

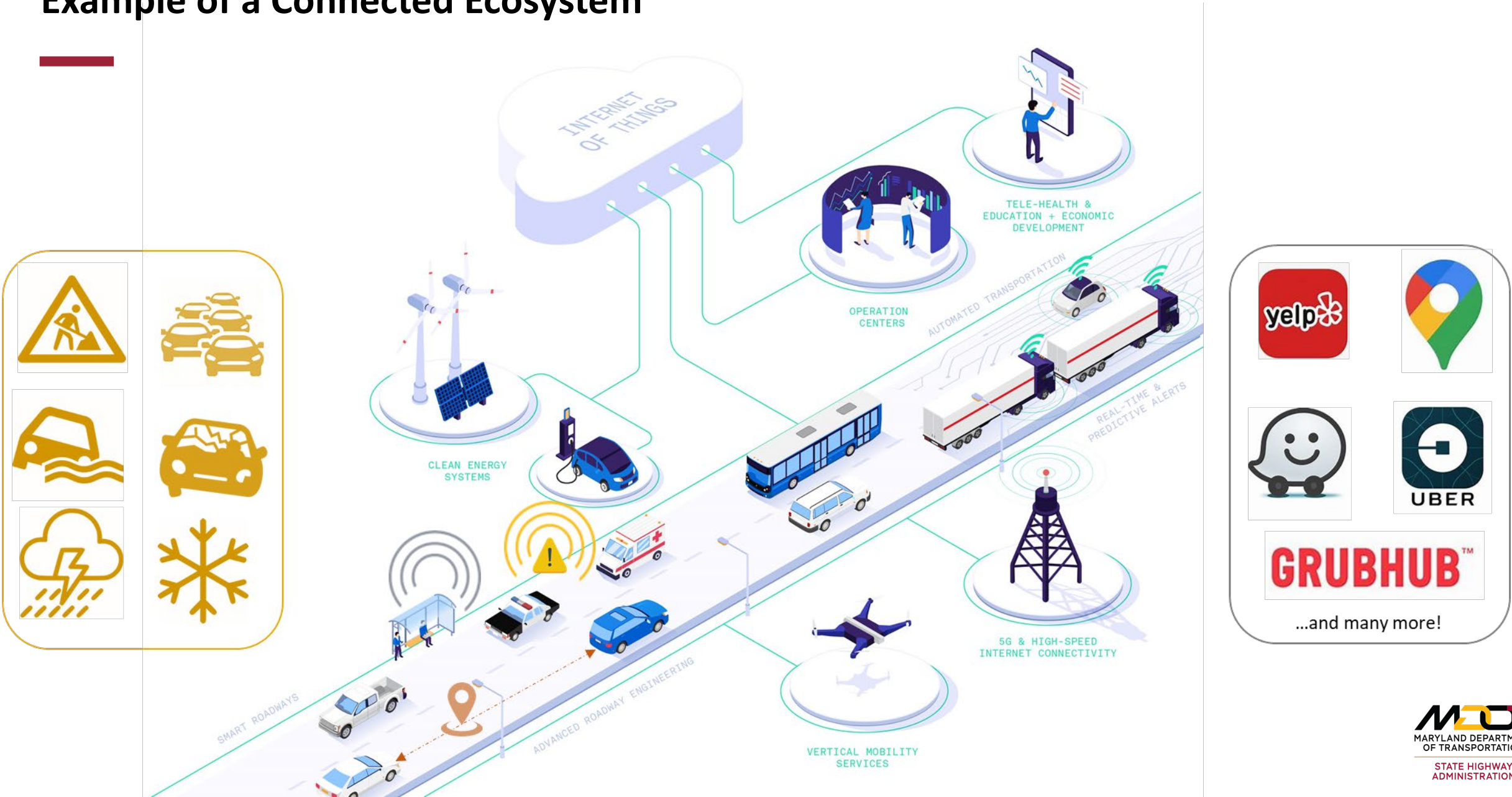
US 1 SPaT Deployment via Connected Vehicle Technology

Carole Delion, P.E.

