Cap East Connector
ACES Shuttle:
Project Scope and Outlook

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Source: Wall Street Journal

Source: Zimbio.com

Source: IIAF

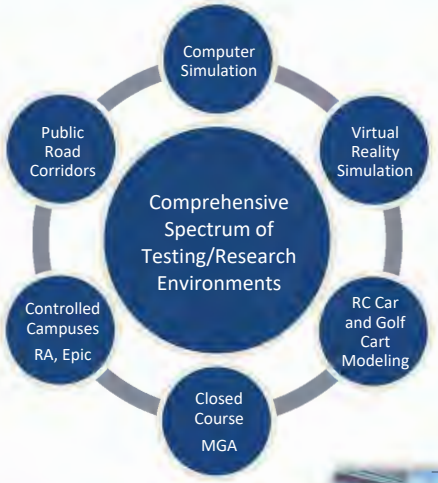
Source: IIAF

Source: Wikipedia

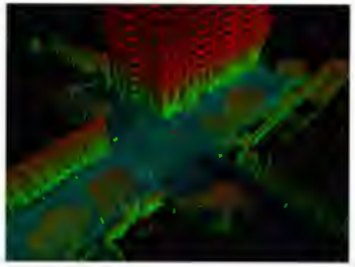
The next 15 years in transportation will be more transformative than any time in our history

- Highly automated vehicles will begin to enter and disrupt the market
- Downtown cores and interstates will be the first movers
- Crashes will decrease and the types of crashes in the mix will change
- The transition offers many challenges and unanswered questions

CAP EAST CONNECTOR – ACES SHUTTLE: PROJECT SCOPE AND OUTLOOK



WISCONSIN AUTOMATED VEHICLE PROVING GROUNDS



Brown County

AMERICAN FAMILY INSURANCE

CITY OF MADISON WISCONSIN

WISCONSIN TOPS

WISCONSIN UNIVERSITY OF WISCONSIN-MADISON

College of Engineering UNIVERSITY OF WISCONSIN-MADISON

SBEL Simulation Based Engineering Lab

WISCONSIN AUTONOMOUS VEHICLE FORUMS

Racine on the Lake

MANDLI COMMUNICATIONS

GWaar

COUNTY of DANE WISCONSIN

mga WISCONSIN RURAL PARTNERS

WISCONSIN DEPARTMENT OF TRANSPORTATION

WISCONSIN STATE PATROL

mGE Madison Gas and Electric

SSTI

metro transit

SCHMIDT'S AUTO INC.

TAPCO Safe travels.

ctaa

Illinois Autonomous Vehicles Association

SOUTHEAST UNIVERSITY

Chippewa Valley REGIONAL AIRPORT

ACES

WiRover
Seamless high bandwidth connectivity on the move

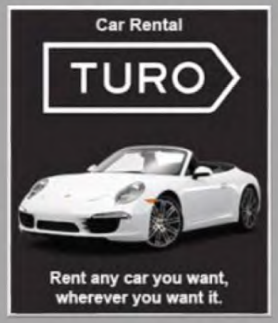
V2V
V2I
V2X

IoT

CV

Shared

AV



EV

Biggest Issues Surrounding AV/CV

- Vehicle Cybersecurity
- Information Privacy
- Vehicle Ethics
- Crashworthiness
- System Disengagements / Driver Re-Engagement
- Complex Driving Situations
- Deep Learning / Artificial Intelligence
- Vehicle Assertiveness
- **Technology is coming – Will we shape it or let it shape us?**

Bringing an Automated Vehicle to Madison

Who's Been Involved in the Process?

- City of Madison
  - Department of Transportation (Traffic Eng., Parking Utility, Metro Transit)
  - Mayor's Office
  - Office of Business Resources / Economic Development
  - Madison Transportation Commission
  - Citizens (Alders, Neighborhood Associations)
- UW-Madison
  - Engineering (Civil and Environmental, Mechanical, Electrical, Industrial Systems)
  - Planning
  - Computer Science
  - Design Innovation Lab
  - Administrators (Transportation Services, UWPD, Community Relations, Risk Management, Corporate Relations, Legal)
- Public/Non-Profit
  - Downtown Madison, Inc.
  - Madison Central BID
  - Greater Madison Chamber of Commerce
  - Dane County and RSVP of Dane County
  - Greater Wisconsin Agency on Aging Resources
  - Wisconsin Rural Partners
  - WisDOT, WSP, Wisconsin DMV
- Industry
  - CapEast Businesses (Festival Foods, Gebhardt, Brink, Big Top Sports, Old Sugar Distillery, Bos Meadery)
  - American Family Insurance
  - Madison Gas and Electric
  - AVPG Test Tracks (MGA, Road America)
  - Others (Green Cab, Schmidt's Towing, Mandli, Continental Mapping, Epic, TAPCO, local entrepreneurs)

