



---

## Vehicle to Everything an Introduction

***N.C.A.Boovarahan***

*Assistant Professor, Sri ChandrasekarendraViswaMahaVidyalaya Deemed to be University, Enathur – 631561*

---

### ABSTRACT

Vehicle-to-everything (V2X) is a vehicle-to-vehicle communication system that lets cars to communicate with moving portions of the traffic system around them. It contains multiple components and is also known as connected-vehicle-to-everything connectivity. Vehicle-to-vehicle (V2V) communication is one aspect of this technology that allows cars to talk with one another. Vehicle-to-infrastructure (V2I) is another component that allows cars to communicate with one other as well as external systems like street lights, buildings, and even cyclists and pedestrians. What this technology is capable of will expand as it becomes more advanced in the future.

---

Keywords: V2X, V2I

---

### 1. INTRODUCTION

V2X is a vehicle-to-vehicle communication system that uses short-range wireless signals to allow cars to connect with other vehicles and the environment around them. Vehicle-to-vehicle communication (V2V) and vehicle-to-infrastructure (V2I) are two subgroups of V2X. V2X is primarily utilized to improve safety, but it also has other advantages, such as the ability to automate toll payment. Understanding Vehicle-to-Everything (V2X) V2X communications systems are primarily utilized for improving safety and reducing collisions. In a typical vehicle, V2X systems can warn the driver about adverse weather, nearby accidents, road conditions, and the potentially harmful activities of neighboring vehicles. V2X adds to a vehicle's existing navigation system in autonomous vehicles.

To interact with compatible systems, V2X uses a short-range wireless signal that is resistant to interference and bad weather. V2X technology can also be used for other applications, such as integrating automatic payments for tolls, parking, and other levies. The market potential for V2X technology is enormous from an economic standpoint. Since 2016, output has increased.

---

### 2. VEHICLE-TO-EVERYTHING (V2X) IS POPULARLY KNOWN

The V2X market is still in its early stages, and many of the system's advantages will not be recognized until the market matures. A V2X car can only communicate with another V2X vehicle or roadside object that also uses V2X technology. Many traffic systems lack V2X systems, preventing vehicles equipped with the technology from communicating with them. Vehicles are projected to be able to communicate not only with traffic systems, but also with bicycles and pedestrians who have V2X devices as V2X systems become more popular.

Many prominent V2X vendors, such as Delphi, Denso, Qualcomm, and Continental, have large-scale integration plans, so vehicle-to-everything technology is likely to increase dramatically over the next 20 years. Many modern car models, particularly luxury manufacturers, incorporate V2X technology in some way. Vehicle-to-everything systems are planned to be included in lower-cost vehicles in the future.

Vehicle-to-everything technology especially important in autonomous vehicles, which will scan their immediate environment for dangers and make decisions based on that information. Vehicle-to-everything systems can also withstand the extreme weather conditions affect self-driving Cars

\* Corresponding author.

E-mail address: [itsmeboovar@gmail.com](mailto:itsmeboovar@gmail.com)

---

### 3. REAL WORLD EXAMPLE OF VEHICLE-TO-EVERYTHING (V2X)

The 5G Automotive Association (5GAA) is a global consortium of automotive, technology, and telecommunications businesses dedicated to the advancement of V2X technology. AUDI AG, BMW Group, Daimler AG, Ericsson, Huawei, Intel, Nokia, and Qualcomm Incorporated launched the company in 2016. It presently has more than 100 members from all over the world.

---

### 4. BENEFITS ON V2X

V2X technology (either C-V2X or 802.11p based devices) will be steadily deployed over time. Starting around 2020, new automobiles will be outfitted with one of the two technologies, and their share on the road is predicted to progressively increase. The Volkswagen Golf 8th generation was the first passenger automobile to have V2X technology, which was developed by NXP. Existing (legacy) vehicles will continue to operate on the road in the meanwhile. This means V2X-enabled vehicles will have to coexist with non-V2X (legacy) automobiles or V2X vehicles with incompatible technologies. The primary roadblocks to its adoption are legal difficulties and the fact that its usefulness will be restricted unless practically all vehicles embrace it. The British monthly "The Economist" claims that regulations, not technology, are driving autonomous driving. However, a recent study found that even during the transitory phase when the technology is being accepted in the market, there are benefits in reducing traffic accidents. The primary roadblocks to its adoption are legal difficulties and the fact that its usefulness will be restricted unless practically all vehicles embrace it. The British monthly "The Economist" claims that regulations, not technology, are driving autonomous driving.

