



Madison CAV Technologies

Yang Tao, PhD, PE
City Traffic Engineer
City of Madison

Wisconsin Automated Vehicle
External Advisory Committee Meeting
March 18, 2021



THE UNIVERSITY
of
WISCONSIN
MADISON



Building a Smart Madison for Shared Prosperity



3 Main Components

- Intelligent data collection, analysis, and sharing
- Autonomous, connected, and electric vehicles
- Smart infrastructure



Smart Park Street Corridor

- Inspiration
 - Needs on Park Street
 - Smart City
 - The SPaT Challenge
- Wisconsin's first CV infrastructure
- One of the first cities in the nation to meet the V2I DC deployment goal



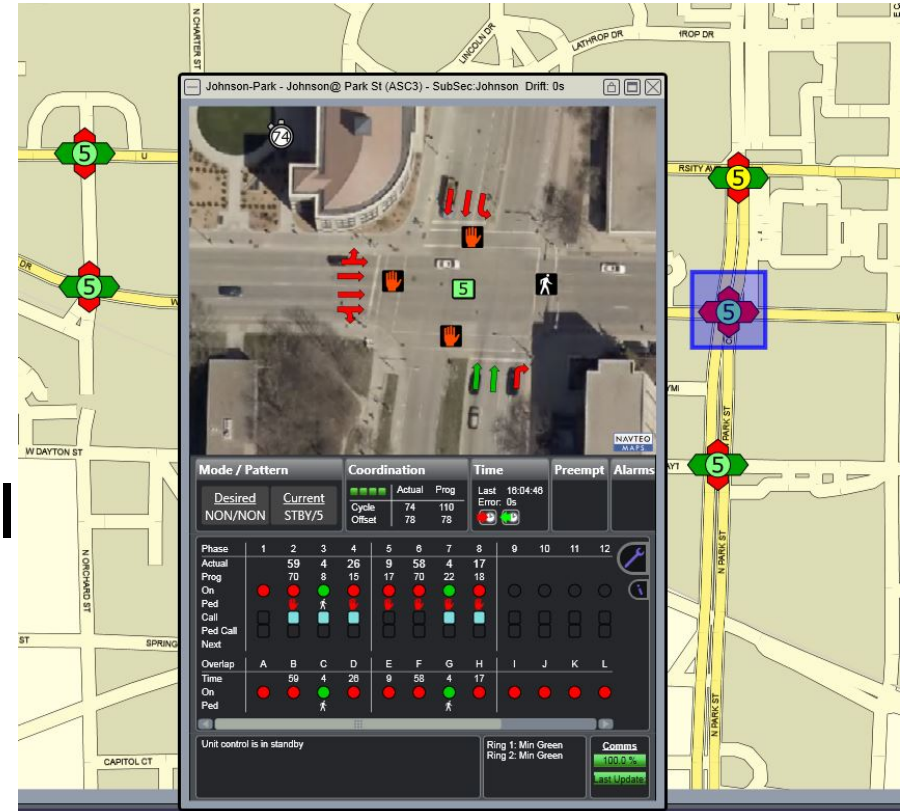
Project Team

- City of Madison
- UW-Madison TOPS Lab
- UW-Madison Computer Science
- WisDOT
- Econolite
- Siemens
- TAPCO
- Other Private Partners



State-of-the-Art Traffic Signal Systems

- Advanced traffic controllers
- Robust fiber optic communications network
- State-of-the-art signal management system
- Innovative detection and count systems
- Performance measurement systems

