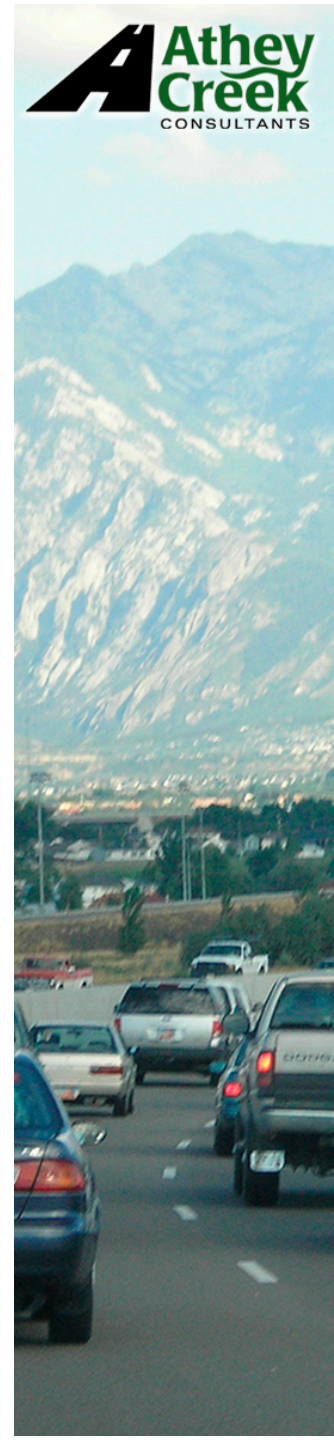# Cooperative Automated Transportation Coalition

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Athey Creek Consultants

Topics

- History

- Coalition Overview

- Technical Examples

- Iowa DOT TSMO Service Layer Plan for CAT

Vehicle to Infrastructure Deployment Coalition

Initial Goals of the V2I DC:

To help accelerate V2I deployments that support passenger vehicles, freight, and transit in both urban and rural areas, with the initial focus on:

1. Intersections (signalized & unsignalized)
2. End of queue warnings
3. Work zone management
4. Curve warning systems

V2I DC Work on Deployment Issues

| Issue	TWG 1 Initiatives	TWG 2 Research	TWG 3 Partners	TWG 4 Guidance	TWG 5 Standards
Issue 1: V2X Applications	P	S	P	S	S
Issue 2: Complementary Communications to DSRC	No action was taken on this issue during Phase 1				
Issue 3: V2I Data	N	S	P	N	S
Issue 4: Patents-Intellectual Property	No action was taken on this issue during Phase 1				
Issue 5: Security	No action was taken on this issue during Phase 1				
Issue 6: V2I Outreach	N	S	N	P	S
Issue 7: Understanding the Benefits and Costs of V2I Deployment and Operation	S	S	P	S	N
Issue 8: V2I Standards	N	N	N	N	P
Issue 9: Understanding V2I Liability Assignment	No action was taken on this issue during Phase 1				
Issue 10: V2I Synergies with Other Emerging Technologies	No action was taken on this issue during Phase 1				
Issue 11: V2I Consumer Messaging	N	N	N	P	N
Issue 12: V2I Multimodal Applications	No action was taken on this issue during Phase 1				
Issue 13: Infrastructure Processes as V2I Obstacles	P	N	N	S	N
Issue 14: Federal V2I Policy Statement	P	N	N	S	N
Issue 15: Maintaining V2I Infrastructure	P	N	N	N	N
Issue 16: Operator and OEM Goals for V2I	N	N	P	N	N

