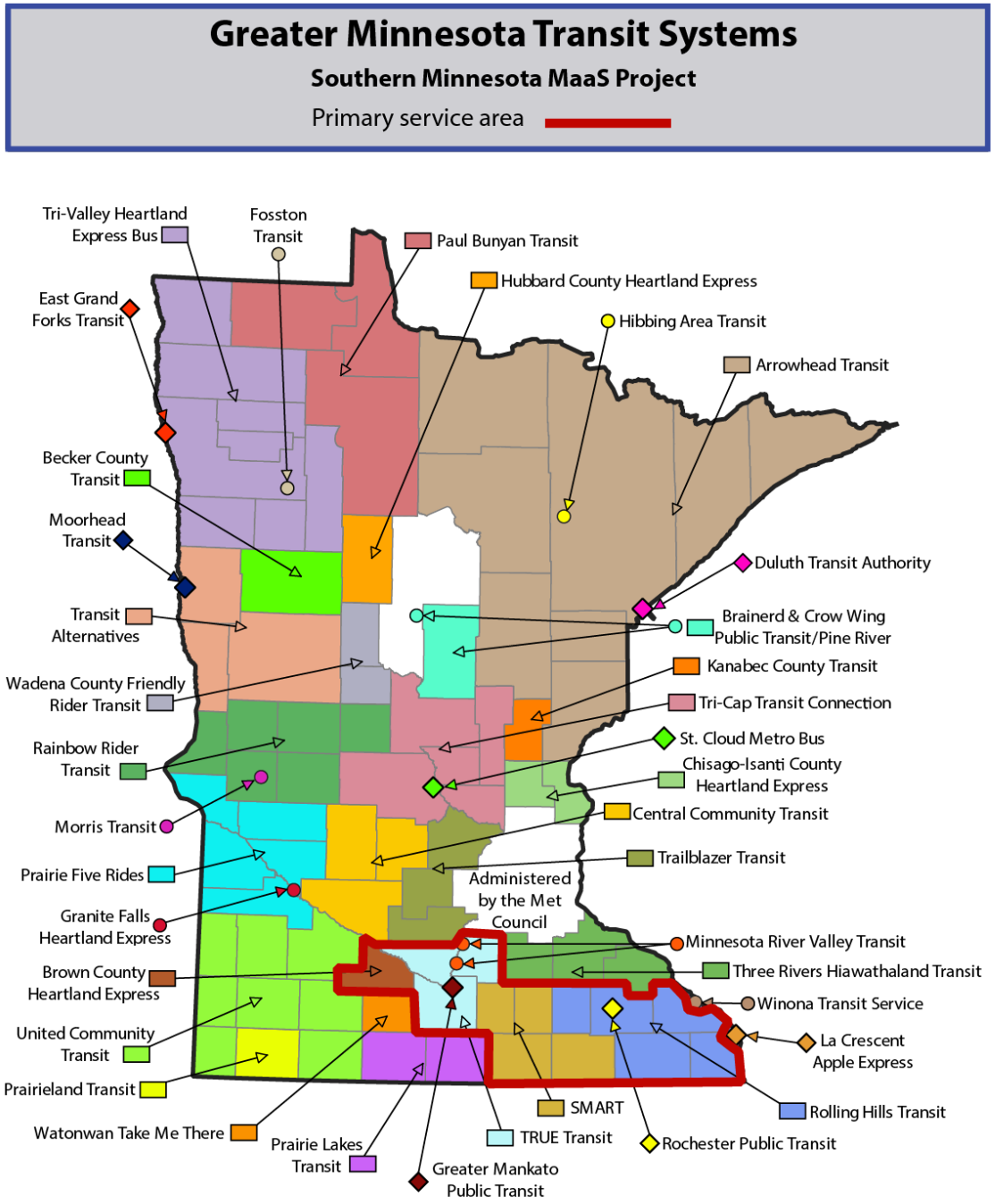
Coverage area



7 Greater Minnesota Transit Systems

- Rochester Public Transit
- Greater Mankato Public Transit
- Brown County Heartland Express
- Minnesota River Valley Transit
- Rolling Hills Transit
- SMART
- TRUE Transit

Coverage area



Additional providers

- Metro Transit
- Jefferson Lines/Land-to-Air
- Rochester City Lines
- HourCar
- Additional taxi, rideshare, private bus, van pool, scooters, etc.

PLUS

- CTS Software and RouteMatch by Uber

Partners

UNIVERSITY OF MINNESOTA

Research Team, led by Assistant Professor Alireza Khani, will study:

- how low-income population can benefit from MaaS
- what extent vehicle miles are reduced due to commuters' mode change
- how people perceive the benefit of the system in time/cost saving and convenience

Pilot costs

The AIM grant will cover:

- Consumer facing app development & ongoing fees
- Open source API/SDK integration
- E-ticketing development and processing fees
- Data analysis & planning software access
- Training and support for partner systems
- Research team
- Marketing to public

GTFS Implementation

Generating GTFS feed for Greater Minnesota

- MnDOT Office of Transit and Active Transportation will be funding development, publishing and maintenance of GTFS & GTFS-Flex feeds for its 35 Greater Minnesota transit systems
- Phase 1: AIM Grant transit systems
- Phase 2: Rest of Greater Minnesota with priority on COVID-19 Research transit systems

Project Workgroups

Implementation
MnDOT, MNIT, Transit agencies

Research
MnDOT, University of Minnesota

Software and Data Standards
MnDOT, MNIT, Project Vendor, Dispatch/Routing Providers

Marketing
MnDOT Office of Communications

Advisory Group
Select stakeholders

Project Timeline

Q1 2021

Cooperative agreements with FTA

Begin procurement

Research scope finalized

Projects Timeline

Q2 2021

- Stakeholder kickoff meeting
- Finish procurement
- Partnership agreements
- Workgroups begin

Projects Timeline

Q4 2021	MaaS API toolkits
	MaaS app beta testing
Q1 2022	Field research begins
	MaaS app launch in Southern Minnesota

Projects Timeline

Q4 2022 Field research wraps up

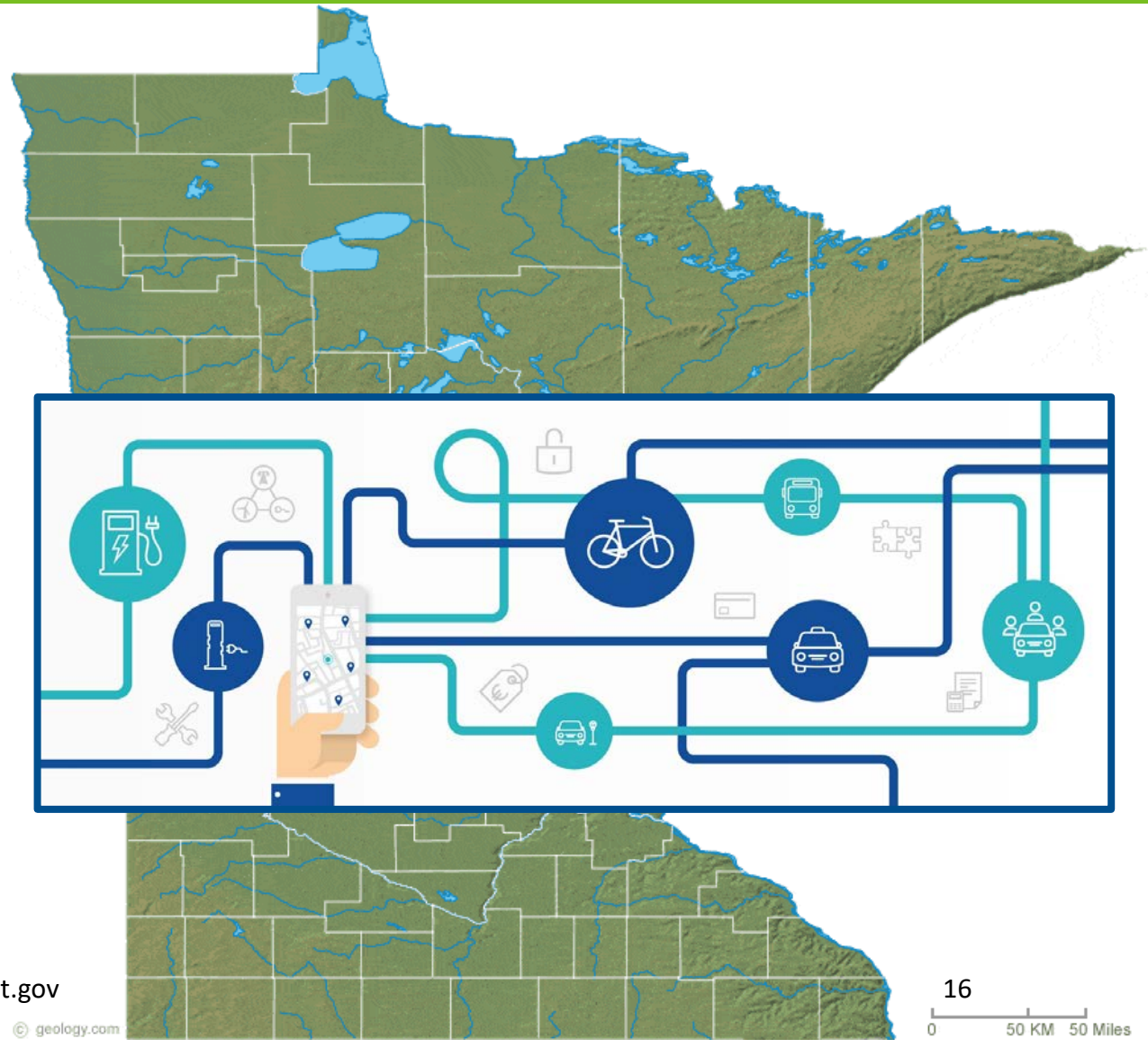
Q1 2023 End of Southern Minnesota pilot service

Future Improvements

Next Steps:

2023 and Beyond

- Evaluate for statewide deployment
- Develop standard for billing transactions including non-emergency medical
- Longer term: parking, curb management, distance-based fees



DEPARTMENT OF TRANSPORTATION

Questions?