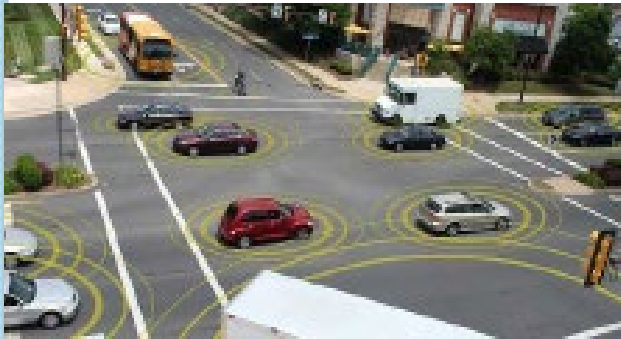


Description	Type	General Status	Communications	Alerts	Alarms	Primary Street	Secondary Street
Broadway @ Pier 37	TOD/FREE	100.0 %	0	0	Broadway	Pier 37	
in 2014 construction	Offline	0.0 %	0	0	Mckee Rd	Seminole Hwy	
Gorham @ Ingersoll	STBY/5	100.0 %	0	0	Gorham	ingersoll	
Mckee Rd @ Nesbit	Comm Fail	1.0 %	0	1	Mckee Rd	Nesbit	
Johnson@ State Street	STBY/5	100.0 %	0	0	Johnson	State St	
Fish Hatchery @ EB Bellline Ramps	STBY/5	100.0 %	3	0	Fish Hatchery	Bellline	



Project Scope

- Pilot and deploy connected vehicle technology to improve:
 - Safety
 - Mobility
 - Bus on-time performance
 - Equity
- Dedicated short range communication (DSRC)
- Vehicle to infrastructure (V2I), Vehicle to Vehicle (V2V), Vehicle to Everything (V2X)



Communication Technology

- DSRC (Dedicated Short Range Communication)
- The Safety Band: 5.9 GHz band (5850-5925 MHz)
- Recent FCC action
- C-V2X (Cellular Vehicle-to-Everything) ?
- Leveraging existing V2X Investment in the changing spectrum environment



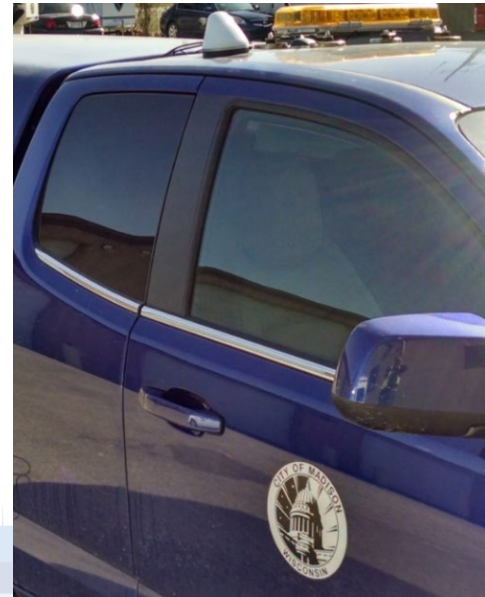
Project Outcome

- Next generation Transit Signal Priority
- Improved safety, especially for vulnerable road users
- Improved mobility, especially during special events
- Signal Priority for snow plows and freight vehicles
- Test corridor for private sector for V2I, V2V and V2X applications
- Establish Madison and Wisconsin as the Upper Midwest hub for CV & AV



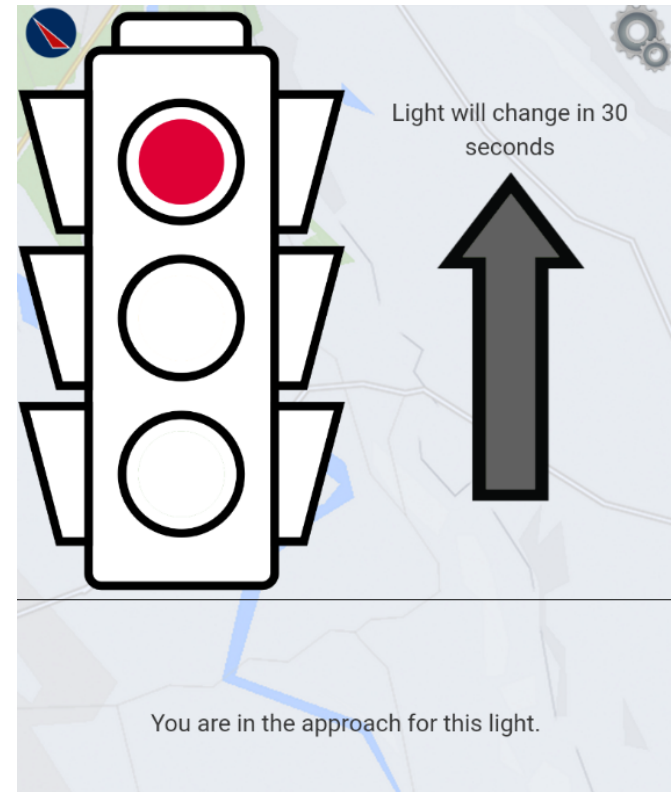
Deployment

- 15 Siemens RSU
- 2 Savari RSU
- 2 Savari OBU
- 22 Danlaw OBU from USDOT (in progress)