V2I DC Deliverables

Tech Memo 1: V2I Deployment Issues   Jun 18, 2015

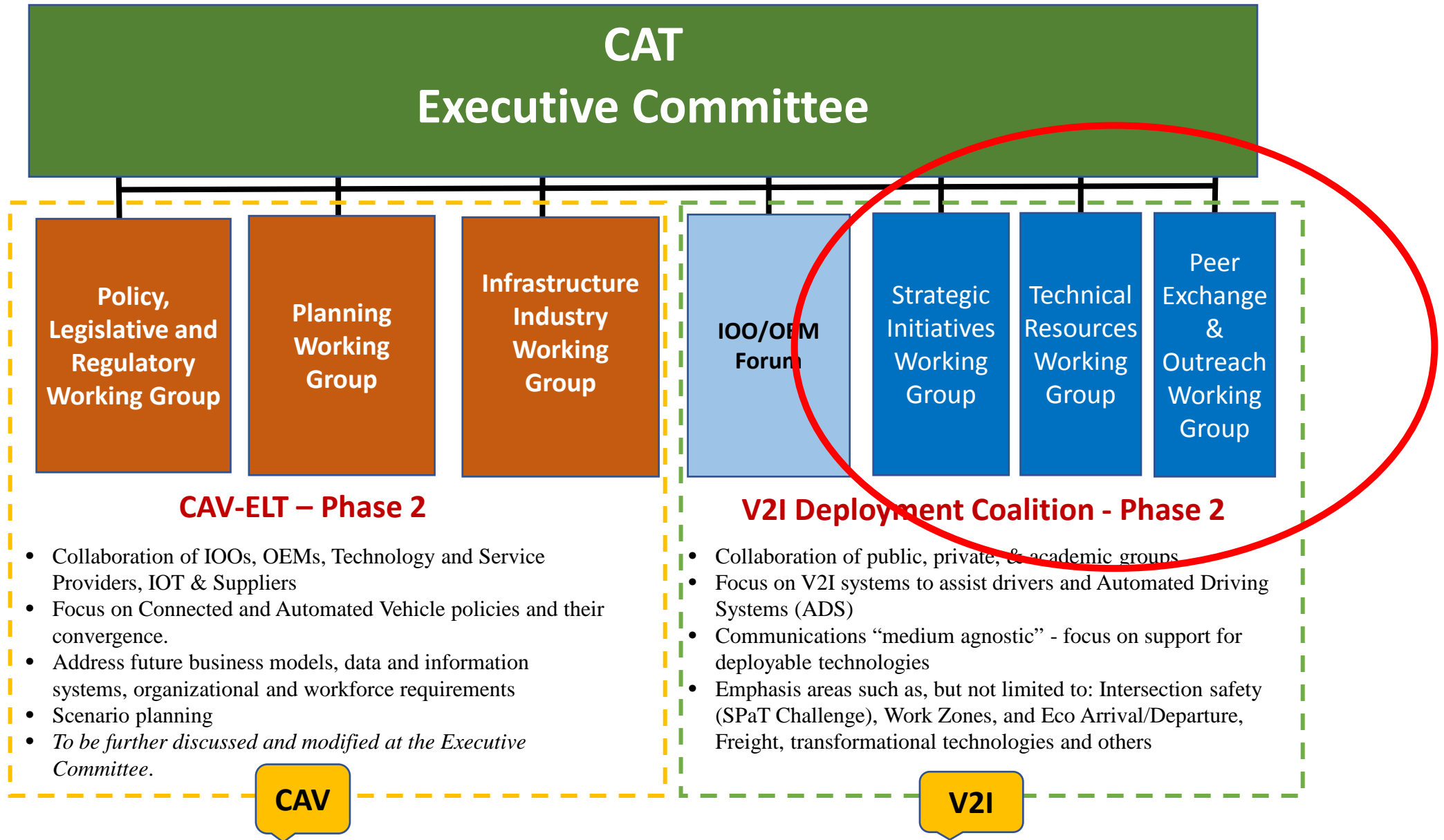Tech Memo 2: Workshop 1 Findings & Progress   Oct 5, 2015

Tech Memo 3: Business Plan & Progress Mar 17, 2016

Tech Memo 4: Phase 1 Final Report   Jan 31, 2017

Cooperative Automated Transportation (CAT) Coalition
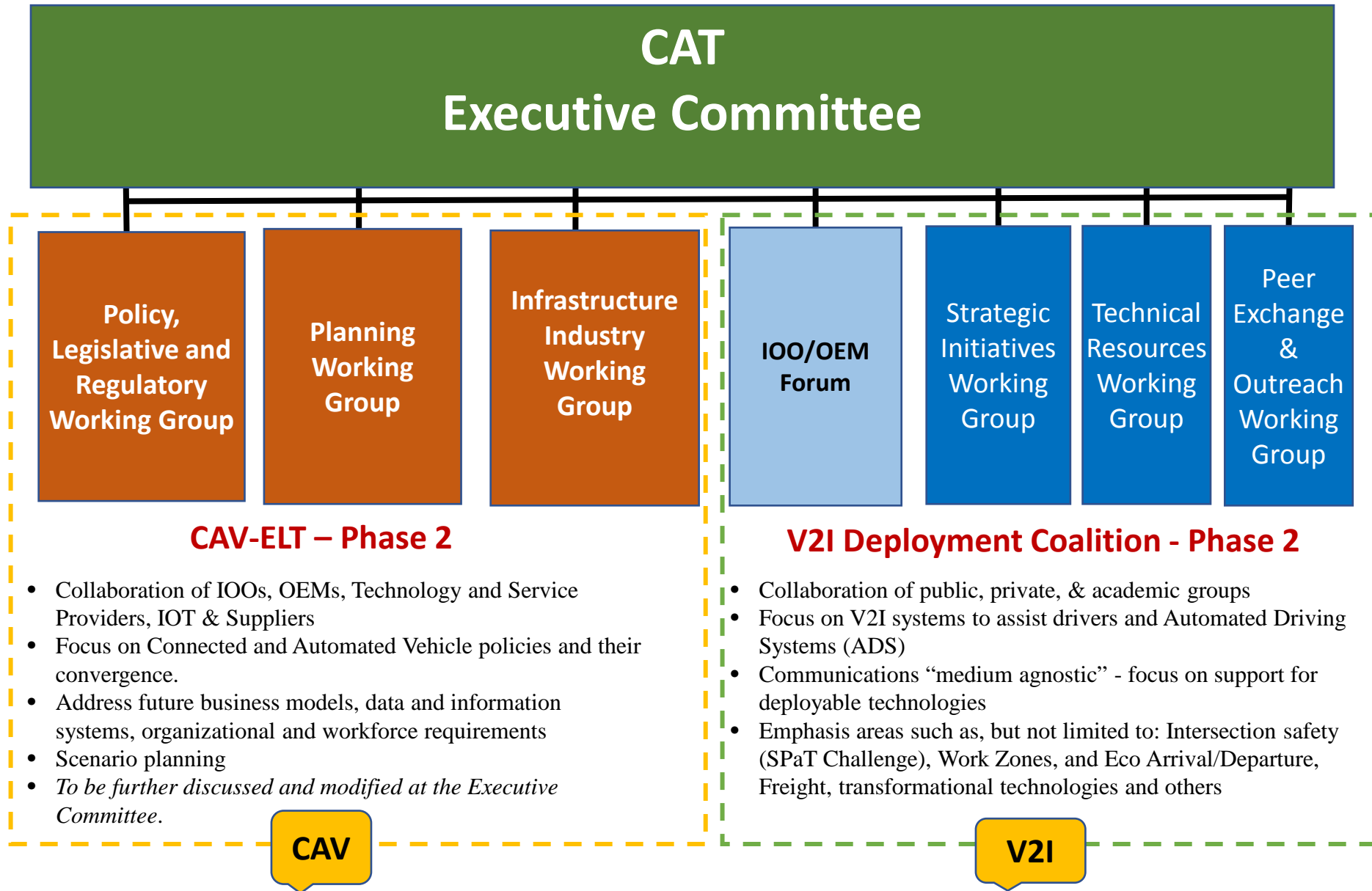
Cooperative Automated Transportation (CAT) Coalition

