

# ***C/AV for Agencies 101***

## ***Transportation Planning Considerations for Connected and Automated Vehicles***

**Connected & Automated  
Vehicle Workshop  
Rancho Cordova, CA**

*presented by*  
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**CAMBRIDGE  
SYSTEMATICS**



January 17, 2018

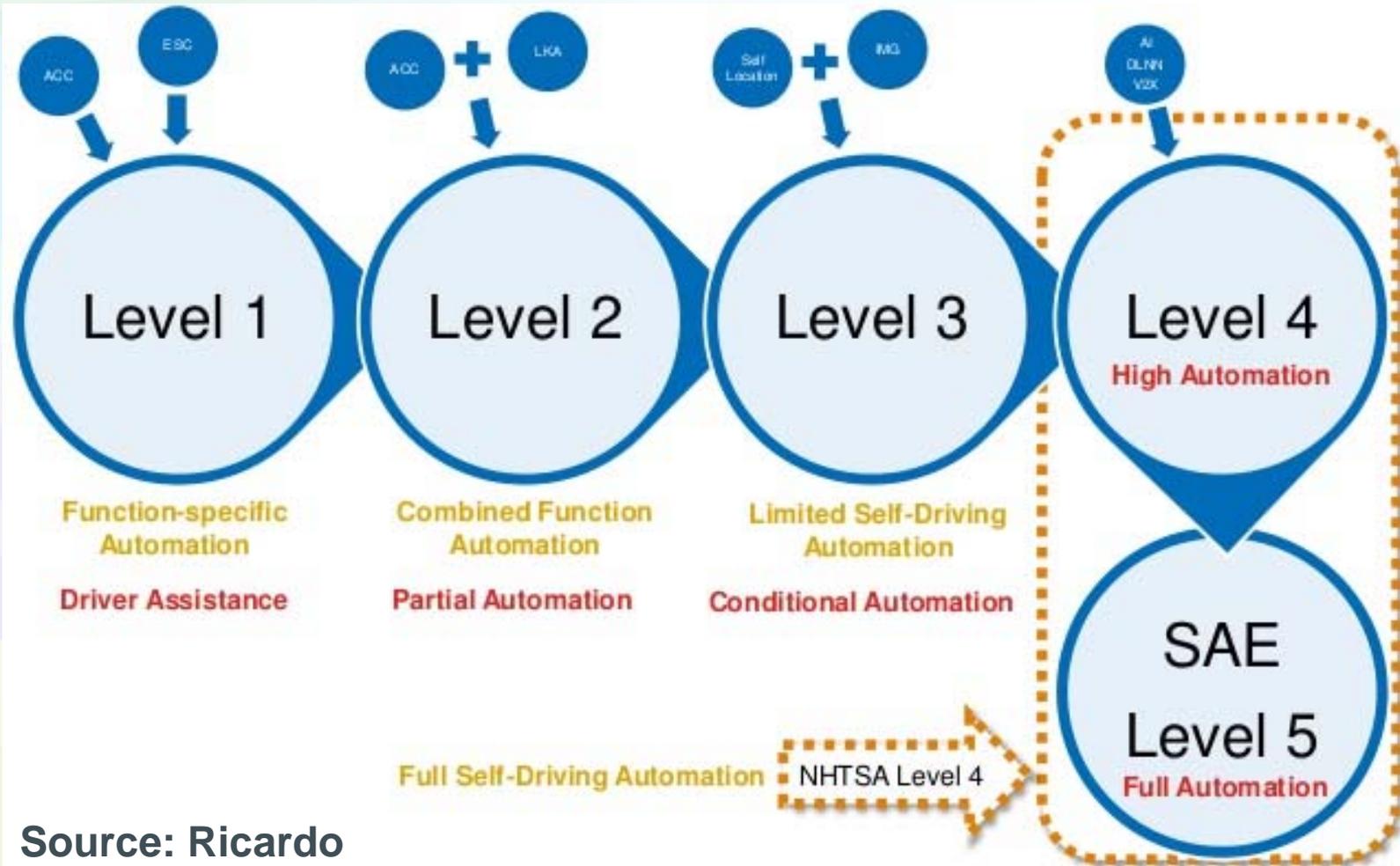
Think  Forward

Every week we hear a story in the news about *connected vehicles, automated vehicles, or self-driving cars* and how these vehicles will *transform mobility* in the United States.