AM ACCELERATING INNOVATIVE MOBILITY

TSMO AND MOD INTEGRATION PEER EXCHANGE

Vermont's Public Transit Data and Technology

FEBRUARY 19, 2021

PRESENTER: DAN CURRIER

VERMONT
AGENCY OF TRANSPORTATION

Starts with MOD Sandbox Grant

VTrans Vision: A safe, reliable and multimodal transportation system that promotes Vermont's quality of life and economic wellbeing.

MOD Vision (sandbox objectives): System Integration, Innovative Business Model, equity of service delivery, partnership Driven

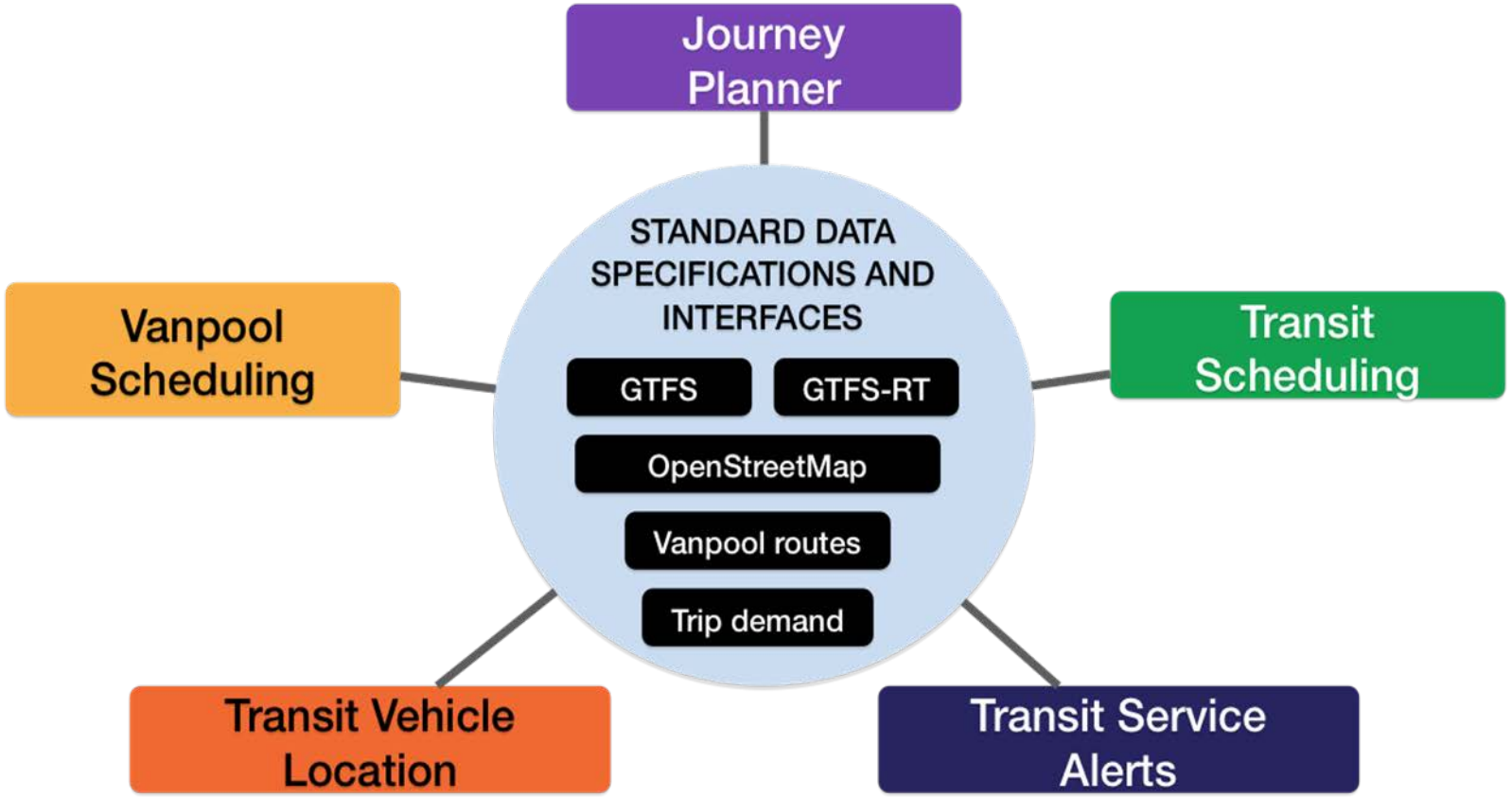
Flexible Trip Planner Vision: To provide a one-click/one-call tool for all transportation options for any trip.

GTFS-Flex

- Open-Source
- Affordable
- Scalable

Products to Date

- Trip Planner
- Transit App/AVL



Standards Allow Interoperability

INTEROPERABLE TECHNOLOGIES ARE MODULAR AND CAN BE REPLACED EASILY.

