US 1 SPaT Deployment via Connected Vehicle Technology

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August 26, 2021
Example of a Connected Ecosystem
Defining Communications: V2V

Vehicle-to-Vehicle (V2V) Communications

Drivers receive warnings and information in-vehicle.
Defining Communications: V2I

Vehicle-to-Infrastructure (V2I) Communications

Drivers receive warnings and information in-vehicle

Infrastructure receives information about the dynamic transportation ecosystem
Defining Communications: V2X

- Vehicle-to-Vehicle (V2V) Communications
- Fixed Infrastructure V2I Communications
- Mobile or Temporary Line-of-Sight V2I Communications
- Vehicle to Pedestrians -- and other roadway users with mobile devices
Defining Communications: V2X

- Vehicle-to-Vehicle (V2V) Communications
- Fixed Infrastructure V2I Communications
- Mobile or Temporary Line-of-Sight V2I Communications
- Vehicle to Pedestrians -- and other roadway users with mobile devices

Drivers receive warnings and information in-vehicle
Technology Used to Communicate

**DSRC**
Transmits data directly from one point to another at a very low latency (e.g. 10 times per second)

**C-V2X (includes 5G)**

Network communications
V2N on "Uu" interface operates in traditional mobile broadband licensed spectrum

Direct communications
V2V, V2I, and V2P on "PC5" interface\(^1\), operating in ITS bands (e.g. ITS 5.9 GHz) independent of cellular network

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\(^1\) PC5 operates on 5-90Hz, whereas, Uu operates on commercial cellular licensed spectrum. RBU stands for roadside unit.
US 1 - Project Description

• US 1 / I-95 / MD 175 technology corridor to pilot innovative connected vehicle applications

• Messaging will occur over two separate deployments:
  • Traffic Signal data to approaching vehicles with associated lane / approach information (Signal Phase and Timing)
  • Origin-Destination data during incident conditions (or other major events)

• Dual-mode units (DSRC and CV2X compatible)

• Messaging will be secured through our statewide SCMS platform

• Schedule: currently being deployed!
Specific Deployment Locations for Signal Data
Specific Deployment Locations for Origin-Destination Data
How does SPaT Work?

For the message to be sent out

- Development of MAP message (geographic layout of intersection)
  - Best practice / standards exist (CV PFS)
- Standardization of signal data from controller to generate the SPaT (requires MAP)
  - Best practice / standards exist (e.g., SAR J2735)
- RSU capable of sending SPaT/MAP
  - Best practice / standards existing (ITE RSU released 2021)
- Ideally, includes a security credential message so receiving unit knows it is official (for Maryland register on the SCMS platform)

For the message to be received

- Need an on-board unit
- Develop application system by OEM/developers (not an IOO function)
- Ideally, includes a security credential message mechanism
What Does it Look Like (ex. from Prince George’s County DPW&T)

SOURCE: Prince George’s County DPW&T
Example Deployment over cellular/Wifi

See video at https://www.traffictechservices.com/
SPaT Opportunities & Limitations

**Opportunities**

• CV capabilities are an upgrade of existing signals (i.e., not a full reconfiguration of the entire signal controller)

• Supports intersection safety and emissions/driving efficiency

• Maryland has knowledge & national involvement to help others adopt the technology

**Limitations**

• Federal Communications Commissions spectrum use restrictions / uncertainties

• Lack of OEM/developer deployments of OBUs to develop applications

• Lack of knowledge of these technologies across local jurisdictions

• Will require upskill and some new equipment in the controller
**TANGENT:** Maryland CAV Strategic Framework

Full report, plus 1-Page Executive Summary available at:

[https://mva.maryland.gov/safety/Pages/MarylandCAV.aspx](https://mva.maryland.gov/safety/Pages/MarylandCAV.aspx)
TANGENT: Maryland CAV Technical SubGroup

- **Co-chairs**: Ed Jones (Prince George’s) and Gervais M bunkeu (Montgomery)
- Looking to advance CAV technical applications and deployments
- To join contact Carole Delion at cdelion@mdot.Maryland.gov
Questions/Discussion
THANK YOU

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