Features and differences between Desay SV and Ford in the solution of C-V2X Technology

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Abstract. C-V2X (means cellular vehicle to everything) is a vehicle wireless communication technology based on cellular network. In the early days of V2X, it was mainly based on DSRC. Its full name is dedicated short range communication, a dedicated short-range communication technology. C-V2X technology supports various vehicle networking applications including vehicle, vehicle road, vehicle person and vehicle network through device to device and cellular communication. C-V2X is a global standard formulated by 3GPP organization, including LTE-V2X and 5g-V2X. Among them, LTE-V2X mainly carries basic traffic safety business. The standard has been formulated since 2015 and R14 version has been released in 2017; 5g-V2X, based on 5g NR technology, is mainly aimed at carrying automatic driving business, and will be released in 3GPP R16 at the end of 2019. This paper will compare the characteristics of C-V2X technology solutions of Ford and Desay SV, and explore the differences between Desay SV and Ford in C-V2X technology solutions [1].

1. Introduction
With the deep integration of ICT industry, automobile industry and transportation industry, the Internet of vehicles is gradually regarded as one of the Internet of things fields with the most clear market demand and the most industrial potential in recent years. The core element of the Internet of vehicles is to use wireless technology to realize the data exchange of various elements in the transportation system, namely V2X, so as to reflect the value of safety, comfort, energy saving and efficiency.

V2X technology has two different technical routes, namely DSRC technology and C-V2X technology. After more than ten years of development, DSRC technology is mature, but it can not support automatic driving in the future. C-V2X technology is very advanced, but due to its later development than DSRC technology, the current technology has only achieved "sporadic" success. As mentioned above, V2X refers to the vehicle that can communicate with everything around. It includes the communication between vehicles (V2V), vehicles and infrastructure (V2I) or vehicles and people (V2P)*. Besides, C means the communication takes place in the same cellular network of our mobile phones.

At present, C-V2X has been running on today's 4G network. 3GPP is an industry organization that develops wireless network standards. It adopts some C-V2X technologies to allow cars to play basic driving information on 4G network. The development of GPP C-V2X standard is shown in figure 1.
UWE Puetschle, head of Nokia V2X department, said that the 15th version of 3GPP can only support downloading car videos and maps, but Puetschle said that the 16th version released in mid-2020 will enable more radical C-V2X functions to be realized, such as allowing multiple cars to negotiate the best solution through the intersection. This will require 5g fast response support, known in the industry as low latency. The 16th edition should reduce the delay from tens of milliseconds to 10 milliseconds, and this "Agility" is also required to unify cars or trucks into a row.

Generally speaking, compared with DSRC technology, C-V2X technology, as a rising star, is better than DSRC in terms of communication range, capacity, vehicle moving speed and anti-interference. Huawei's C-V2X white paper on vehicle road integrated intelligent network system (released in 2018) points out that the results of comparative test show that the performance of LTE-V2X in terms of communication distance (no blocking and blocking environments) and anti-interference ability is 2~3 times that of DSRC [8].

In addition, C-V2X also has the advantage of an evolution route that can support unmanned automatic driving in the future, that is, 5G-V2X. At present, the formulation of 5G-V2X standard has been released in 3GPP R16.

At present, China's Ministry of Industry and Information Technology has clearly selected the C-V2X technology route as the direct communication technology of the Internet of Vehicles (intelligent network connected to vehicles). Combined with national policies and the development of industrial chain ecology, C-V2X technology is more suitable for the development of China's Internet of Vehicles [1].

On November 6, 2018, Desay SV announced that it would develop LTE-V2X solutions for automobile manufacturers using 9150 C-V2X chipset solutions from Qualcomm Technologies, Inc., a subsidiary of Qualcomm Incorporated. Desay SV is committed to providing cutting-edge technical support to the depot, including LTE-V2X, to support the improvement of road safety, traffic efficiency and autonomy. LTE-V2X technology is C-V2X technology [7].

