

Benefits of Automation

- **Safety** 30K, 1K
- **Congestion**
- **Mobility**
- **Sustainability**
- **Productivity**
- **In-Vehicle Personal Time**

Drive to Automation

Enablers of Automation

- **Technological Advancements**
- **Industry**
- **Government**
- **Media**

Drive to Automation

LIDAR

A rotating sensor on the roof scans more than 200 feet in all directions to generate a precise three-dimensional map of the car's surroundings.

POSITION ESTIMATOR

A sensor mounted on the left rear wheel measures small movements made by the car and helps to accurately locate its position on the map.

VIDEO CAMERA

A camera mounted near the rear-view mirror detects traffic lights and helps the car's onboard computers recognize moving obstacles like pedestrians and bicyclists.



RADAR

Four standard automotive radar sensors, three in front and one

How does it Work?

Advance Driver Assist Systems (ADAS)

Google's Self-driving Car

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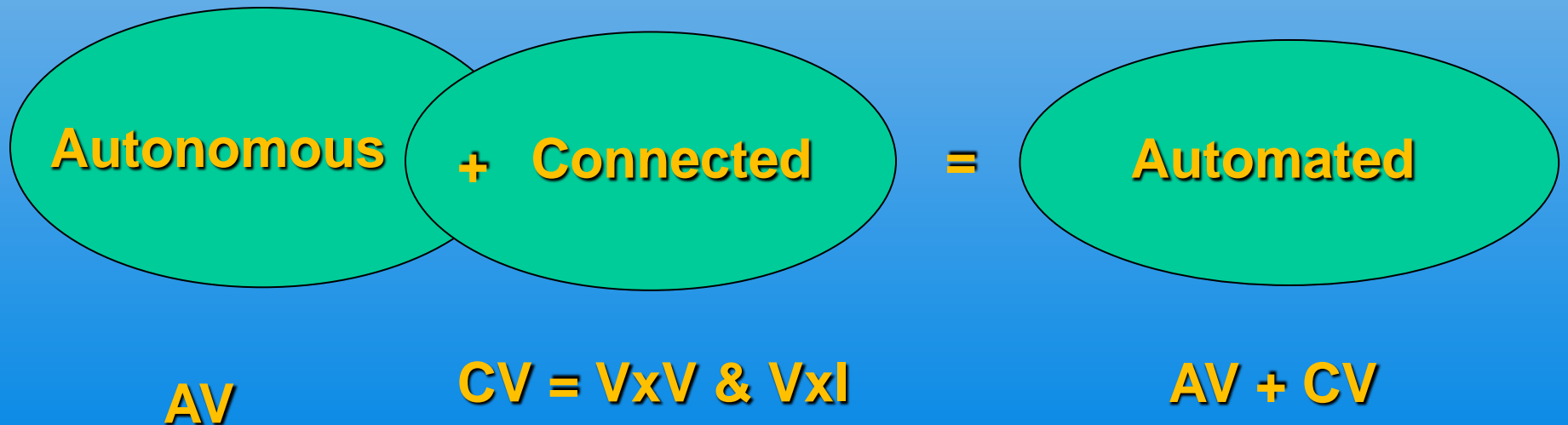
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Connected Vehicles



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Autonomous vs Connected Cars