## Definitions

# Automated Vehicle Technology



Source: Ricardo

# *Ready or Not – Elements of Automated Vehicle Functionality Have Already Arrived*

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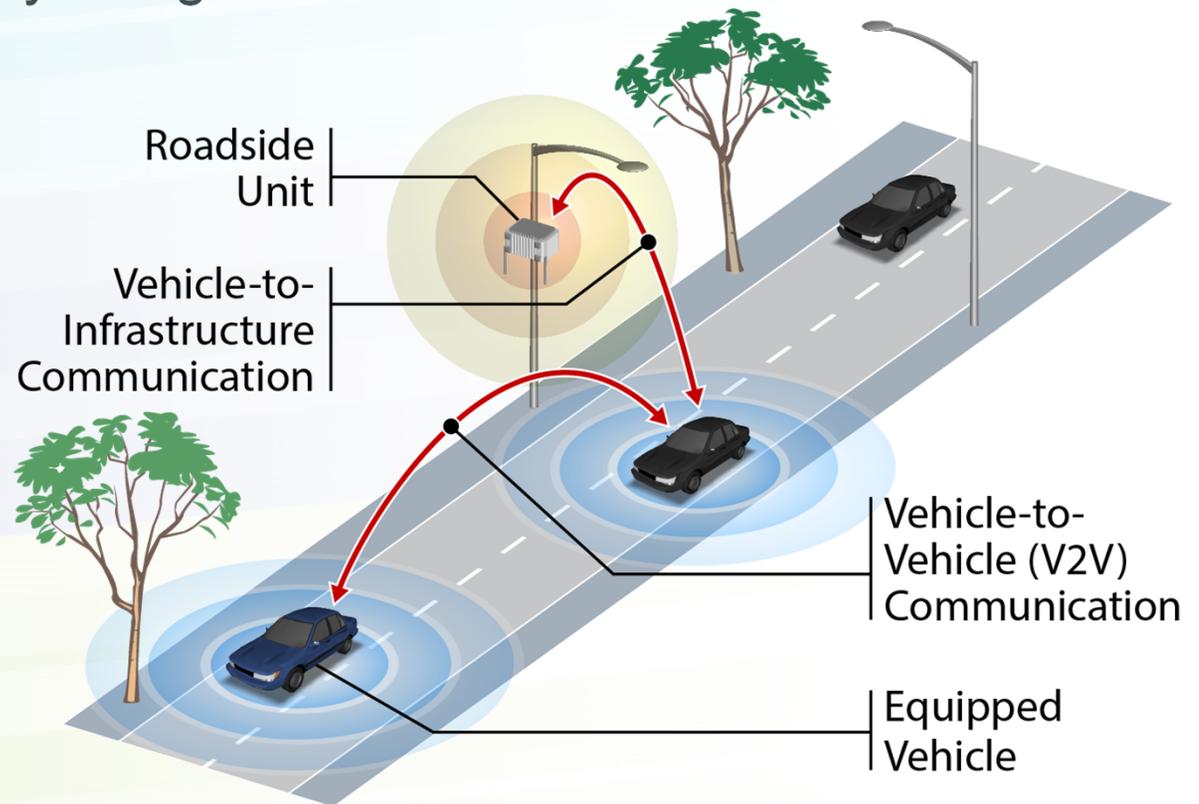
***While driving to work, Joshua Neally began to suffer severe chest pain. He had pre-programmed the nearest Emergency Room into Tesla's Autopilot software, and by selecting that location, the car navigated 20 miles of highway for him, and he was able to re-take control near the exit, and make it to the ER.***

Source: Green Car Reports

## Definitions

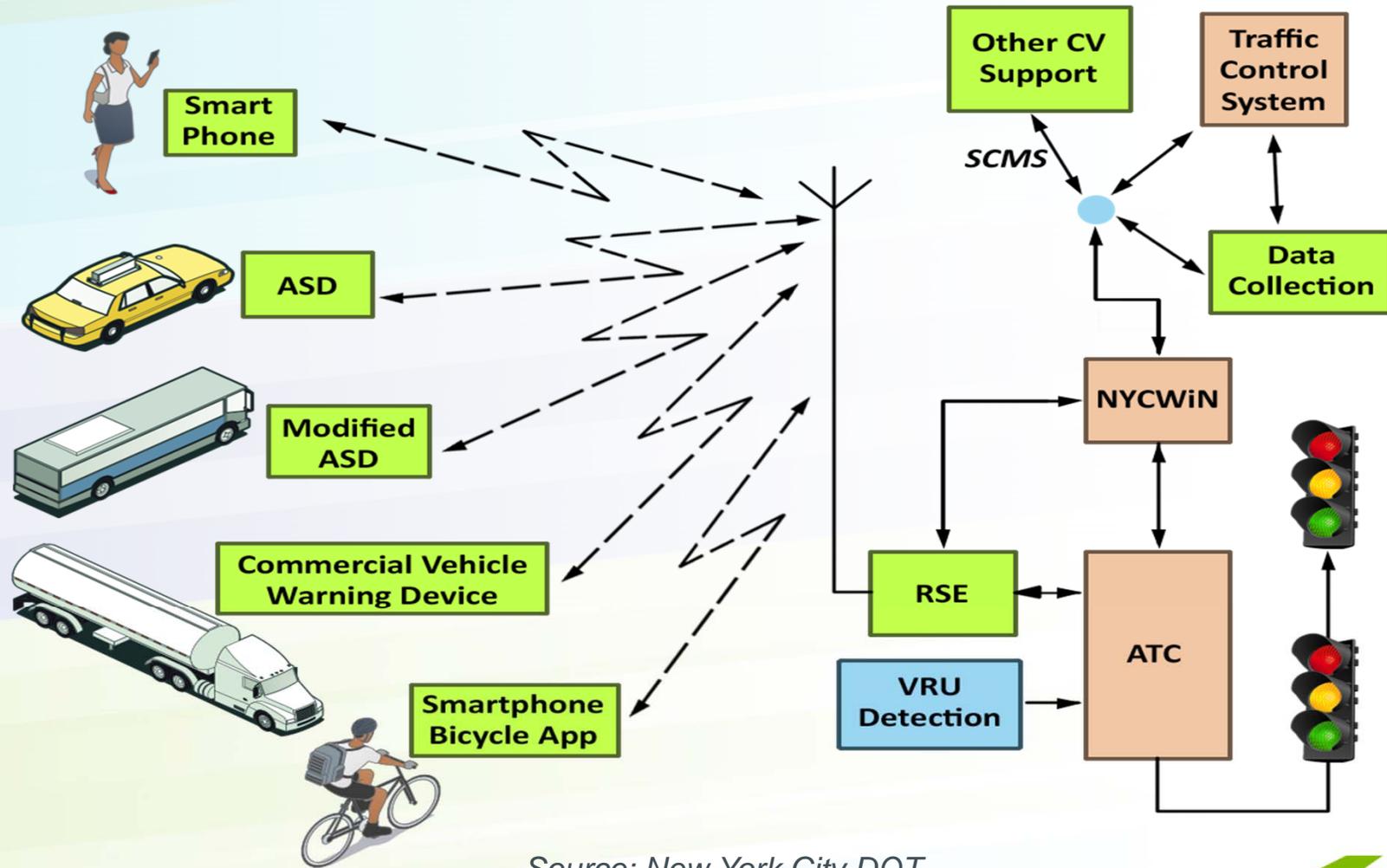
# Connected Vehicle Technology

Connected Vehicles (CVs): technology that provides driver assistance functions by using wireless communications with other vehicles and infrastructure to gather information about their environment.



