中国汽车工程学会
China Society of Automotive Engineers

China Industry Innovation Alliance for the Intelligent and Connected Vehicles

CSAE Standards and CAICV Activities Update

3GPP PCG#50

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China Industry Innovation Alliance for the Intelligent and Connected Vehicles(CAICV)
China Society of Automotive Engineers (China-SAE)

Contents

01 Introduction of C-SAE and CAICV

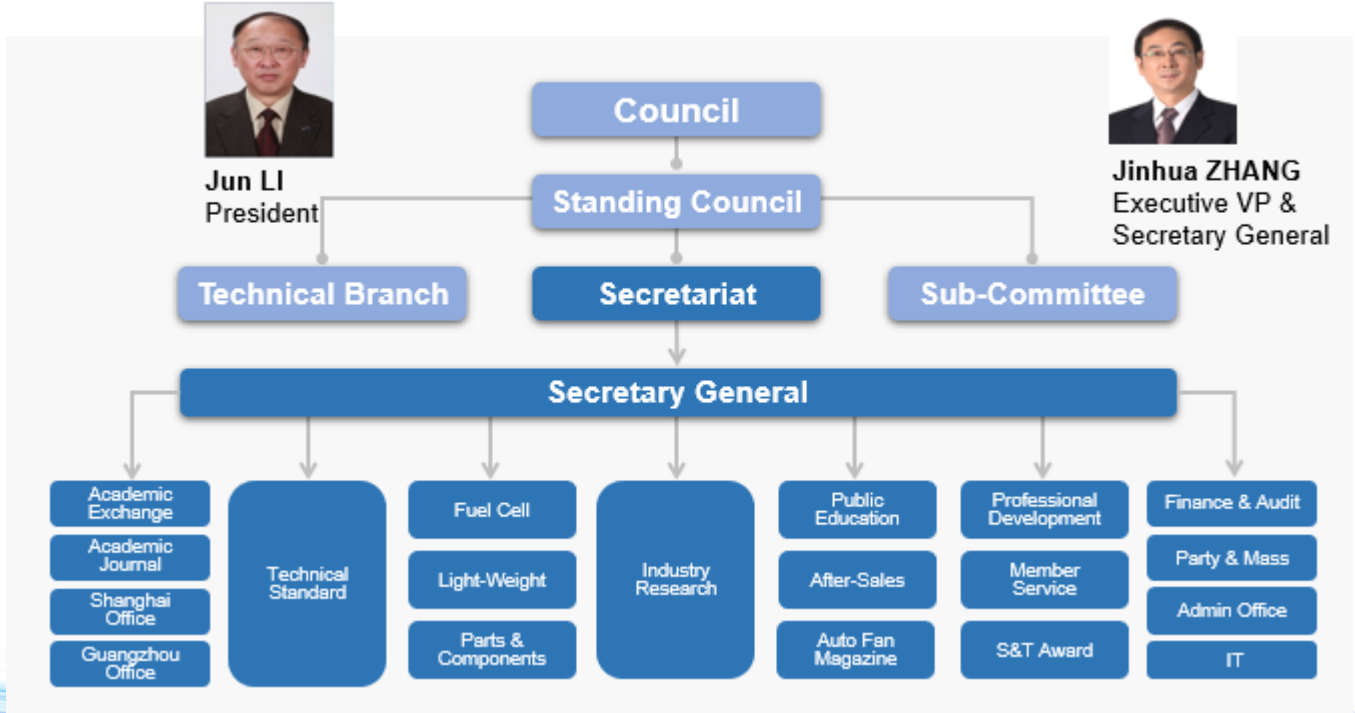
02 C-SAE Standards

03 CAICV Activities and Research Projects

C-SAE

- **China Society of Automotive Engineers** (China-SAE or CSAE), a national academic organization, was founded in **1963**, the secretariat is set up in Beijing.
- **CSAE** main services include academic communication, automotive policy research, collaborative innovation, talent training and technical standards establishment.