Process Timeline

Q4 2015 – Q1 2016: Madison Smart City Challenge

Q4 2016 – Q1 2017: Wisconsin AV Proving Grounds established

Q2 2017: Park Street Connected Corridor established

Q4 2017: First AV Shuttle demo (static demo)

Q2 2018: Second AV Shuttle demo (750 Rides)

Q4 2018: AmFam agrees in principal to fund a UW shuttle

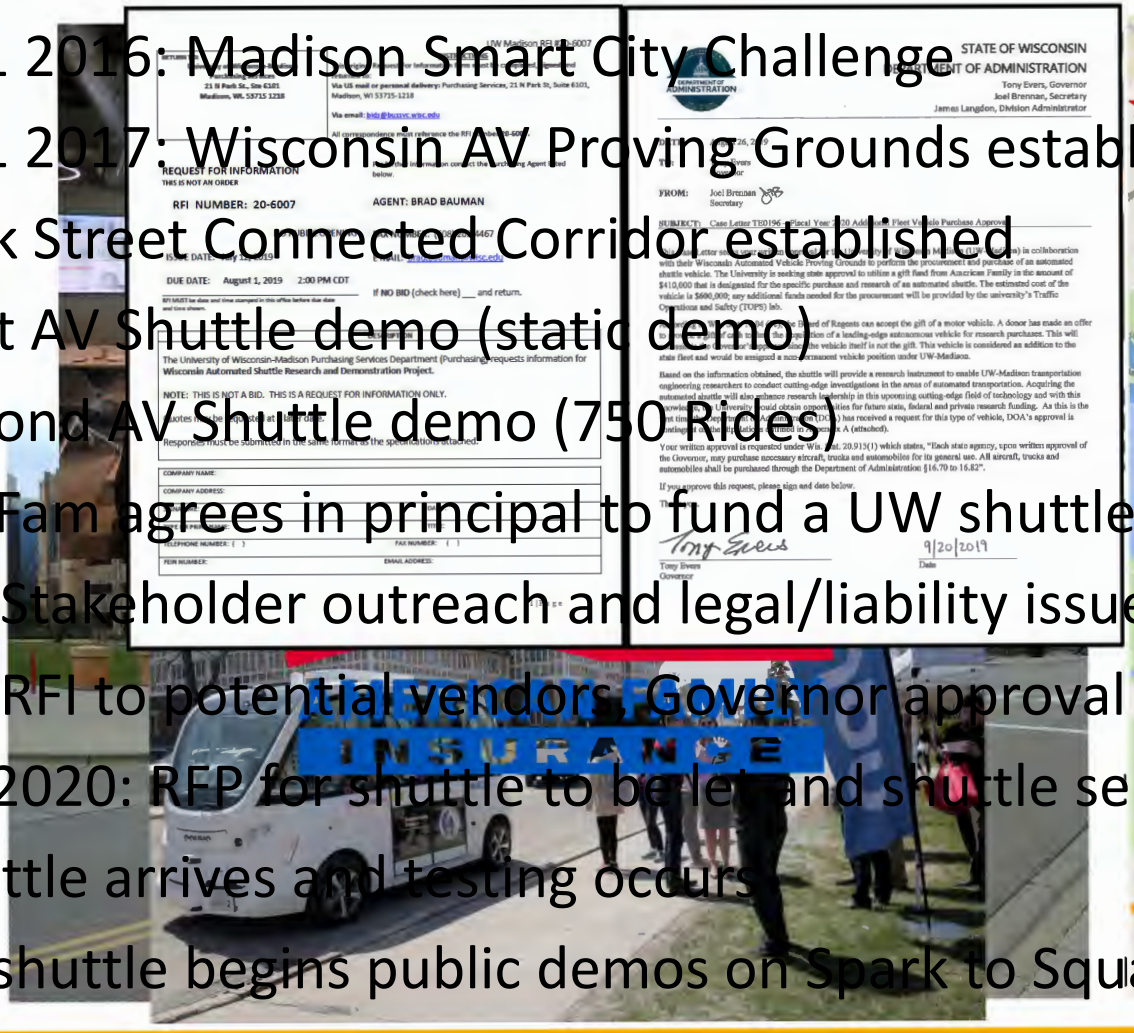
Q1-Q2 2019: Stakeholder outreach and legal/liability issues