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Automation Levels vs Time

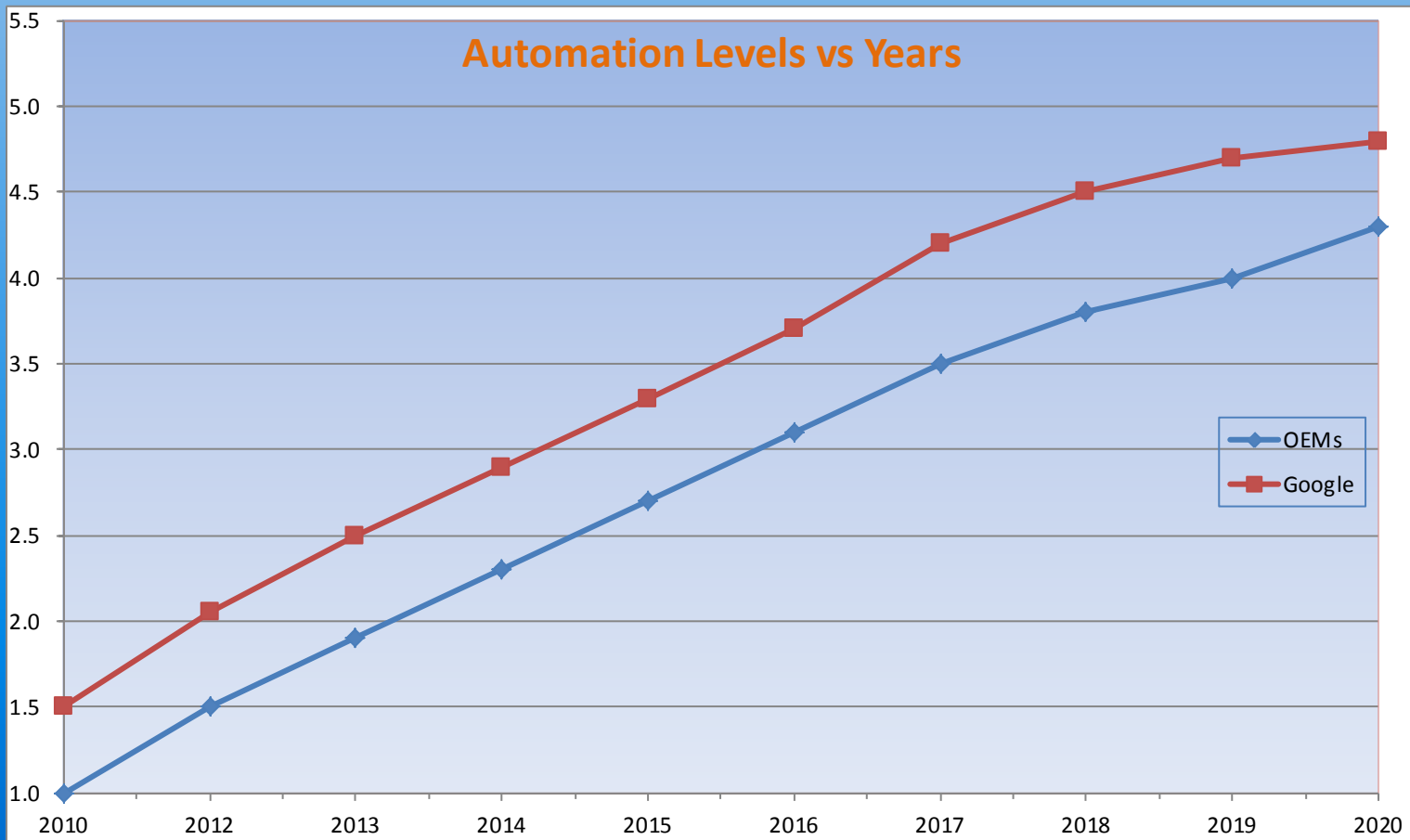
Level of Automation (SAE)

Full

High

Conditional

No



Year

Challenges Facing Automation

- **Cyber Infrastructure**
- **Product Liability**
- **Cyber Security**
- **Driver Acceptance**
- **Value Proposition**

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Recent Developments, 2010 - 2014

- **Automakers**
 - **NISSAN**
 - **VOLVO**
 - **Ford**
 - **German Luxury Automakers**
 - **TESLA**
 - **Tier 1 Parts Suppliers**
 - **Google**

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Ford's ADAS cars – Focus and Mondeo