Individual members:	**70,000+**
Registered members:	**110,000+**
Unit members:	**2,000+**

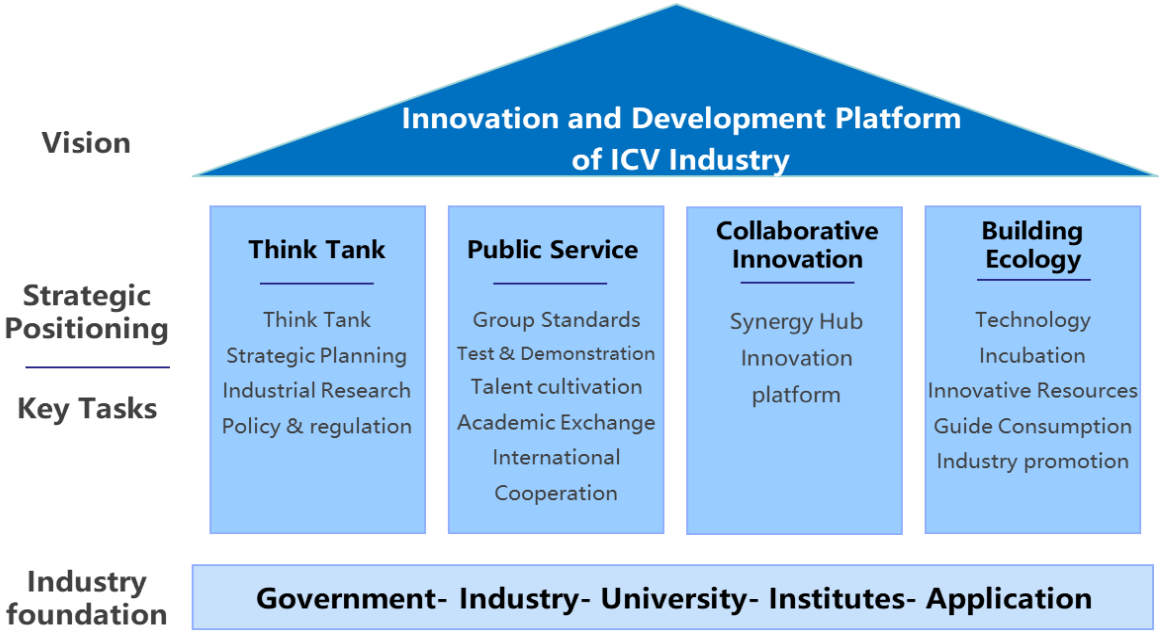


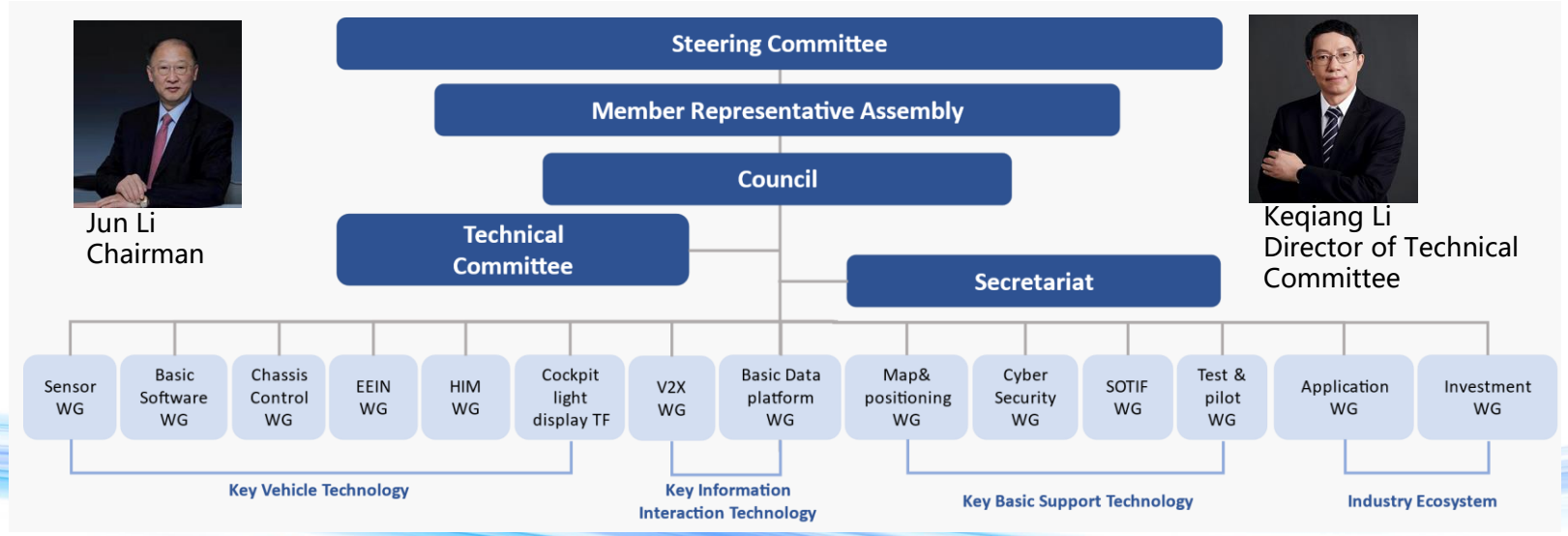
CAICV

- **China Industry Innovation Alliance for the Intelligent and Connected Vehicles** (CAICV) was initiated by China SAE and the China Association of Automobile Manufacturers (CAAM), with the support of MIIT on June 12, 2017.

- CAICV has more than 614 members, including companies, universities, and institutes from the automotive, telecommunication, transportation, and internet industries.

- CAICV has 13 working groups and 1 independent task force.





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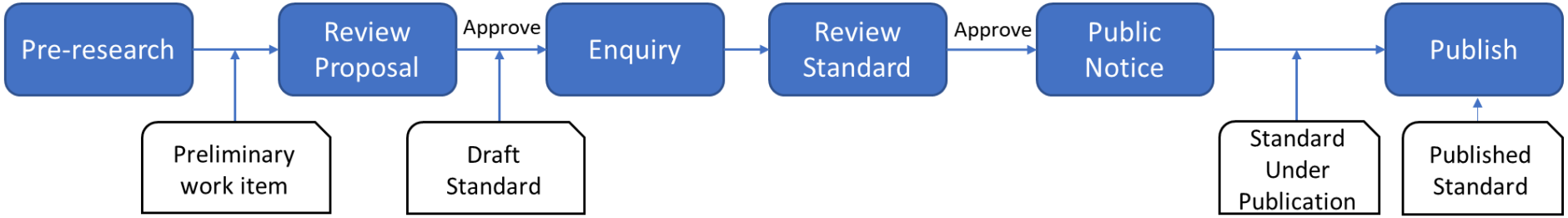
CSAE Standards

CSAE Standard Research Process



No	WG	Standard Name	Current Stage
1	V2X	T/CSAE 53-2020 Cooperative Intelligent Transportation System—Vehicular Communication Application Layer Specification And Data Exchange Standard （Phase I）	Published
2	V2X	T/CSAE 157-2020 Cooperative Intelligent Transportation System—Vehicular Communication Application Layer Specification And Data Exchange Standard （Phase II）	Published
3	V2X	T/CSAE 158-2020 Data Exchange Standard For High Level Automated Driving Vehicle Based On Cooperative Intelligent Transportation System	Published
4	V2X	T/CSAE 159-2020 LTE-Based Vehicular Communication—Direct Communication System Roadside Unit Technical Requirements	Published
5	V2X	T/CSAE 246-2022 Test and Evaluation Methods For V2X System Warning Application Function of Intelligent And Connected Vehicles	Published
6	V2X	**Collaborative Intelligent Transportation Systems—Application Layer Interaction Technical Requirements Part 1: Intention and Cooperation**	Enquiry