Technical Resources WG

Recent Activities

- Reviewed MAP Creation Tools developed by CAMP and USDOT
- Developing two White Papers on
  - 1) CAV Resources and
  - 2) Lessons Learned from Deployments
- Identify specific issues related to resource gaps that should be addressed

Peer Exchange and Outreach WG

Focus Areas

1. Facilitate outreach & peer exchange on bi-monthly webinars

2. Identify needs and create more formal outreach activities

3. Provide a forum for associations to announce upcoming CAT related meetings, conference, and webinars
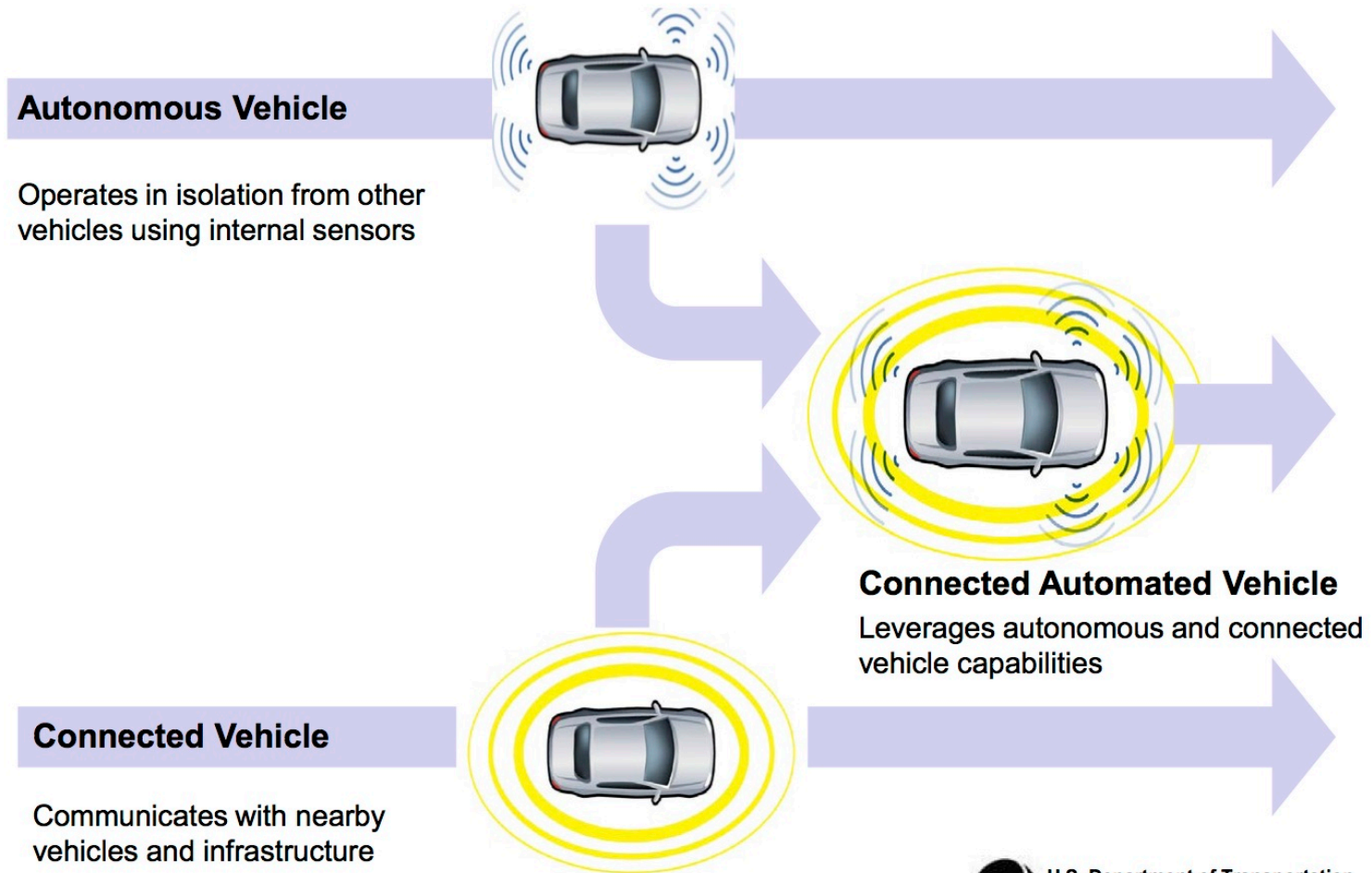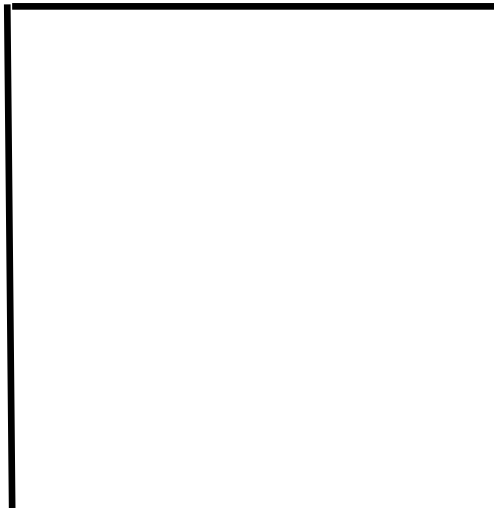
Strategic Initiatives WG

