The Future of Smart Mobility

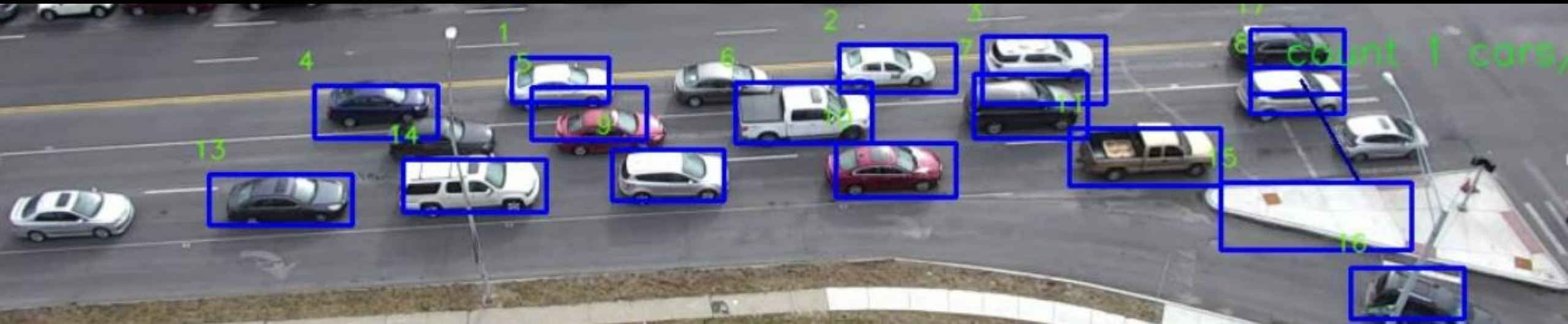
DriveOhio

October 2019

Patrick Smith
DriveOhio
Interim Executive Director


MAIN ST
NO
TURN
ON RED


DriveOhio
SM
RT


count 1 cars,

294,789

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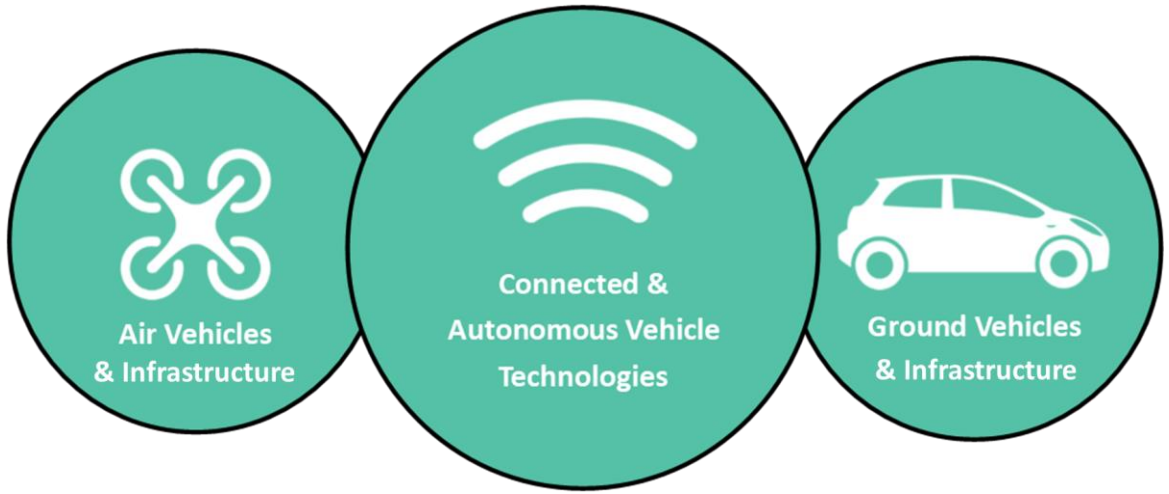
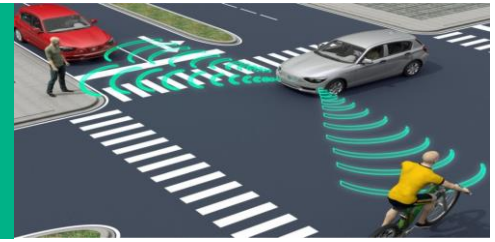


Safety

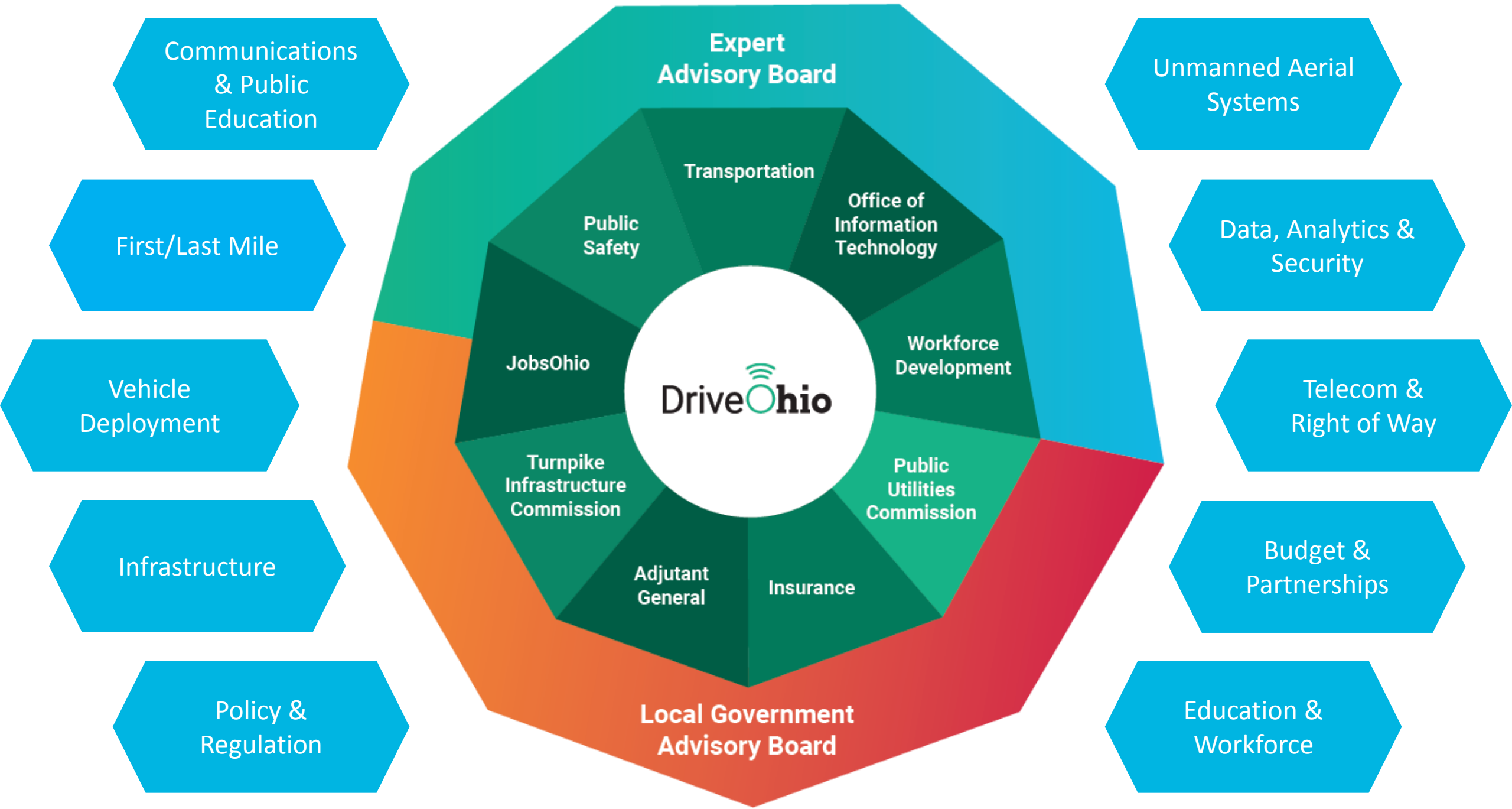


Mobility

Access

Reliability

Talent


Communications & Public Education
First/Last Mile
Vehicle Deployment
Infrastructure
Policy & Regulation
Expert Advisory Board
Transportation
Office of Information Technology
Workforce Development
Public Utilities Commission
Insurance
Adjutant General
Turnpike Infrastructure Commission
JobsOhio
Public Safety
DriveOhio
Local Government Advisory Board
Unmanned Aerial Systems
Data, Analytics & Security
Telecom & Right of Way
Budget & Partnerships
Education & Workforce

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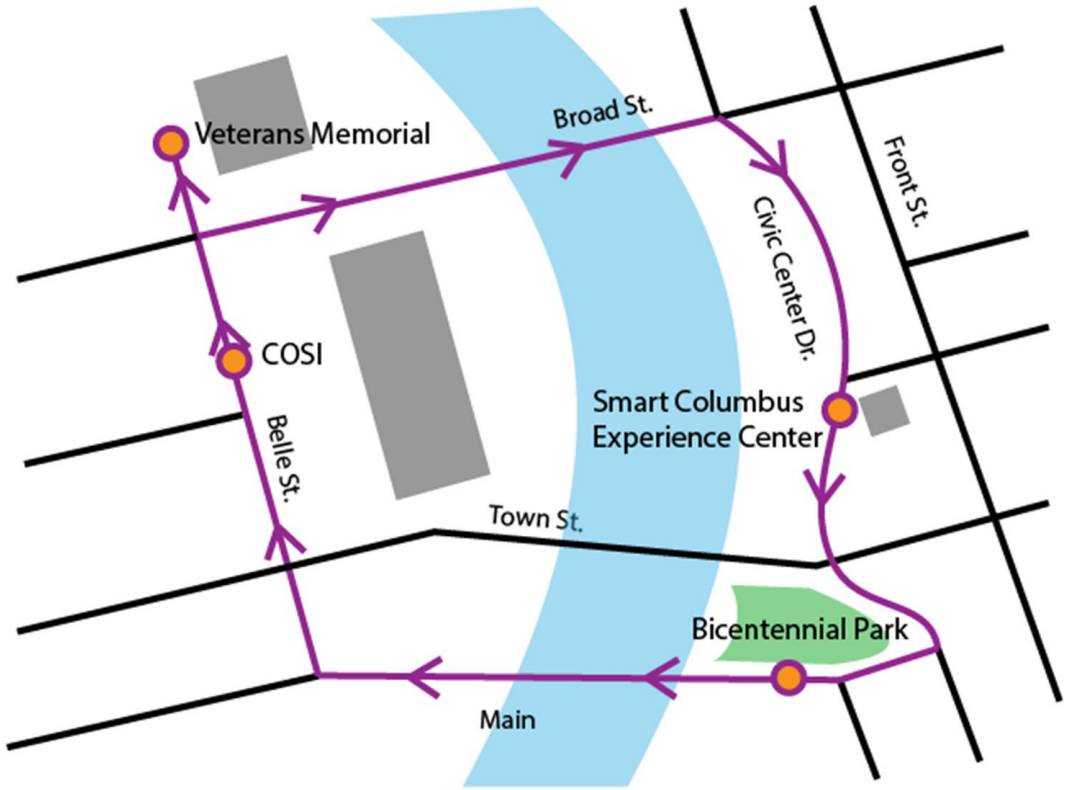
The Future of Smart Mobility