August 26, 2021



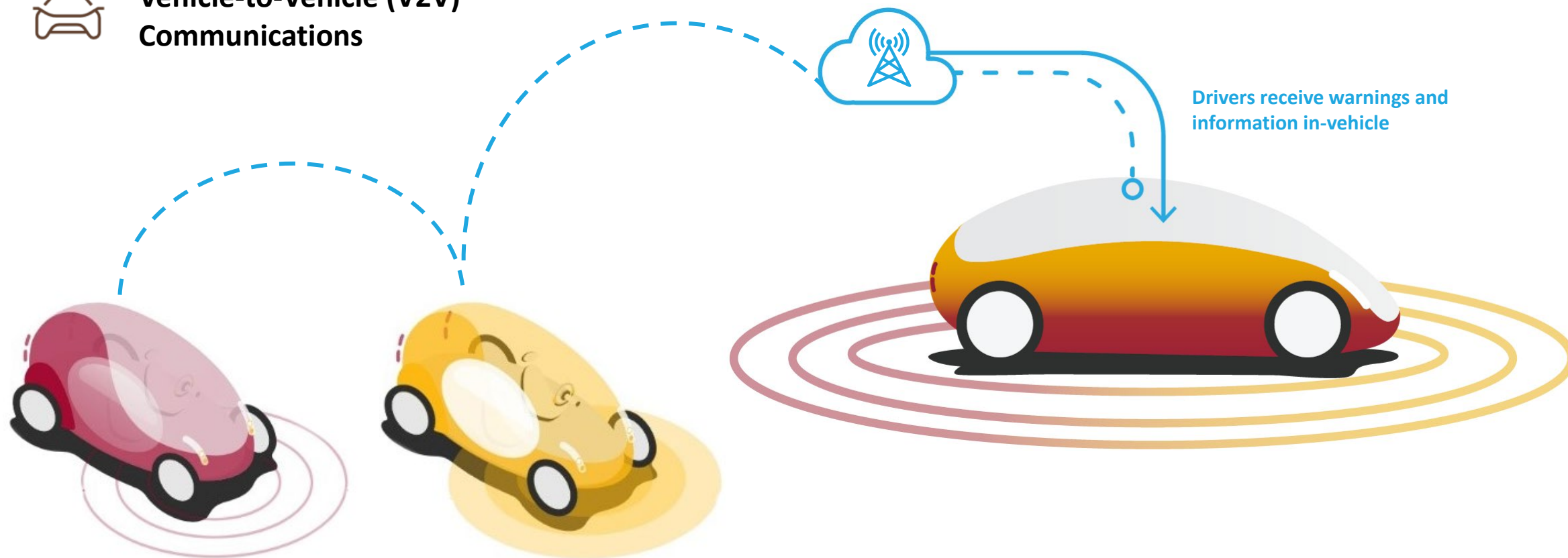
Example of a Connected Ecosystem



Defining Communications: V2V

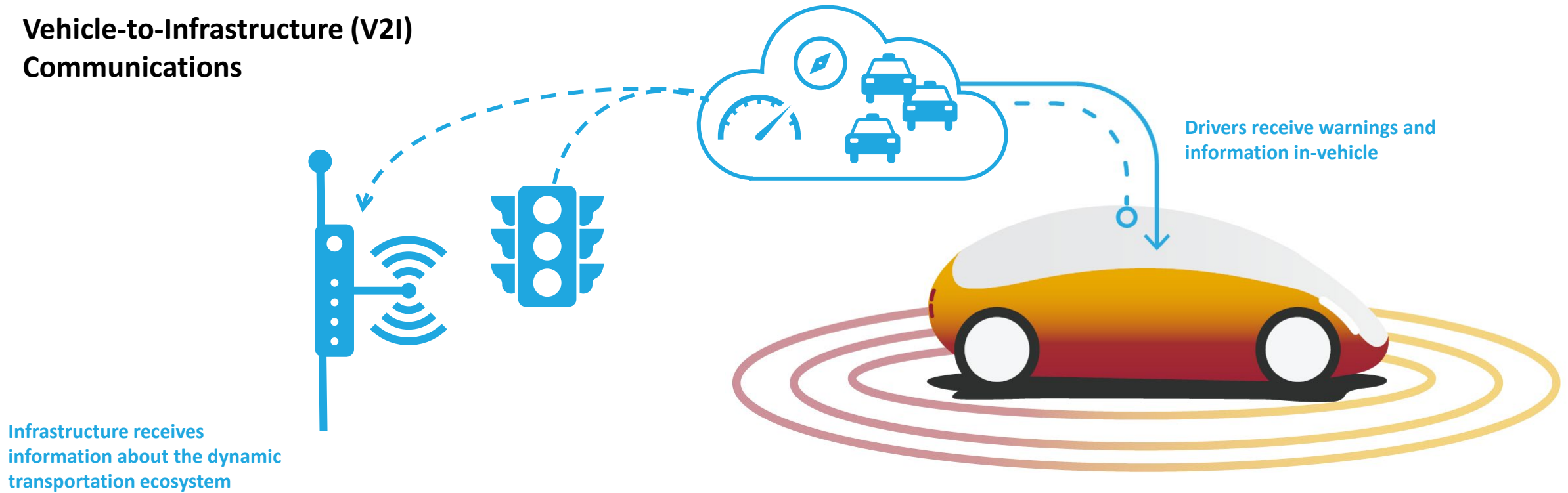


Vehicle-to-Vehicle (V2V) Communications