VERMONT
AGENCY OF TRANSPORTATION

Menu

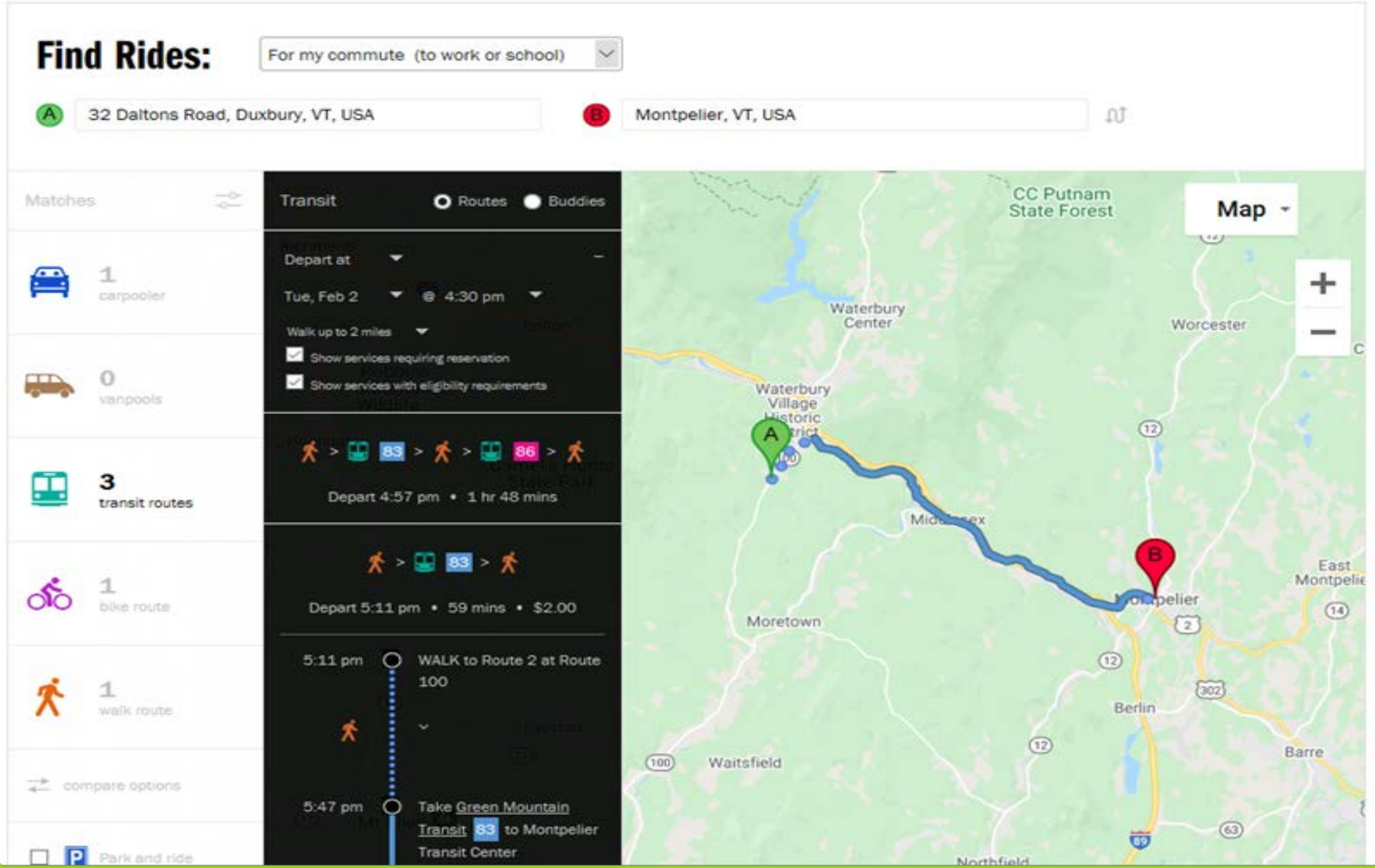
32 Daltons Rd, Duxbury, VT 05676

Montpelier, Vermont 05602

Leave now

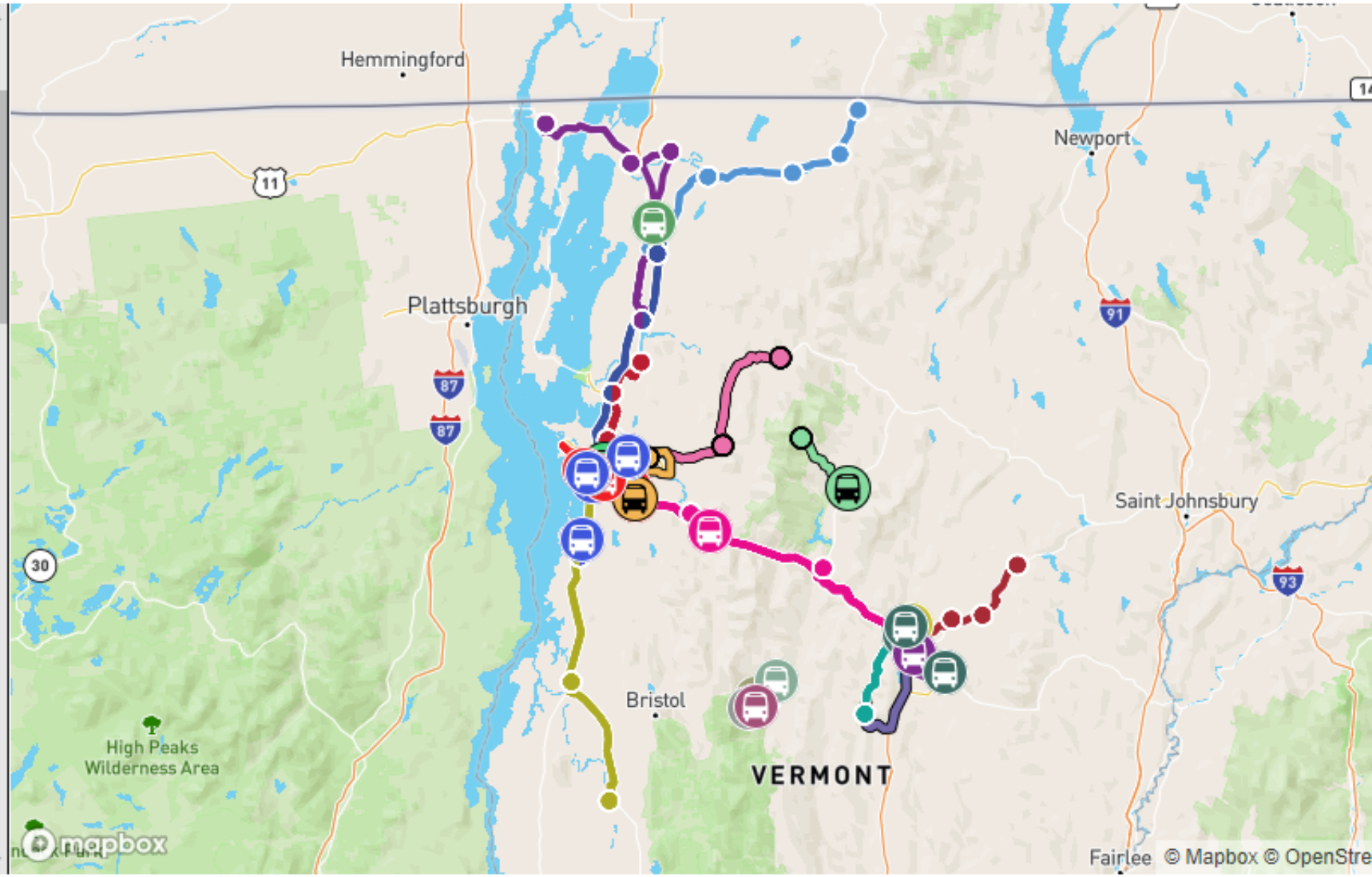
OPTIONS

Sorry, we could not calculate transit directions from "32 Daltons Rd, Duxbury, VT 05676" to "Montpelier, Vermont 05602"


Find Rides:
For my commute (to work or school)
A
32 Daltons Road, Duxbury, VT, USA
B
Montpelier, VT, USA
Matches
1
carpooler
0
vanpools
3
transit routes
1
bike route
1
walk route
compare options
Park and ride
Transit
Routes
Buddies
Depart at
Tue, Feb 2
4:30 pm
Walk up to 2 miles
Show services requiring reservation
Show services with eligibility requirements
83
86
Depart 4:57 pm • 1 hr 48 mins
83
Depart 5:11 pm • 59 mins • $2.00
5:11 pm
WALK to Route 2 at Route 100
5:47 pm
Take Green Mountain Transit 83 to Montpelier Transit Center
Map
CC Putnam State Forest
Waterbury Center
Worcester
Waterbury Village Historic District
Moretown
Berlin
Barre
Waitsfield
East Montpelier
Northfield

Welcome to Green Mountain Transit

- **Red Line** — see schedule
- **Blue Line** — see schedule
- **Green Line** — see schedule
- **Purple Line** — see schedule
- **Orange-Silver Line** — see schedule
- **Gold Loop** — see schedule
- **36: Jeffersonville Commuter** — see schedule
- **56: Milton Commuter** — see schedule
- **76: Middlebury LINK Express** — see schedule



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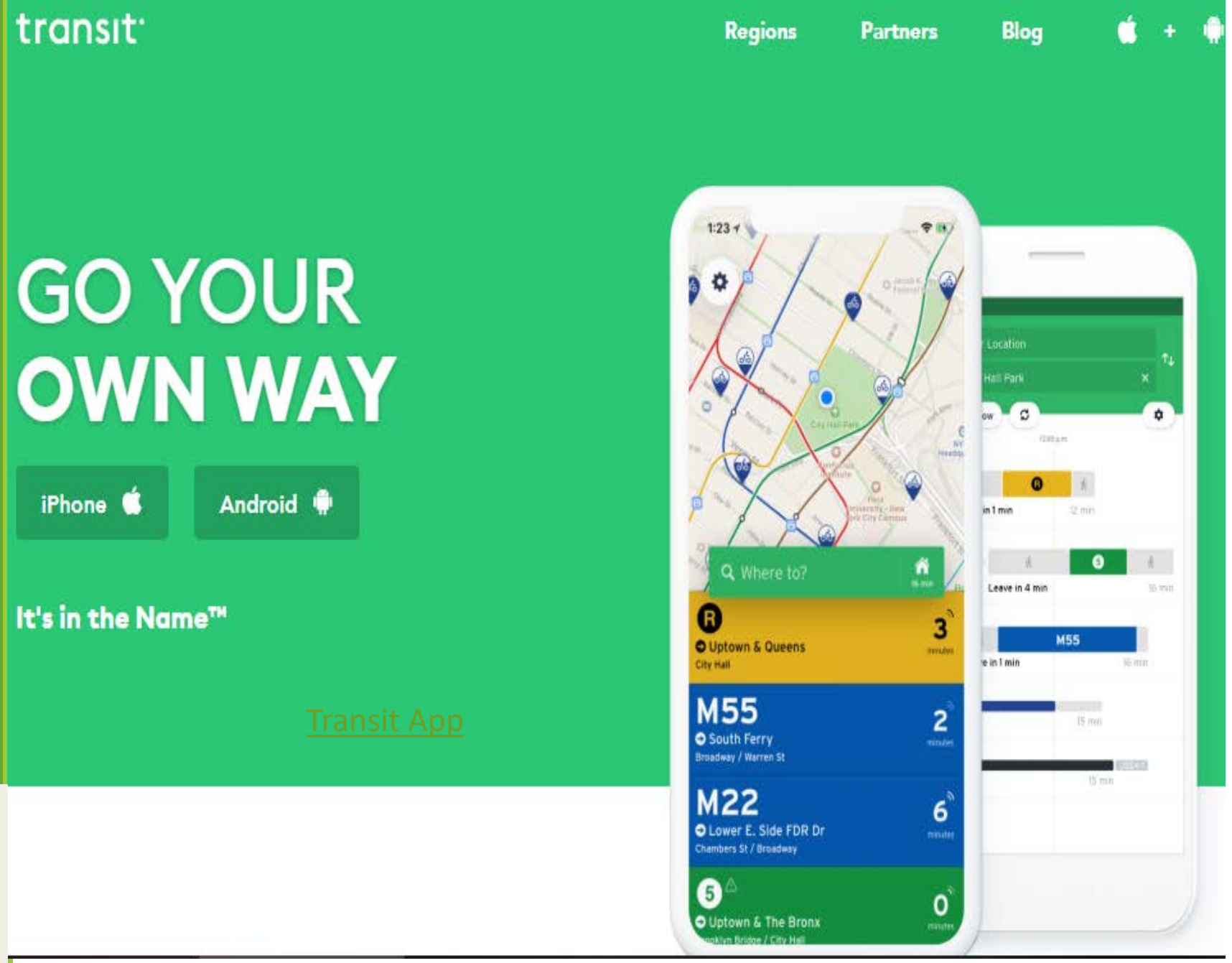
Transit App/ Statewide AVL