Initiatives:

- ***SPaT Challenge***

- ***Connected Fleet Challenge***

Connected Automation
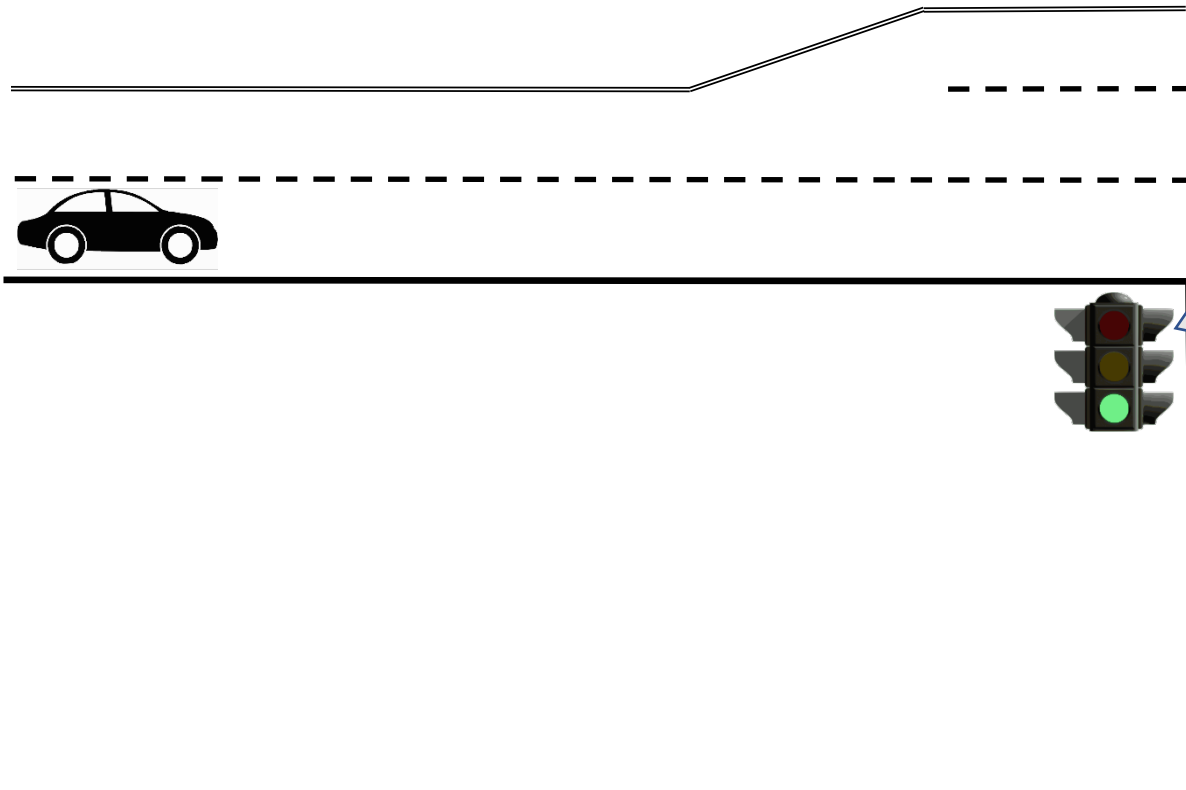
Connected Automation for Greatest Benefits

