

Connected and Automated Vehicles

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Difference Between Connected and Autonomous Vehicles

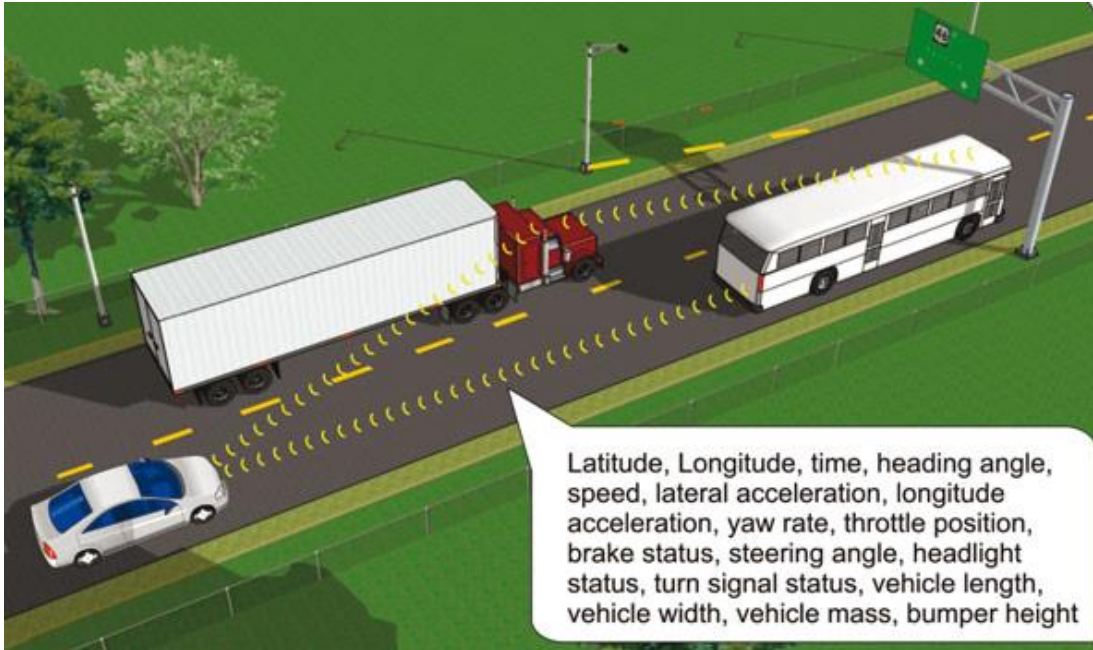
Connected Vehicles

- Vehicles use radio communications between each other and the infrastructure
- Vehicles warn drivers, DOTs about dangerous situations
- Work to be done on harmonization at agency level

Autonomous Vehicles

- Vehicle has control of at least some aspects of driving
- Less work to be done at agency levels – vehicles designed to support any environment

Connected Vehicles - The Concept



<http://www.nbcnews.com/video/nightly-news/54263850#54263850>



Connected Vehicle Background Overview

1999 – 75 MHz at 5.9 GHz allocated by US DOT

1999-2014

- Policy development
- Technical research
- Standards development
- Early Deployments



US DOT Announcement

February 2014

“NHTSA will begin taking steps to enable vehicle-to-vehicle (V2V) communication technology for light vehicles. This technology would improve safety by allowing vehicles to "talk" to each other and ultimately avoid many crashes altogether by exchanging basic safety data, such as speed and position, ten times per second.”

US DOT Announcement

September 2014

- General Motors' Mary Bara announced that the 2017 CTS will have standard 5.9 GHz communications equipment.
- Toyota and Honda are expected to follow

Example V2I Applications

V2I Safety

Red Light Violation Warning
Curve Speed Warning
Stop Sign Gap Assist
Spot Weather Impact Warning
Reduced Speed/Work Zone Warning
Pedestrian in Signalized Crosswalk Warning (Transit)

V2V Safety

Emergency Electronic Brake Lights (EEBL)
Forward Collision Warning (FCW)
Intersection Movement Assist (IMA)
Left Turn Assist (LTA)
Blind Spot/Lane Change Warning (BSW/LCW)
Do Not Pass Warning (DNPW)
Vehicle Turning Right in Front of Bus Warning (Transit)

Agency Data

Probe-based Pavement Maintenance
Probe-enabled Traffic Monitoring
Vehicle Classification-based Traffic Studies
CV-enabled Turning Movement & Intersection Analysis
CV-enabled Origin-Destination Studies
Work Zone Traveler Information

Environment

Eco-Approach and Departure at Signalized Intersections
Eco-Traffic Signal Timing
Eco-Traffic Signal Priority
Connected Eco-Driving
Wireless Inductive/Resonance Charging
Eco-Lanes Management
Eco-Speed Harmonization
Eco-Cooperative Adaptive Cruise Control
Eco-Traveler Information
Eco-Ramp Metering
Low Emissions Zone Management
AFV Charging / Fueling Information
Eco-Smart Parking
Dynamic Eco-Routing (light vehicle, transit, freight)
Eco-ICM Decision Support System

Road Weather

Motorist Advisories and Warnings (MAW)
Enhanced MDSS
Vehicle Data Translator (VDT)
Weather Response Traffic Information (WxTINFO)

Mobility

Advanced Traveler Information System
Intelligent Traffic Signal System (I-SIG)
Signal Priority (transit, freight)
Mobile Accessible Pedestrian Signal System (PED-SIG)
Emergency Vehicle Preemption (PREEMPT)
Dynamic Speed Harmonization (SPD-HARM)
Queue Warning (Q-WARN)
Cooperative Adaptive Cruise Control (CACC)
Incident Scene Pre-Arrival Staging Guidance for Emergency Responders (RESP-STG)
Incident Scene Work Zone Alerts for Drivers and Workers (INC-ZONE)
Emergency Communications and Evacuation (EVAC)
Connection Protection (T-CONNECT)
Dynamic Transit Operations (T-DISP)
Dynamic Ridesharing (D-RIDE)
Freight-Specific Dynamic Travel Planning and Performance
Drayage Optimization

Smart Roadside

Wireless Inspection
Smart Truck Parking

Applications to US DOT Deployment Grant

- Florida
 - MDX
 - THEA
 - FDOT
- Virginia
- Utah
- California including
 - One CA
 - Sacramento
 - Contra Costa
 - Oakland
- CO
- Arizona
- MI
- Texas
- PA
- NJ
- NY
 - City
 - State
- Seattle City
- Seattle Port of Tacoma
- INRIX, Purdue, U Iowa
- MA
- SC (Clemson)
- TN
- MD
- Wyoming

Other Deployments

- Mcity, Michigan
- Osceola County, Florida
- New York City
- New York State
- VA DOT
- Lee County
- Ohio
- Seattle
- California
- Oregon
- Novi test bed
- GA (coming)
- Florida (coming)
- Utah (coming)
- CO (coming)
- Detroit
- Others

Data

- Potentially the largest source of data from any single source in the history of the world and it starts in 18 months.
- Options for an agency:
 - Nothing
 - Outsourcing
 - Hiring data management experts
 - Building software/hardware systems to manage the data