2019 Statewide Projects


Veterans Memorial
Broad St.
Front St.
Civic Center Dr.
COSI
Belle St.
Smart Columbus
Experience Center
Town St.
Bicentennial Park
Main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SMART

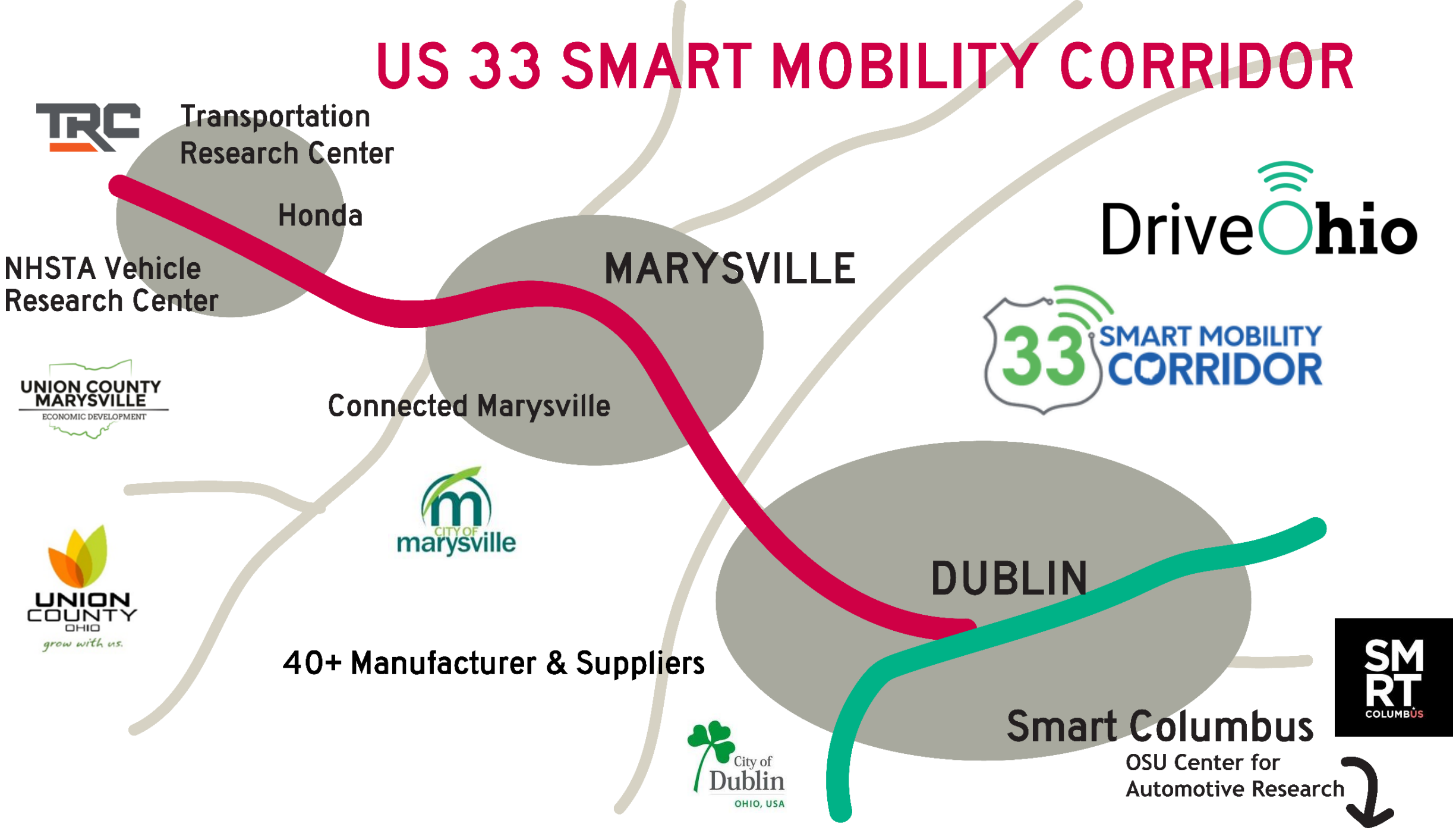
SMART COLUMBUS

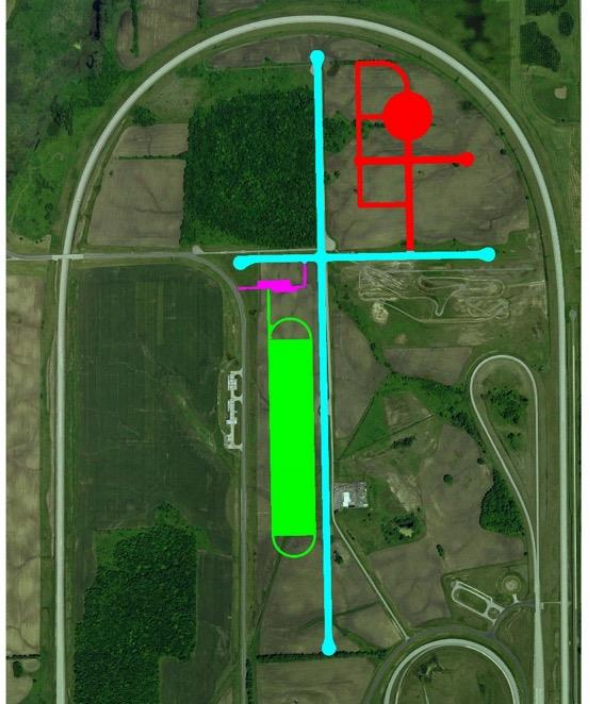
EASY MILE

St. Stephen's Community House

Brightening Lives in Columbus since 1919

US 33 SMART MOBILITY CORRIDOR

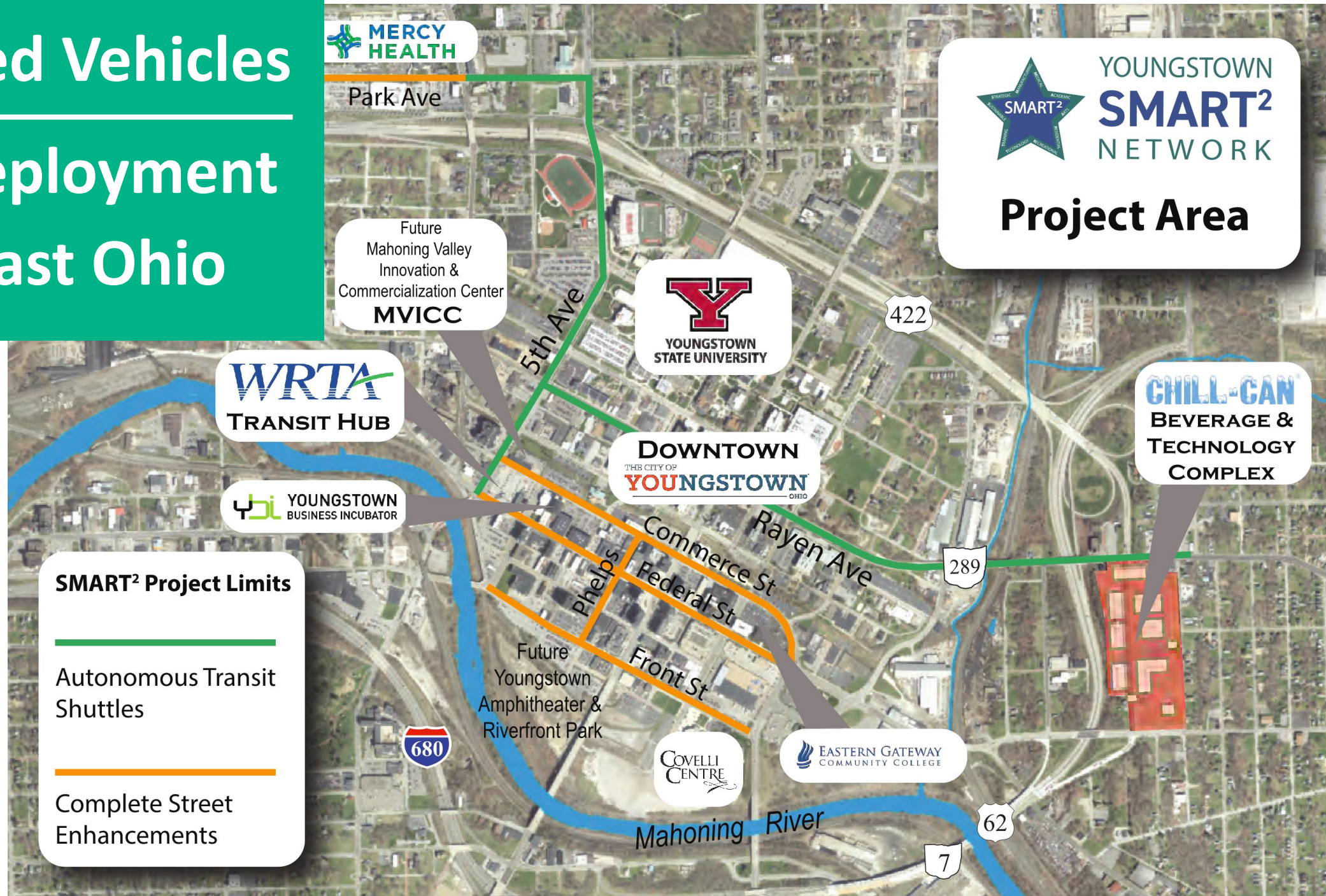





TRC
SMARTCENTER

Automated Vehicles

Urban Deployment Northeast Ohio



EASTGATE
Regional Council of Governments

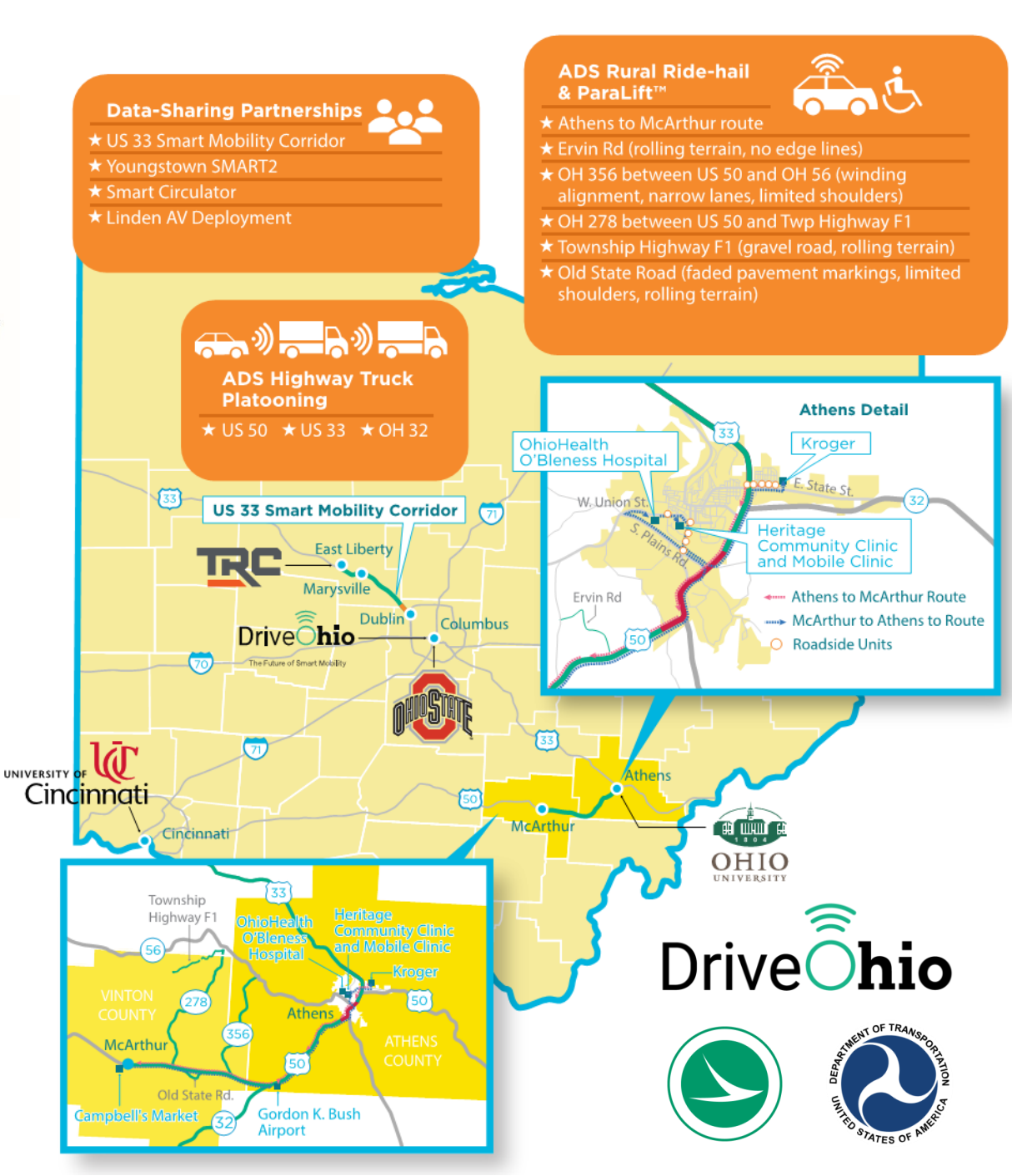
DEPARTMENT OF TRANSPORTATION
UNITED STATES OF AMERICA

DEPLOYING AUTOMATED TECHNOLOGY ANYWHERE

Data-Sharing Partnerships
- ★ US 33 Smart Mobility Corridor
- ★ Youngstown SMART2
- ★ Smart Circulator
- ★ Linden AV Deployment

ADS Rural Ride-hail & ParaLift™
- ★ Athens to McArthur route
- ★ Ervin Rd (rolling terrain, no edge lines)
- ★ OH 356 between US 50 and OH 56 (winding alignment, narrow lanes, limited shoulders)
- ★ OH 278 between US 50 and Twp Highway F1
- ★ Township Highway F1 (gravel road, rolling terrain)
- ★ Old State Road (faded pavement markings, limited shoulders, rolling terrain)

