Tech Brief Series **Tech Brief - 2018-2**

Connected & Autonomous Vehicles

With a host of new vehicle technologies emerging, it's common to see news articles discussing automated and connected vehicle technologies. Though at times these terms are mistakenly used interchangeably, there is a clear distinction between the two concepts. This technical brief provides an overview of the two technologies.

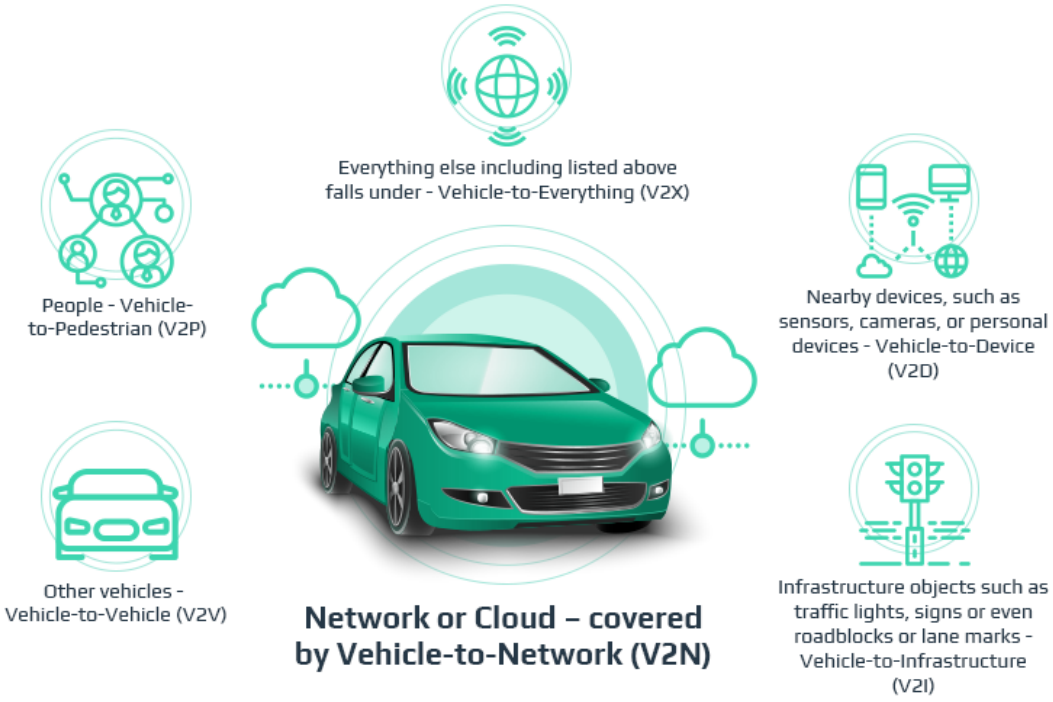
Connected Vehicles

In the simplest sense, connected vehicle (CV) technologies are tools that allow vehicles to communicate with each other and with the world around them. This communication in turn allows drivers to make decisions using information from the surrounding environment. One should note that while using CV technologies, human drivers are still in control of the vehicle.

Connected vehicles may seem like a futuristic concept, but the average driver is already familiar with CV technology in the form of dynamic routing using GPS navigation via the cellular network. Information regarding collisions, active construction and other congestion along a route are communicated to the driver using visual and audio displays, either in the vehicle or on a mobile phone. This information then allows the driver to make an informed decision regarding the best route to take. In the future, connected vehicle technologies may include those shown in the graphic below.

Courtesy Qualcomm

When talking about connected vehicle technologies, the terms V2V, V2I, V2P and V2X are often used. As show in the graphic below, V2V refers to vehicles talking to each other, V2P refers to vehicles talking to pedestrians, and V2I refers to vehicles talking to infrastructure surrounding them.