Autonomous Vehicle

Operates in isolation from other vehicles using internal sensors

Connected Automated Vehicle

Leverages autonomous and connected vehicle capabilities

Connected Vehicle

Communicates with nearby vehicles and infrastructure
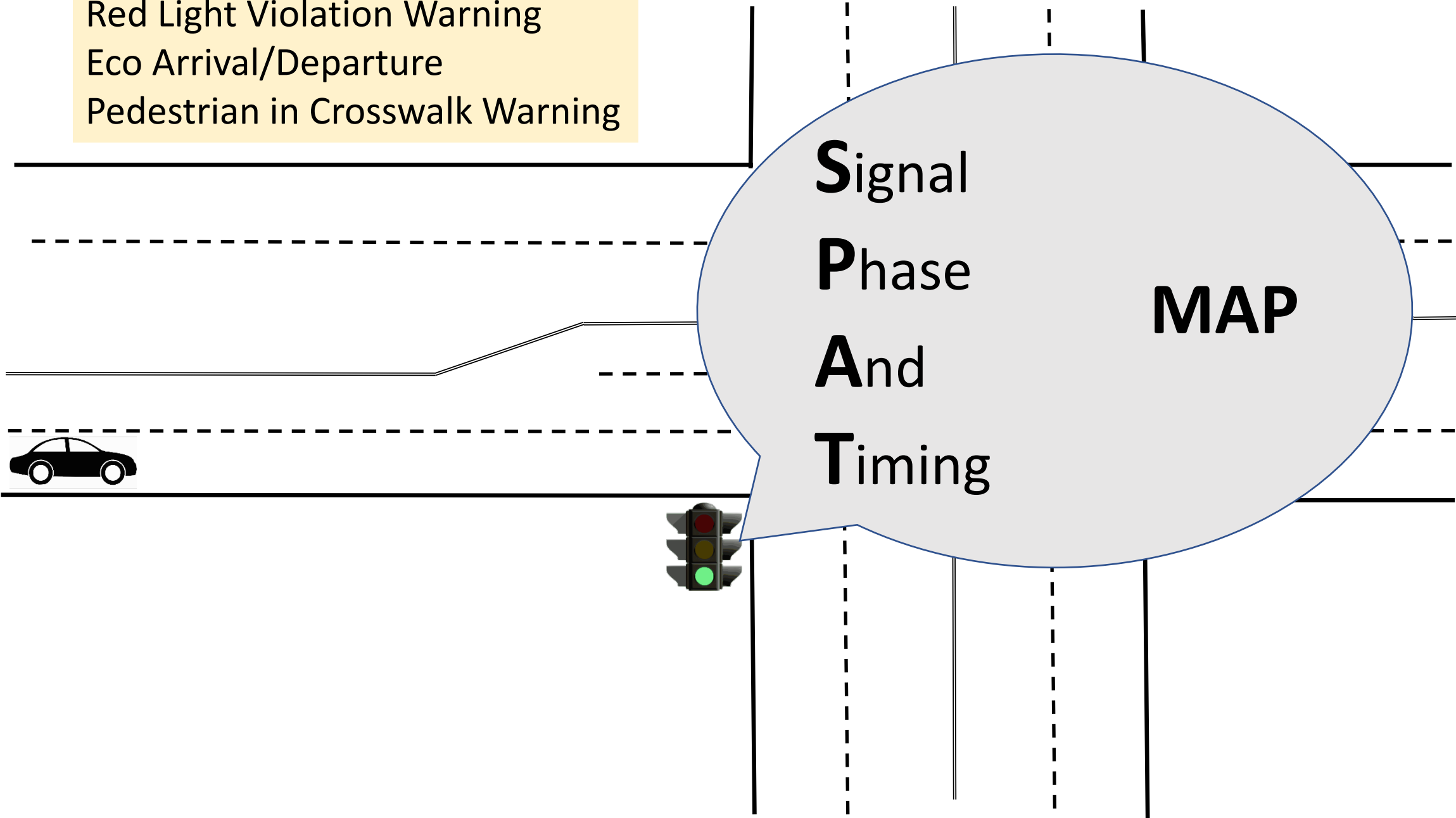
SPaT Message:

- From the Signal Controller
- Current Signal Status for each approach
- Expected time of next signal phase change
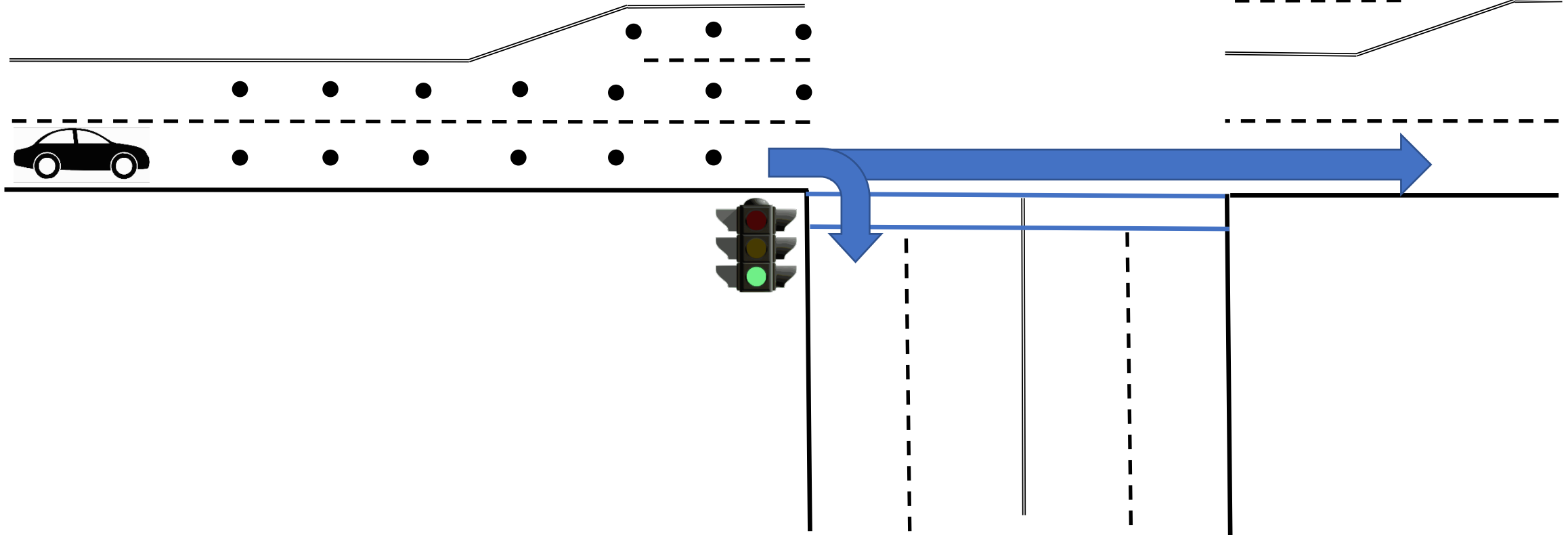- Whether pedestrian cross walks are activated
- Others