ADS Highway Truck Platooning
★ US 50 ★ US 33 ★ OH 32



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UNITED STATES OF AMERICA

DEPLOYING AUTOMATED TECHNOLOGY ANYWHERE

Partners

Lead Applicant

odot transportation.ohio.gov

DriveOhio The Future of Smart Mobility

TRC Transportation Research Center Inc.

University of Cincinnati

The Ohio State University

Ohio University 1804

D.A.T.A. in Ohio Advisory Board

Industry

Honda

BOSCH

Autonomous Tuff Bringing Together the World's Best Technologies™

Honda

Robotic Research

Yellow Cab Columbus 1928

tusimple

DENSO Crafting the Core

Community

Athens 1797

Ohio University | The Diabetes Institute Heritage College of Osteopathic Medicine

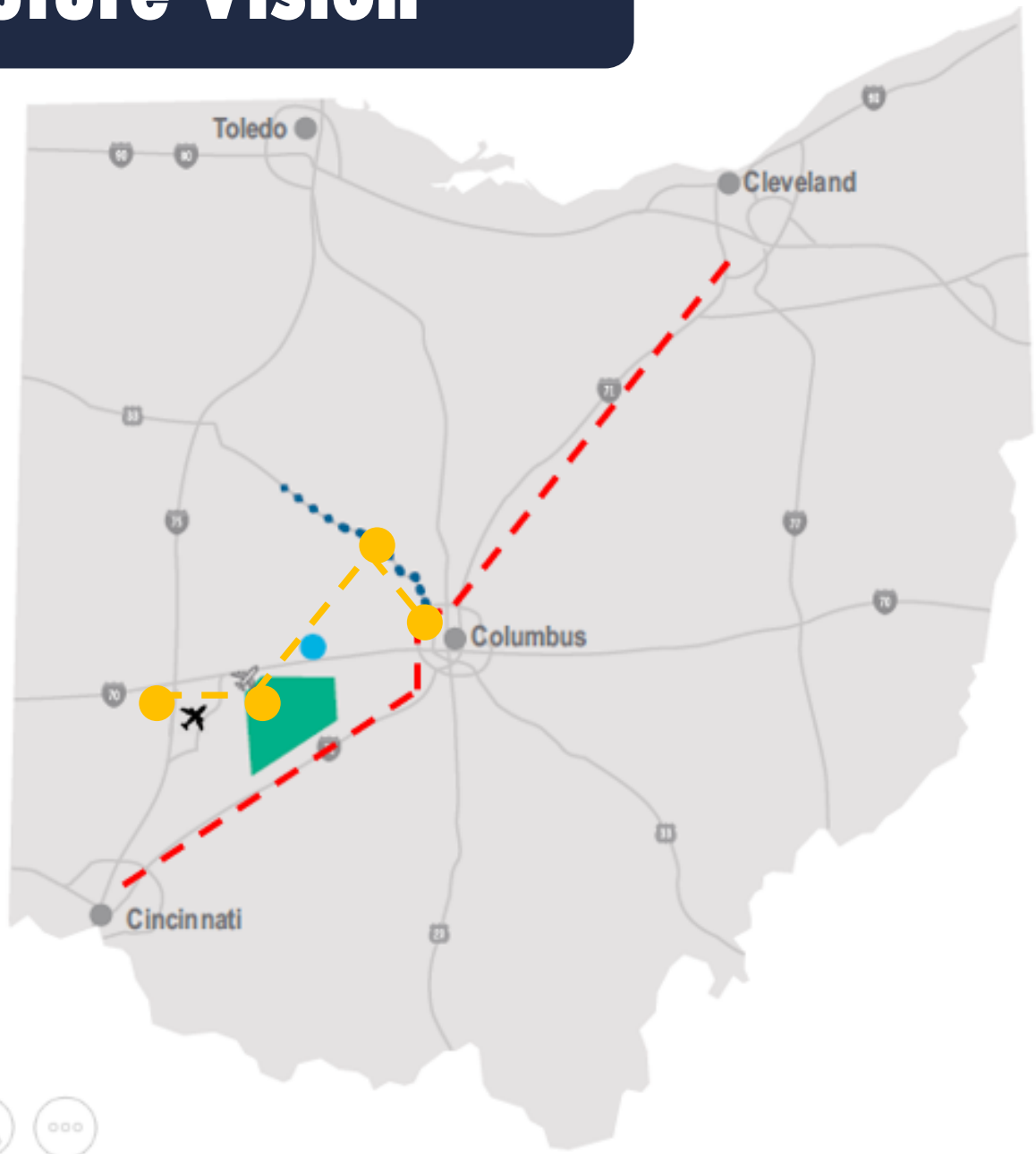
Buckeye Hills regional council

Foundation for Appalachian Ohio Give. Grow. Create.

Greater Ohio Policy Center


SkyVision

Future Vision



- UAM Research Corridor
- 33 UTM and Smart Mobility Corridor
- Springfield Test Area
- Springfield/Beckley Airport
- The Ohio UAS Center
- Initial Proposed Managed UTM/UAM Corridors
- Wright-Patterson Air Force Base

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PTIO Partnership for Transportation Innovation & Opportunity