- All providers, routes, and bus stops operating with the same AVL service.
- Open-Source Data(GTFS-RT)
- Basic Service expectation

FIND MY BUS

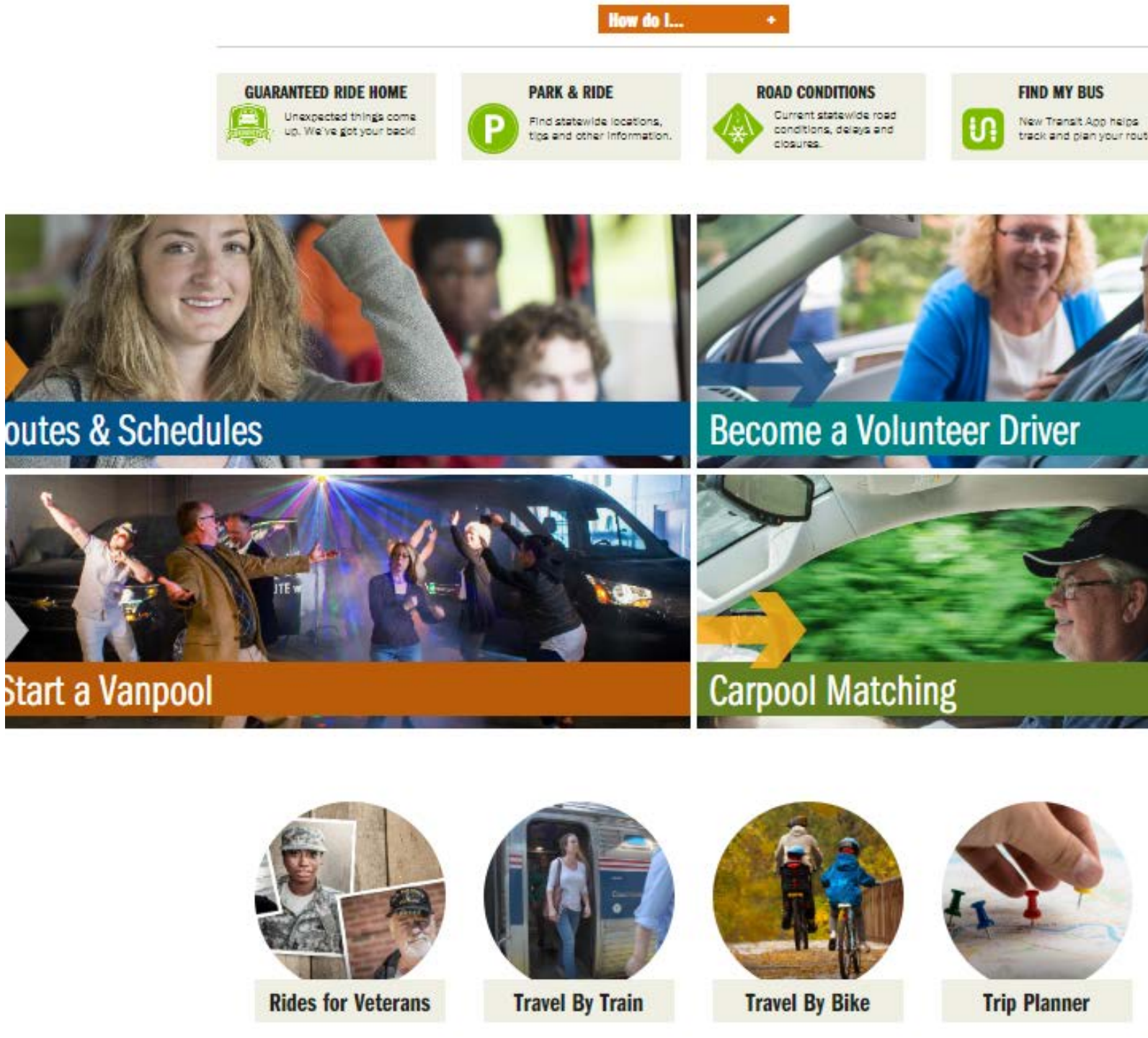
New Transit App helps track and plan your route.



VERMONT
AGENCY OF TRANSPORTATION

GO! VERMONT

- Web site
- Call Center
- Open-Source Data
- Trip Planner
- Transit App/AVL
- COVID Guidance



Lessons Learned

Users and agencies both desperately want to see demand-response transit in trip planners.

Project technical outcomes were needed and received instant development community support (e.g. GTFS-flex, OTP flex routing).

Long-term, replicability and scalability will require building out real-time features.

Path towards real-time greatly facilitated by GTFS-flex and MOD OTP development.

THANK YOU

Link to Final MOD Report:
https://www.transit.dot.gov/sites/fta.dot.gov/files/docs/research-innovation/146891/fta-report-no-0150.pdf

PUBLIC TRANSIT COORDINATOR AND GO!VERMONT MANAGER
DAN.J.CURRIER@VERMONT.GOV
802-279-5236

MOD Pilot Projects

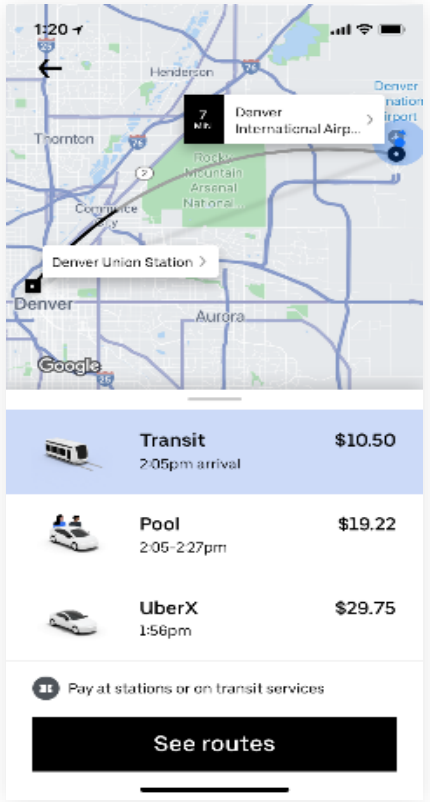
Brian T. Welch, AICP, Senior Manager, Planning Technical Services