1
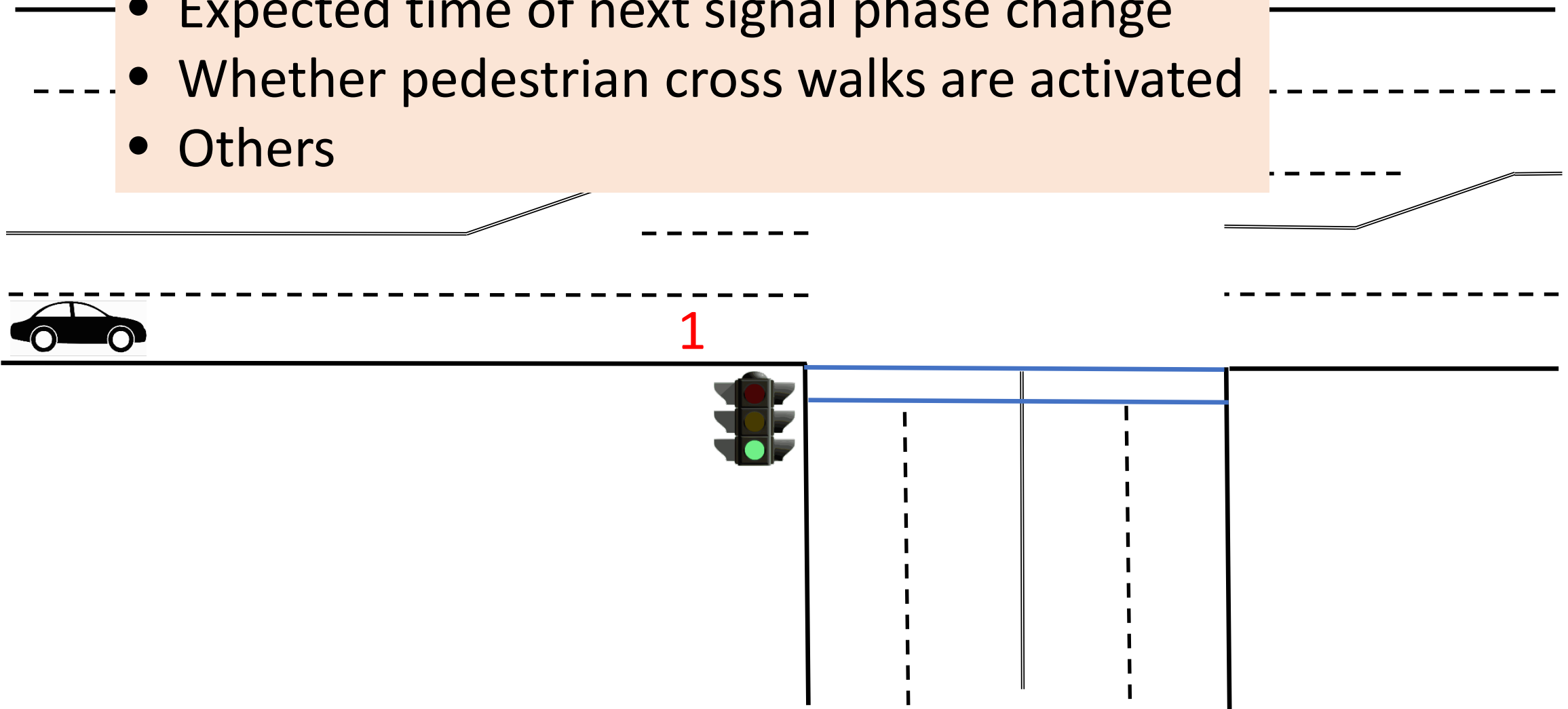
MAP Message:
- Details of all lanes
- Nodes (lat/long) of all approaches
- Crosswalks
- Connections from Ingress to Egress

SPaT Challenge

What is the Challenge?

To challenge state and local public sector transportation IOOs to cooperate together to achieve deployment of DSRC infrastructure with SPaT broadcasts in at least one corridor or network (approximately 20 signalized intersections) in each state by January 2020
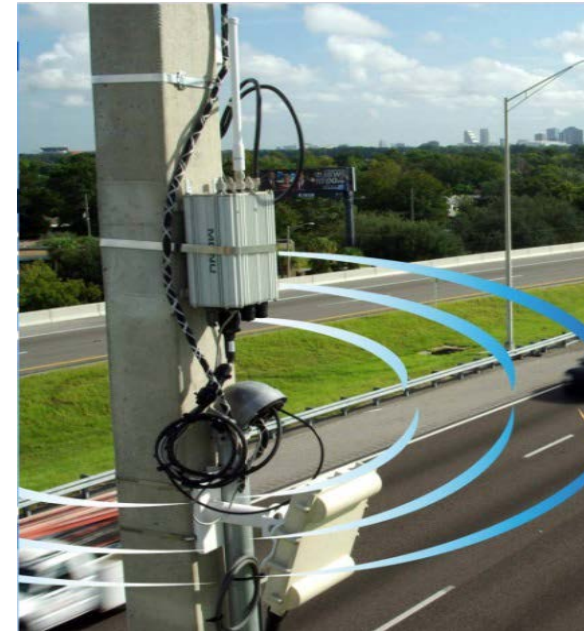
SPaT Challenge Website