Defining Communications: V2I

Vehicle-to-Infrastructure (V2I) Communications



Defining Communications: V2X



**Vehicle-to-Vehicle (V2V)
Communications**



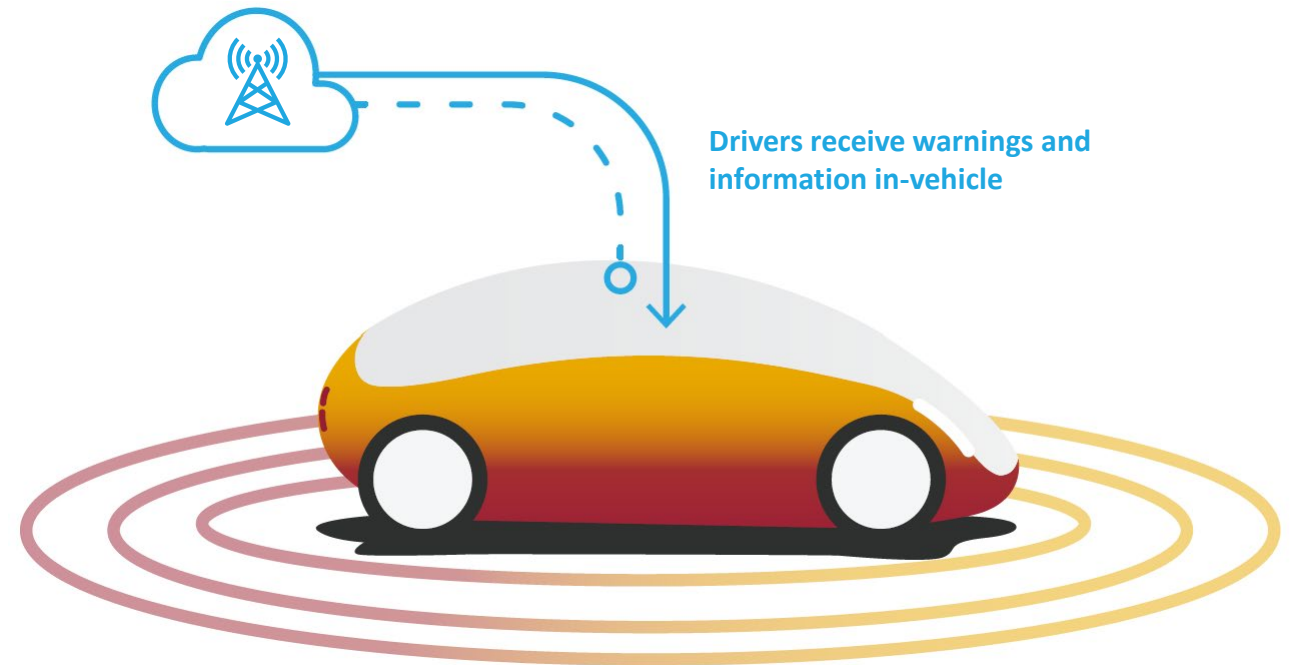