No	WG	Standard Name	Current Stage
7	V2X	**Collaborative Intelligent Transportation Systems—Application Layer Interaction Technical Requirements Part 2: Sensor Data Sharing**	Pre-research
8	V2X	Technical Requirement of Scenario Database and Simulation Testing for V2X Communication Application	Standard Reviewed
9	Basic Data Platform	T/CSAE 211-2021 Security Requirements for Data Sharing of Intelligent and Connected Vehicles	Published
10	Basic Data Platform	Technical Requirements of Regional Cloud Application of IOV Based on Public Communications Network	Standard Reviewed
11	Basic Data Platform	ICV Cloud Control System Part 1: System Composition and Infrastructure Platform Architecture	Standard Reviewed
12	Basic Data Platform	ICV Cloud Control System Part 2: Vehicle-Cloud Data Exchange Specification	Standard Reviewed
13	Basic Data Platform	ICV Cloud Control System Part 3: Road-Cloud Data Exchange Specification	Standard Reviewed
14	Basic Data Platform	ICV Cloud Control System Part 5: Platform Service Scenario Specification	Standard Reviewed

CSAE Standards

☐ Standards of Test & Pilot WG, Innovation & Application WG, SOTIF WG

No	WG	Standard Name	Current Stage
1	Test & Pilot	T/CSAE 248-2022 Cooperative Intelligent Transportation System—Technical Specifications of C-V2X Equipments Access to Vehicle-Road Collaborative Cloud Control System	Published
2	Test & Pilot	Intelligent and Connected Vehicle— Technical Requirements and Test Methods for the Automatic Driving Systems on Highway	Proposal Approved
3	Test & Pilot	Intelligent and Connected Vehicle— Technical Requirements and Test Methods for the Automatic Driving Systems on Urban Road	Under research
4	Test & Pilot	Intelligent and Connected Vehicle— Technical Requirements and Test Methods for the Automatic Driving Systems on Suburban & Rural Road	Under research
6	Test & Pilot	General Requirement of Roadside Infrastructure for Vehicle Infrastructure Cooperative System	Proposal Approved
7	Test & Pilot	Intelligent And Connected Vehicle—Method and Requirements for Naturalistic Driving Scenario Extraction	Proposal Approved
8	Test & Pilot	Intelligent and Connected Vehicles —Technical requirements for partial hands-free driving systems	Proposal Approved

No	WG	Standard Name	Current Stage
9	Test & Pilot	Intelligent Connected Vehicles Technical requirements and test methods for highway navigation pilot	Proposal Approved
10	Innovation & Application	Memory Parking System Technical Requirements	Proposal Approved
11	Innovation & Application	T/CSAE 156-2020 General Technical Requirements of Automated Valet Parking Systems	Published
12	Innovation & Application	Automated Valet Parking —Field Test Methods and Requirements	Standard Reviewed
13	Innovation & Application	Data exchange contents of communication between vehicle and parking lot of AVP system	Proposal Approved
14	SOTIF	Intelligent and connected vehicle - Safety of the intended functionality for visual perception system - Part I: Analysis and description method of triggering conditions	Enquiry
15	SOTIF	Intelligent and connected vehicle - Safety of the intended functionality for visual perception system Part II: Testing and evaluation method	Enquiry
16	SOTIF	Intelligent and connected vehicles——SOTIF Requirements and Test Methods for Decision Making algorithm	Proposal Approved

Market-oriented Standards

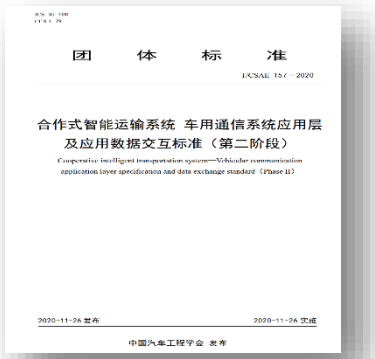
➢ OEMs Need Advanced Applications

- 6200+ sets of roadside infrastructure have been constructed nationwide
- 13+ car makers have launched mass production models equipped with C-V2X technology, needing advanced applications for better user experience