Duan Yongzheng, deputy general manager of Desay SV, said that Desay SV had been laying out DSRC-V2X technology as early as 2017 and had successively completed several V2V and V2I scenarios. At the launch exhibition of Desay SV in December 2017, the software and hardware products developed by Desay SV were displayed and the real vehicle scene was demonstrated. At the same time, the technology based on C-V2X has been in synchronous pre research. Based on Qualcomm 9150 C-V2X chipset and Desay SV's software and hardware development integration capability, Desay SV will jointly contribute to the safety and efficiency improvement of intelligent networked vehicles.

In addition, on December 22, 2020, Ford China officially announced that Ford's New Explorer and Ruijie plus will take the lead in carrying the Ford vehicle road coordination system based on cellular vehicle Networking (C-V2X) technology, and plans to carry this technology on more domestic models in 2021, which marks that Ford has become the first vehicle enterprise in China to realize the mass production application of C-V2X technology [5].
2. Analysis
Taking 2021 Buick GL8 Avenir Avia as an example, this vehicle is equipped with Desay SV C-V2X wireless communication technology, which makes the intelligent performance of the vehicle further. It can realize the emergency braking warning EBW related to vehicle to vehicle communication, vehicle out of control warning CLW, abnormal vehicle warning AVW, intersection collision warning ICW, and speed limit warning SLW related to vehicle to road infrastructure communication Functions such as red light running warning SVW, road danger status prompt HLW, green wave speed guidance GLOSA [4].

With the support of C-V2X wireless communication technology, when the automatic driving function of some vehicles still stays at the stage of automatic parking at traffic lights, the 2021 Buick GL8 Avenir Avia can provide the driver with recommended speed according to the real-time data of signal lights through the interconnection between C-V2X wireless communication technology and urban traffic signals, So that every intersection can "meet" the green light.

Internet of vehicles is an important development direction of intelligent vehicles. Figure 2 shows a smart city model using C-V2X Technology. C-V2X wireless communication technology accelerates the process of Internet of vehicles industry. C-V2X is a global solution for vehicle networking communication. It aims to improve vehicle safety, traffic efficiency and automatic driving ability through high-performance real-time direct communication between vehicles and communication between vehicles and roadside infrastructure. Desay SV C-V2X wireless communication technology has the characteristics of fast connection speed and short transmission delay. It can transmit data through some obstacles to improve the perception of vehicles in the blind area of line of sight. It has a high degree of accuracy, reliability and strong non line of sight performance, which greatly improves the user's driving experience, traffic efficiency and safety.

In addition to Desay SV company, Ford also has a good application of C-V2X technology. Taking the new Ford adventure and Ruijie plus as an example, from January 1, 2021, the owners of the new Ford adventure and Ruijie plus can take the lead in experiencing the Ford vehicle road coordination system in specific areas of Wuxi and Changsha. Through the interconnection between vehicles, intelligent infrastructure and urban traffic cloud control platforms, the system timely pushes the traffic light information and countdown, green wave speed, green light start reminder, traffic information broadcast and other information ahead for car owners to help car owners predict risks [3].

Figure 2. C-V2X Technology: 5G travel to build a smart city.
In addition, after nearly three years of road testing and user research, the Ford China engineer team has deeply understood China's road characteristics and consumers' driving habits, and continuously optimized the functions and algorithms of the model coordination system. The Ford vehicle road coordination system is deeply integrated with the whole vehicle. Its algorithm is based on China's road traffic regulations and actual road conditions, combined with the current position, state and driver's intention of the vehicle, so as to accurately, timely and intelligently push information for the owner and avoid unnecessary interference. Ford engineers have also optimized the human-computer interaction interface of Ford vehicle road coordination system. For example, the system is combined with Intelligent travel infotainment system sync +, which displays the driving route in the map navigation mode and visually informs the owner of the red and green light status, road infrastructure and other information in the form of sound and image; Even if the central control screen of the vehicle is not in the navigation interface, an obvious floating window will pop up to inform the owner in time in the form of sound and image. The owner can also make personalized settings such as sensitivity adjustment and voice reminder on / off according to personal driving habits.