Fixed Infrastructure V2I Communications



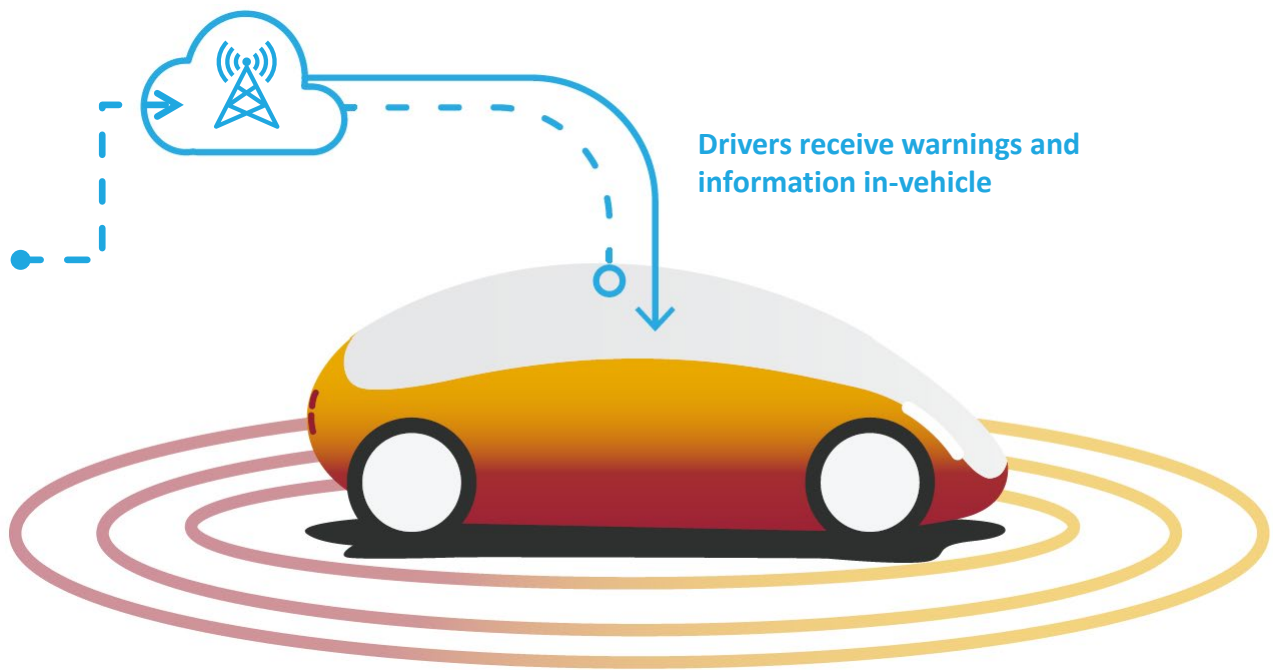
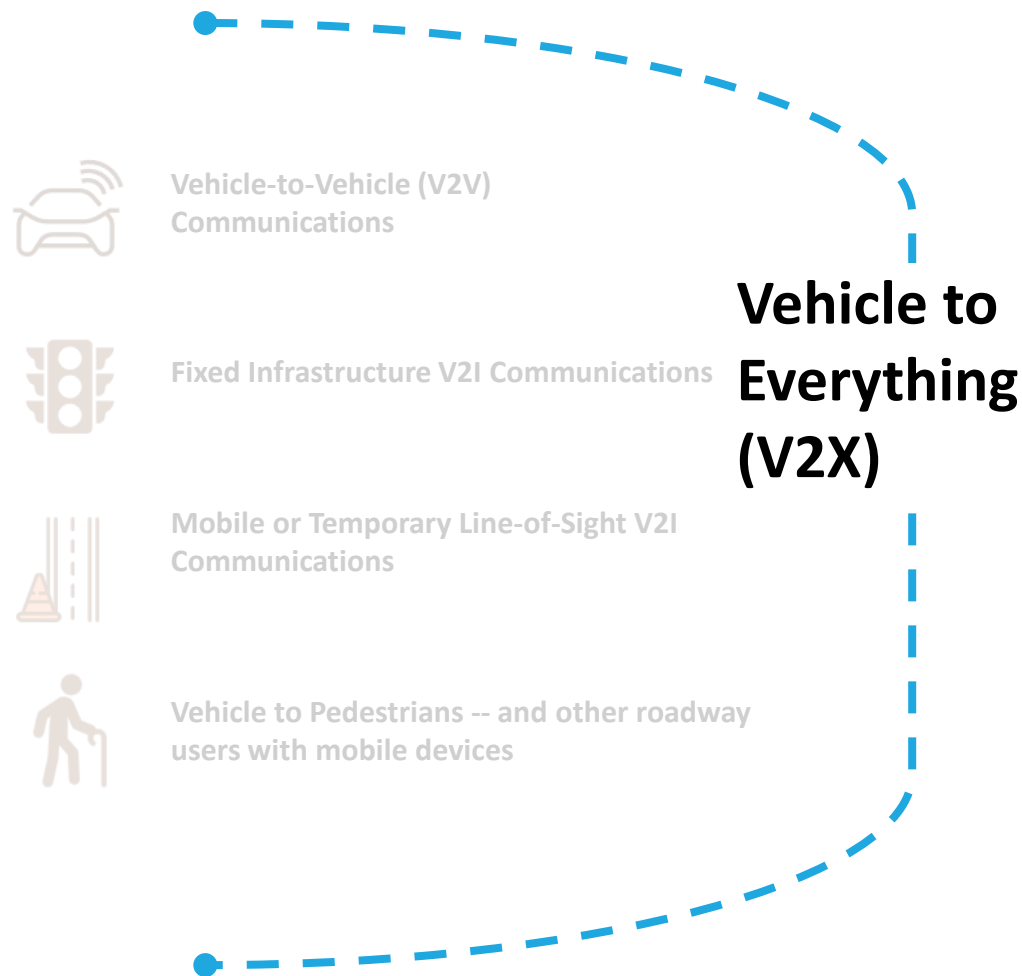
Mobile or Temporary Line-of-Sight V2I Communications