Courtesy Intellias

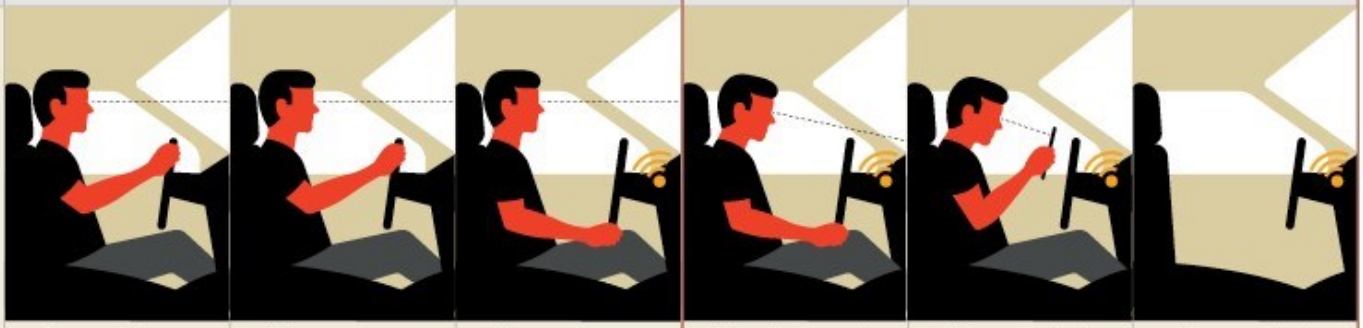
One of the biggest issues surrounding CV technologies is ensuring a secure communications network. The Federal Communications Commission (FCC) set aside bandwidth specifically for intelligent transportation systems communication using dedicated short-range communication (DSRC), which is a specialized form of WiFi. A security credential management system (SCMS) for messages sent over DSRC will be tested as part of national connected vehicle pilot deployment projects currently underway in New York City, Tampa and Wyoming.

In the municipal realm, the National Operations Center for Excellence, a partnership of AASHTO, ITE and ITSA with support from FHWA, issued the SPaT Challenge to local agencies. The SPaT Challenge is to implement DSRC and transmit Signal Phasing and Timing (SPaT) data along a corridor in each of the 50 states by 2020. So far 26 states have committed to respond to the SPaT Challenge, with 216 signals currently in operation and 2,121 planned. Look for more in-depth information on the SPaT Challenge in future tech briefs.

Courtesy NOCoE

Autonomous Vehicles

True autonomous (fully automated) vehicles (AV) do not require a human driver. Auto manufacturers have begun introducing various automated features to their products, including collision avoidance and self-parking technologies. However, development of fully autonomous vehicles will require significant further research and testing. The defined levels of automation are described in the graphic below.

				Automated Driving Systems (ADS)		
	Level 0 No Automation	**Level 1 Driver assistance**	**Level 2 Partial automation**	**Level 3 Limited self-driving (conditional automation)**	**Level 4 Full self-driving under certain conditions (high automation)**	**Level 5 Full self-driving under all conditions (full automation)**
Vehicle	No automation.	Can assist driver in some situations.	Can take control of speed and lane position in certain conditions.	Can be in full control in certain conditions and will inform the driver to take control.	Can be in full control for the entire trip in these conditions and can operate without a driver.	Can operate without a human driver and need not have human occupants.
Driver						
	In complete control at all times.	Must monitor, engage controls, and be ready to take over control quickly at any moment.	Must monitor and be ready to take over control quickly at any moment.	Must be ready to take control quickly when informed.	Not needed	Not needed

Courtesy GHSA

The United States currently has no regulations specifically governing the safety of autonomous and highly-automated vehicles (HAV). The AV START Act (S. 1885), which would establish federal oversight of AV/HAV, was introduced to the Senate in 2017 and is currently under consideration. The impetus behind the bill is to maintain States' rights to regulate AV/HAV on public roads to establish federal safety standards for AV/HAV.

In 2017, Connecticut passed legislation establishing an AV Task Force, which held its first meeting in July of 2018 and is planned to reconvene in advance of the January 2019 legislative session. A pilot program for testing autonomous vehicles in four Connecticut municipalities was also established as part of the legislation. Thus far, Stamford and Windsor Locks have submitted pilot program applications and Manchester, New Haven and Bridgeport have submitted statements of interest.

Other initiatives in Connecticut include a full-sized driving simulator to investigate driver behavior in relation to autonomous vehicles and the annual Northeast Automated and Connected Vehicle (NACV) Summit in June hosted by the Department of Transportation, the University of Connecticut, and the Federal Highway Administration.

Additional Resources:

For more information on the USDOT Connected Vehicle Pilot Program Projects:

https://www.its.dot.gov/pilots/

For more information on the SPaT Challenge:

https://transportationops.org/spatchallenge

For more information on the 2017 AV START Act and the AV Task Force:

http://www.ctn.state.ct.us/ctnplayer_html5.asp?odid=15453

https://www.cga.ct.gov/2017/ba/2017SB-00260-R01-BA.htm

Information from the Governors' Highway Safety Association:

https://www.ghsa.org/resources/AutomatedVehicles18

Information on the Northeast Automated and Connected Vehicle Summit:

https://ctsrc.uconn.edu/nacv2018/

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