2014 Ford Focus



2014 Ford Mondeo

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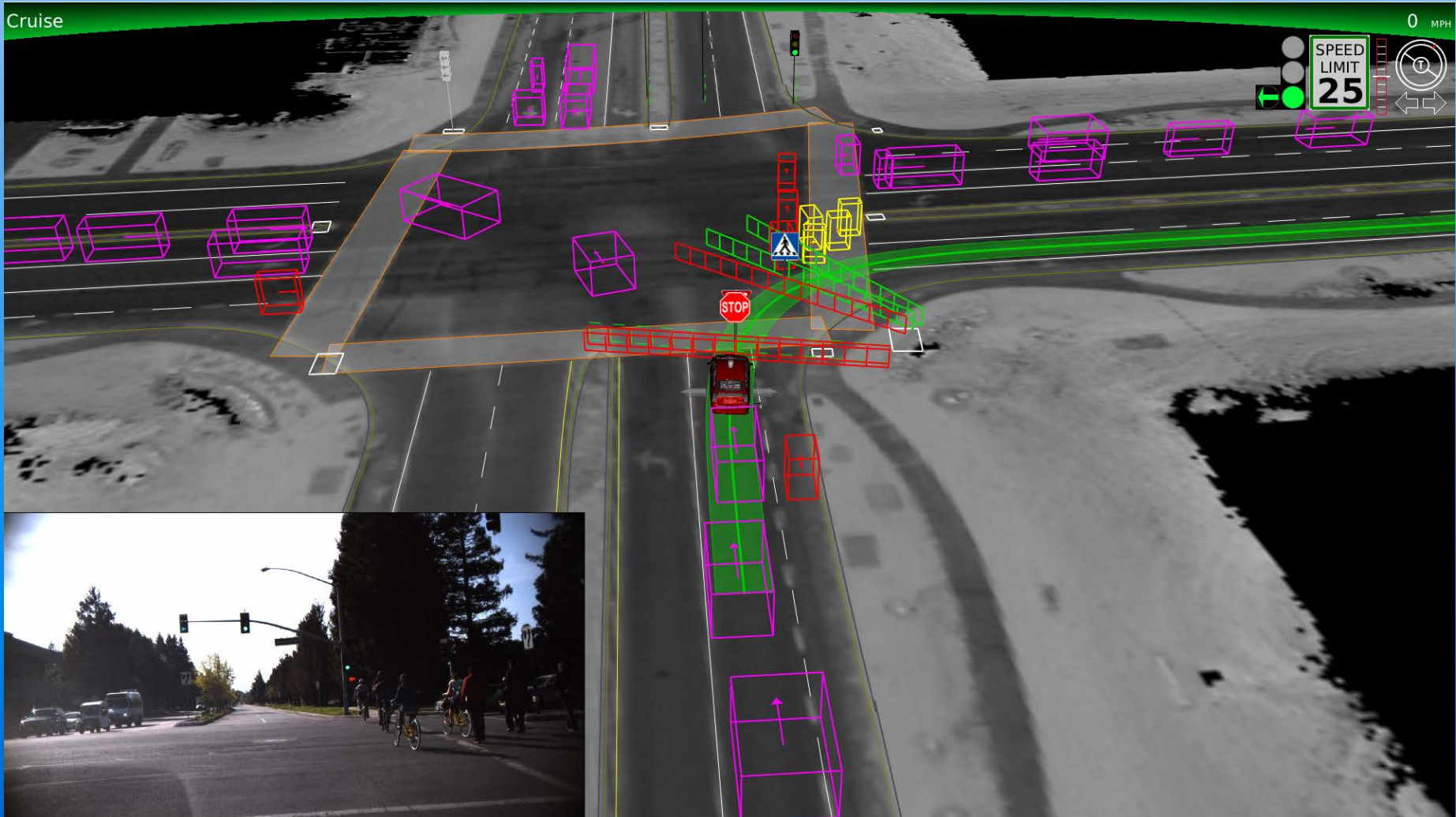
Recent Developments, 2010 - 2014

- **Google (Cont'd)**
 - **Influence**
 - **Public awareness of AV**
 - **Promises kept**
 - **Would it deliver near automatic car by 2018?**
 - **Formidable competitor to automakers**

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What Google's Self-Driving Car Sees



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Autonomous Vehicles



Google's prototype
self-driving car

V3

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Recent Developments, 2010 - 2014