Overview of CV technology

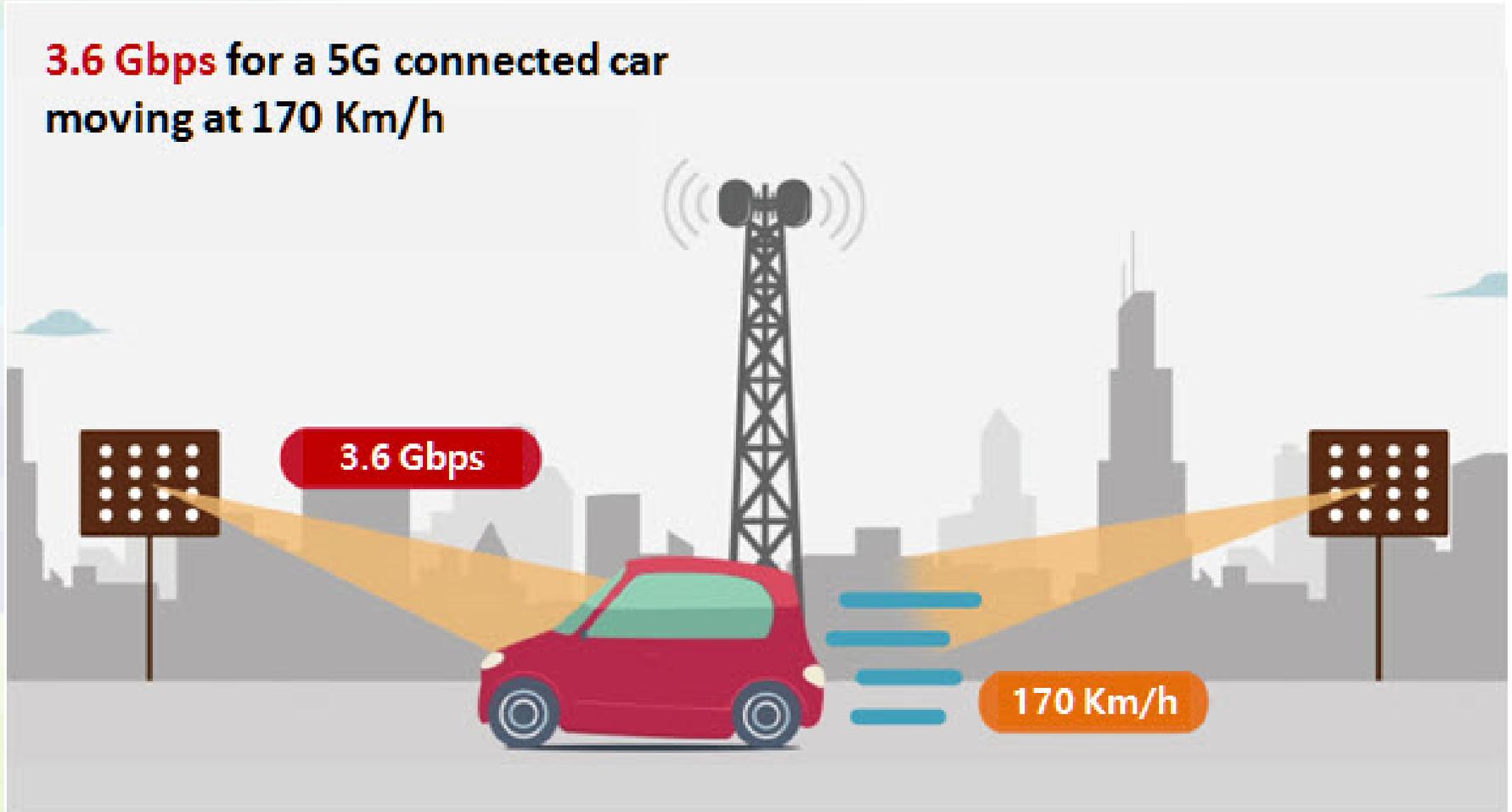
# Development and Deployment of Connected Vehicle Technologies