➢ Advanced Applications Need Support of Implementation STD

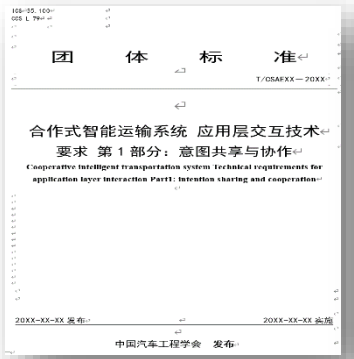
- Phase-II (T/CSAE 157-2020) defined 12 advanced applications use cases, identified the complex message sets
- There is a gap between standard development and industry implementation

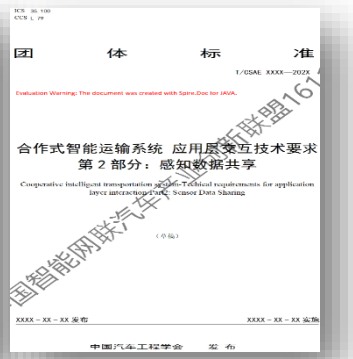
V2X WG Standards



T/CSAE 157-2020 Phase II

- **Refine use case scenarios**
- **Define V2X communication procedures**
- **Revise message sets in Phase II**





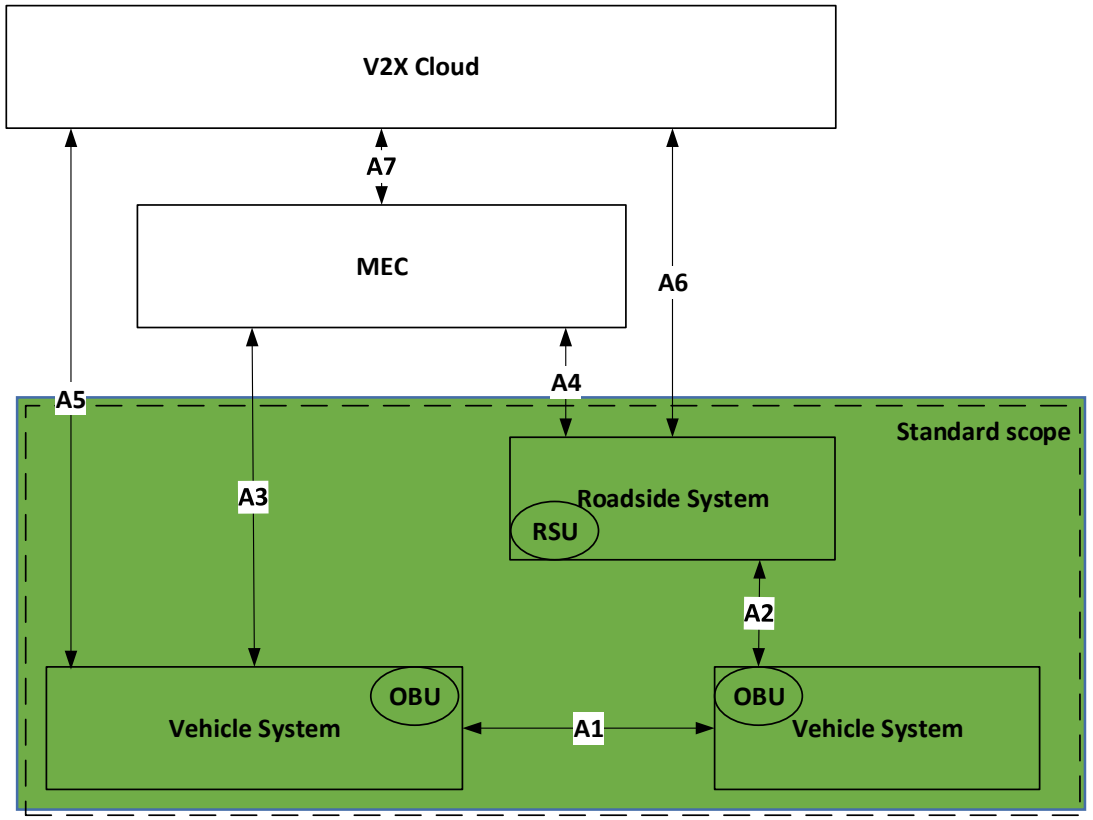
T/CSAE xxx Series Standards

Phase-II Use Cases	Message Body	Use Case Implementation Series	Message Body
Sensor Data Sharing	Msg_SSM	**Part 2: Sensor Data Sharing**	Msg_SSM、Msg_SAM、Msg_VIR
Cooperative Lane Change	Msg_VIR、Msg_RSC	**Part 1: Intention & Cooperation**	Msg_VIR、Msg_RSC、Msg_ISM、Msg_SAM
Cooperative Vehicle Merge	Msg_VIR、Msg_RSC		
Cooperative Intersection Passing	Msg_RSC		
Cooperative High Priority Vehicle Passing	Msg_VIR、Msg_RSC	Part 3: Management & Priority	
Dynamic Lane Management	Msg_RSC		
Differential Data Service	Msg_RTCM	Part 4: Advanced Information Service	
Probe Data Collection	Msg_BSM、Msg_VIR、Msg_SSM		
Vulnerable Road User Safe Passing	Msg_PAM、Msg_VIR	Part 5: VRU	
Guidance Service in Parking Area	Msg_VPM	Other Standard discussed	
Cooperative Platooning Management	Msg_CLPMM	Other Standard discussed	
Road Tolling Service	Msg_VPM	Other Standard discussed	