One-stop shop for SPaT-related information

- Overview

- Current map
  with SPaT
  deployment details
  and contacts

- Resources

SPaT deployment underway

SPaT deployment operational

https://transportationops.org/spatchallenge

SPaT Challenge Resources on the Website

SPaT Challenge Resource	Status
DSRC Licensing Information	On-line / Available
Guidelines for Selecting Corridors	On-line / Available
Implementation Guidance	On-line / Available
SPaT Challenge FAQs	On-line / Available
SPaT Challenge Estimated Costs	Draft Being Reviewed
Model Concept of Operations Model Requirements	On-line / Available
Procurement Guidance	On-line / Available
SPaT/RLVW Verification Document	On-line / Available

Test Devices and Procedures for Testing Broadcasts

Reduced Speed Zone / Lane Closure:

- Freeway
- Arterial
- Work zone or non-work zone (e.g. school speed zones)

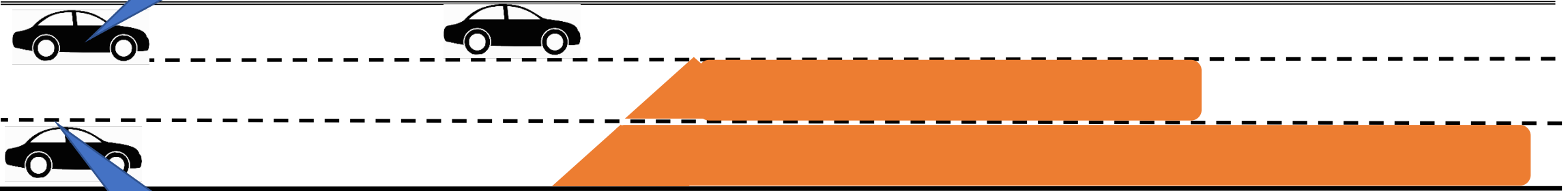# Reduced Speed Zone / Lane Closure:

- Road or lane closures
- Merging information, warning, and alert
- Reduced /workers present information, warning, alert

Reduced Speed Zone / Lane Closure:

- Road or lane closures
- Merging ~~warning,~~ and alert
- Redu~~~~ information, warning, alert

Slow Down

Merge Left and
Slow Down

**Roadside
Safety Message**

- Lane closures
- Speed restrictions
- Other details

Reduced Speed Zone / Lane Closure:

- 🔴 Reference Point – Work Zone start
- ⚫ Approach Nodes
- 🟣 Work Zone Nodes

Work Zone Lanes

- Closed Lanes – Start/End of closure
- Open lanes – Speed limit / Are workers present?

Reduced Speed Zone / Lane Closure:
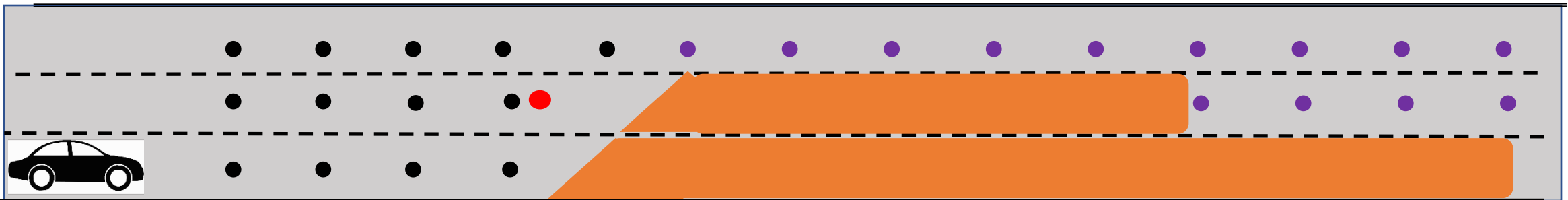- 🔴 Reference Point – Work Zone start
- ⚫ Approach Nodes
- 🟣 Work Zone Nodes
- Work Zone Lanes
  - 🟧 - Closed Lanes – Start/End of closure
  - - Open lanes – Speed limit / Are workers present?
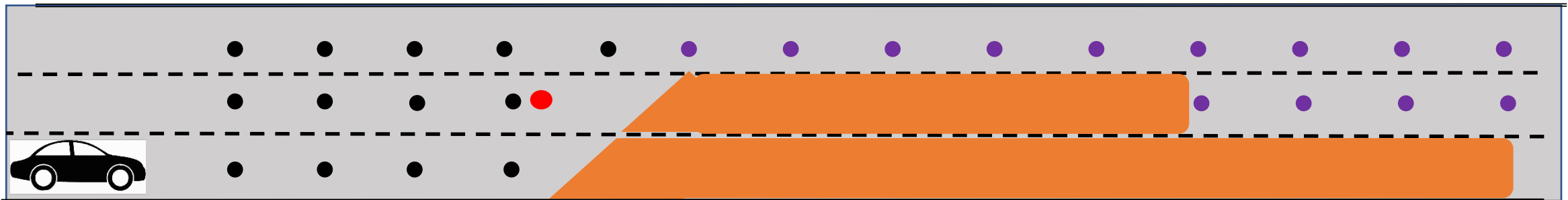
Automated Tool / Software – Open Source Circulation

Connected Fleet Challenge

Why is the Connected Fleet Challenge Needed?