Source: New York City DOT

# Connected Vehicles: The 5G Option

**3.6 Gbps** for a 5G connected car  
moving at 170 Km/h



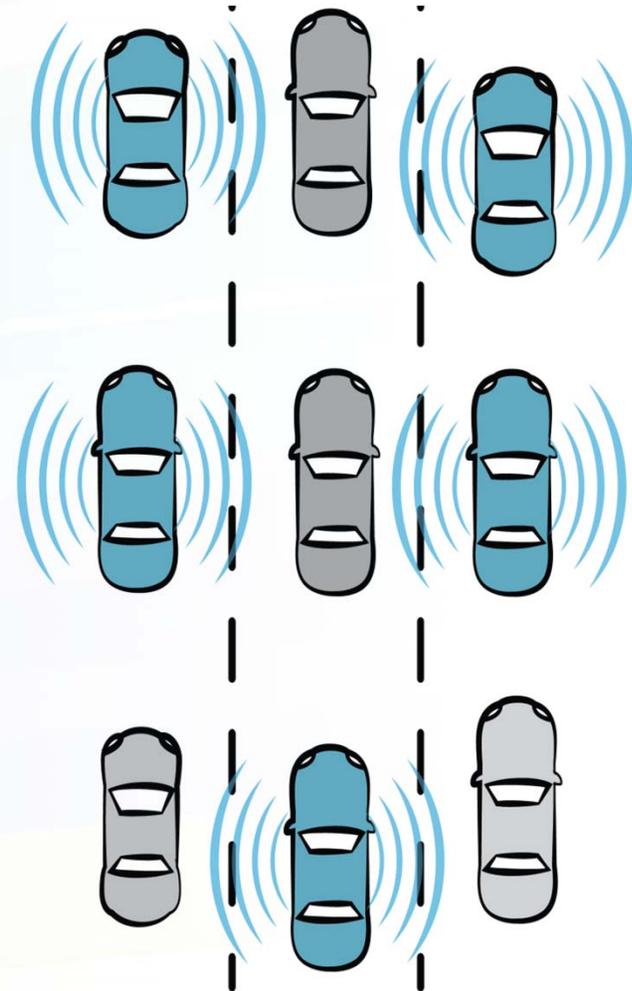
Don't get caught up in choosing sides  
or thinking one way is better than another.

The Future will be  
Connected  
**AND**  
Automated  
**(C/AV)**



When the majority of the fleet is both *connected and automated*, there will be significant decreases in crashes, resulting in significant increases in safety and reliability.

Vehicle spacing on roadways will be safely reduced on a large scale



*Capacity Expansion Could Be a Thing of the Past*

# Example of C/AV Planning – CA Truck Platooning

## Planning for the I-710 Dedicated Truck Lanes

- Project Lead: LA Metro & Gateway Cities COG
- Connected Corridor from ports to downtown LA
- ConOps and Corridor Plan
- 710 Corridor Simulation Modeling for C/AV Dedicated Truck Lanes
- Project list and long-term Implementation Plan

**Truck Platooning**  
and the proposed I-710 Freight Corridor

**PLATOONING BASICS**  
A platoon is a series of trucks following each other on the road, with acceleration and braking controlled automatically. (Steering is still manual). When any truck's speed changes, the others behind it are instantly notified wirelessly, and those trucks respond immediately by braking or accelerating. This allows for much closer following distances, which reduces wind resistance and increases the number of trucks that can fit on the road at high speeds, thereby increasing roadway capacity.

**Without Platooning**  
Large gaps are needed to ensure the following driver has enough time to react.

**With Platooning**  
Automatic control means shorter gaps are possible without compromising safety.

**BENEFITS**

- Less Congestion**  
Capacity improvements result in less delays and better travel time reliability.
- Cost Savings**  
Typical fuel savings average 5-10% for all trucks when platooning.
- Improved Safety**  
Automated control of braking and accelerating reduces crash frequency and severity.
- Enhanced Driver Comfort**  
Platooning technology takes much of the stress out of stop-and-go driving.

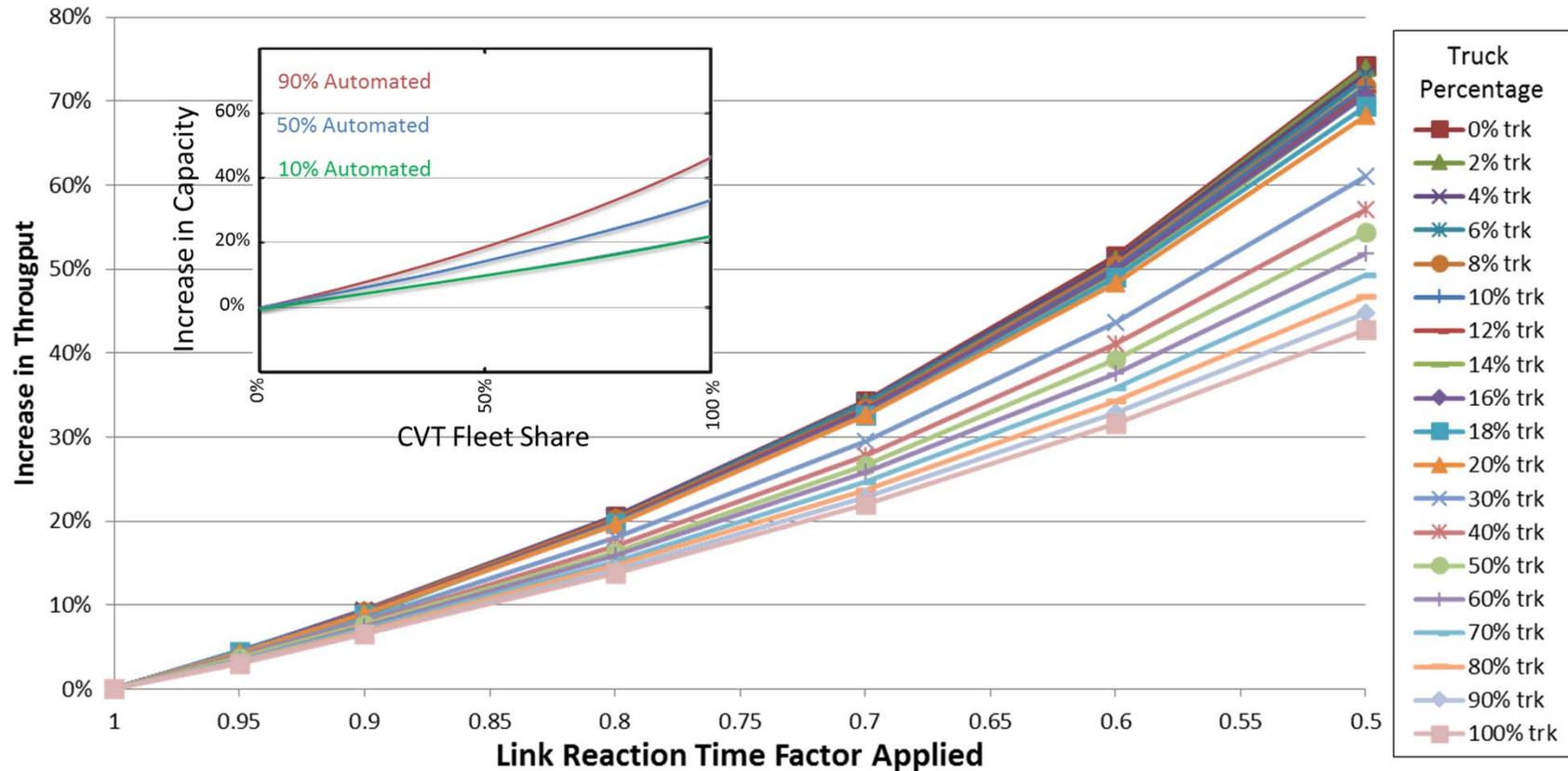
**I-710 FREIGHT CORRIDOR**  
A dedicated four-lane freight corridor parallel to the 710 freeway is currently proposed as part of the Gateway Cities Strategic Transportation Plan. Caltrans estimates that this 18-mile truck-only facility would be completed by 2025. Key characteristics of the proposed system are indicated below.