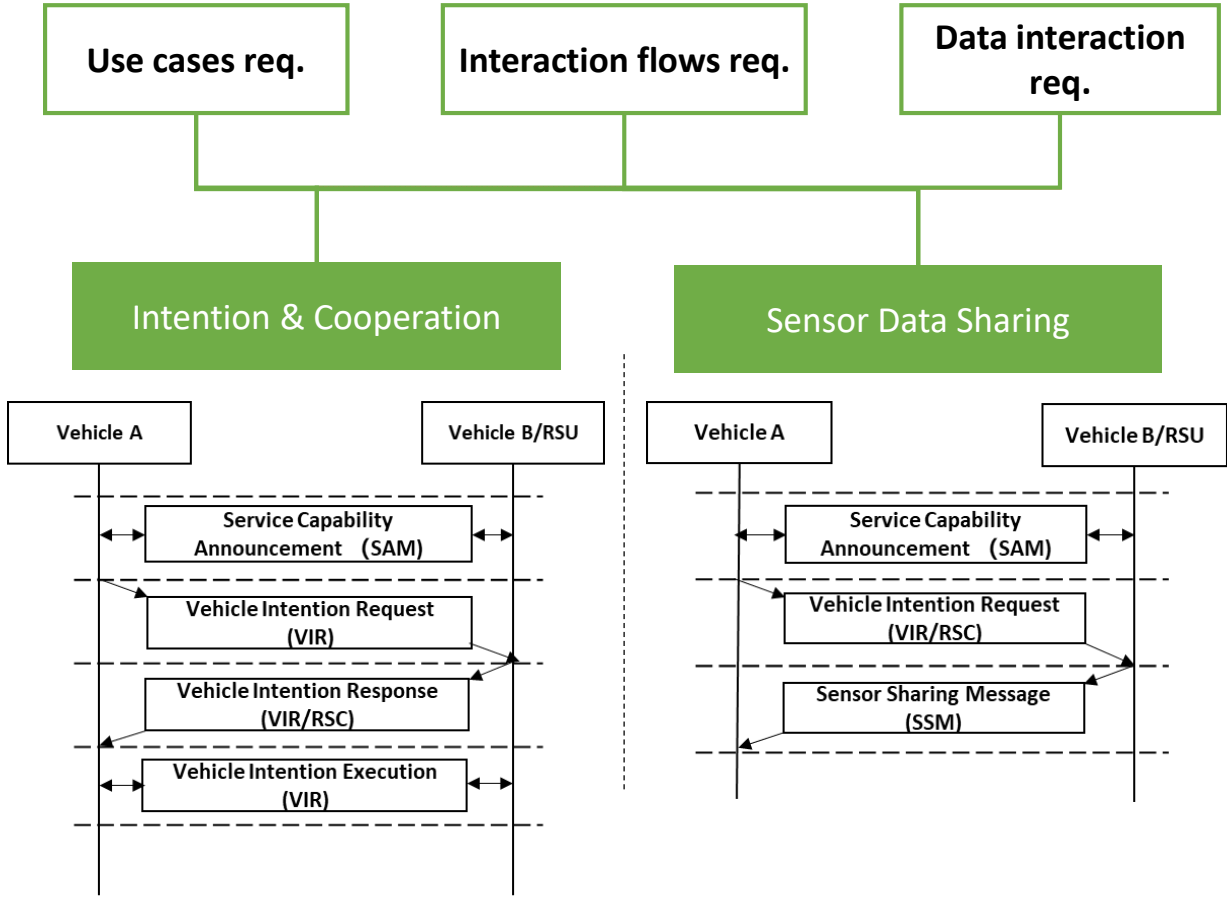
V2X WG Standards

V2X services are based on PC5, Communication methods support V2V and V2I.

System architecture



Main contents



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V2X WG Work Plan

V2X Application Scenario TF

- Collaborative Intelligent Transportation Systems—Application Layer Interaction Technical Requirements Part 1: Intention and Cooperation; Part 2: Sensor Data Sharing

Telematics Test TF

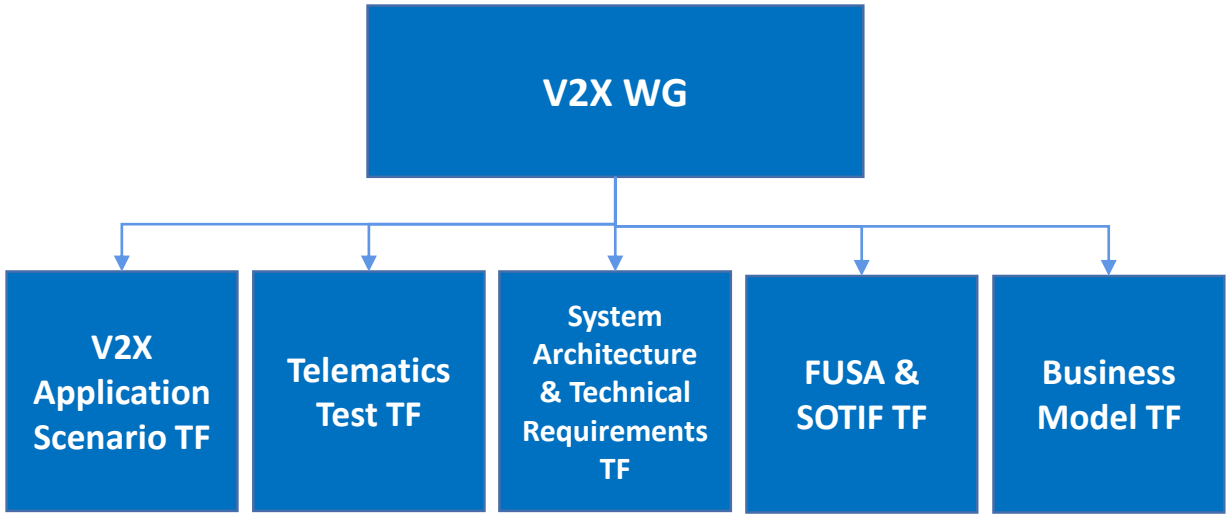
- Test methods for vehicle-level high-precision positioning system antennas and RF links

System Architecture & Technical Requirements TF

- LTE-based vehicular communication — Technical requirements for special vehicle's on-board information interactive system

Business Model TF

- Roadmap for the convergence development of automation and connectivity based on C-V2X technology



NEBULA LINK星云互联 CICV

CICT Connected and Intelligent Technologies Co., Ltd

C-V2X Application Demonstration in China

CAICV and IMT2020 build a cross-industry collaborative testing and verification platform and carry out application demonstration for 5 consecutive years.