DRIVING #OURAVFUTURE: OHIO

A Discussion on Automated Vehicles and the Future Workforce

Ohio STEM Learning Network

OHIO STEM LEARNING NETWORK
DESIGN CHALLENGE

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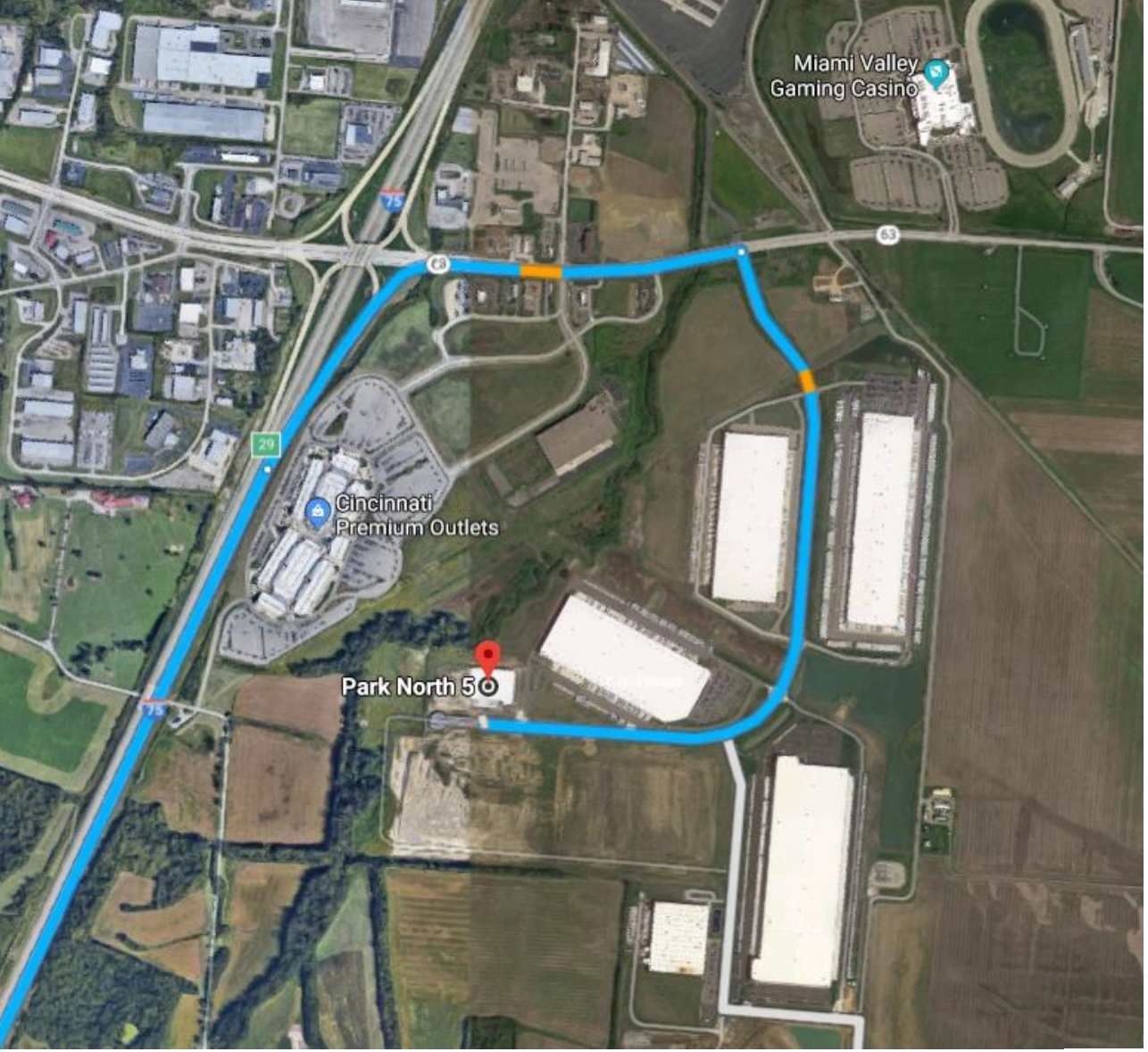
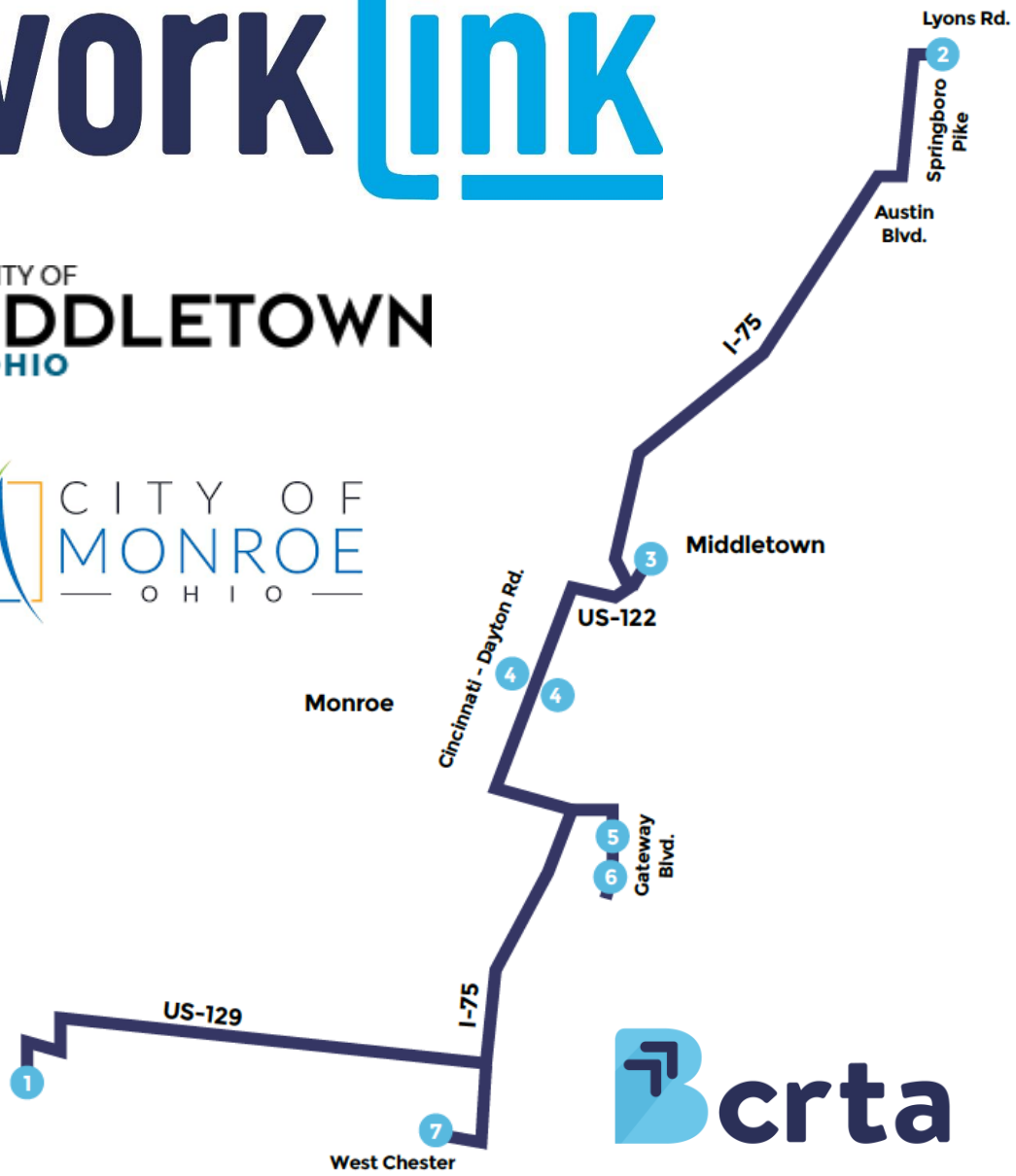
designchallenge.osln.org



workLink

CITY OF MIDDLETOWN OHIO

CITY OF MONROE OHIO



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OKI REGIONAL COUNCIL OF GOVERNMENTS

Cincinnati USA Regional Chamber

Bcrta

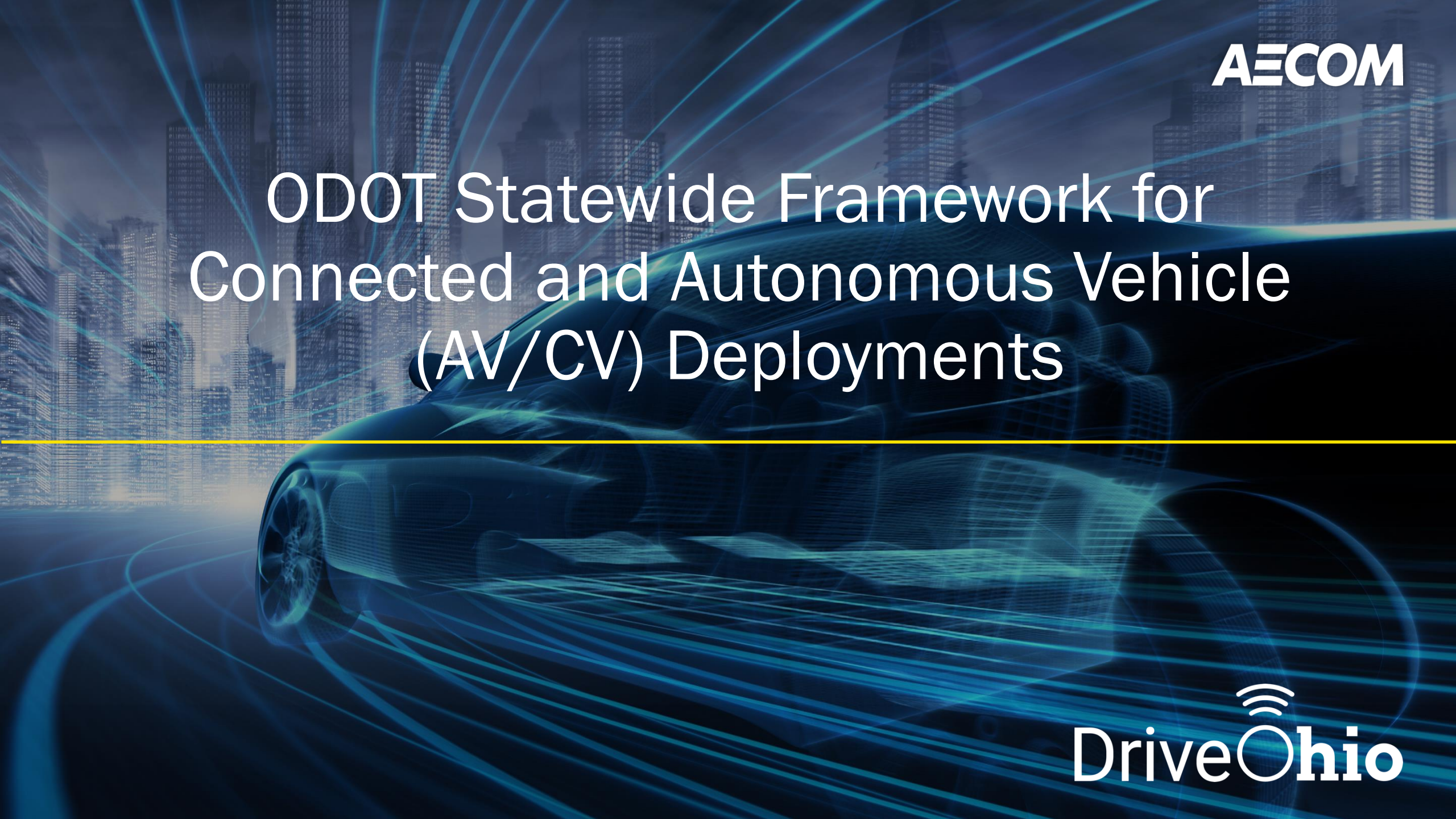
NO CAR,
NO JOB.

NO JOB,
NO CAR.

THE
PARADOX
PRIZE

“IT’S LIKE BEING BORN ON AN ISLAND WITHOUT BRIDGES OR BOATS AND EVERYTHING YOU NEED IS ACROSS THE WATER.”