CV Pooled Fund Study

- 34 federal, state and local agencies
- Madison Park Street Project chosen for support
- MMITSS deployment
 - MAP + SPaT
 - VISSIM modeling
 - MMITTS software



Processed BSMs

```

{
  "Type": "BSM",
  "Number": 84,
  "VehicleID": "69AAC6EC",
  "VehicleClass": "PASSENGER",
  "Latitude": 43.0717972,
  "Longitude": -89.4092214,
  "Speed": 0.071,
  "Elevation": 229.291,
  "Heading": 348.02064,
  "Self": true
}
{
  "Type": "BSM",
  "Number": 35,
  "VehicleID": "0B3B7BFF",
  "VehicleClass": "PASSENGER",
  "Latitude": 43.0717665,
  "Longitude": -89.4091939,
  "Speed": 0.1,
  "Elevation": 238.8,
  "Heading": 177.6375,
  "Self": false
}
    
```

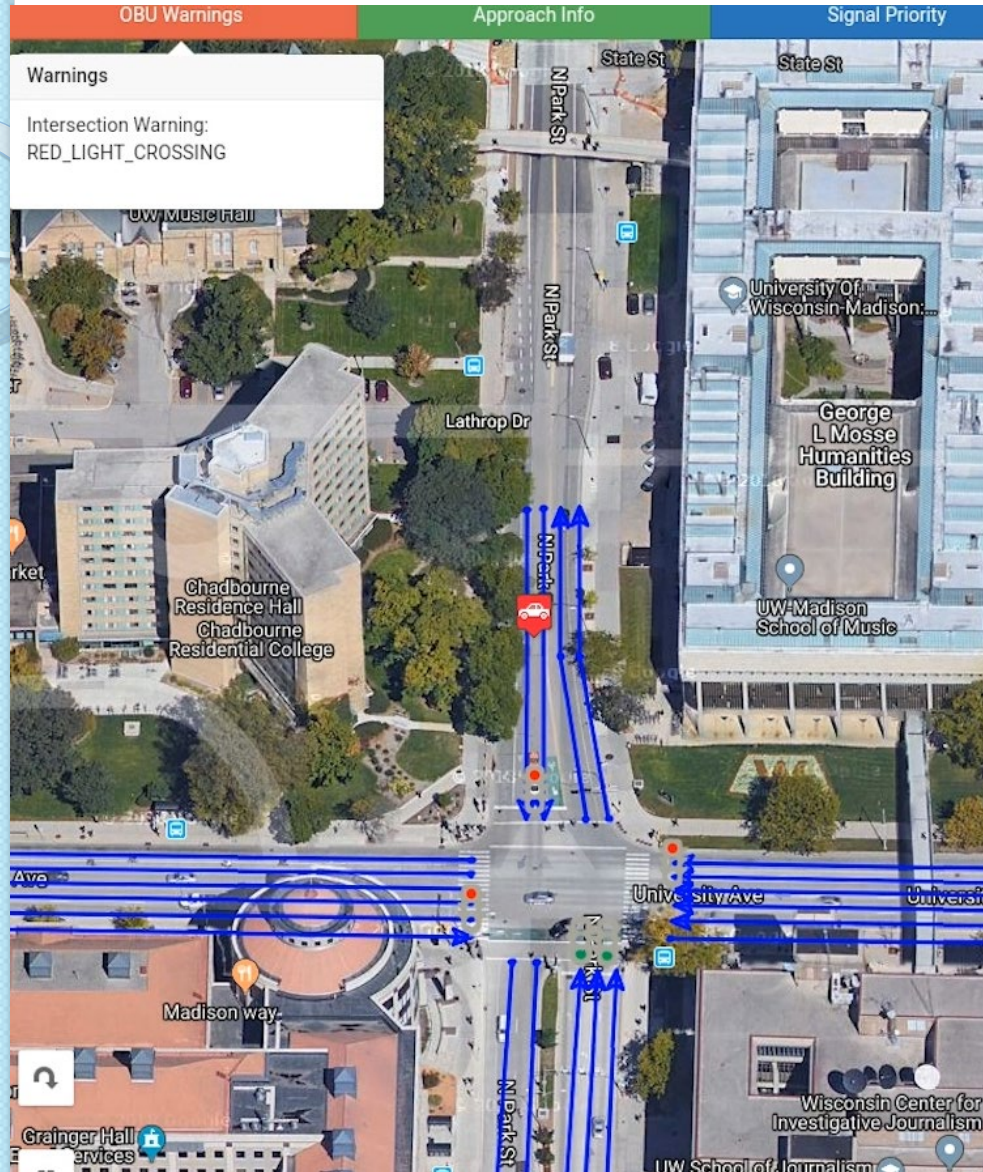
Warnings

No warnings have been generated yet.

Statistics

```

{
  "Type": "Statistics",
  "BSMs": 3127,
  "MAPs": 0,
  "SPATs": 0,
  "PSMs": 0,
  "RTCMs": 0,
  "SignalRequest": 0,
  "SignalPriorityStatus": 0,
  "TIMs": 0,
  "Others": 0,
  "Unknown": 0
}
    
```



NOCoE Featured Projects

Map Satellite

Description: The City of Madison, in collaboration with UW-Madison, will equip 20-30 intersections with the DSRC technology along the 4-mile long Park Street/Fish Hatchery Road corridor. The City Traffic Engineering Division and UW TOPS Lab will coordinate with Madison Metro Transit to install onboard units on buses that run the corridor multiple times per day. The initial step provides priority to buses behind schedule, leveraging open-source software – the prototype Multi-Modal Intelligent Traffic Signal System (MMITS) with Transit Signal Priority (TSP) available via the Open Source Application Development Portal. Success for the initial deployment will be measured through improved travel-time and on-time reliability of transit vehicles, while causing minimal adverse effects on other road users. Then onboard units will be installed on select fire trucks, ambulances and taxis that frequently use the route. Eventually applications will be developed for vehicle-to-pedestrian and vehicle-to-bicycle communications. The test-bed will also be open to other private partners for testing and research purposes.

Contact: Yang Tao, Ph.D., P.E., City of Madison,
ytao@cityofmadison.com, (608) 266-4815





MADISON, WISCONSIN



WISCONSIN
AUTOMATED VEHICLE
PROVING GROUNDS

► **OUR PARTNERS**



College of Engineering
UNIVERSITY OF WISCONSIN-MADISON

City of Madison

Epic Systems

GTiMA

Mandli Communications

MGA Research Corp.