---

### 5. CONCLUSION

V2X technology (either C-V2X or 802.11p-based products) will be steadily deployed over time. Beginning around 2020, new automobiles will be outfitted with one of the two technologies, and their share of the road will steadily increase. The Volkswagen Golf 8th generation was the first passenger automobile to feature NXP-based V2X technology. Existing (legacy) vehicles will continue to operate on the road in the meanwhile. This means V2X-enabled vehicles will have to coexist with non-V2X (legacy) automobiles or V2X vehicles with incompatible technologies. Testing is a crucial aspect of the V2X process. The abstract test system is described first, followed by test methods from three perspectives: function, performance, and conformance. Then we look at testing methods such vehicle gateway testing, penetration testing, and accelerated testing, as well as field testing needs. Finally, we have suggested an end-to-end testing solution that combines virtual and real environments to do full protocol stack testing.

---

### REFERENCES

- [1] California Vehicle-Grid Integration (VGI) Roadmap: Enabling vehicle based grid services, February 2014.
- [2] Hybrid and Electric Vehicles. The Electric Drive Commutes. International Energy Agency, Implementing Agreement for Cooperation on Hybrid and Electric Vehicle Technologies and Programmes, Annual Report, 2016.
- [3] W. Kepton, J. Tomic, S. Letendre, A. Brooks, T. Lipman. "Vehicle to grid power: battery, hybrid and fuel cell vehicles as a resource for distributed electric power in California", UCD-ITS-RR-01-03, 2001.
- [4] <http://parker-project.com/>.
- [5] C. Corchero. Task 28 V2X technology. IEA IA-HEV Hybrid and Electric Vehicles, 2017
- [6] [https://5gaa.org/wp-content/uploads/2017/12/Final-report-for-5GAA-on-cellular-V2X-socio-economic-benefits-051217\\_FINAL.pdf](https://5gaa.org/wp-content/uploads/2017/12/Final-report-for-5GAA-on-cellular-V2X-socio-economic-benefits-051217_FINAL.pdf)
- [7] SAE J2945/1: On-Board System Requirements for V2V Safety Communications, Warrendale, PA, USA, 2016.
- [8] A. Bazzi, B. M. Masini, A. Zanella and I. Thibault, "On the performance of IEEE 802.11p and LTE-V2V for the cooperative awareness of connected vehicles", IEEE Trans. Veh. Technol., vol. 66, no. 11, pp. 10419-10432, Nov. 2017.
- [9] Intelligent Transport Systems (ITS); Vehicular Communications; Basic Set of Applications; Definitions, Sophia Antipolis, France, 2009.
- [10] 5G V2X The Automotive Use-Case for 5G, 2017, [online] Available: [http://www.3gpp.org/ftp/information/presentations/Presentations\\_2017/A4Conf010\\_Dino%20Flore\\_5GAA\\_v1.pdf](http://www.3gpp.org/ftp/information/presentations/Presentations_2017/A4Conf010_Dino%20Flore_5GAA_v1.pdf).
- [11] H. Z. B. Sun, "IEEE 802.11-18/0861r9: 802.11 NGV proposed PAR", IEEE 802.11 NGV Meeting, Nov. 2019.
- [12] L. Cheng, B. E. Henty, R. Cooper, D. D. Stancil and F. Bai, "A measurement study of time-scaled 802.11a waveforms over the mobile-to-mobile vehicular channel at 5.9 GHz", IEEE Commun. Mag., vol. 46, no. 5, pp. 84-91, May 2008.