5G Automotive Association
pioneering digital transformation
in the automotive industry
Development Progress and OEM Perspective of C-V2X in China

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1. C-V2X Development Progress in China
2. OEM’s Perspective on C-V2X
3. Forward Looking C-V2X Mission
Recent Activities for C-V2X in China

- **2017.09** Internet of Vehicle (IoV) Industry Development Special Committee was established to improve the LTE-V2X testing and certification.

- **2017.12** MIIT (Ministry of Industry and Information Technology) is building LTE-V2X into Intelligent Connected Vehicles Industry Standard System.

- **2018.01** NDRC (National Development and Reform Commission) defined a target of LTE-V2X Network Coverage rate reaching 90% in 2020.

- **2018.05** LTE-V2X city pilot project initiating in Wuxi means "5+2" IoV demonstration completes Industrial Concentration and Application Promotion.

- **2018.06** MIIT and SAC (Standardization Administration of the People's Republic of China) co-released the guidelines for the construction of national automotive network industry standards.

- **2017.09** Internet of Vehicle (IoV) Industry Development Special Committee was established to improve the LTE-V2X testing and certification.
Trials of C-V2X in China

- National ICT Application Zone Changchun
- MOT ICT Pilot zone Beijing
- C-V2X Performance Test @ SIAC Shanghai
- Wuxi City-wide LTE-V2X Project Wuxi
- Car2X Wuzhen Wuzhen
- ICV&ITS Pilot zone Wuhan
- i-VISTA ICT Test zone Chongqing
Timeline for Deployment of C-V2X

- **C-V2X (R14) chipsets from various vendors**
- **Integration, Validation and Testing with OEMs (EU, China, US)**
- **Testing of traffic infrastructure (EU, China, US)**
- **5.9 GHz Spectrum Target Availability**

**H1/2017**
- Chipsets for tests
- Inter-operability tests
- Commercial availability of Mode 4 chips

**H2/2017**
- China (spectrum for deployment)
- US (spectrum for deployment)

**H1/2018**
- EU spectrum, China (Test spectrum)

- EU

- C-V2X standardized in 3GPP Release 14 (June 2017)

- C-V2X commercial chipsets (R14) available in 2018

- In-vehicle commercial deployment (i.e. type-approved vehicles) at the latest by 2021 globally
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SAIC’s Strategy for Smart Mobility: Internet + Transportation + Vehicles

Functional Scenarios of Future Mobility

- Real-time bus scheduling
- Car rental
- Transport recommendation
- Automatic searching
- Real-time traffic alert
- Public information release
- Intelligent toll
- Carpooling
- Remote alert
- Parking charge
Connection Architecture of Future Mobility

- **Hand-held Wearable Devices**
  - V2C
  - P2C
- **Roadside Local Network**
  - V2P
  - P2I
- **Infrastructure**
  - monitor
  - warning board
  - parking area
- **Public Network**
  - WAN
  - Public Network

**Data Collection**

**Service Data**

**Automobile lifecycle and mobility service eco-cloud**
- Purchase & Sale
  - sale/second-hand/finance
- Maintenance
  - repair/accessories
- Car Service
  - rescue/park/refuel/ETC
- Logistics
  - final product/spare part
- Mobility
  - navigation/music/social/ordering
- Sharing
  - carpooling/socializing
- New energy vehicles
  - charging piles/battery changing

**Public service cloud**
- ITS
  - dispatch/traffic control
- Smart Home
  - remote control/monitor
- Smart Healthcare
  - on-line diagnostics
- Smart Office
  - telecom/scheduling

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Implementation of SAIC ICV

Highway Pilot:
Decision control for highway, industrial level intelligent system architecture

V2X Prototype Verification:
LTE-V communication for high efficiency and safety level

Auto parking:
Without electronic maps and GPS

Highway and Urban (SAE: level 3-4)
Vehicle-level intelligent system architecture
Information fusion for urban road
Multi communication fusion (LTE-V/WiFi)
Intelligent driving decision and planning

Autopilot in an urban scenario

Highway Pilot/Platoon Pilot

Auto parking and the last 1km in urban area

Sensor
Eye
Camera, Radar, Lidar

Controller
Brain
Perception, Localization, Planning, Control, Communication

Actuator
Limb
Accelerator, Brakes, Steering, Gears, Electrical System, Smart HMI

Network
Partner
C-V2X, ITS Map, Internet, Cloud

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In April 2015, SAIC became the 1st OEM in China who realized vehicle test based on C-V2X in cooperation with Huawei at ITS exhibition in Nanjing;

In October 2016, C-V2X applications were implemented on SAIC’s independent-branded vehicles (ROEWE RX5) during the G20 Summit in Hangzhou;

Currently, SAIC is working closely with CMCC, Huawei, Qualcomm, Alibaba, and SIAC to promote the industrialization of C-V2X technology.
5G, with its low latency, high reliability and wide bandwidth, is born to enable cars as intelligent IoT terminals.

- **2009**: 3G
- **2013**: 4G
- **2020**: Allocate network according to data priority using Software Defined Network (SDN)
- **2030**: 5G

### Upgrade of vehicle functions
- **Autonomous Driving**
- **Active Safety**
- **Intelligent Cloud**
- **Interconnectivity**
- **In-vehicle Infotainment**
- **Positioning Service**
- **Info Reception**

### Impact
- Continuous, on-time info for autonomous driving
- Prioritize real-time warning & vehicle controlling in network allocation
- Massive transmission of V2X data
- Multimedia infotainment such as enhanced/virtual reality
- Remove network blind zones and area restriction of autonomous driving & car interconnection
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Forward Looking C-V2X Mission

Accelerating the commercialization of C-V2X needs efficient cooperation in the whole C-V2X ecosystem

- Explore more application scenarios with valued business models
- The formulation of C-V2X standardization is critical
- Large-scale trials and tests are needed
- Leveraging the broader C-V2X ecosystem
- Enhancing the study of automotive cyber security

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Thanks!