NOCoE TSMO and MOD Integration Peer Exchange

February 19, 2021

MaaS and MOD Projects Completed / Underway

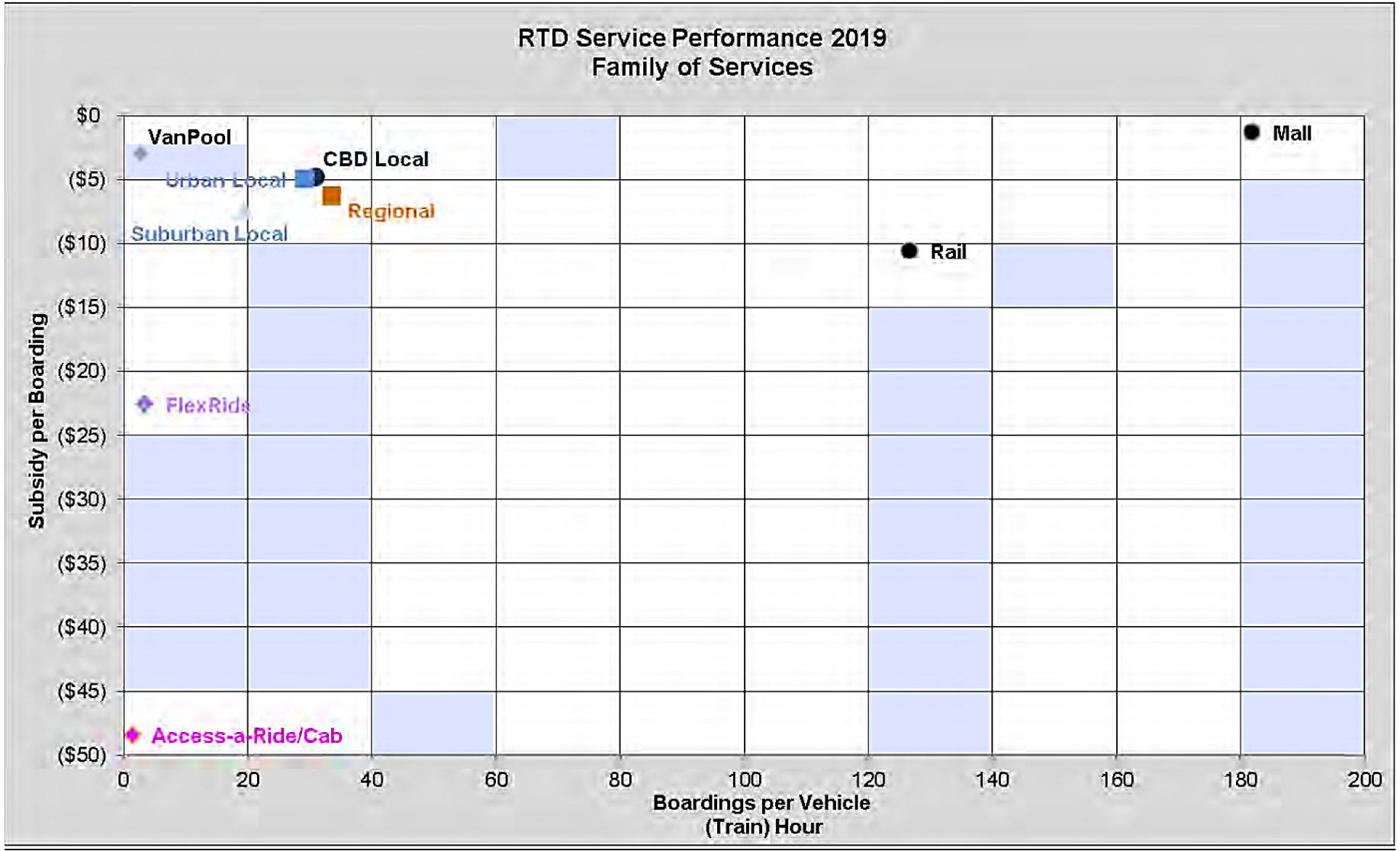
- FlexRide Microtransit (23 zones) (established in March 2000)
- 61AV Autonomous Shuttle Pilot
- Uber travel planning and payment
- Lyft nearby transit
- Transit app collaboration



Demand Response Services Increasingly Important

“The future of public transit hinges on shifting from a supply model to a demand model and embracing emerging modes to better serve, satisfy and grow ridership.” Rahul Kumar, TransLoc

Demand Response Services Relatively Less Productive



Demand Response Services Relatively Costly

Year 2019 Service Standards

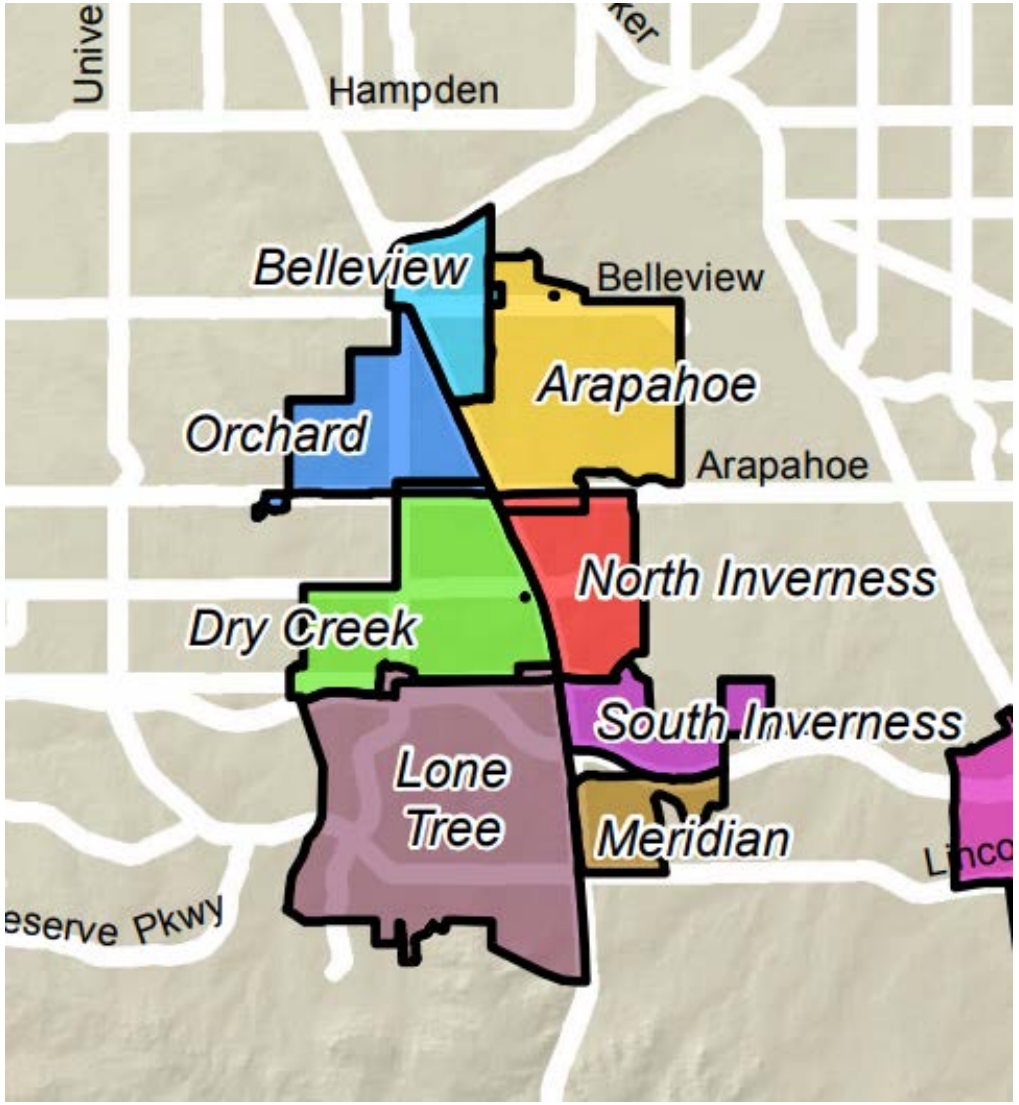
Service Class	Subsidy Per Boarding			Boardings Per Hour		
	Average	10% Max	25% Max	Average	10% Min	25% Min
CBD Local	$5.04	$8.77	$6.99	30.9	17.7	24.0
Urban Local	$5.09	$9.46	$7.38	29.1	15.1	21.8
Suburban Local	$7.67	$12.80	$10.36	19.5	10.1	14.6
Regional	$6.68	$15.16	$10.90	32.2	10.4	20.8
FlexRide	$22.60	$34.09	$28.61	3.5	1.9	2.7
Rail	$10.52	$17.82	$14.34	126.5	62.0	92.7
Mall	$1.25			181.8		
Access-a-Ride&Cab	$48.44			1.4		
Vanpool	$2.90			2.7		
System	$7.19			32.6		
System 2018	$6.07			31.1		

Peer Agency Demand Response Experience Similar to RTD

Reimagine RTD - Peer System Review	FY 2008	FY 2010	FY 2012	FY 2014	FY 2016	FY 2018	Change FY 08-18
Subsidy per Passenger Boarding - Demand-Responsive Service							
Dallas, TX (DART)	$40.68	$33.44	$35.57	$48.11	$38.26	$44.15	8.53%
Houston, TX (METRO)	$22.92	$23.79	$24.48	$29.65	$26.72	$28.44	24.06%
Portland, OR (TRIMET)	$24.25	$26.71	$28.54	$29.75	$28.14	$31.58	30.25%
Salt Lake City, UT (UTA)	$36.24	$33.86	$38.25	$48.65	$41.64	$46.34	27.88%
San Diego, CA (MTS)	$12.85	$22.37	$24.68	$24.54	$26.18	$29.34	128.33%
San Jose, CA (VTA)	$28.55	$27.87	$25.72	$23.43	$31.04	$41.33	44.77%
Peer Average	*$28.01*	*$27.53*	*$28.61*	*$33.68*	*$31.14*	*$35.72*	*27.51%*
Denver, CO (RTD)	**$30.33**	**$32.79**	**$34.43**	**$36.61**	**$30.02**	**$39.65**	**30.71%**