- Fleet owners need experience procuring, deploying, and operating On-board units (OBUs) to prepare for future deployments

- Fleet owners and IOOs would benefit from real-world trials of various applications (e.g. RLVW, Eco Glidepath)

- IOOs that have participated in the SPaT Challenge need a mechanism to perform additional verification of their broadcasts

Scale of the Connected Fleet Challenge

- Public sector fleet owners are generally not ready for wide-scale deployment of OBUs, for several reasons:

  - There are limited funds available, and a general 'wait and see' approach to observing benefits demonstrated in Pilot Site (and other early) deployments

  - There is limited (not none) experience with operating OBUs in the various vehicle types owned by fleet operators – resulting in uncertainty regarding operating costs, and institutional challenges

- There is still a need for an initiative to help fleet operators gain the experience that will position them for future large scale deployments

Scale of the Connected Fleet Challenge

- Diversification is the goal of the Connected Fleet Challenge

  - Ideally numerous variations of models and configurations of light duty and heavy duty vehicles will be equipped in this challenge

  - But each fleet operator does not need to deploy each of these variations – Sharing of lessons learned will help build the 'industry experience' to include many variations of vehicles

  - While the SPaT Challenge tracks locations where SPaT broadcasts are developed and displays them on the map, the Connected Fleet Challenge would likely track the variations of maintenance vehicles, buses, delivery vehicles, passenger vehicles, etc. with OBUs equipped, sharing lessons learned from each variation

Scale of the Connected Fleet Challenge

- Using Transit Buses as an Example:

    - If 10 transit agencies each equip two of their buses…

    - This could result in as many as 20 different models or configurations of buses

    - Through a tracking website/table, the lessons learned, costs, installation experiences of each could be reported and tracked

    - To the industry, this would represent a substantial percentage of 'types' of buses

- Additionally, if several school bus fleets participate, this could result in understanding of the institutional/legal steps required to equip school buses with OBUs

Target Goals of the Challenge

- Fleet operators equip at least 2 of their fleet vehicles, including one heavy duty and one light duty vehicle if their fleet supports it.

- Fleet operators collaborate with other fleet operators to achieve as much diversification in vehicles equipped as possible nationwide and to share lessons learned

- Fleet operators partner with IOOs that have deployed SPaT/MAP broadcasts to exchange data

CONNECTED FLEET CHALLENGE

Draft

Draft
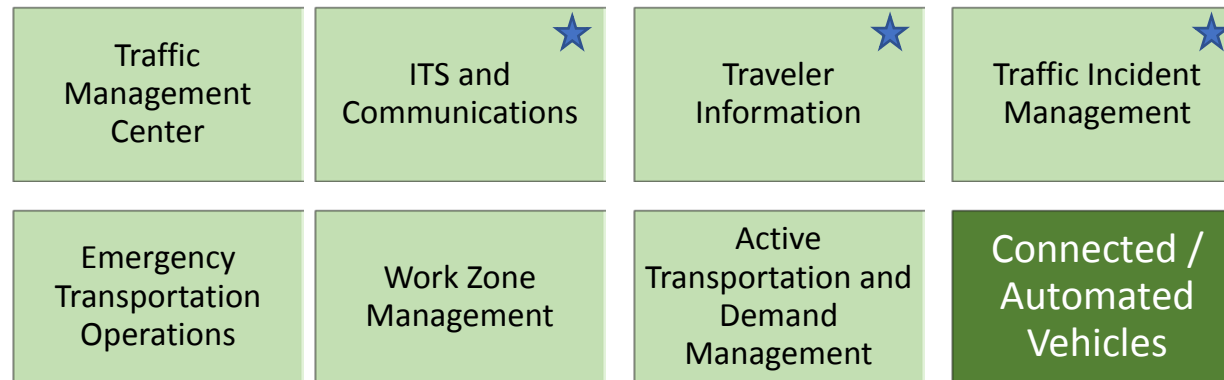
Fleet operators equip at least 2 vehicles (one heavy duty and one light duty), with an industry focus on diversity in the make, model, year of vehicles to learn as many lessons as possible and to share these lessons across the industry

Iowa DOT TSMO Service Layer Plan for CAT

- Iowa DOT completed a TSMO Strategic Plan and Program Plan in 2016

- Iowa's TSMO Plans describe 8 Service Layer Plans:

Traffic Management Center	ITS and Communications ★	Traveler Information ★	Traffic Incident Management ★
Emergency Transportation Operations	Work Zone Management	Active Transportation and Demand Management	Connected / Automated Vehicles

★ Service Layer Plan Completed

Iowa CAT - TSMO Service Layer Plan Approach

- Primary emphasis of the SLP is ***on identifying and describing the business aspects required*** to accomplish Iowa DOT's CAT roles:
  - Input to the Automated Transportation Advisory Council
  - Driver education and training
  - Vehicle registration, licensing, and insurance
  - Data management and security
  - Information sharing with Iowa residents and travelers
  - Anticipated organizational/workforce changes needed to institutionalize CAT within Iowa DOT
- ***Other aspects of the SLP***:
  - "Future-proofing Iowa" – SLP will not be specific to any one technology, but rather keeps Iowa open to new technologies as they emerge
  - Identify likely impacts to Iowa DOT Highways Division bureaus and offices
  - Defining roles for CAT pilots and public supported deployments of CAT approaches
  - Little emphasis to be on the technologies to be deployed

Recap

- CAT Coalition

- SPaT Challenge

- Connected Fleet Challenge

- Iowa CAT TSMO Service Layer Plan

Questions?

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