**Vehicle to Pedestrians -- and other roadway users with
mobile devices**



Defining Communications: V2X



Technology Used to Communicate

DSRC

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



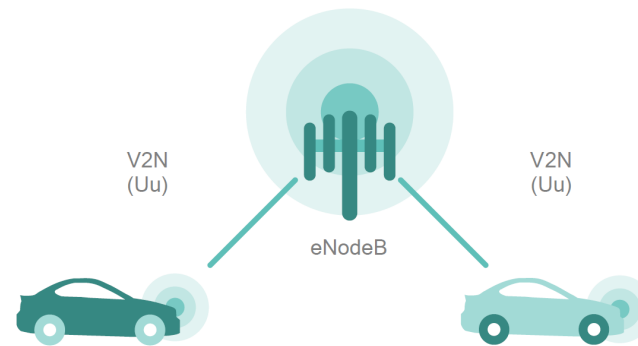
C-V2X (includes 5G)

Network communications

V2N on “Uu” interface operates in traditional mobile broadband licensed spectrum

Uu interface

e.g. accident 2 kilometer ahead



Direct communications

V2V, V2I, and V2P on “PC5” interface¹, operating in ITS bands (e.g. ITS 5.9 GHz) independent of cellular network

PC5 interface

e.g. location, speed

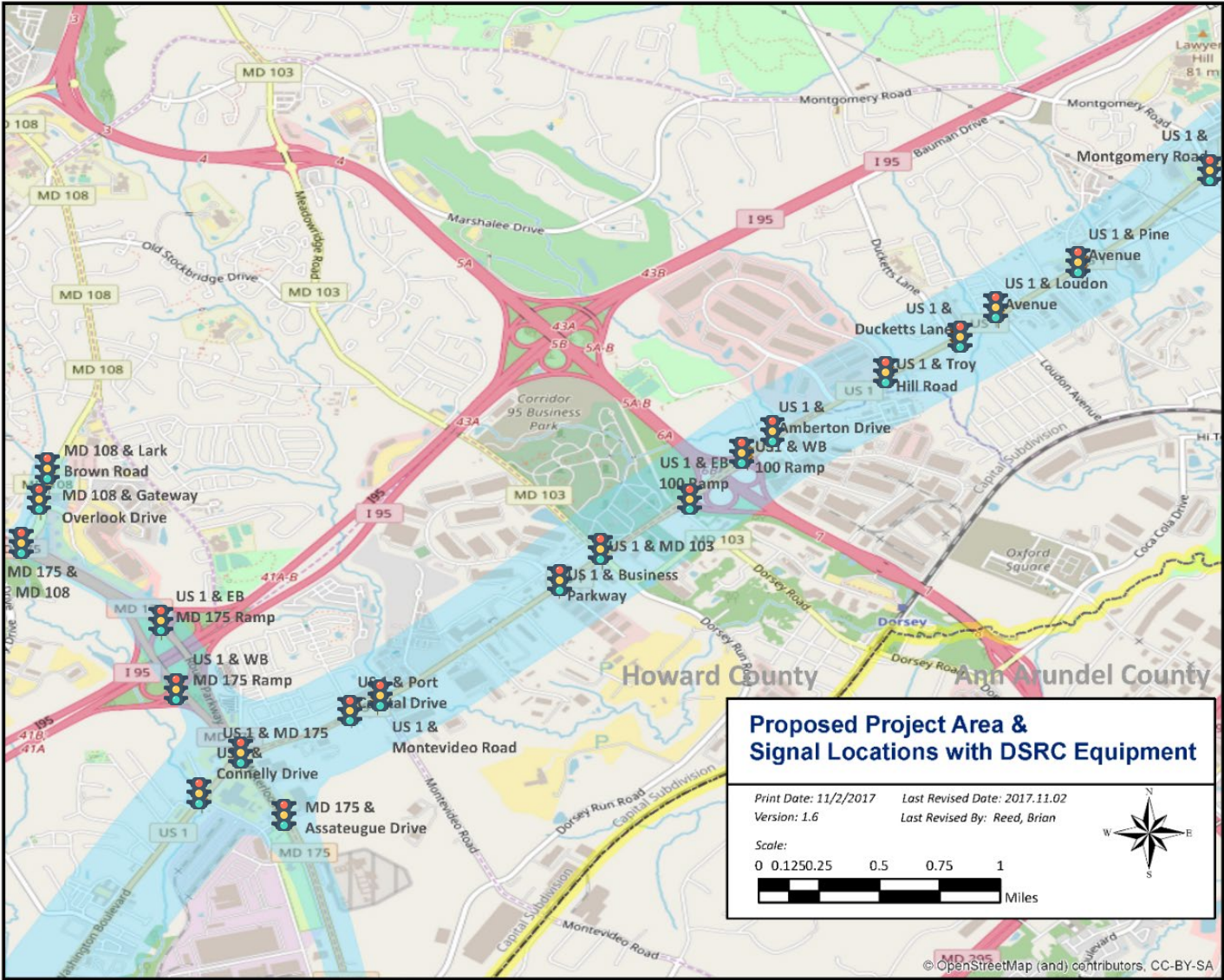


1. PC5 operates on 5.9GHz; whereas, Uu operates on commercial cellular licensed spectrum 2. RSU stands for roadside unit.

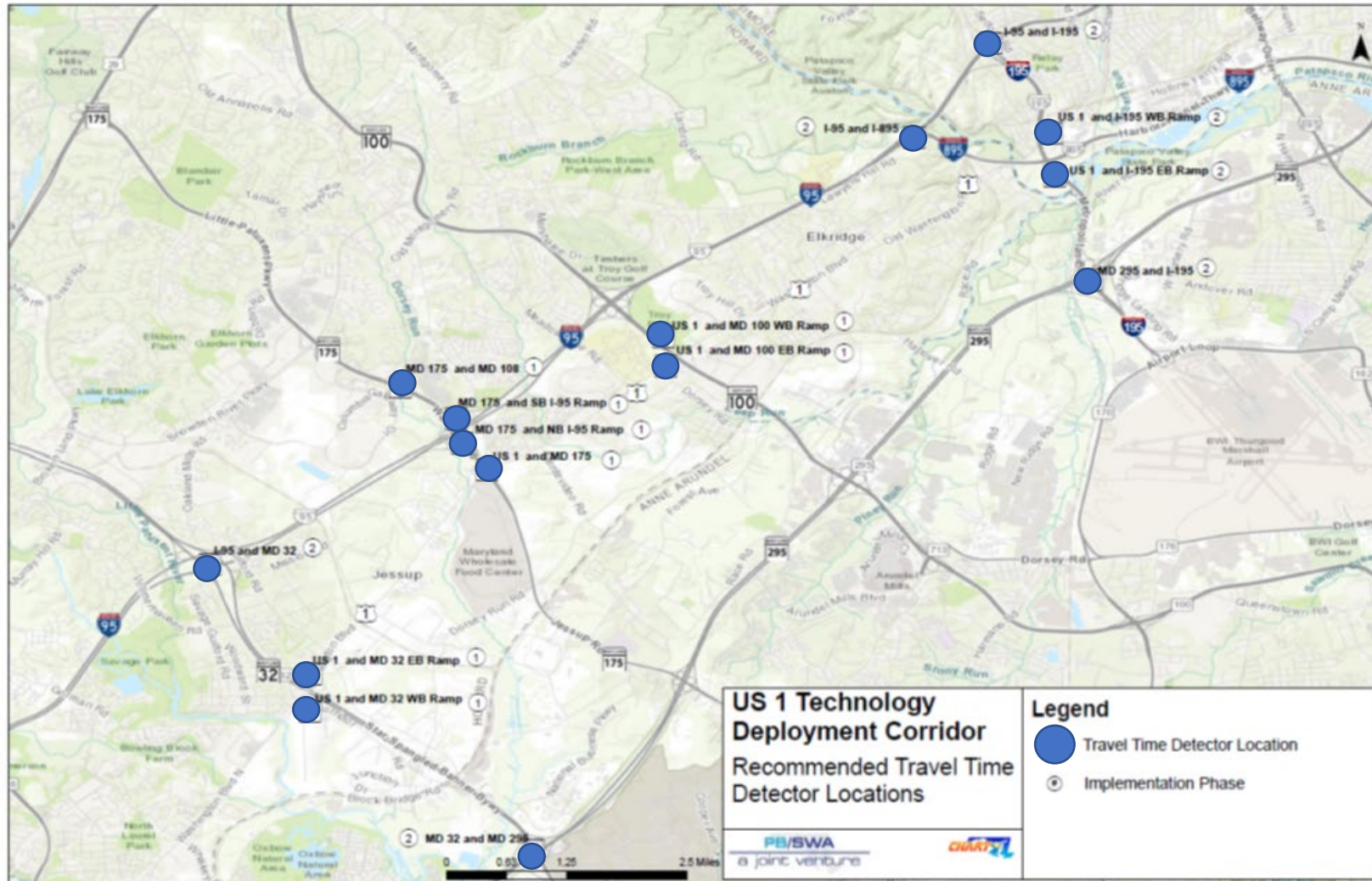
US 1 - Project Description

- 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?