Road America

UW-Madison Transportation Services

One of the 10 former
USDOT Designated
AV Proving Grounds



THE UNIVERSITY
of
WISCONSIN
MADISON

AV Microtransit Demonstration



April 2018, UW-Madison



THE UNIVERSITY
of
WISCONSIN
MADISON



College of Engineering
UNIVERSITY OF WISCONSIN-MADISON



MADISON AV SHUTTLE DEPLOYMENT

The Foundation of Automated Vehicle Research and Development in Wisconsin

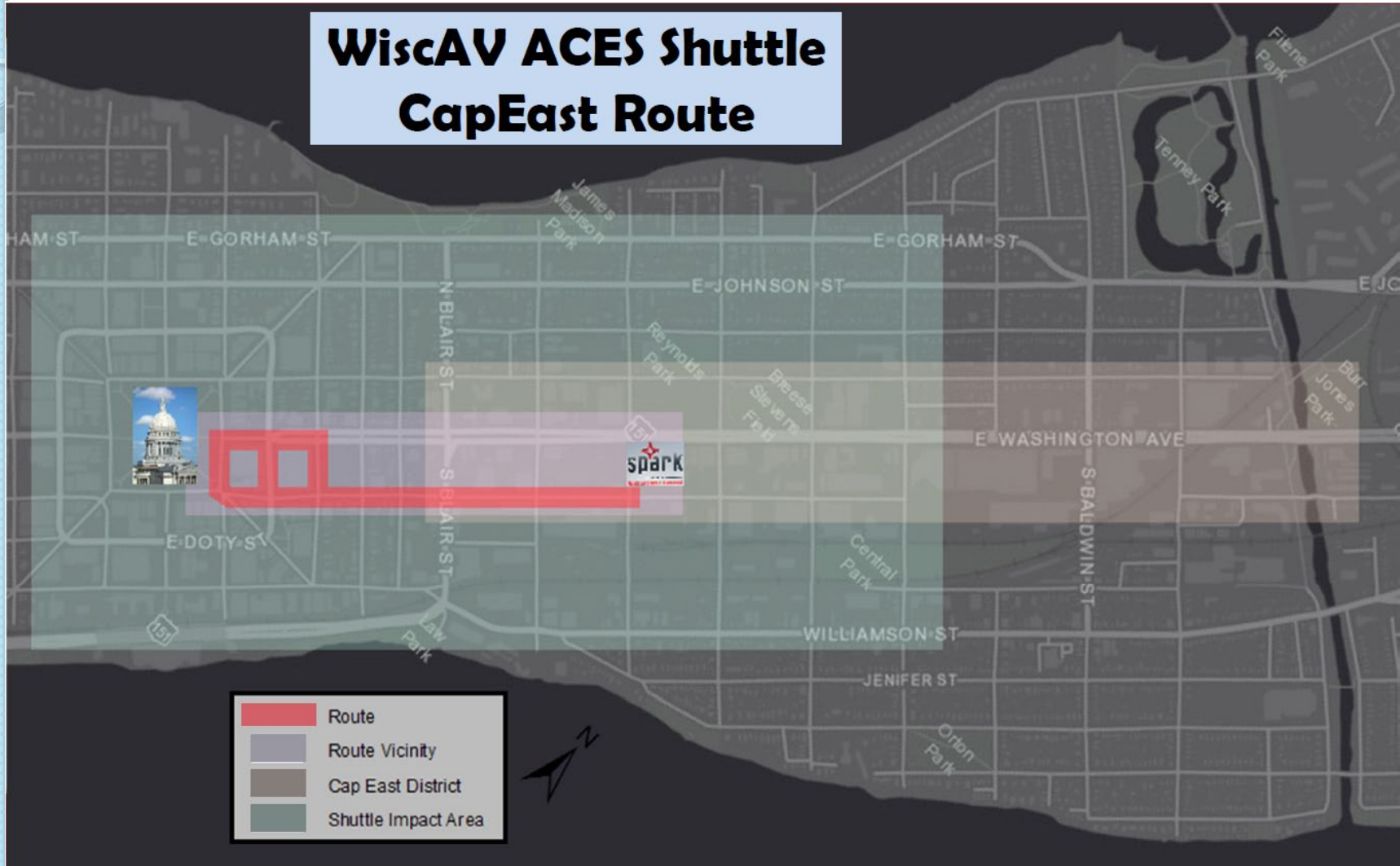


THE UNIVERSITY
of
WISCONSIN
MADISON



AV Pilot Under Consideration

WiscAV ACES Shuttle CapEast Route



Personal Delivery Devices in Madison



Stakeholder and Public Engagement



**DRIVERLESS CARS:
HOW SHOULD MADISON PREPARE?**

THE CAP TIMES TALKS
PANEL SERIES

HIGH NOON SALOON
701 E WASHINGTON AVE

TUE FEB 21
6:30 MEET & GREET 4:00 PM
DISCUSSION 6:30-7:30 PM

PANELISTS
TERESA ADAMS
UW-MADISON
MAURICE CHEEKS
ALDERMAN
DAVE CIESLEWICZ
WISCONSIN BIKE FED
FRED RISSER
STATE SENATOR, D-MADISON
SUSAN SCHMITZ
DOWNTOWN MADISON INC.
YANG TAO
MADISON TRAFFIC ENGINEERING

MODERATED BY
ERIK LORENZSONN CAP TIMES

SPONSORED BY
Heartland CREDIT UNION



THE UNIVERSITY
of
WISCONSIN
MADISON

Collaboration is Key

- The self-driving future: utopia vs. dystopia
- Collaboration across sectors is needed for the greater public good:
 - Governmental policy
 - Academic research
 - Industry cooperation
 - Public engagement



A Leader in the Nation



Contact

Yang Tao, PhD, PE
City Traffic Engineer
Madison, Wisconsin
ytao@cityofmadison.com

