

# *What Planners Need to Know*

## *Connected and Automated Vehicles*

*presented by*  
Mark Jensen

CAMBRIDGE  
SYSTEMATICS



September 28, 2016

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

Automated Vehicle (AV) technology allows vehicles to operate with limited or no human involvement, using onboard sensors to gather information about their environment.

LEVEL	Description	
0	Driver guidance and assistance applications; human control required.	
1	Automation of individual driver functions; human performs other functions.	
2	Automation of multiple driver functions; human performs other functions.	
3	Limited self-driving capability; human drives in complex situations.	
4	Fully autonomous operation from origin to destination	

*Explanation of the five levels of vehicle automation recognized by NHTSA*

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

---



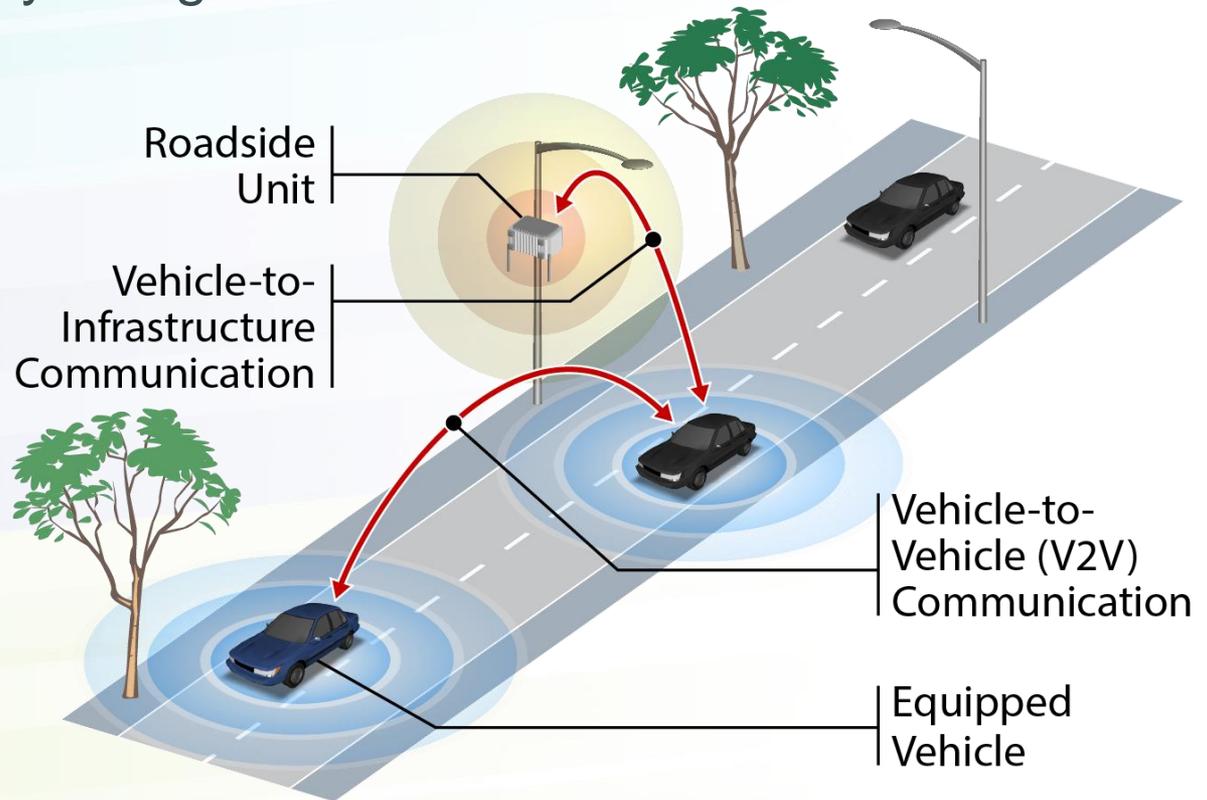
***Joshua Neally was driving his week-old Tesla Model X electric utility vehicle home from work in Missouri. He began to suffer sudden heart attack symptoms of severe chest pain. He had pre-programmed the nearest Emergency Room into Tesla's Autopilot beta software, and by selecting that location, the 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.***