- Lane dedicated (they must use the existing lanes).
- Hybrid operation: combination of platooning and manual driving.
- Dedicated for truck mobility.
- Trucks will utilize existing technologies, including basic platooning.

Your feedback is crucial to providing the most relevant and useful I-710 freight corridor possible. Visit [https://www.surveymonkey.com/s/hta\\_platooning](https://www.surveymonkey.com/s/hta_platooning) to fill out a survey today (takes approx. 10-15 minutes)

# Example of C/AV Planning – CA Truck Platooning

## I-710 Dedicated Truck Lanes Impact



- Mesosimulation: CV effects simulated using adjustments to saturation flows (capacity).
- Different factors used depending on facility type and CV strategy being considered.

## Example of C/AV Planning – CA Truck Platooning

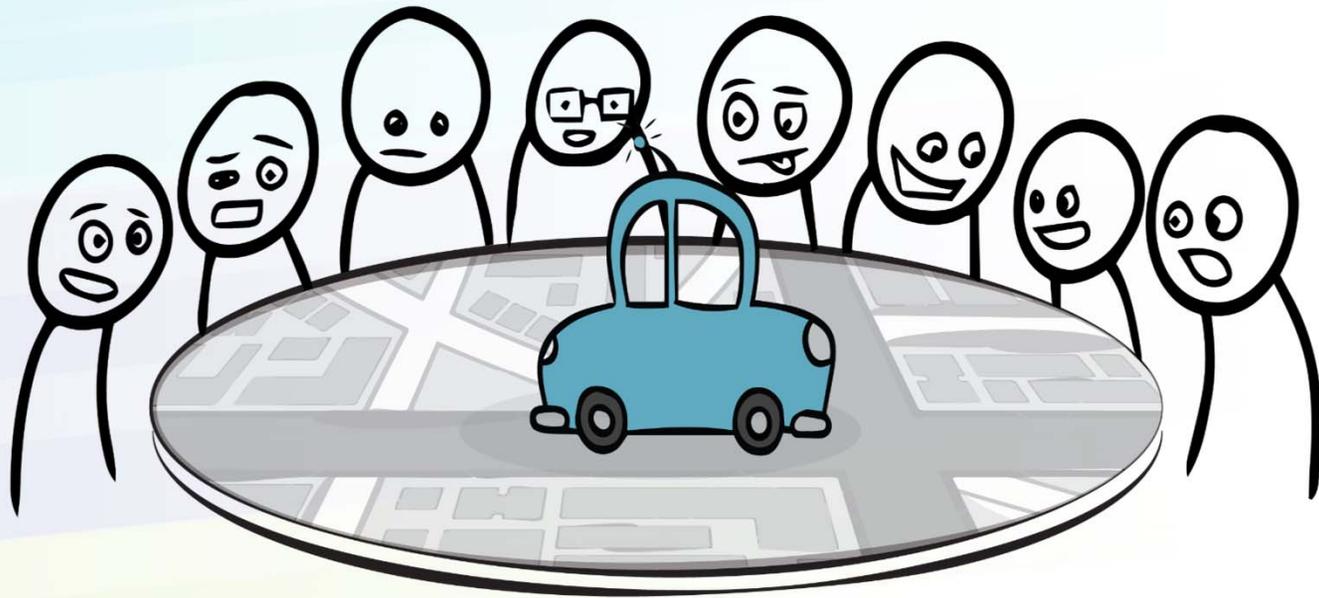
# Legislative Changes for C/AV

- Many states have “Anti-Convoy” laws that preclude truck platooning
- California’s Anti-Caravanning Law requires a minimum spacing of 100 feet.
  - » Law was recently amended to allow for shorter headways for testing purposes only