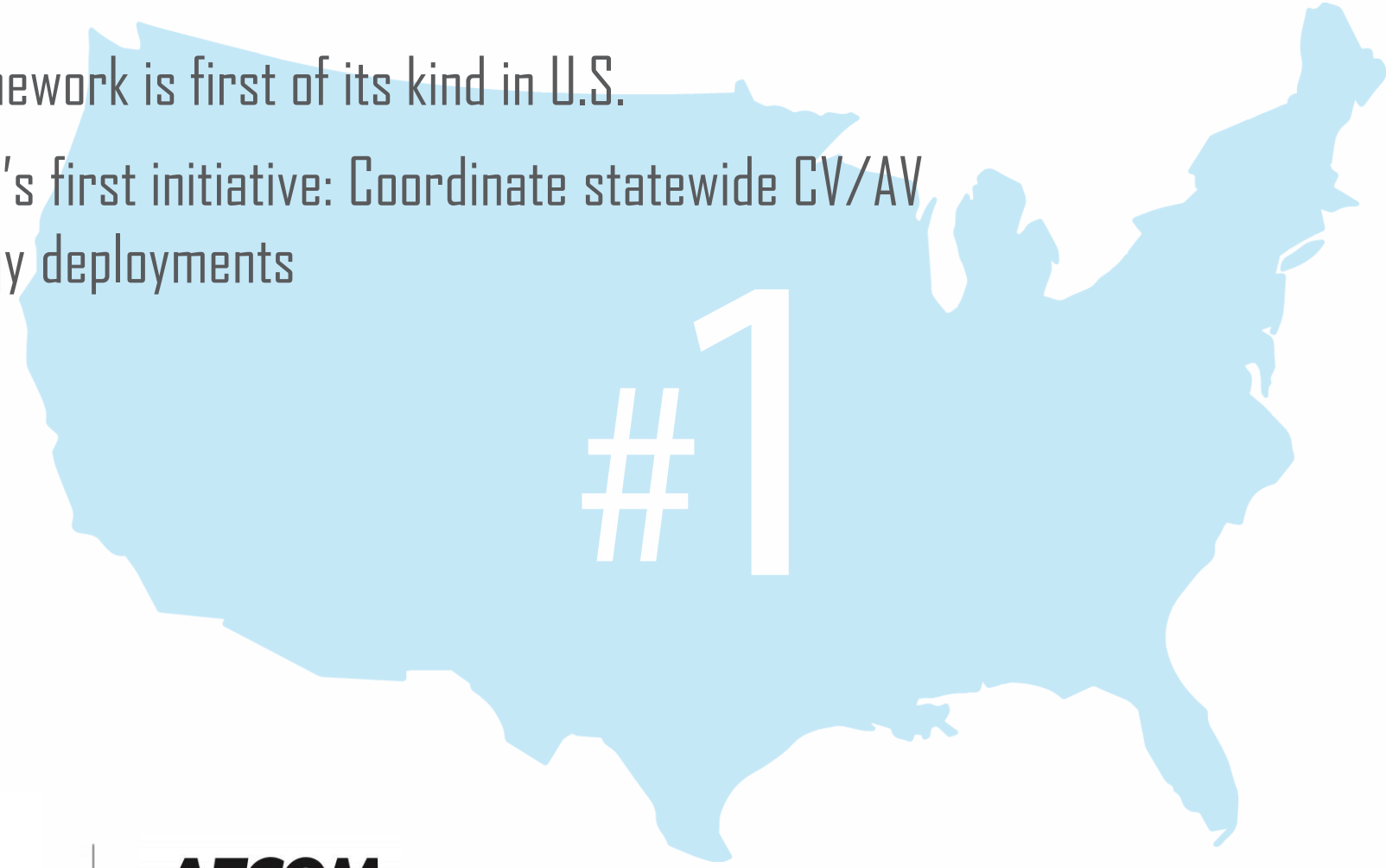
The Future of Smart Mobility



ODOT Statewide Framework for Connected and Autonomous Vehicle (AV/CV) Deployments

Goal: Create Statewide Framework

- This Framework is first of its kind in U.S.
- DriveOhio's first initiative: Coordinate statewide CV/AV technology deployments



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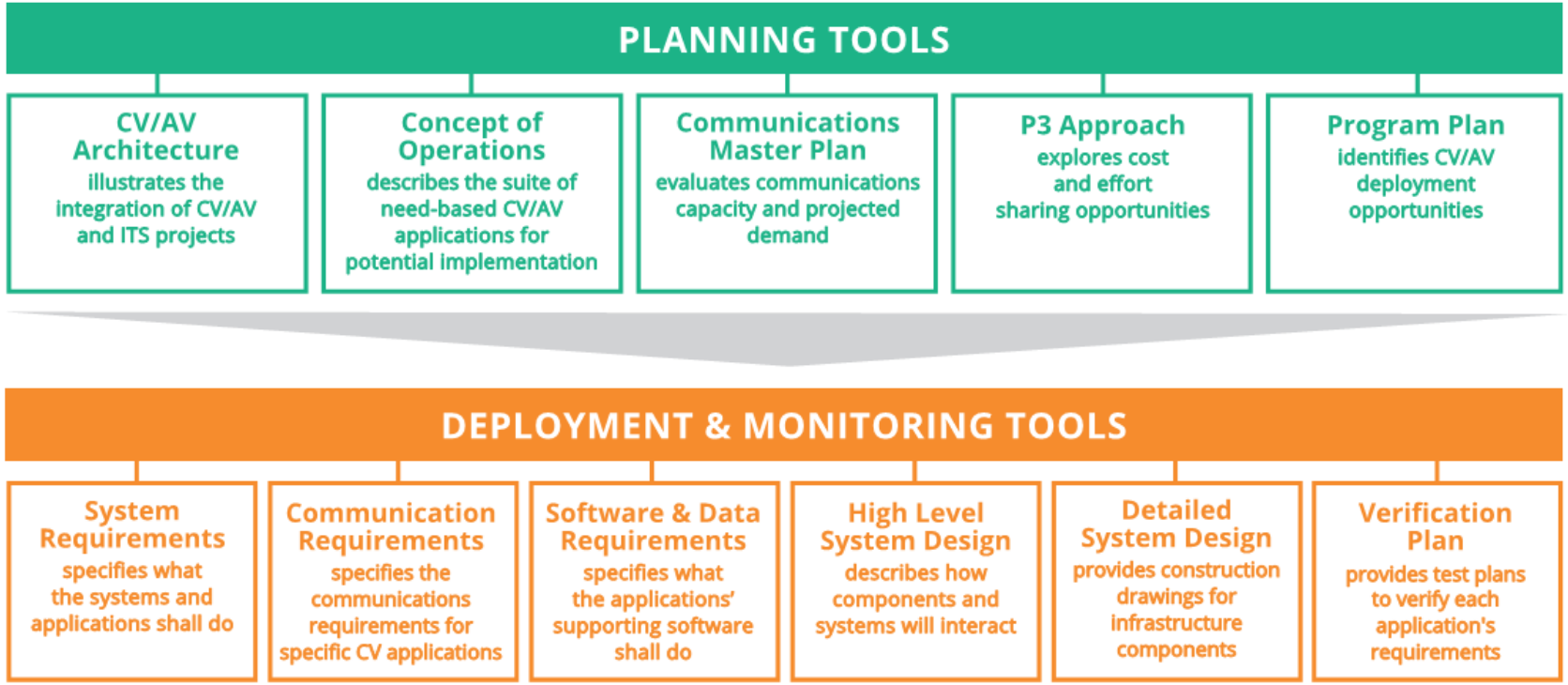
Framework Outcome: Guidebook

Completed or underway: tools needed to **plan**, **deploy** and **monitor** AV/CV projects that will work together



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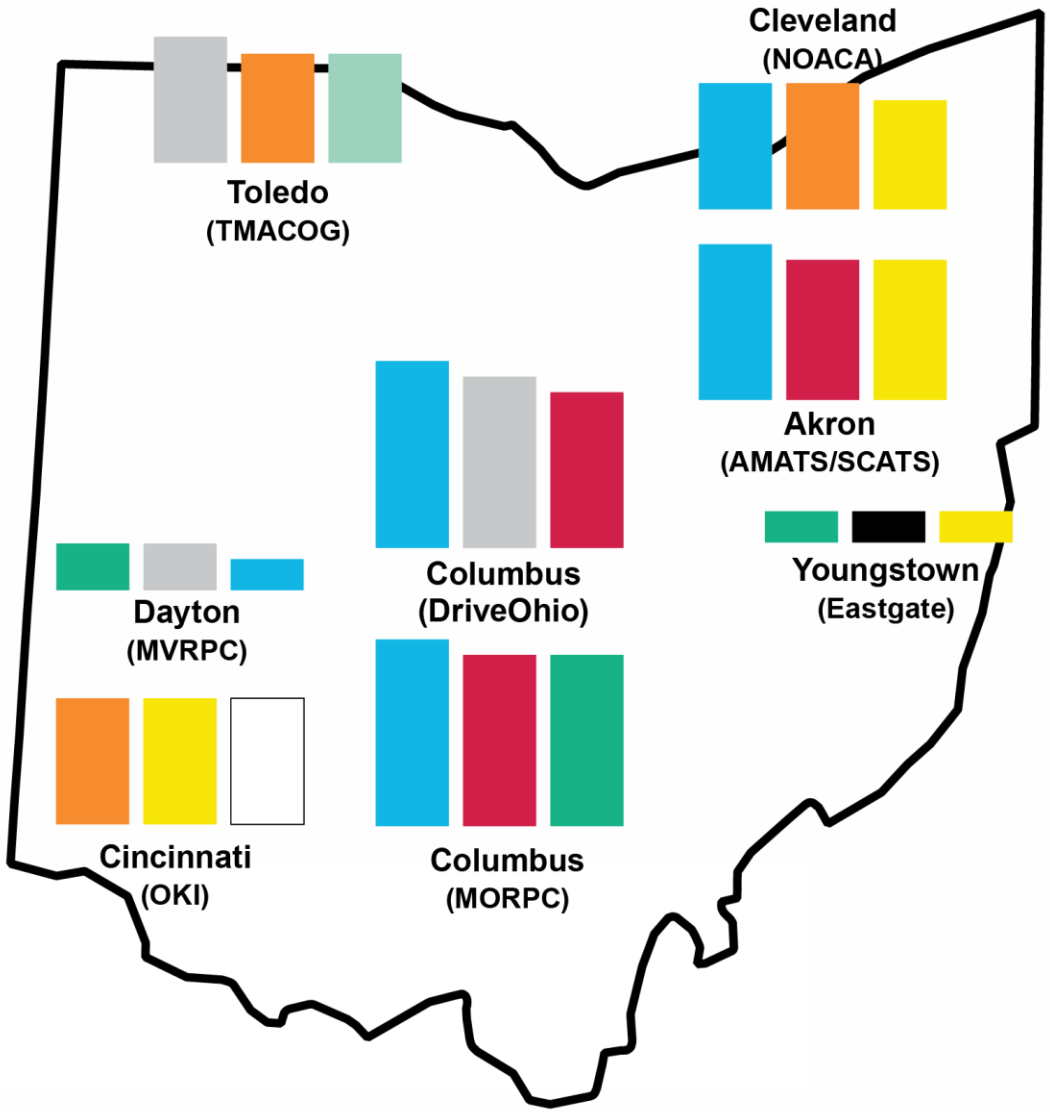
Identified Top Challenges that May Be Addressed by Technology



- Vehicle crashes at intersections
- Lack of traffic data collection capability
- Provision of real time travel information (congestion/ incident/weather/ construction) to the public
- Congestion on freeways/expressways
- Congestion on arterial roadways
- Congestion caused by roadway construction/ maintenance
- Roadway crashes due to weather conditions
- Rear-end collisions due to traffic backup/queues
- Crashes in and around roadway work zones
- Lack of real-time traffic monitoring capability
- Conflicts and safety incidents between pedestrians/cyclists and transit vehicles
- Conflicts and safety incidents between transit vehicles and other vehicles
- Transit on-time performance
- Conflicts and safety incidents between pedestrians/cyclists and non-transit vehicles