RTD Partnership with Metro Taxi – Pilot Program

- Will supplement 7 RTD FlexRides in the Denver Tech Center
- Intelligently integrate FlexRide dedicated fleet with Metro Taxi
- Goal is to provide better midday service more cost effectively
- More cost effective during low demand periods – discontinue idle vehicles and use Metro Taxi
- Rides are booked through RTD's FlexRide reservation system



RTD Partnership with Metro Taxi – Pilot Program

Table 1 Average Weekday DTC FlexRide Trips (2019)

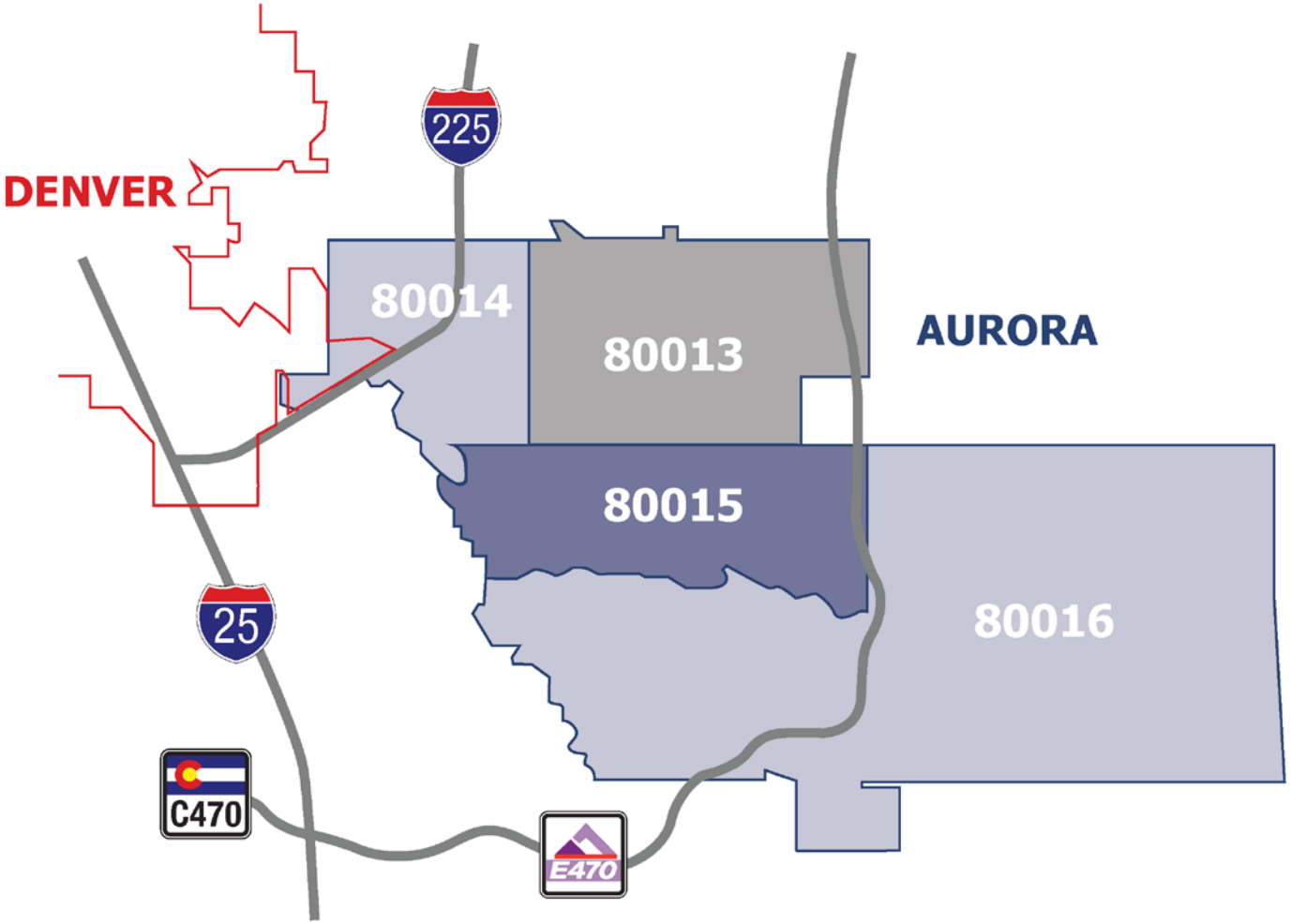
FlexRide	Trips 10:00-14:00	Median Trip Length (mi)	Service Area Size (mi.^{2})
Belleview	5.8	1.2	1.52
Orchard	3.4	1.1	2.92
Arapahoe	5.2	1.5	4.66
Dry Creek	5.8	1.6	5.21
North Inverness	6.4	1.0	2.22
South Inverness	2.2	1.0	1.46
Meridian	2.4	1.1	1.14
Total	31.2		19.13

RTD Partnership with Metro Taxi – Pilot Program

- Customer is told which type of vehicle to expect (like an Uber/Lyft reservation)
- Fares are the same as FlexRide
- Metro Taxi accepts cash, passes, and tickets
- Wheelchair users will be assigned to RTD's own FlexRide fleet
- Integrated service delivery offers a simple, seamless approach to the customer

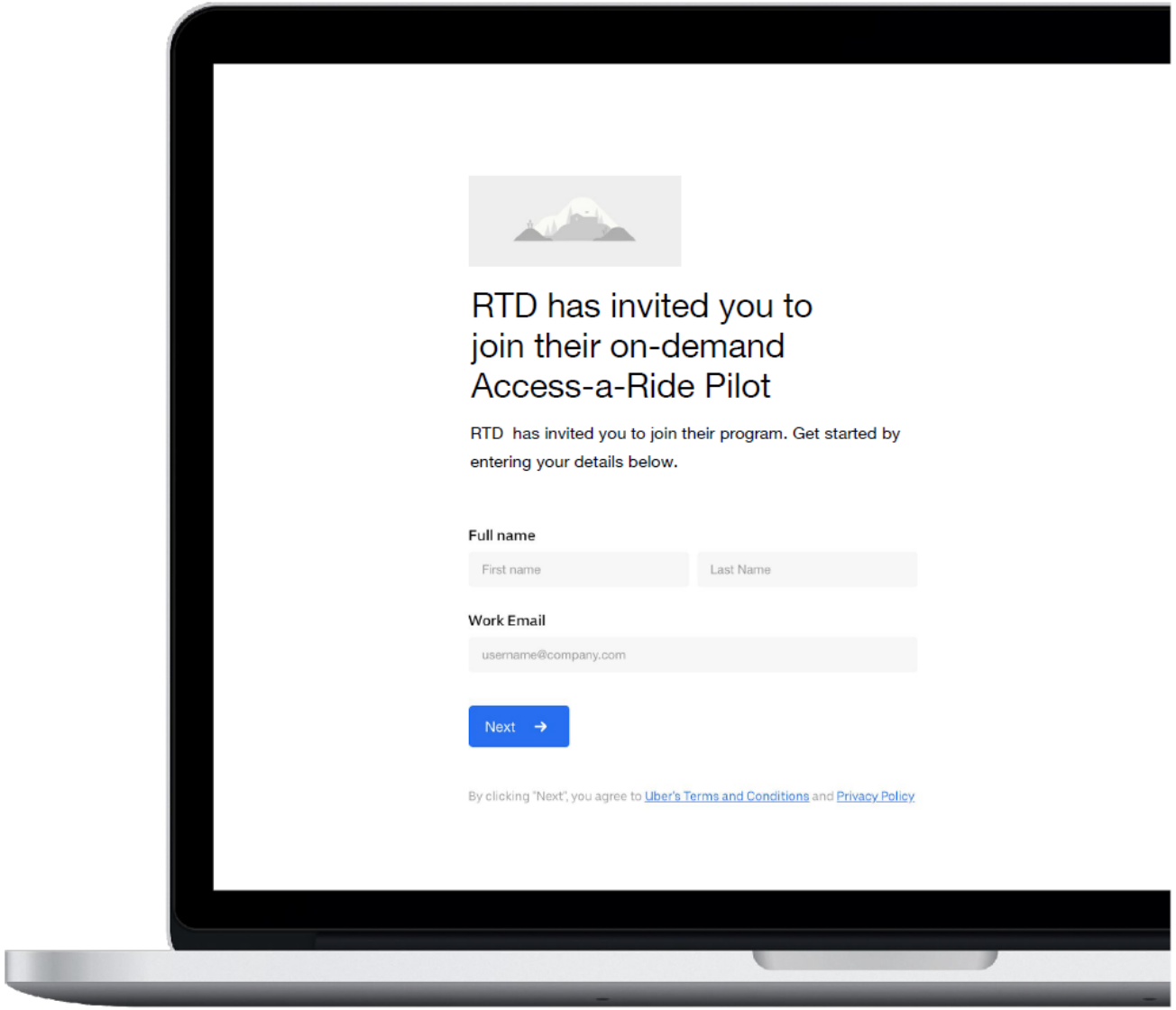
RTD Partnership with Uber – Pilot Program