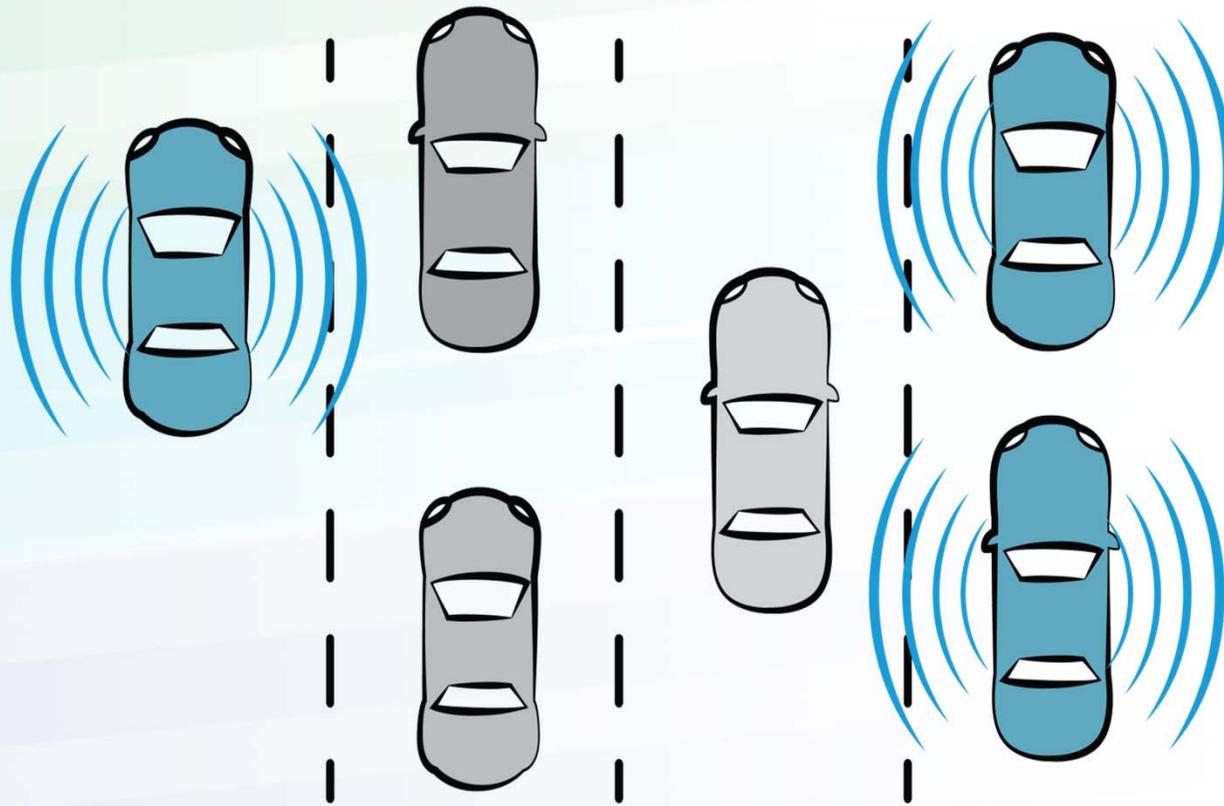


Source: Oshkosh Northwestern

What do we need to examine as we develop planning scenarios **today**...



about these vehicles of **tomorrow**.



Now is the time to start developing new forecasts  
Based on these vehicles being in the fleet.

But there are conflicting predictions:



Some say  
VMT will go up...

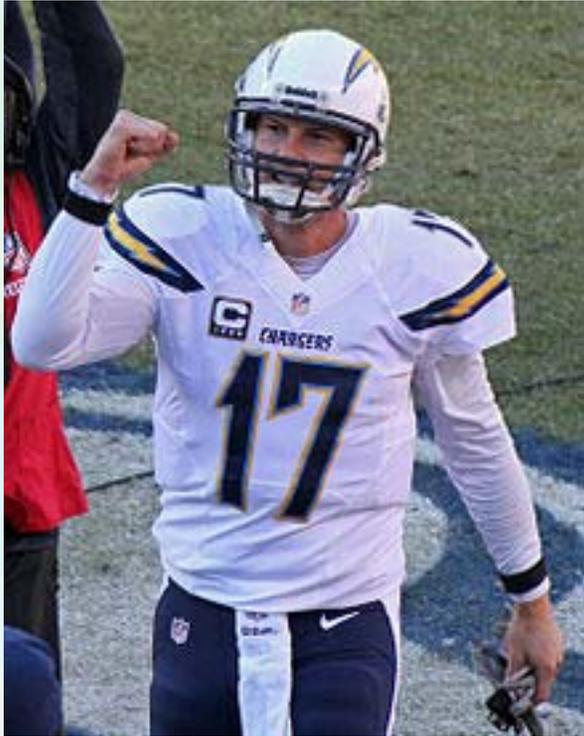


Some say  
VMT will go down...



And some folks are now  
talking about VMD...

Tomorrow:  
VMT  $\neq$  VMD



## Phillip Rivers Example



Three days a week, for every week during the NFL season, Rivers "works" from the back seat while his driver delivers him from his home to the Chargers' facility in Costa Mesa.