Determined Top, Statewide User Needs

1. Traffic signal timing optimization and coordination
2. Multi-agency/jurisdictional information exchange/sharing
3. Ped/bike safety at/near intersections or along roadway
4. Staffing skills, knowledge and resources to support technology

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Identified Readiness Status of AV/CV Applications

- Assessed applications being used across U.S.
- Identified ready-, near-ready and future deployment applications

Application	Deployment Ready	Deployment Near Ready	Further Development Required
Emergency Electronic Brake Light	●		
Forward Collision Warning	●		
Do Not Pass Warning	●		
Intersection Movement Assist	●		
Vehicle Turning Right in Front of a Transit Vehicle	●		
Blind Spot Warning + Lane Change Warning		●	
Left Turn Assist (LTA)			●

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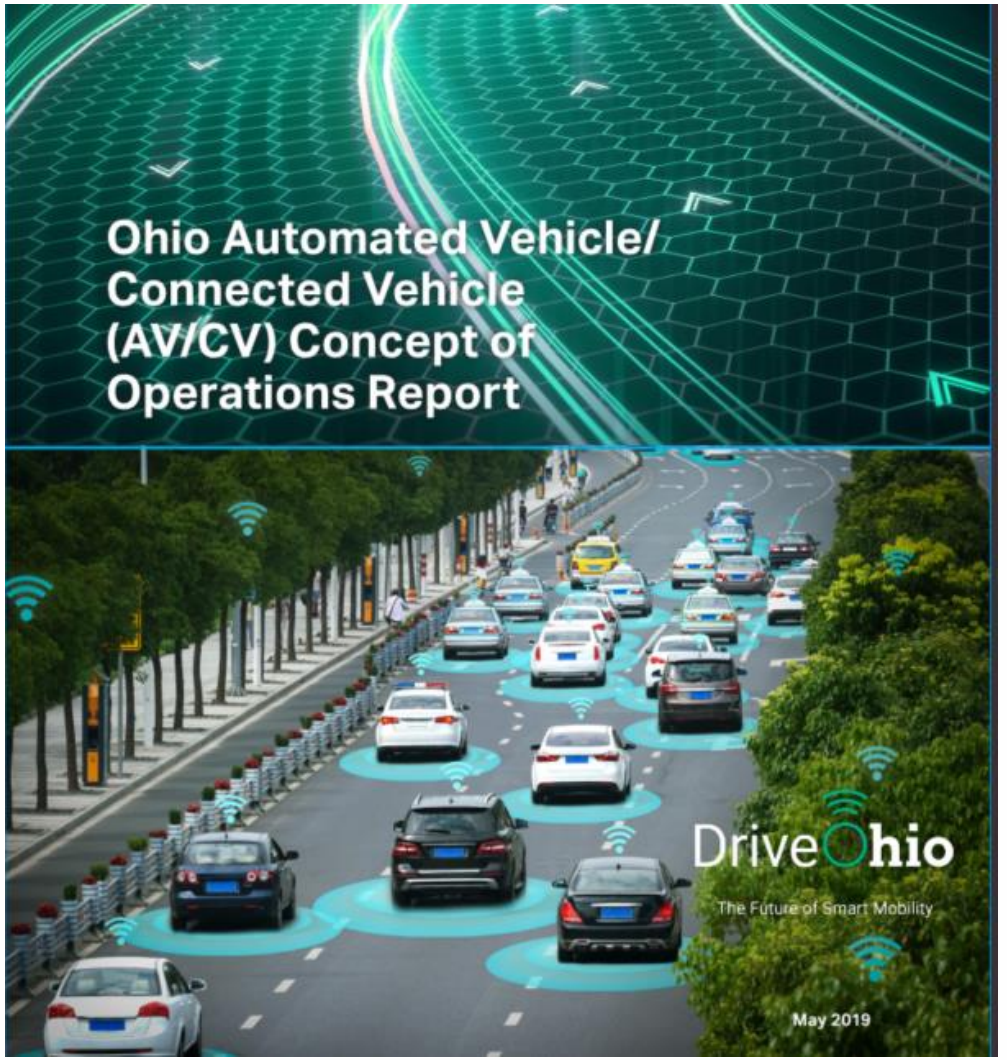
Developed Concept of Operations

- Described target system and desired operation
- Includes applications, core systems and infrastructure



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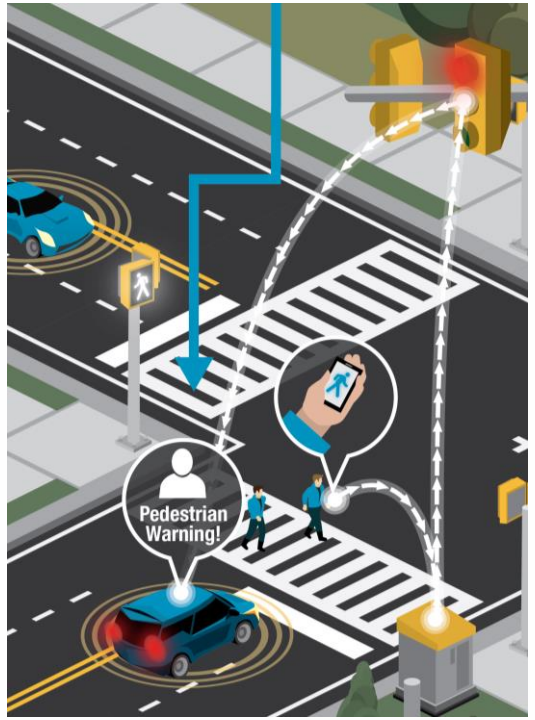
Identified 109 CV/AV Applications to Include in the Ohio Framework

Application	Need-Based	Project-Based	Future Projects
Curve Speed Warning	●		
End of Ramp Deceleration Warning (ERDW)	●		
Reduced Speed Zone Warning/Lane Closure		●	
Pedestrian in Signalized Crosswalk Warning	●		
Red Light Violation Warning	●		
SPaT MAP Display Signal Timing, Time to Green	●	●	
Wrong Way Entry (WWE)	●		
Speed Limit Warning			●
Spot Weather Impact Warning	●	●	
Restricted Lane Warnings			●
Oversize Vehicle Warning			●
Stop Sign Violation Warning	●	●	
Stop Sign Gap Assist	●	●	



Pedestrian in Signalized Crosswalk Warning

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Convened Concept of Operations Workshop

Discussed 8 operational scenarios:

- Traffic signal operation
- Rail crossing issues
- Unplanned incidents
- Work zones
- Trucker parking information
- Mobility support
- Disruption to mobility ecosystem
- Safety across transportation modes

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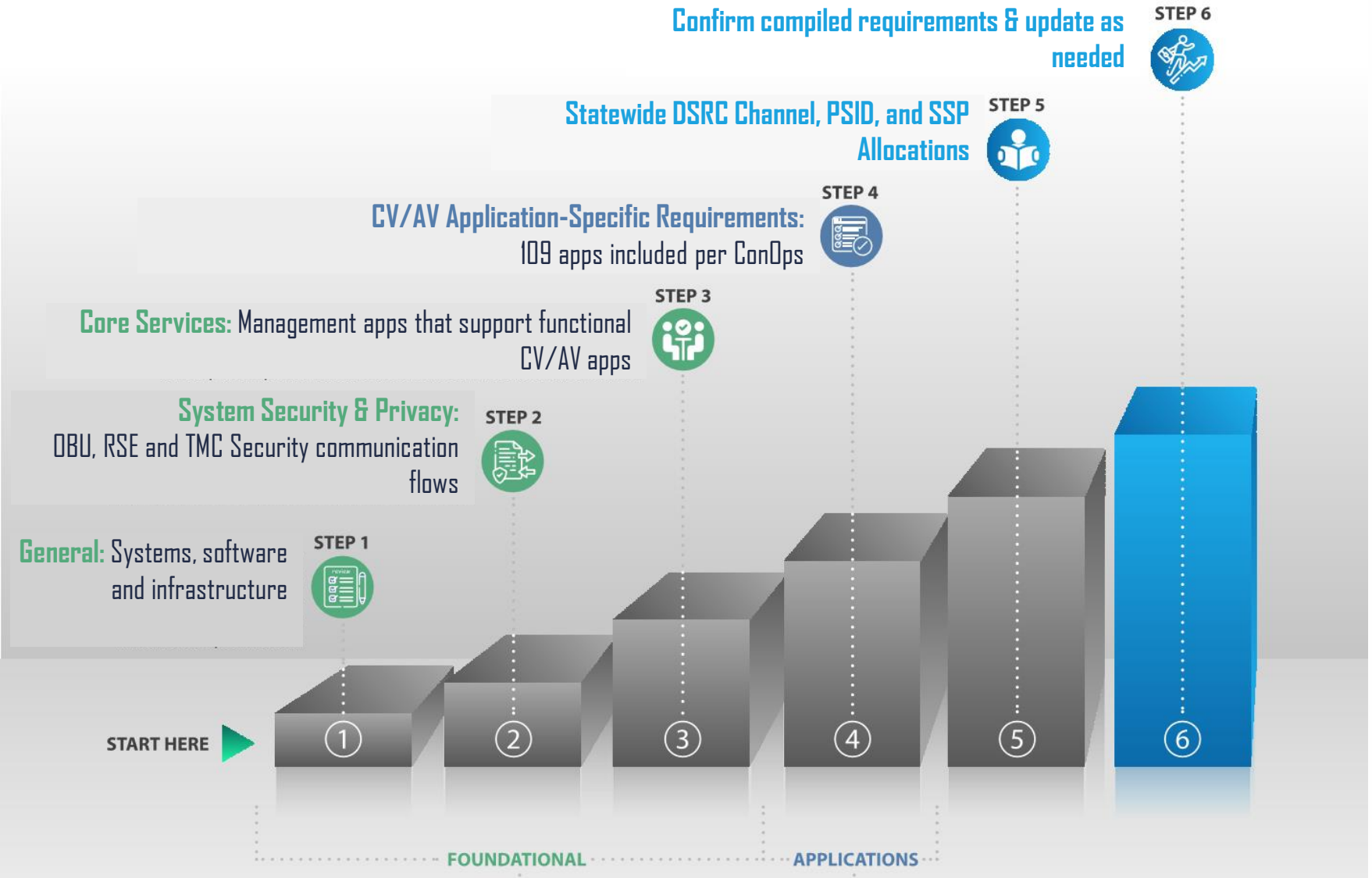
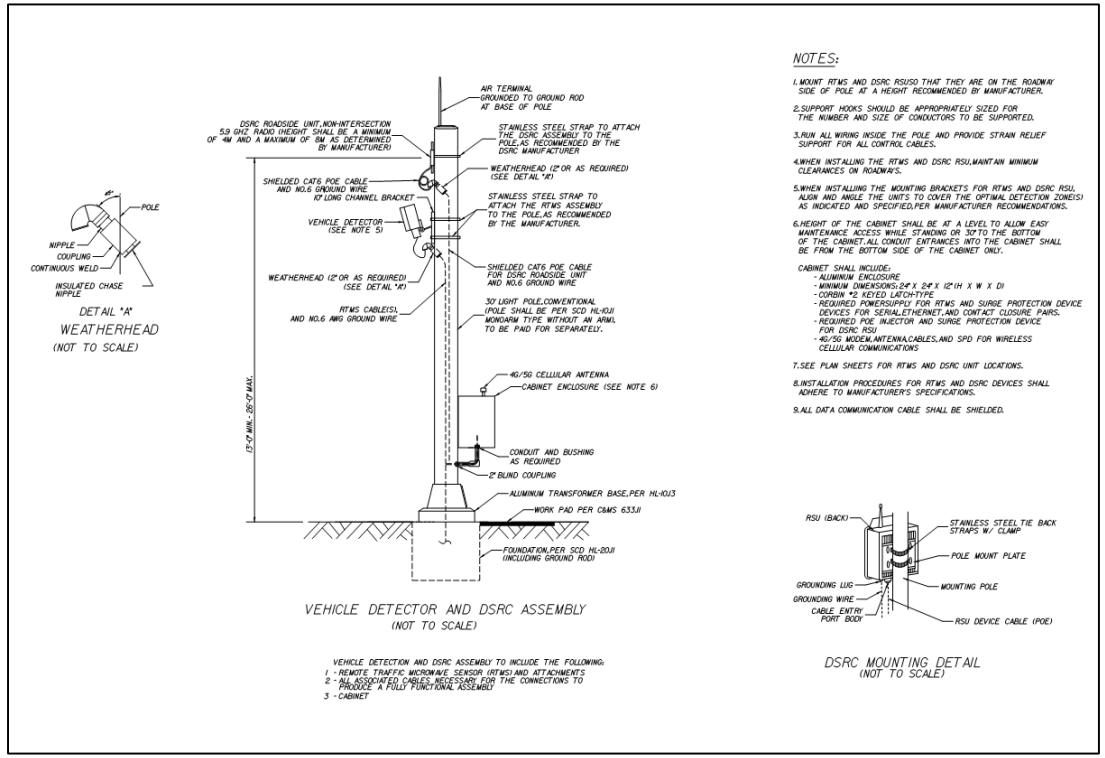
System Requirements Utilization Process