## 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.

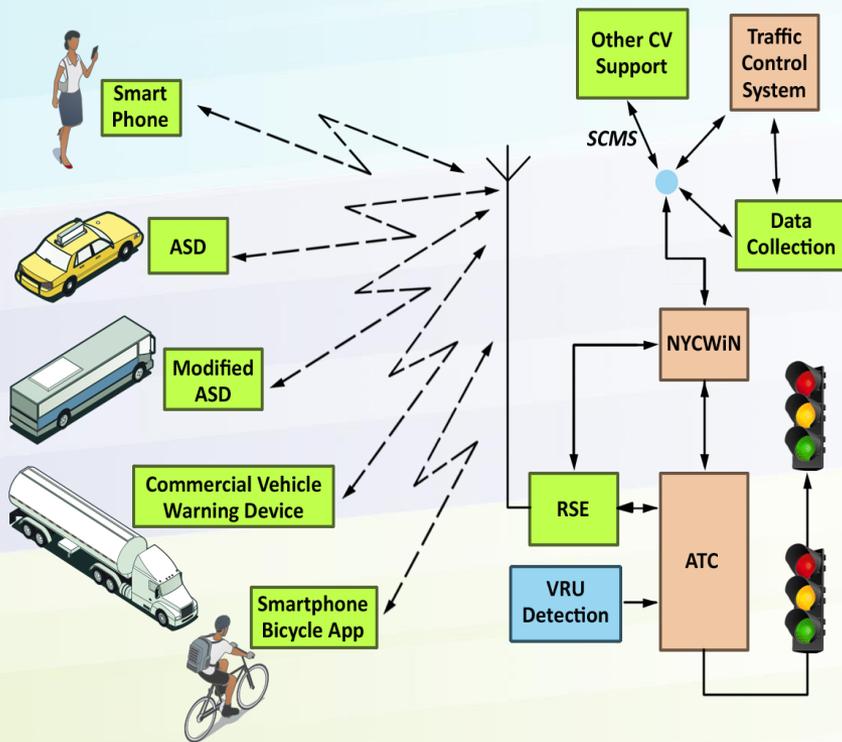


Overview of CV technology

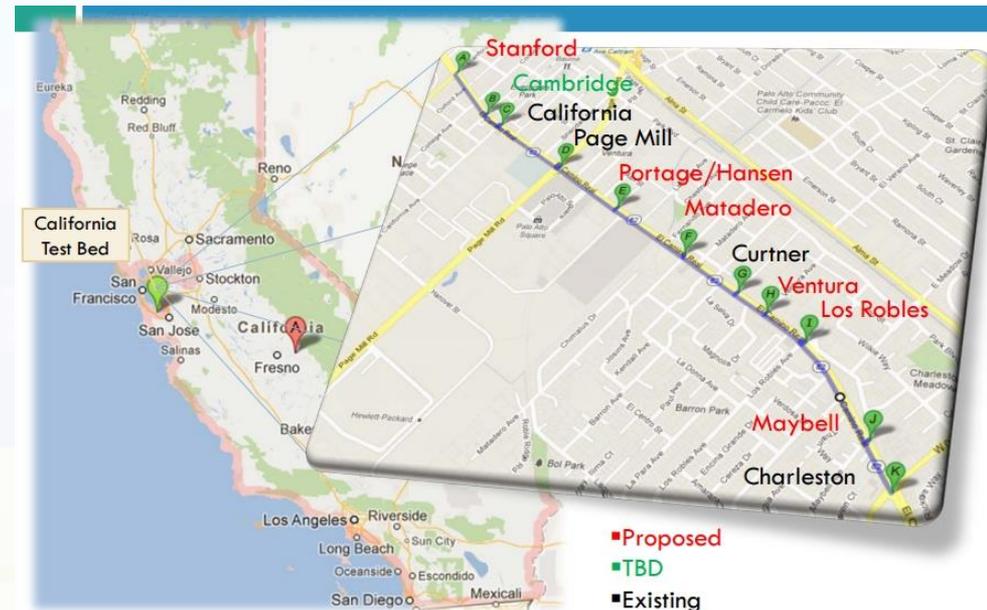


# Development and Deployment of Connected Vehicle Technologies

## NYC CV Pilot Deployment Concept



## California CV Test Bed



Sources: New York City DOT; Caltrans

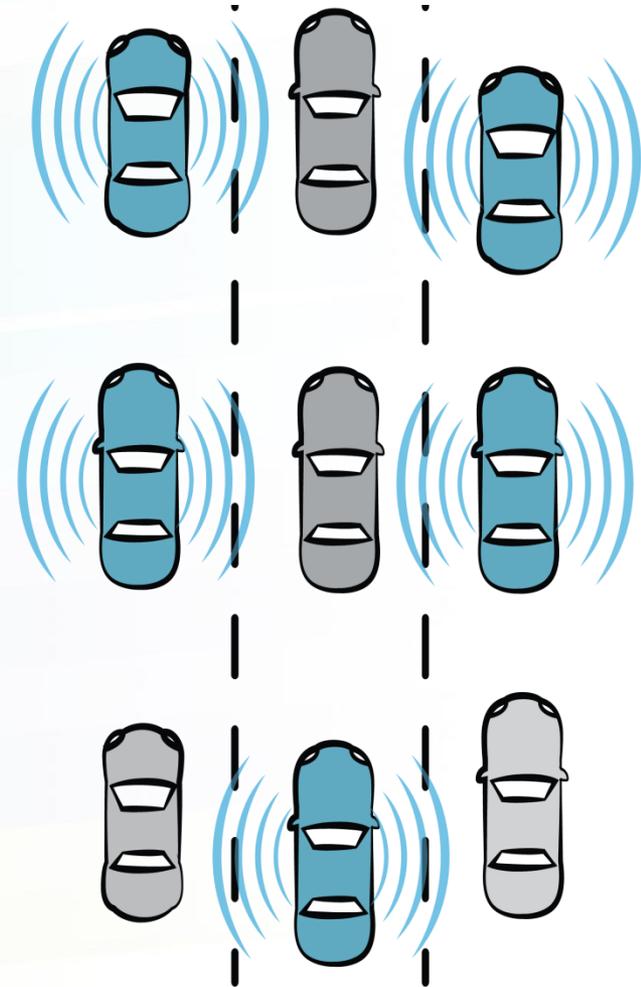
Don't get caught up in choosing sides  
or thinking one way is better than another.

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**

# *Near-Term C/AV Technology Example: Truck Platooning (Caltrans, FHWA)*

---



# Truck Platooning Example

## Planning for the I-710 Dedicated Truck Lanes

- Project Lead: LA Metro & Gateway Cities COG
- Connected Corridor from ports to downtown LA
- Regional mesoscopic model runs were developed which accounted for decreased truck spacing on the I-710 corridor
- ConOps and Corridor Plan
- 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 these 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.

- Case published (they must use the existing freeway).
- Trucks use advanced driving technologies, including truck platooning.
- Vehicle-to-vehicle communications.
- Dedicated bus and mobility.