*"An hour and 18 minutes, which is nothing" - Rivers*

And we need answers to several major questions:

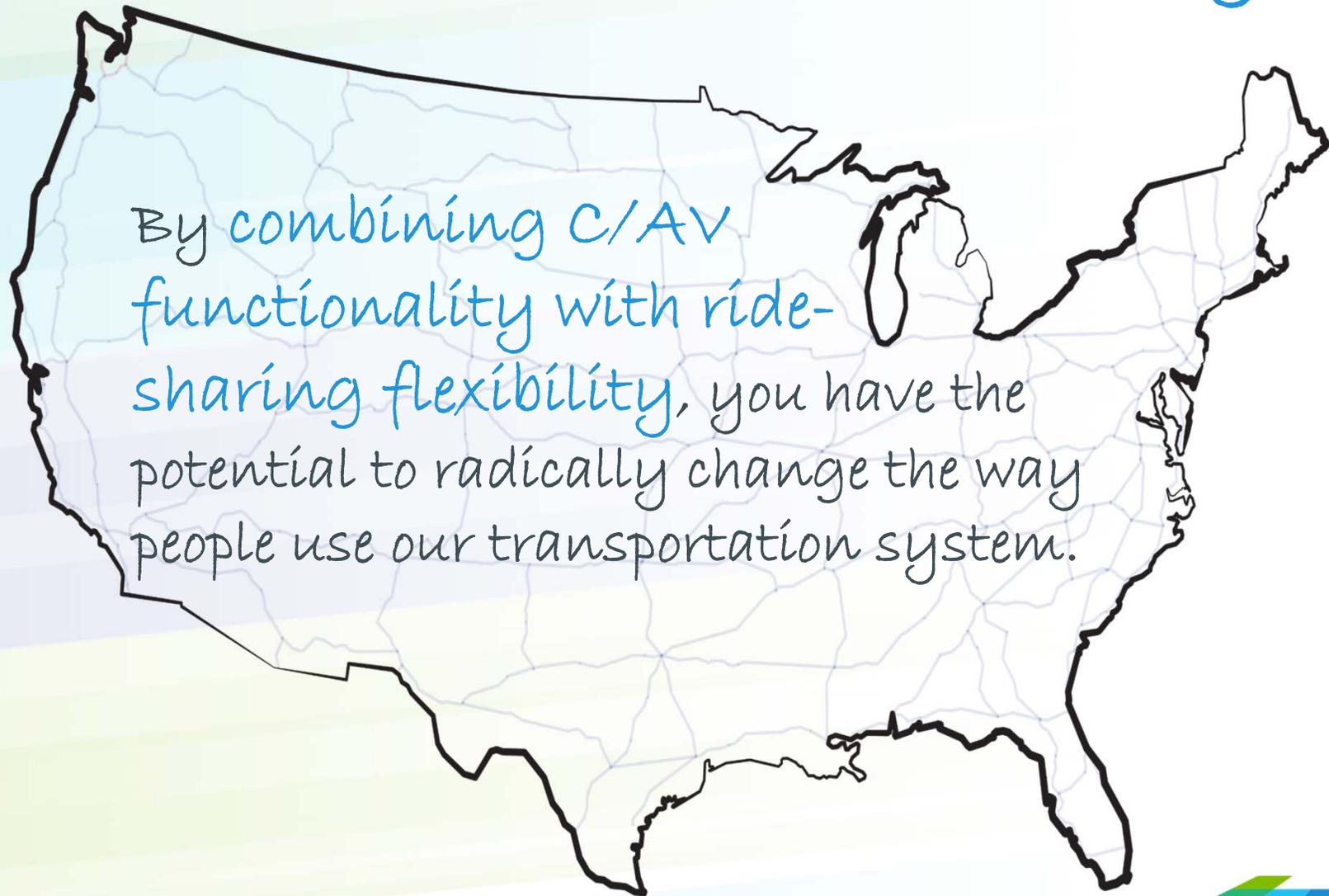
How do we plan for  
**MIXED** vehicles  
in the mid-term

What happens  
to  
**TRANSIT?**

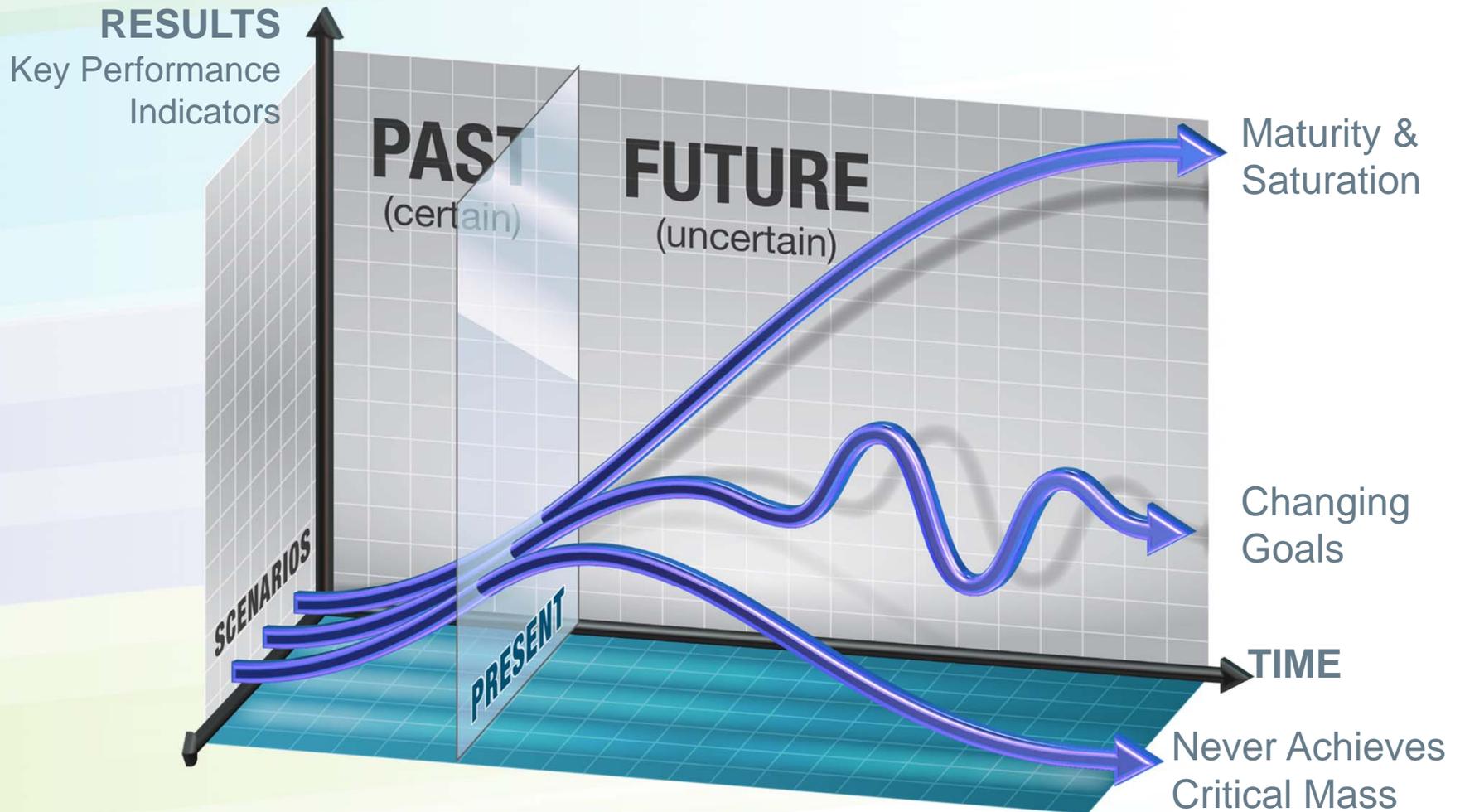
How will  
**LAND**  
**USE**  
change?