Living doc to be updated as apps develop and deploy!

Prepared Standard Drawings

- Dedicated Short Range Communications
- Closed Circuit TV Assembly
- Vehicle Detector
- Highway Advisory Radio and Beacon Sign
- Dynamic Message Sign
- Destination Dynamic Message Sign
- Ramp Meter



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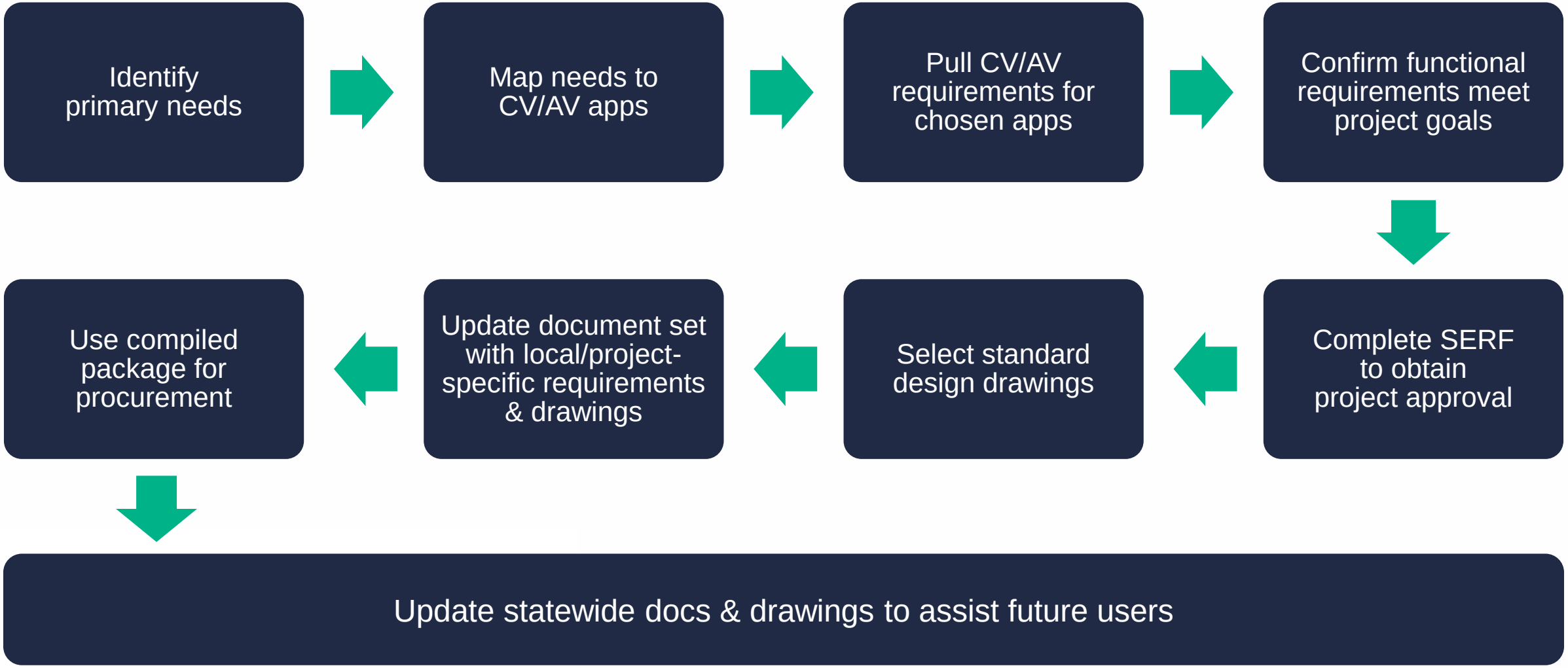
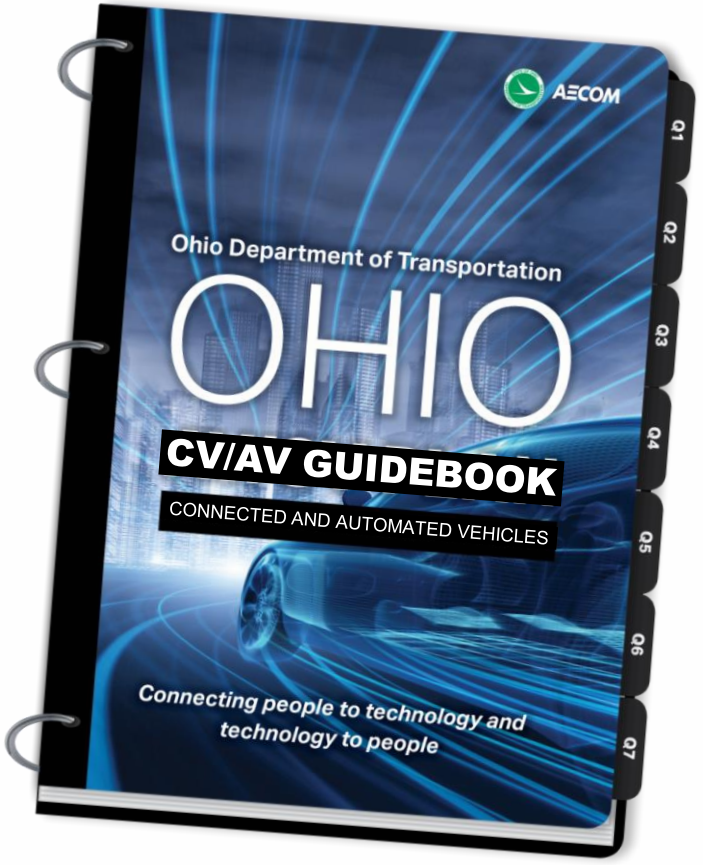
CV/AV Project Deployment Process



The Guidebook is Meant to be Used

- Use tools as a resource for planning and deploying of future projects
- Contribute updates that may assist future uses