- **Government and Academia**

- **Government**

- **US DOT**

- **FHWA , ITS JPO**

- **NHTSA**

- **States**

- **DOTs**

- **Legislators**

- **DMVs**

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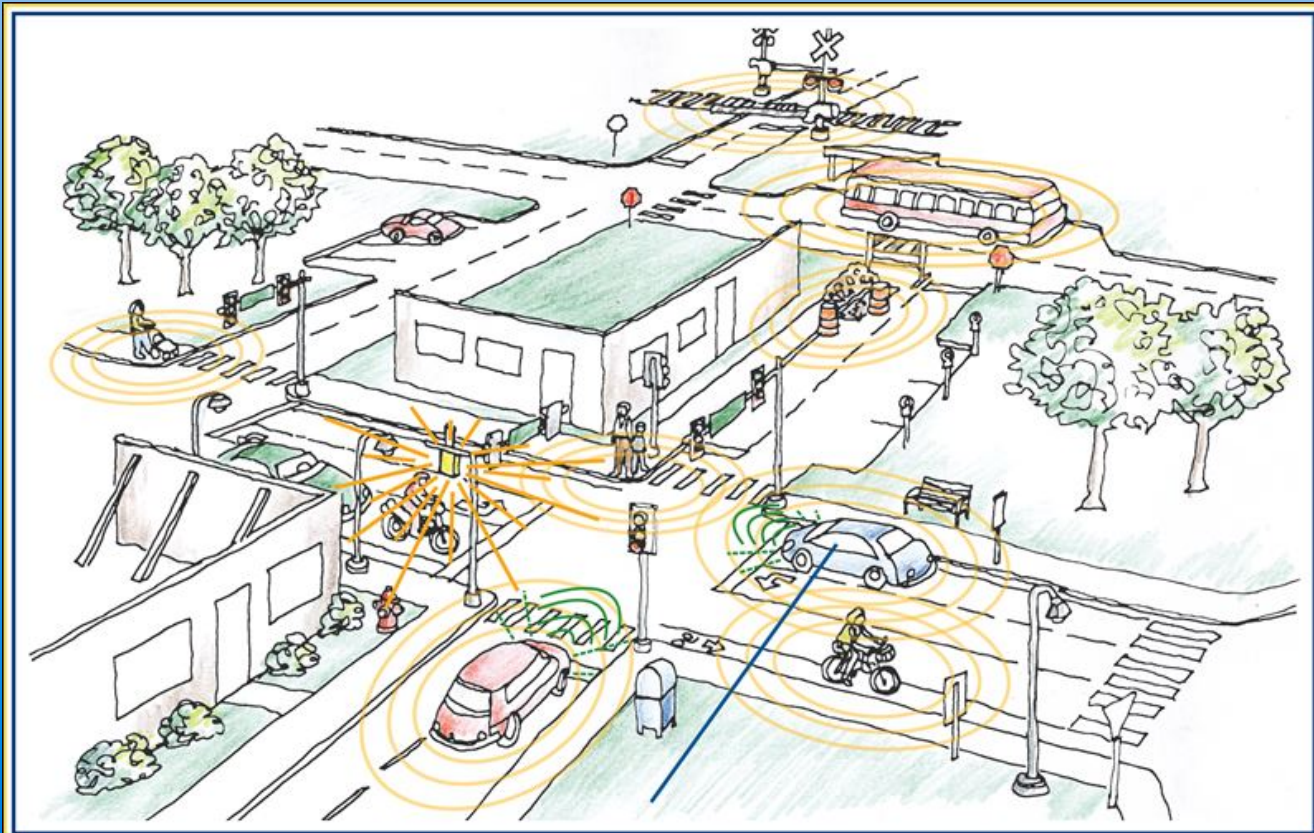
Recent Developments, 2010 – 2014 (Cont'd)

- **Government and Academia**
 - **Academia**
 - **Industry Partnerships
(UMTRI, MTC)**
 - **Applied Research
(Artificial Intelligence)**

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Industry partnerships



Mobility Transformation Facility

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External Accelerators

- **EV - AV**
- **AV - CV**
- **AV - IN**
- **AV - RS**

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In closing...

- **Work in progress**
- **Lots of Challenges Ahead – uncharted territory**
- **Champions**
- **Will we see near Autonomous Cars in 2018?**

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The End