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

## Truck Platooning Example

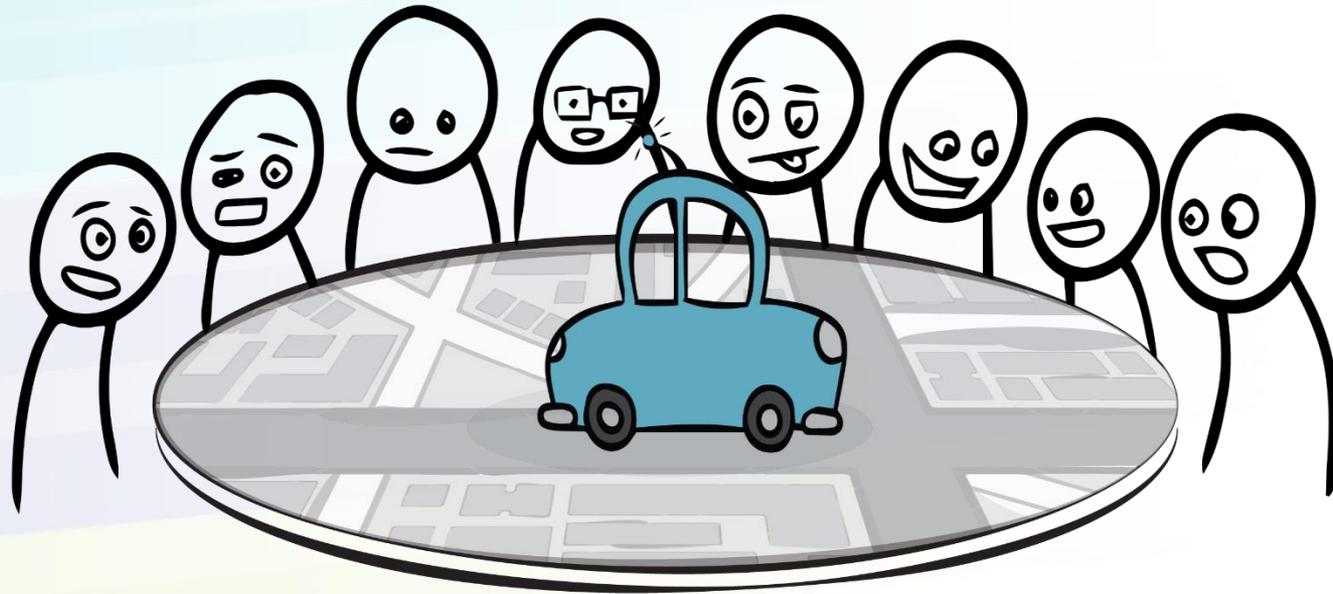
# Legislative Changes for C/AV

- 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

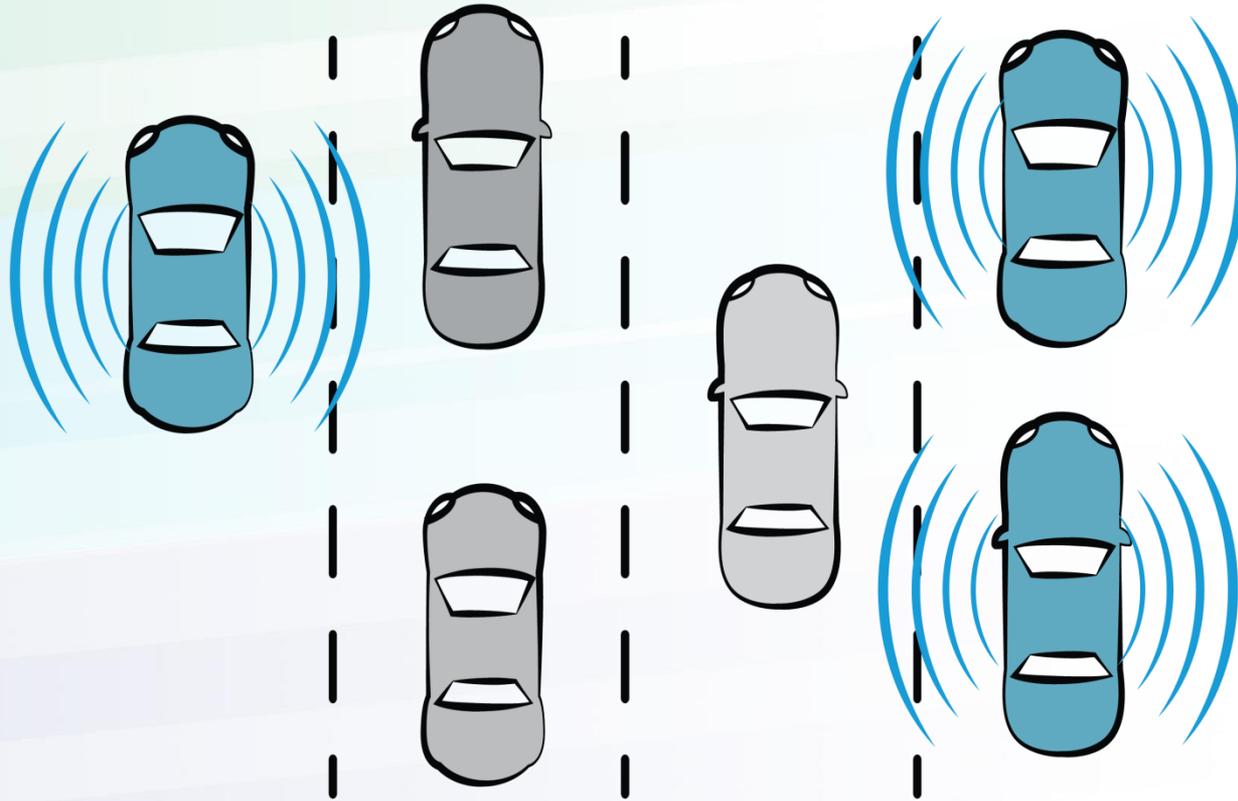


Source: Oshkosh Northwestern

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

And we need answers to several major questions:

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

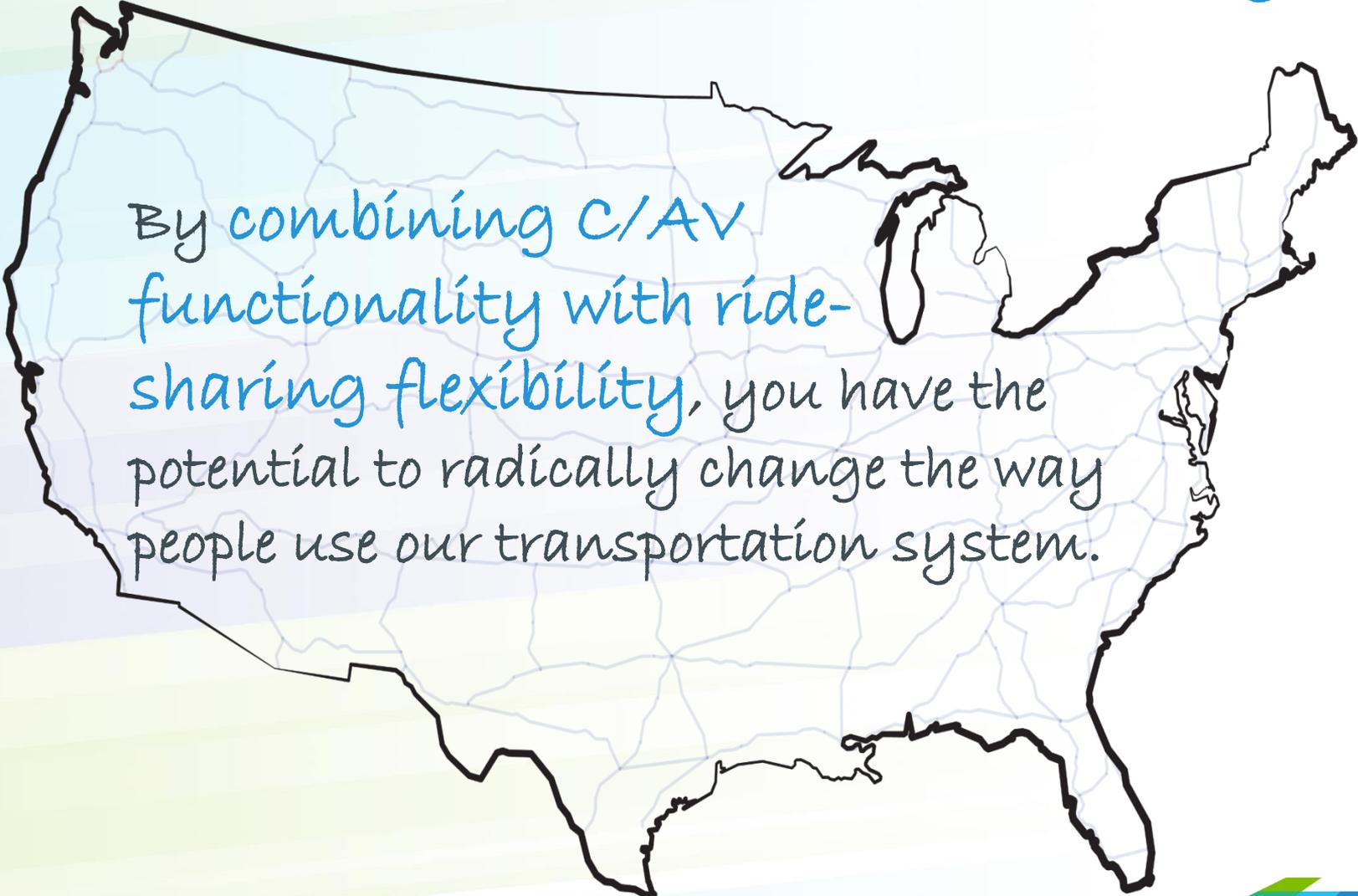
What happens  
to  
**TRANSIT?**

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**



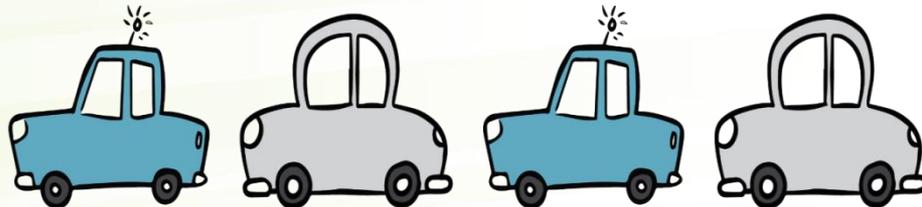
By combining C/AV  
functionality with ride-  
sharing flexibility, you have the  
potential to radically change the way  
people use our transportation system.



# *Additional C/AV Factors to Consider for Planning*

---

- A wider range of “futures” will need to be considered
- Crash reductions could dramatically reduce the need for safety infrastructure
- Long-term significant reductions in roadway signage
- What roadside infrastructure will be required to support C/AV operations?
- Enhancements to transportation planning workforce development



# *Thank You !*

---

- For more information:  
Mark Jensen  
Principal, PMP  
Cambridge Systematics  
[mjensen@camsys.com](mailto:mjensen@camsys.com)  
805-474-8483