Q2-Q3 2019: RFI to potential vendors, Governor approval of purchase

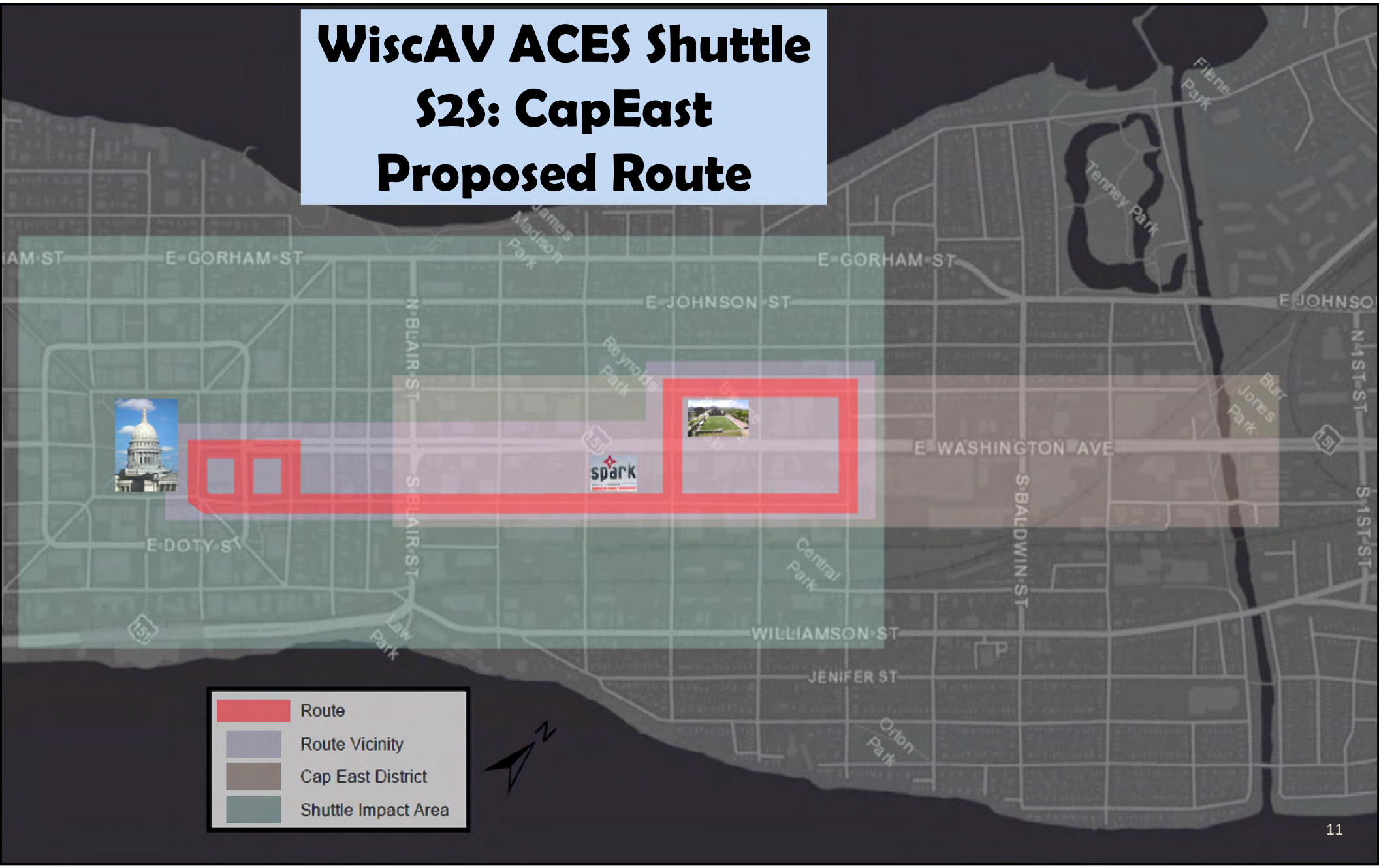
Q4 2019/Q1 2020: RFP for shuttle to be let and shuttle selected