Finally, Ford will continue to optimize the function and user experience according to the feedback of the first batch of car owners, and plans to carry the vehicle road coordination system on more mass-produced new models and connect to the intelligent transportation system in more cities in China in 2021.

3. Discussion

Before the implementation of C-V2X technology, V2X technology adopts DSRC technology route.

DSRC (special short range protocol) is used as a communication protocol between roads and vehicles in the field of intelligent transportation. DSRC consists of roadside unit RSU, on-board unit OBU, control center and some auxiliary equipment. DSRC communication protocol is the core technology for RSU and OBU to realize wireless short-range communication and ensure safe and reliable information transmission [9].

As early as 2004, the United States led to customize the standard of DSRC technology and released it in 2010. It can be said that DSRC technology is the earliest technical route of V2X technology. In fact, as far as the C-V2X technology itself is concerned, compared with the previous connection technology, the C-V2X standard has several main advantages:

Firstly, it relies on the existing perfect LTE networks, which have provided excellent security and good coverage.

Secondly, the support reliability, real-time and low latency communication between different network participants. With the advent of 5g cellular network, the speed and quality of data transmission can be further improved.

Thirdly, C-V2X supports short distance and remote transmission between vehicles and other connected equipment.

This is also the reason why the technology has bright prospects and broad market. The Internet car market is growing at an exponential rate. Zhihu.com's article C-V2X Technology: 5g travel to build a smart city points out that it is expected to generate $273 billion in revenue by 2026. The explosive growth of C-V2X market is not far away, and the scale is expected to reach US $1.1 billion by the same year [2].

In fact, not only Desay SV and Ford, but also other companies are adopting and developing this technology. For example, Audi and Ducati are the second largest adopters of c-v2x technology. Like Desay SV, they also cooperate with Qualcomm. Their c-v2x test system has been tested in Newburg, Germany. They are simulating how the system can minimize the risk in three road situations that often lead to accidents: entering the intersection, responding to the sudden braking of the vehicle in front, and crossing the traffic line.
4. Conclusion
Comparing the current C-V2X technology solutions of Ford and Desay SV, the solutions of the two companies are actually very good. Among them, Ford is the world's largest supporter of vehicle to vehicle communication technology. The company has a high reputation for developing an innovative ecosystem where all road users can communicate seamlessly with each other:

At first, vehicles equipped with C-V2X (whether autonomous or not) can negotiate which mode they use.
Secondly, in case of accident, V2V communication system will be able to relay information to other approaching vehicles. With a cellular connection, the car will be able to send updates to city authorities, insurance companies or trailer services.
Then, pedestrians with Bluetooth devices can send their positions to other road users so that vehicles can adjust their routes.
In addition, vehicle to infrastructure technology will enable communication with traffic lights, road signs and intelligent traffic management systems, so as to better regulate traffic flow.
As far as Desay SV company is concerned, the company has been deeply engaged in the field of automotive electronics for 35 years. Desay SV has accumulated rich experience in design, R & D and quality management, providing strong technical support for Vigorously Innovating and developing technical products and services such as intelligent cockpit, intelligent driving and Internet of vehicles. As for the layout of intelligent solutions, Desay SV has been developing around the two major fields of L1~L3 intelligent driving and L4 ~ L5 automatic driving since 2016 [6].
In the world of Desay SV, cars are no longer just means of transportation, but also represent a cool attitude towards life. The company has created a simpler and casual way to travel for daily travel. The
powerful human vehicle interaction function makes everything convenient. The highly personalized and interactive intelligent cockpit and the multi-functional vehicle "personal housekeeper" make your travel more wonderful.

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