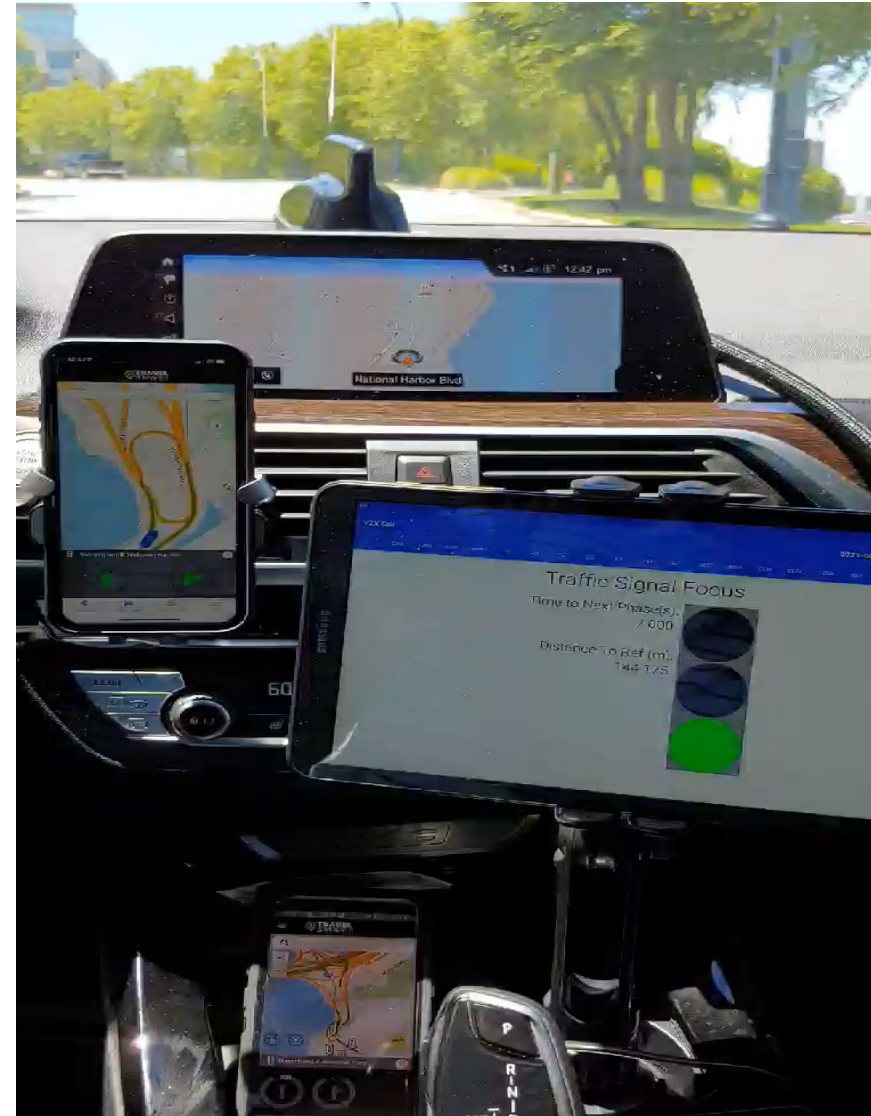
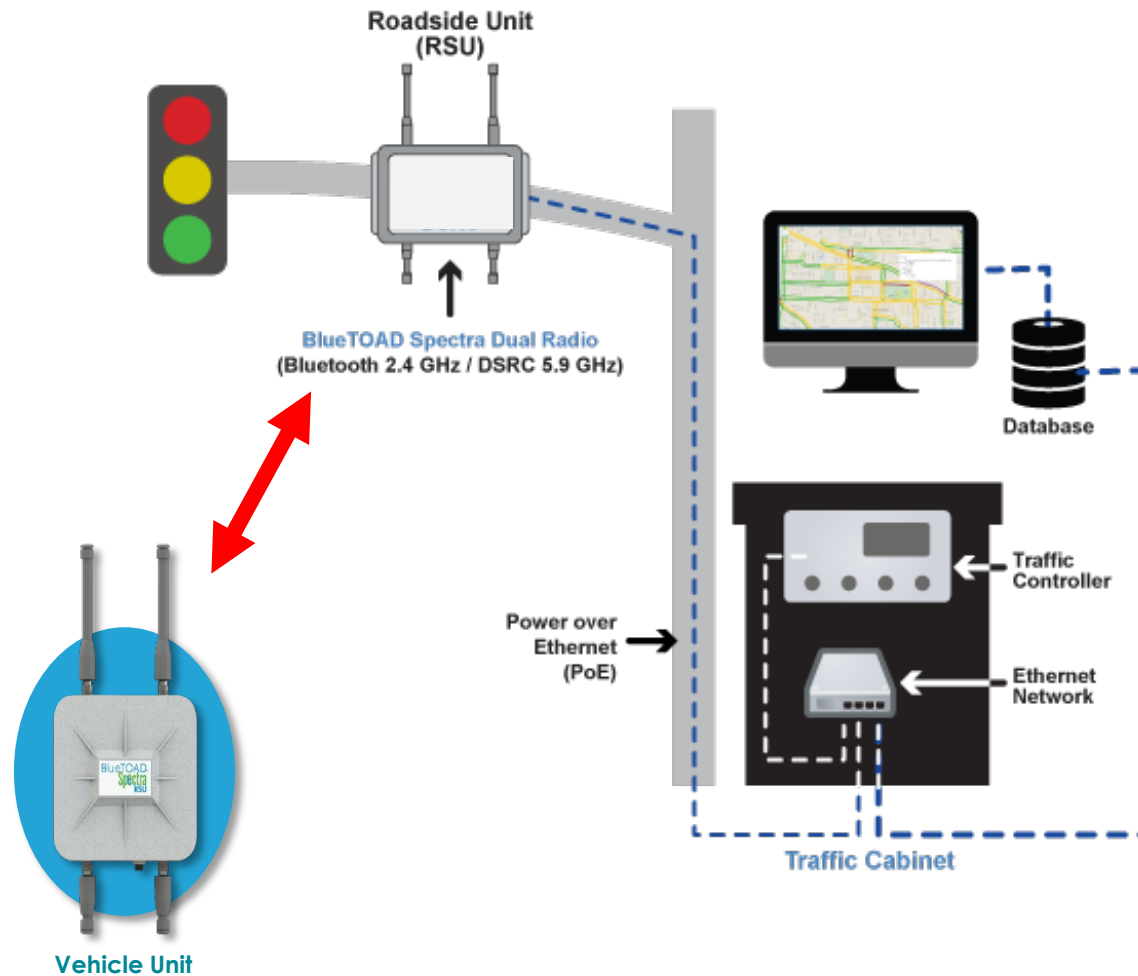
For the message to be sent out