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PLANNING FOR CAVS









OHIO DEPARTMENT OF TRANSPORTATION

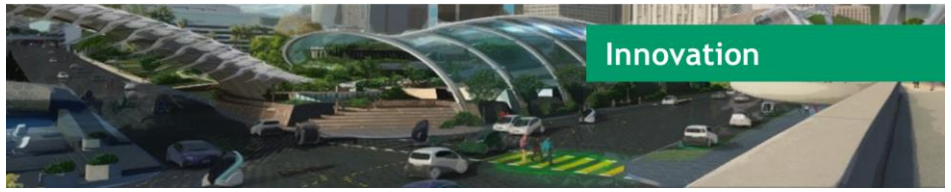
Access Ohio 2045

Long Range Transportation Plan

Ohio Department of Transportation

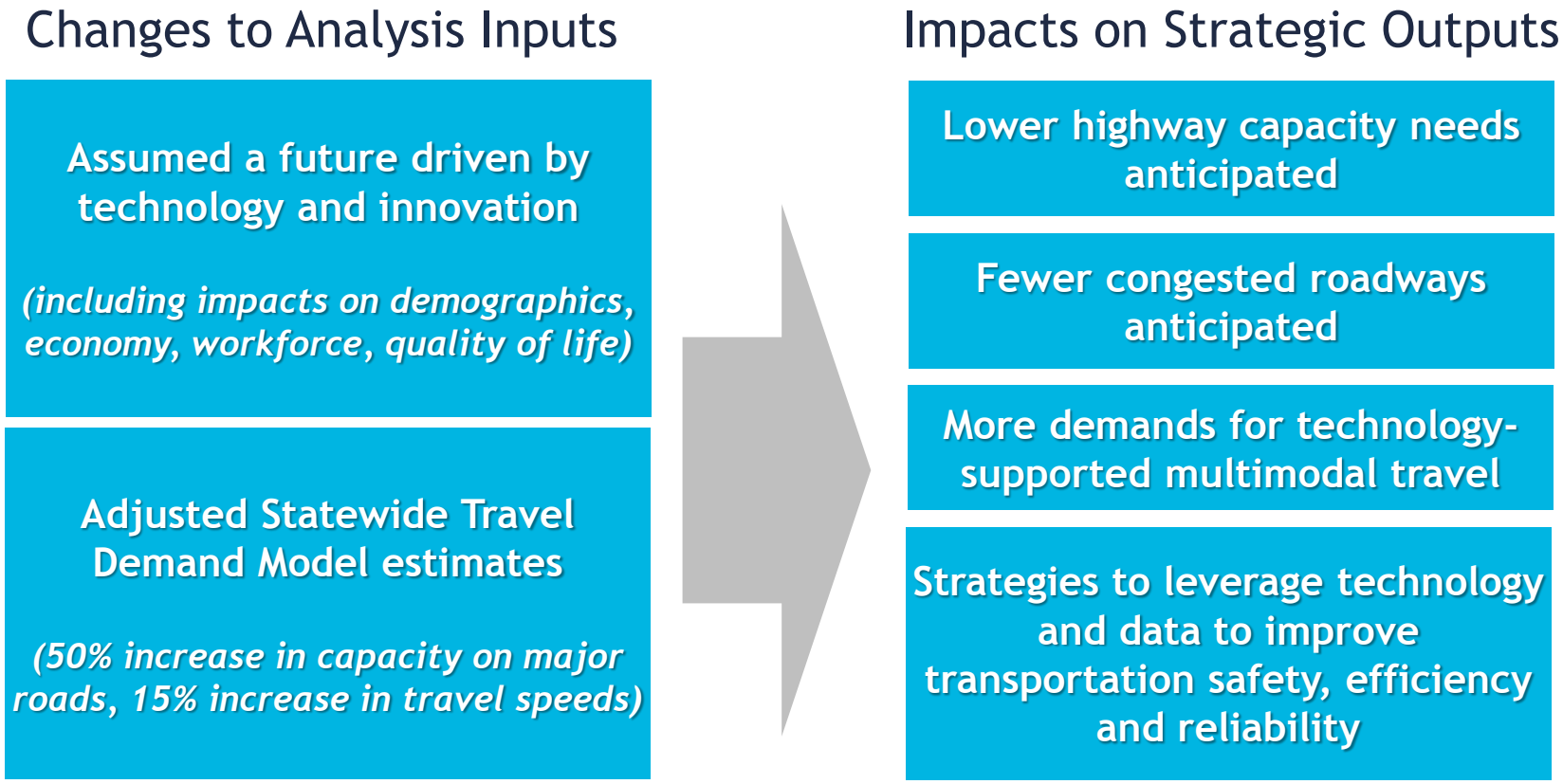
AO45 SCENARIO PLANNING

- Long Range Transportation Plan needed to consider CAV and emerging tech impacts
- Needed resilient strategy and policy recommendations
- Used scenario planning approach



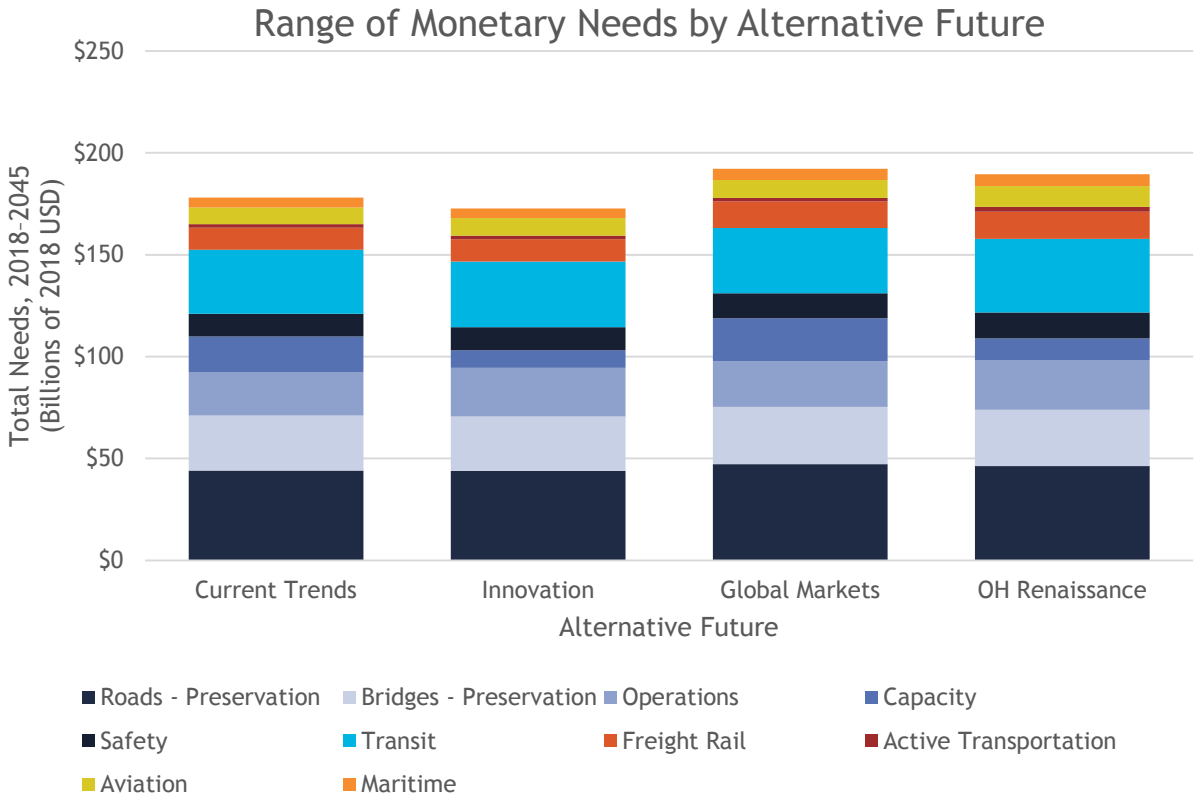
AO45 SCENARIO PLANNING

- Both Innovation and Ohio Renaissance Alternatives included significant CAV penetration



AO45 SCENARIO PLANNING

- Anticipated future needs vary across future alternatives, driven by CAV and other tech



Significant Changes

- Overall Needs ↓
- Operations ↑
- Capacity ↓

Modest Impacts

- Active ↑
- Aviation ↑

OHIO DEPARTMENT OF TRANSPORTATION

Acce

Travel Demand Modeling

CAVS IN THE TRAVEL DEMAND MODEL
2 DESIGN MODIFICATIONS

- How People View Travel
  - Cars become available at any location at any time
  - In-Vehicle Time Productivity in Mode Choice – AVs allow “drivers” to use travel time productively (working, reading, texting, …)
  - HH AVs are convenient for transit access
- How Vehicles are Used
  - Older adults, youth, disabled and others without a driver’s license will have access to AVs (can make independent car trips)
  - Empty repositioning trips made by AVs to accommodate other HH members’ travel
  - Availability of cheap, driverless taxi/TNC

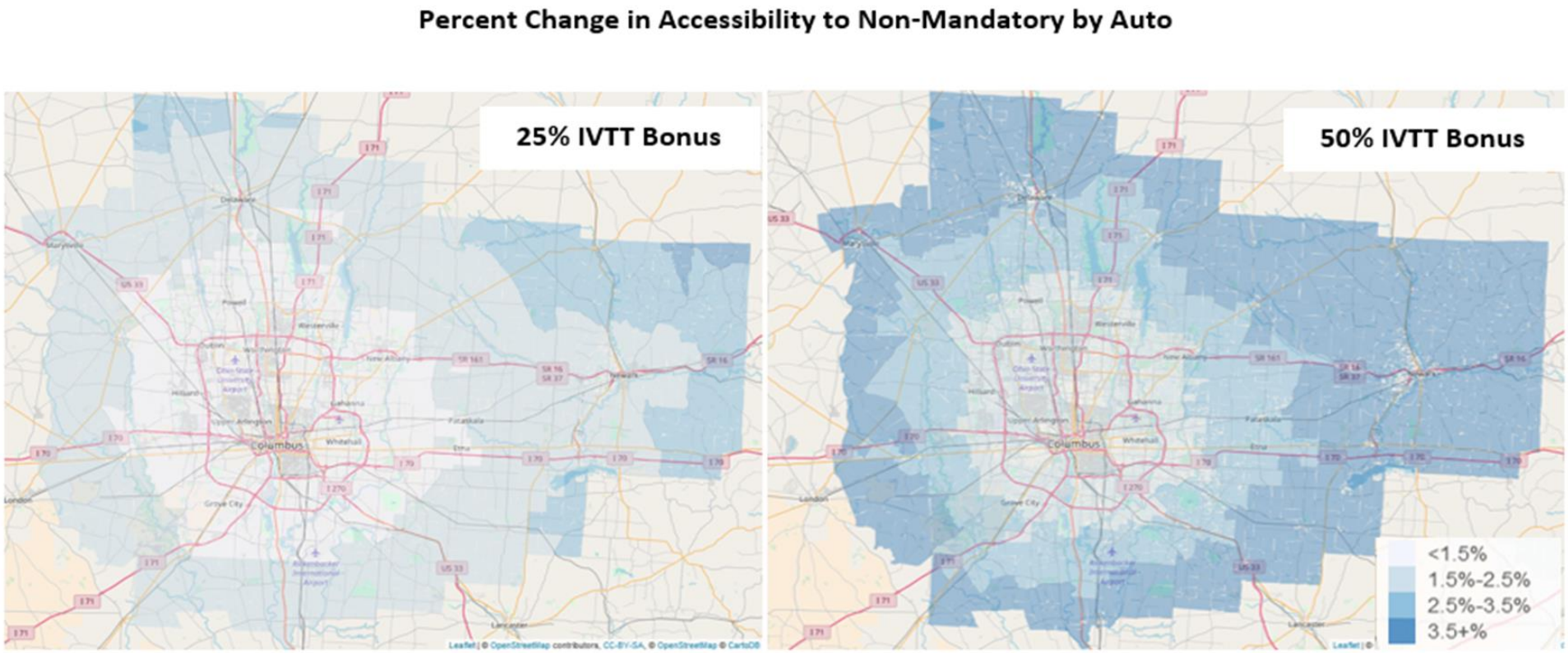
CAVS IN THE TRAVEL DEMAND MODEL
UPDATED MODEL CONSTRAINTS & EXAMPLE

- Market Penetration Rates
- Age for traveling alone
- Productivity time bonus
- Capacity and Speed bonuses by penetration rate and facility type
- Transit accessibility
- CAVs for HH
- CAVs for taxi

Scenarios

Parameters	1	2
	Low productivity bonus, high roadway capacity improvement	High productivity bonus, high roadway capacity improvement
Objective of scenario	Analyze sensitivity to productivity bonus	Analyze sensitivity to productivity bonus
AVs proportion in market	100%	100%
Auto in-vehicle time productivity bonus for AV	25%	50%
"No escort" promotion for AV households	5	5
Minimum age for traveling alone in AV	10 years	10 years
K_RNR promotion factor	3	3
Roadway capacity improvement	Interstate: 80% Arterial: 60%	Interstate: 80% Arterial: 60%
Vehicle spacing reduction due to single AV	30%	30%
Zonal parking cost	No change	No change

Impact on Accessibility: Scenario 1 and 2



PROJECT LEVEL TRAFFIC MICROSIMULATION GOALS

- Determine how effective different CV/AV applications are in **reducing traffic congestion** and **improving safety, traffic speeds, capacities** and **reliability**
- Determine **which locations and traffic conditions** are most amenable to these applications
- Synthesis noted uncertainties with:
  - CAV Penetration Rates
  - Impacts of CAV Technologies
  - How the public perceives and experiences travel

QUESTIONS

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