Q2 2020: Shuttle arrives and testing occurs

Q3 2020: AV shuttle begins public demos on Spark to Square Route

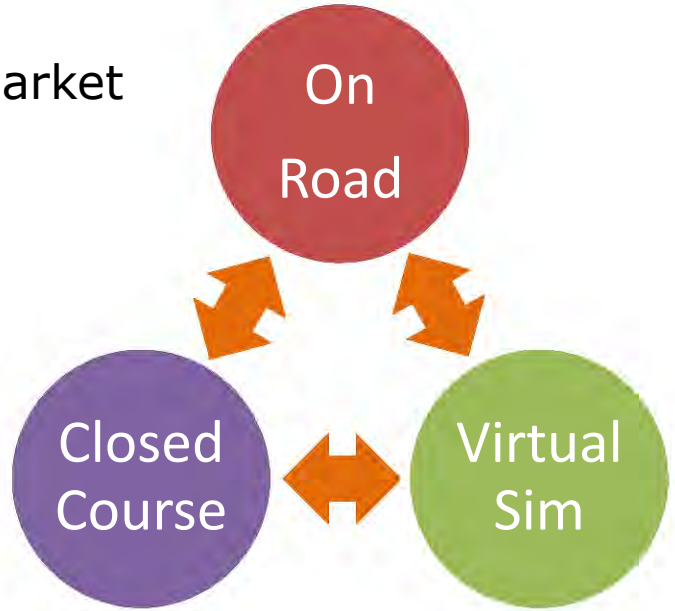


WiscAV ACES Shuttle
S2S: CapEast
Proposed Route

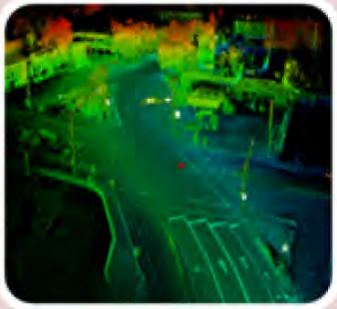


Deployment Strategy – Near Term

- Limited CapEast demonstrations
  - Saturdays for the Dane County Farmers' Market
  - Other special events
  - User-group demo days
  - Emphasis on safety
- Establish data collection system
- Closed-course testing
- Virtual Simulation
- Secure funding for additional research, testing, and deployment



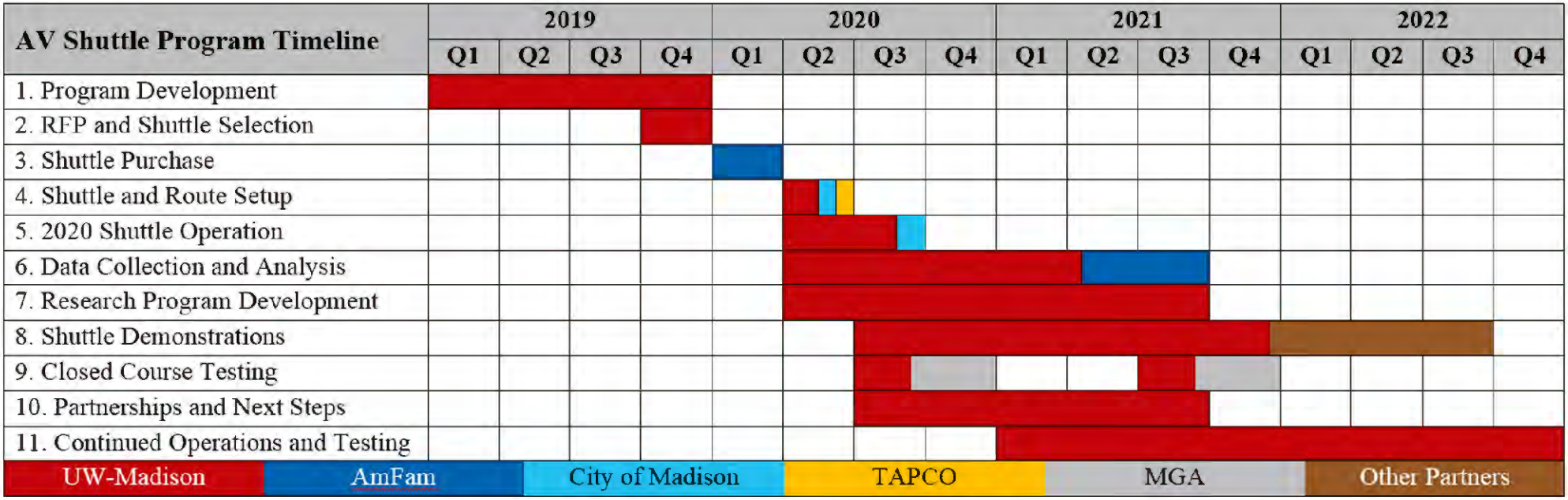
Operational Plan – Safety and Mobility Data

ROADWAY INTERACTIONS	USER INTERACTIONS	SYSTEM DATA	OPERATIONAL DATA	CONNECTED DATA
				
Other Vehicles	User Acceptance	Basic Vehicle Data	Operating Limitations	Vehicle to Infrastructure
Pedestrians	Passenger Comfort	Sensor Data	Obstacle Detection	Vehicle to Anything
Bicyclists	Usage Statistics	Operating Data	Winter Performance	External Sensors
Infrastructure	Survey Responses	Vehicle Security	Changing Traffic Patterns	Data Processing

