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UMTRI's Roots in Connected Vehicles



SPMD Launched
August 21, 2012 1:00.00 PM

AACVTE Transition started
May 11, 2015



Connected Vehicle Investment in Ann Arbor

SPMD: \$30.3M (2011 – 2014)

- \$25.5 M Federal Funds
- \$4.8 M Cost Share
 - University of Michigan (\$3.9M)
 - MEDC (\$450K)
 - MDOT (\$300K)
 - Program Partners (\$196K)

AACVTE: \$15.2M (2015 – 2018)

- \$9M in Federal Funds
- \$6M Cost Share
 - MEDC (\$3M)
 - Mcity (\$2.25M)
 - Program Partners and Suppliers (\$950K+)

Mcity Investment: \$4.1M (2019 – 2021)

- \$3.4M Operations and Maintenance
- \$150K Green Hills
- \$550K Pedestrian Detection

TOTAL INVESTMENT: \$49.6M



AACVTE Deployment Plans

- **2016 Industry Standards, fully certified**
- **70 infrastructure locations:**
 - **3 Curve Speed Warning Sites**
 - **4 Pedestrian Crosswalks**
 - **8 Freeway Sites**
 - **1 Roundabout**
 - **5 Staging/Testing Sites**
 - **49 Intersections**
- **2,650 minimum Vehicle Deployments**
 - **1,500 Vehicle Awareness Devices**
 - **1,150 Aftermarket Safety Devices**
- **Additional Applications**
- **GNSS**



Supplier Selection

- **Vehicle Awareness Device (VAD)** – Only sends the basic safety message. Does not generate warnings.
 - Aptiv (1500)
- **Aftermarket Safety Device (ASD)** – Sends and receives the safety messages. The device issues visual and/or audible warnings to the driver.
 - Danlaw (1,150)
- **Roadside Equipment (RSU)** – Devices installed into the infrastructure that both send and receive safety messages, and can interface with traffic control systems.
 - Lear (70)











ASD Driver Vehicle Interface (DVI) Hardware

- DVI selection by UMTRI
 - UMTRI speaker
 - Danlaw display
 - Warnings – combination of text and tones
- DVI Arbitration specified by UMTRI
 - Only one warning at a time
 - No pre-emption
 - Some warnings are ignored



ASD On-Board Applications

- Applications developed by the Supplier
- Subjective assessment by UMTRI

Vehicle	Warning	Infrastructure	Warning
Pedestrian in Crosswalk (V2P)		Curve Speed Warning (CSW)	
Forward Collision Warning (FCW)		Ice Warning	
Emergency Electronic Brake Light (EEBL)			
Red Light Violation Warning (RLVW)			
Emergency Vehicle Approach (EVA)			
Intersection Movement Assist (IMA)			



AACVTE Data Collection Plans

- For Research
 - RSU Offload every hour, full pcaps
 - PVDs from deployed OBUs when in vicinity of RSU
 - Vehicle stored pcaps upon download at UMTRI
 - Video data from pedestrian detection sites
- For Traffic Control
 - Real time
 - RSU BSM Forward
 - Streamed from Traffic Signal Controller
 - SPaT
 - Signal Detection Data



AAIMS and Other Projects

- Ann Arbor Integrated Mobility System
 - UMTRI, Ford and City
 - Awards will be announced in October
- Other Projects leveraging AACVTE include:
 - Alleyway Management – pilot downtown
 - Dynamic Traffic Control – deploy on Plymouth Rd
 - Pedestrian Detection – from 4 to 19 mid-block crossings (starting on Plymouth Rd)
 - Eco- Approach and Departure (Dixboro – Barton)