How do we need to  
**UPDATE** our  
modeling techniques to better  
capture the **IMPACT** of  
these **VEHICLES?**

And we must also take into account  
the emerging **Shared Economy**



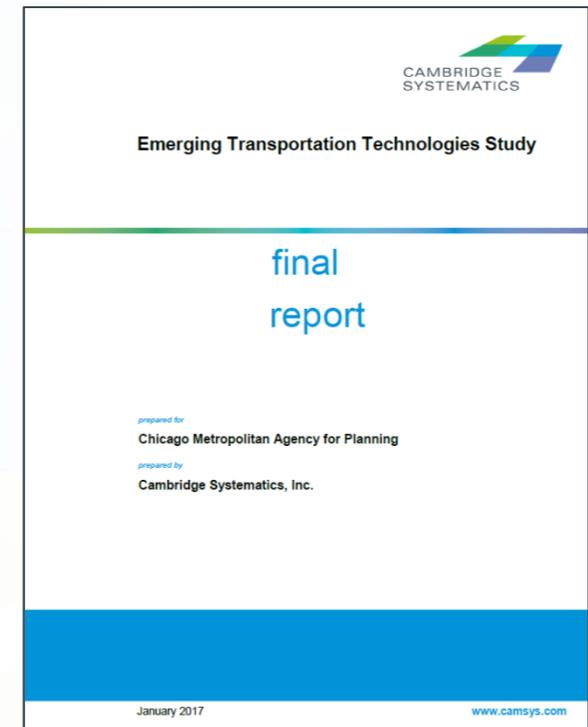
How do we develop future C/AV scenarios  
Given all the uncertainty?



# Robust Decision Making C/AV Strategies Example

## Robust Strategies for the Chicago Region for Automated Vehicles

- Near-term **NT**
  - » Supportive policies for shared mobility
  - » Advance existing ITS strategies into AV usage
  
- Shaping **S**
  - » Pricing options for AV roadway use and parking in denser urban areas
  - » Infrastructure to promote shared mobility, and continued investment in transit
  
- Hedging **H**
  - » Hedge against VMT increases caused by AVs, by maintaining a dedicated ROW for shared vehicles
  
- Deferred Adaptive **DA**
  - » Dynamic pricing to encourage capacity utilization
  - » Integrating fleet of mid-size AV transit vehicles



# C/AV Strategic Planning Example

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- Virginia AV Strategic Plan Example
  - » Formed stakeholder groups (internal and external) to address core functional areas
  - » Strategy-driven approach using RDM
  - » Engaging private sectors partners through workshop and charrette

## Statewide AV Needs: Functional Areas

- Traffic Engineering and Operations
- Driver Licensing and Vehicle Registration
- Transportation Planning
- Data Management and System Security
- Capital Investment
- Vehicle Sales Oversight
- Vehicle Inspection and Commercial Vehicle Regulation
- Public Transportation
- Non-Motorized Transportation
- Research
- Vehicle to Infrastructure Technology Deployment

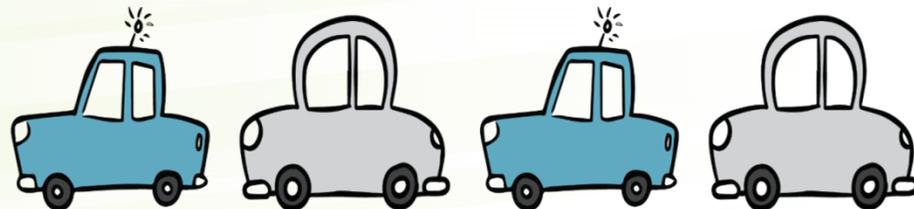
# USDOT Primer on C/AV Impacts on Agency Planning Products and Processes



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# Conclusions: Some questions that must be addressed in C/AV Planning

- Will capacity improvements from CAV reduce need for physical expansion on major freeway corridors?
- What policies and regulations are needed to mitigate the potential for unforeseen consequences of new traveler behavior that could substantially increase VMT?
- Will roadway configurations have to change during the period of mixed fleet operation? (e.g. separation of automated and non-automated vehicles)
- Will AV replace or supplement some transit services?



# Thank You!

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