- 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

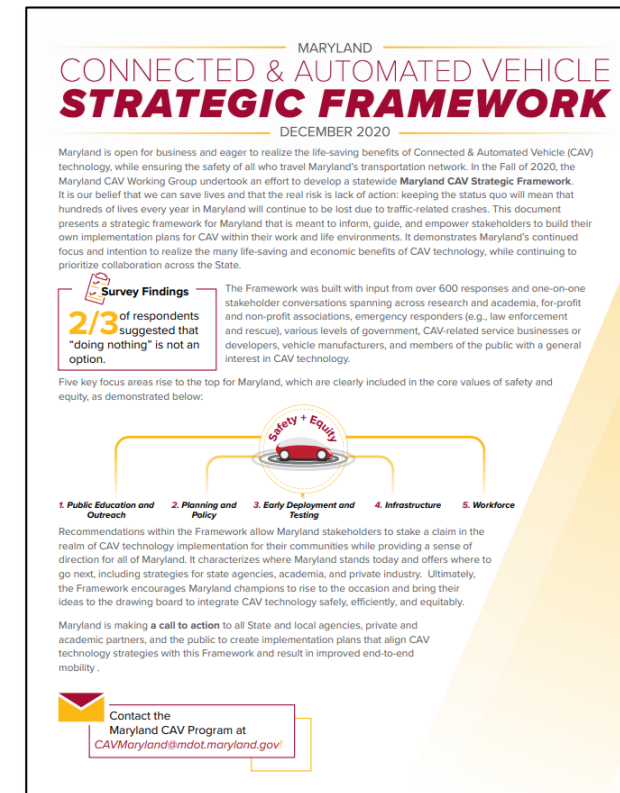
Limitations

- 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>



TANGENT: Maryland CAV Technical SubGroup

- **Co-chairs:** Ed Jones (Prince George's) and Gervais Mbunkeu (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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