- Supplements Access-a-Ride, Access-a-Cab in 4 zip codes
- Goal is to add capacity to meet high demand during peaks and achieve cost savings
- Provides faster response times and contactless payment platform
- Improves rider experience through faster response times



RTD Partnership with Uber – Pilot Program

- Peak period trips are eligible for RTD fare subsidy, but customers can choose to book an Uber or Access-a-Cab trip through the Uber app at any time
- Customer pays first $2, RTD pays next $25, customer pays any amount over $27
- Currently Uber cannot serve those who require a lift or cannot transfer out of their wheelchair; will use RTD's paratransit fleet for these customers

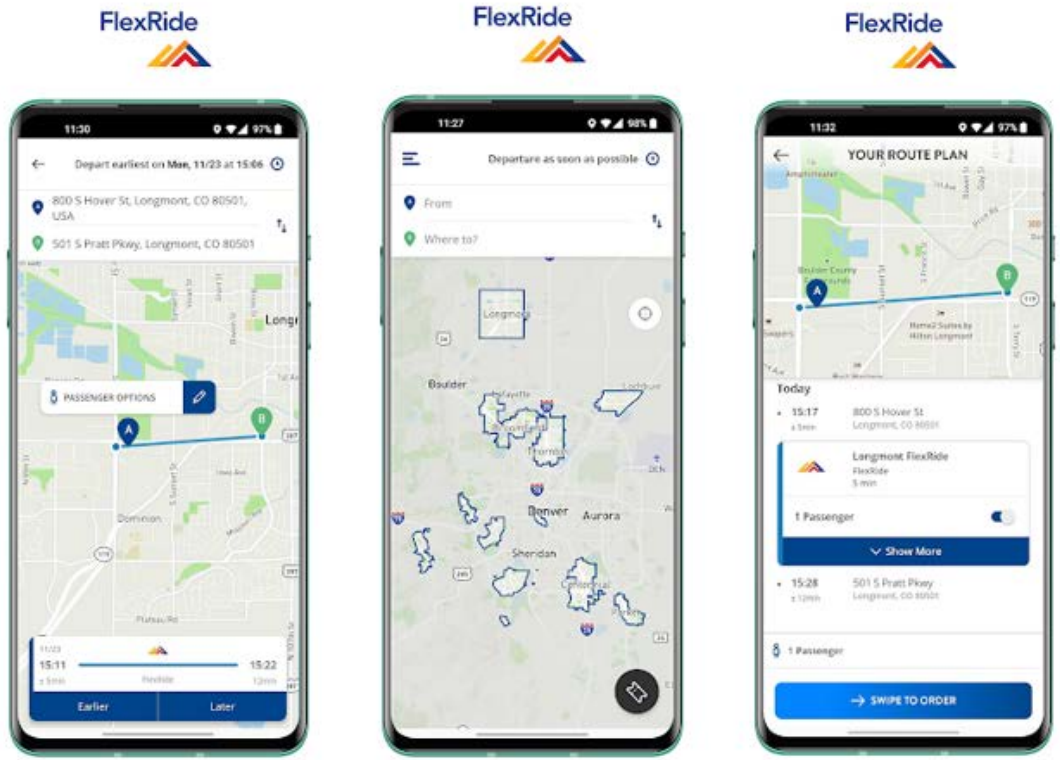


RTD Partnership with Uber – Pilot Program

- Pilot will run for 12 months
- Will test whether improved response times for same-day travel and low fares will draw more customers to a lower-cost alternative
- Cost savings to both customer and RTD

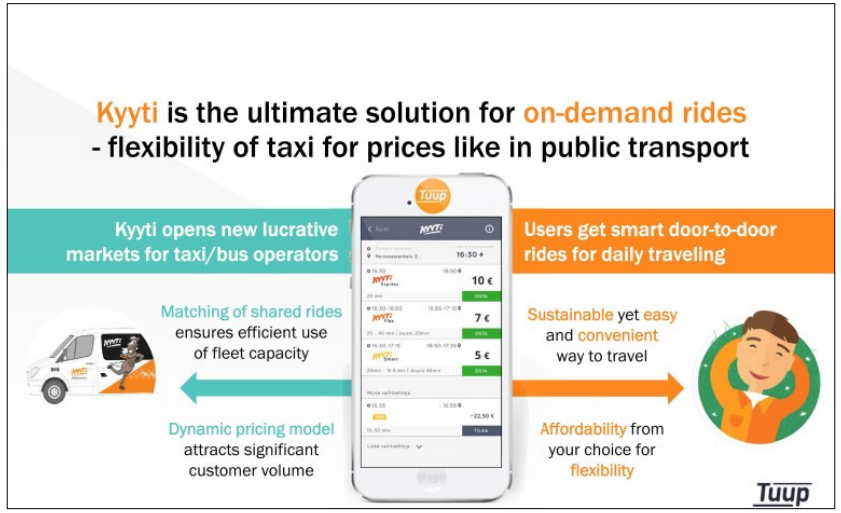
RTD Partnership with Kyyti Group

- Book FlexRide trips and see bus and rail connections in real time
- Facilitates first- and last-mile connections between bus and rail and other destinations
- Currently underway
- Fully integrated route planner includes step-by-step navigation and on-demand ride hailing for FlexRide trips



RTD Partnership with Kyyti Group

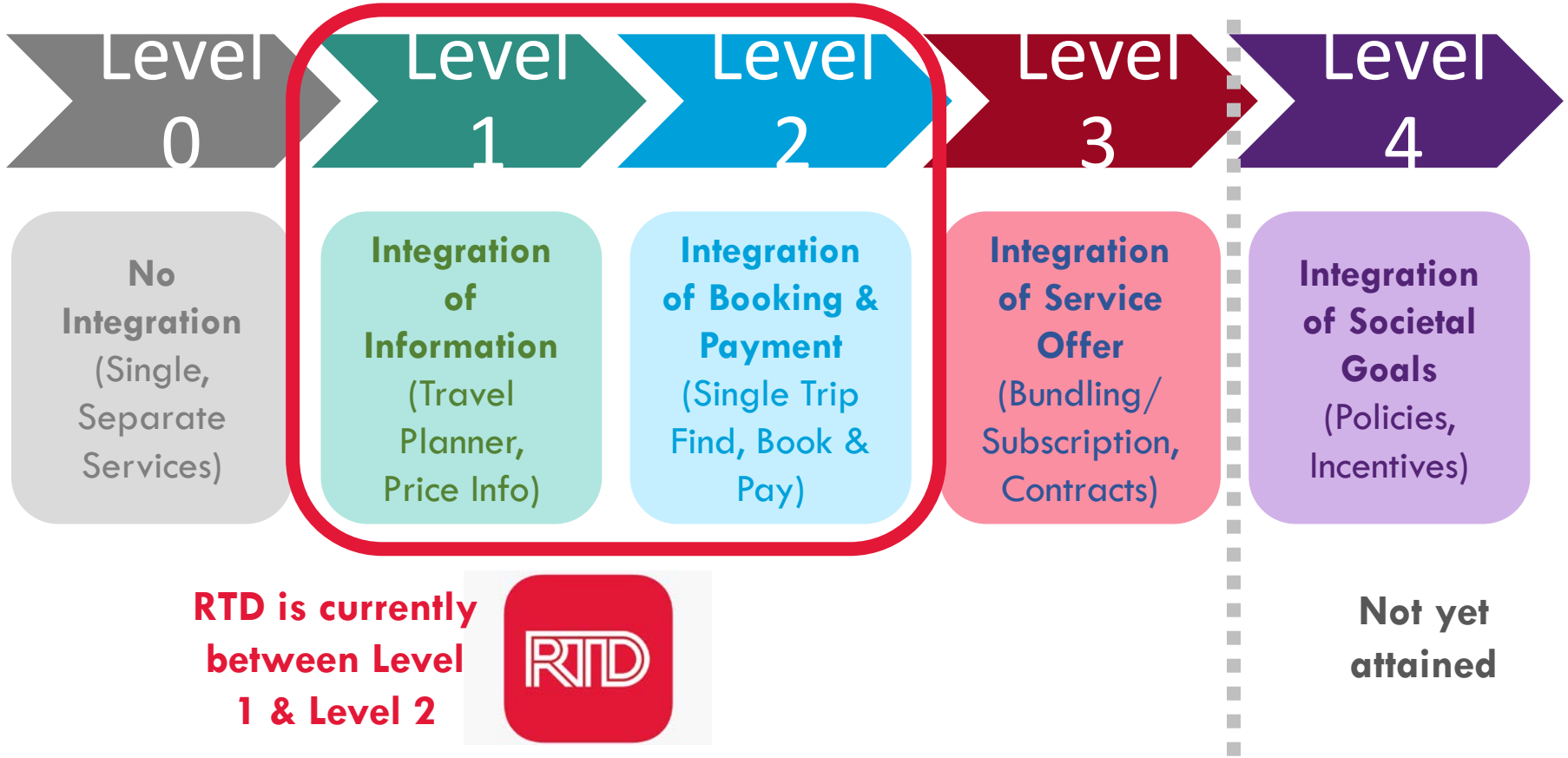
- Makes RTD services more attractive to current and future RTD customers
- FlexRide reservations can be made up to 30 days in advance or as little as 10 minutes prior to pick-up time. Previously, needed one-hour lead time.
- Can use pick-up address or place name, or current location, or map location
- Real-time data based on Open Trip Planner




Questions?