WiscAV Shuttle ADS Grant Overview

- **Demonstrations**
- **Safety Performance**
  - Performance Measures for Safe Operation of AVs
  - AV Interaction with Pedestrians and Bicyclists
  - Advanced Communications System
  - Simulation for Safety Characterization of AVs
- **Operational Impacts**
- **Agency Needs**
  - Law Enforcement and Traffic Records Data Needs
  - Pavement Marking Maintenance Standards
  - Registering, Licensing, and Insuring AVs
- **Transit Integration**
- **User Acceptance**
  - User Trust
  - Equitable Access
- **Data Sharing**
- **Outreach**
  - State DOT and City
  - Wisconsin Rural
  - National Rural

Current Program Timeline

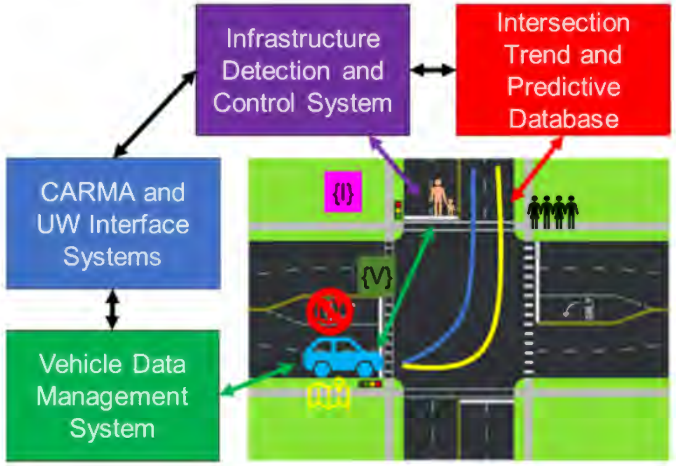


mga research corporation

Closed-Course Testing

- ADS Operational Design Domain Testing
  - Vehicle Performance including AEB, ped detection, grades, environmental factors, and parking
  - Traffic/Obstacle Performance including vehicle interaction, parked cars, structures, emergency vehicles, and roadway obstructions
- Consumer Safety Testing Protocols including IIHS and EuroNCAP

Living Lab – Smart Intersection



- A combined **DSRC/LTE-V2X** roadside unit (RSU) and necessary hardware to integrate the device into the controller – To communicate SPaT and other messages to the vehicle (1, 2)
- **Wireless access points** – for vehicle and VRU localization (1, 2, 3)
- **LiDAR sensors** – to validate detection of VRUs (2, 3)
- A 360 degree **video camera** – to validate detection of VRUs (1)
- **Edge computer** – to process data and communicate with the data center (4)
- Other **controller hardware** (4)

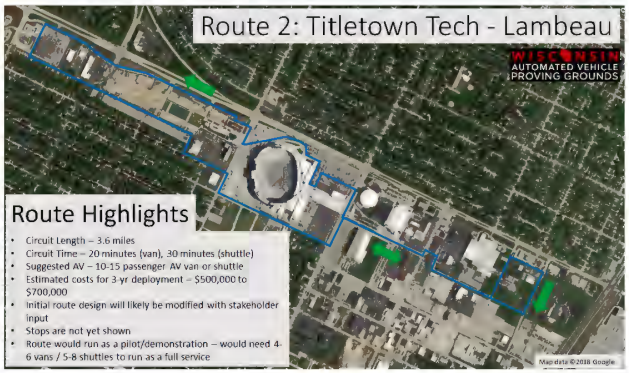
Simulation Environments

- Recreate corridor in virtual simulation and driving simulator environments
- Software-in-the-loop testing
  - Synthetic sensor data
  - Scenario development
  - Data analysis
- Human-user interaction and human factors research
- Near-Miss Categorization

Engaging Stakeholders

- User Acceptance
  - Community demonstrations
  - Vulnerable road users
  - Equitable access
  - Outreach/Public Reaction
- Law enforcement and traffic records data needs
- Registration / licensing / insurance
- Transit integration / training
- City and state data needs

Next Steps



Additional Routes

- Madison First/Last Mile Route
- UW-Madison Route
- Community/Technical College Routes
- Brown County AV Route(s)
- SE Wisconsin Route(s)

Additional Vehicles

- Integrating vehicles with transit (dynamic routing)
- Closed course scenario testing and standards development
- High speed AVs on freeways, rural two-lane arterials

Additional Data

Thank You

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Stay Engaged

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