Extra Material Follows
(*Not Part of Presentation*)

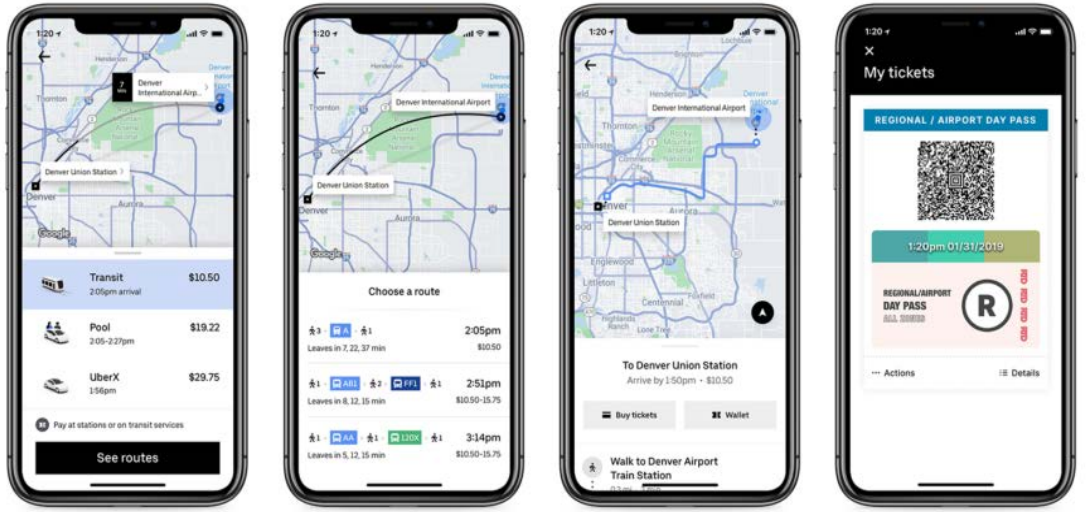
How does **MOBILITY as a SERVICE** work at RTD?



Level 2 Integration of Booking & Payment

At this level, MaaS facilitates the **finding, booking, and payment of individual trips**. The added value of Level 2 is that users can find, book, and pay for their trip at a **single service point** (e.g. through an app with a pre-registered credit card).

- Level 2: Partial – Trip with Single Mode
- Level 2: Full – Trip with Multiple Modes



Examples:

RTD Mobile Ticketing App (Partial)

Uber Transit Ticket Sales (Partial)

MaaS App in Vienna, Austria (Full)

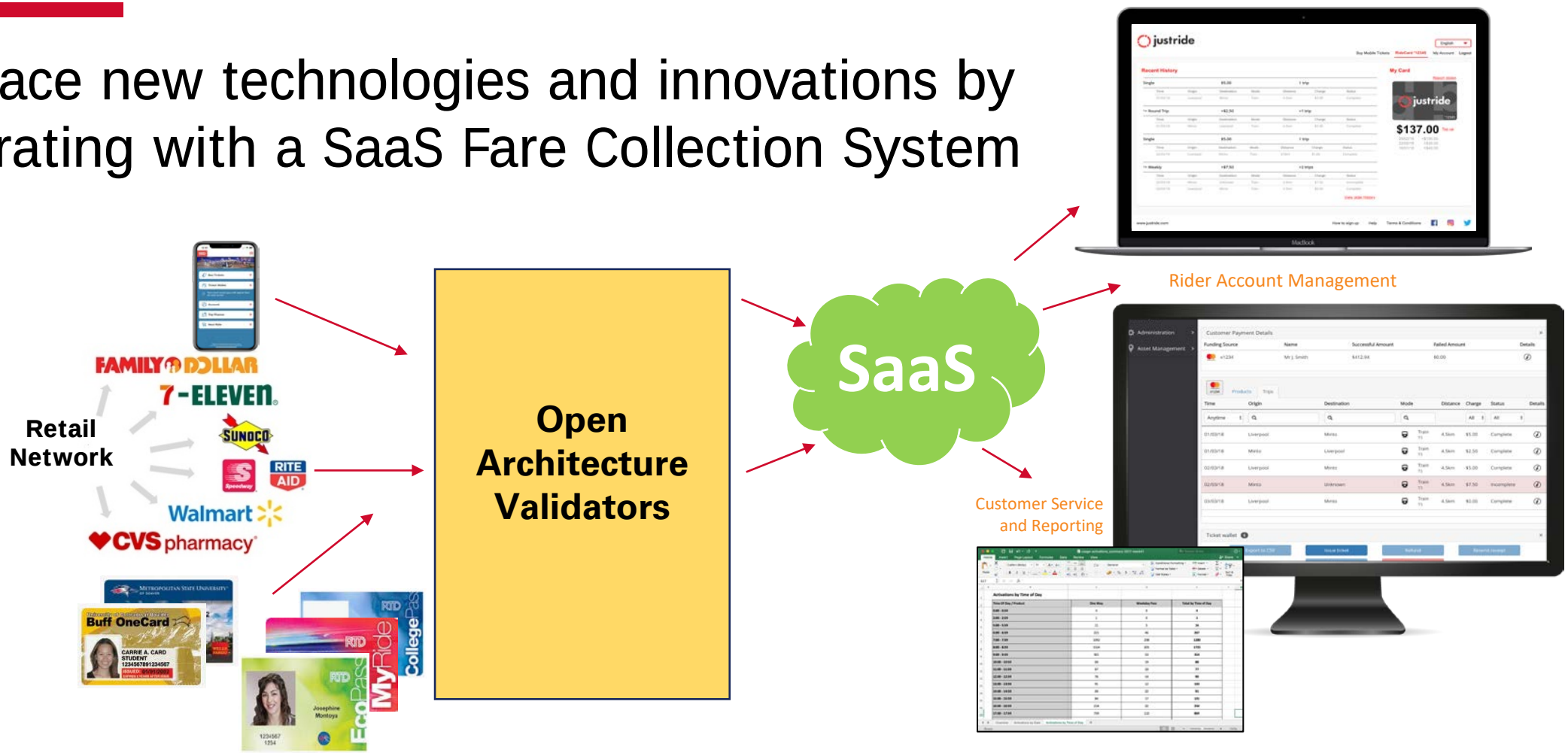
Uber + masabi + RTD

New Open Standard Validators

- Replacing existing validators with open standard validators is the first major step to an Account-Based Fare Collection System
  - Competitive procurement to purchase new bus and rail platform validators
  - Validators will be able to integrate with the current mobile ticketing platform as well as future SaaS fare collection platforms.
  - The new Account – Based Fare Collection System is an important step to enabling Mobility-as-a-Service.

Integrate validators with a SaaS Solution

- Embrace new technologies and innovations by integrating with a SaaS Fare Collection System



Recent COVID-19 Response Example

Case Study: *NEW* Denver RTD Access-a-Ride Food Delivery Program

Author: Todd Hansen, Texas A&M Transportation Institute; Al Benedict, Shared-Use Mobility Center

This case study is part of a larger review of **Public Transit Food Delivery Programs** that have popped-up across the country in response to COVID-19. The **Regional Transportation District** (RTD) example below offers a large transit agency perspective and a complimentary case study featuring **Charlevoix County Transit** (CCT) looks at transit deliveries from a rural context.

—

The Regional Transportation District (RTD), created in 1969, is the transit authority for the Denver metro area in Colorado, with a service area of 2,342 square miles and 2,920,000 people (2018 National Transit Database). RTD's services include fixed-route bus, ADA-paratransit demand response (branded as Access-a-Ride), and light rail and commuter rail routes. Normal Access-a-Ride fares are $5.00 for local trips (travel between 1-2 zones) or $9.00 for regional trips (travel between 1-3 zones), as well as options for ticket books and ability to ride any RTD fixed-route service fare free. Access-a-Ride operated 434 vehicles in maximum service to provide 1,226,319 trips in 2018 (National Transit Database).

RTD Operator Delivering a Grocery Order

In This Case Study

Source: Shared-Use Mobility Center, 2020 https://learn.sharedusemobilitycenter.org/casestudy/denver-rtd-access-a-ride-food-delivery-program/