“Three Cross”in 2018
- 22 Companies
- Cross “module, terminal, OEMs
- Day I scenarios
- Large-scale Communication Scenarios

“Four Cross”in 2019
- 72 Companies
- Cross “modules, terminals, OEMs, CA platform”
- Test on open road
- Day I scenarios
- Large-scale Communication Scenarios

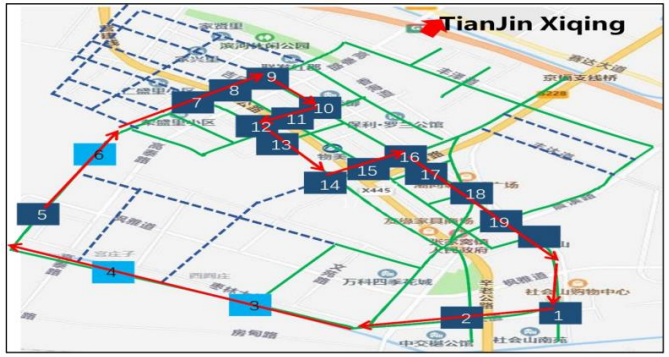
New “Four Cross”in 2020
- 100+ Companies
- HD Map & Positioning enabling
- Day I scenarios
- Large-scale Communication Scenarios

Application Demonstration in 2021
- 70+ Companies
- Multi-location pilots
- Integration of automation and connectivity
- Mass produced application
- Cloud control platform verification
- Day I & II scenarios

Application Demonstration in 2022
- 40+ Companies
- Multi-location pilots
- Mass produced vehicles
- Day I & II application
- Innovation application

C-V2X Application Demonstration in 2022

2022.5-7 Tianjin — 12 Companies



C-V2X Security Verification

Abnormal Scenarios
Fake emergency vehicle
Fake traffic lights
Abnormal vehicle

2022.8 Beijing — 40+ Companies

Application Demo

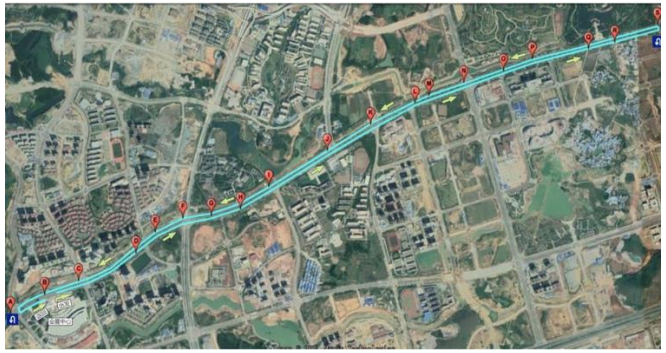
Day I

- Speed limit warning
- Bus lane warning
- Road occupation for construction warning
- Vehicle reversing warning
- Vehicle malfunction warning
- Abnormal parking warning
- Green light optimal speed advisory (uu)
- VRU collision warning (uu)

V2X+ADAS Verification

- ACC function under V2V collaborative computing

2022.9 Liuzhou, Guangxi — 31 Companies



Application Demo

Day I

- Day 1 scenarios except vehicle near-field payment, GLOSA

Day II

- Sensor Data Sharing(V2I)
- Cooperative Lane Change (V2V, V2I)
- Cooperative Vehicle Merge(V2I)
- Cooperative lane reservation(V2I)

Detected participants & position in SSM from roadside has been basic synchronized with BSM

C-V2X Application Demonstration in 2022

2022.11 Suzhou

47 Companies

DAY I Scenarios

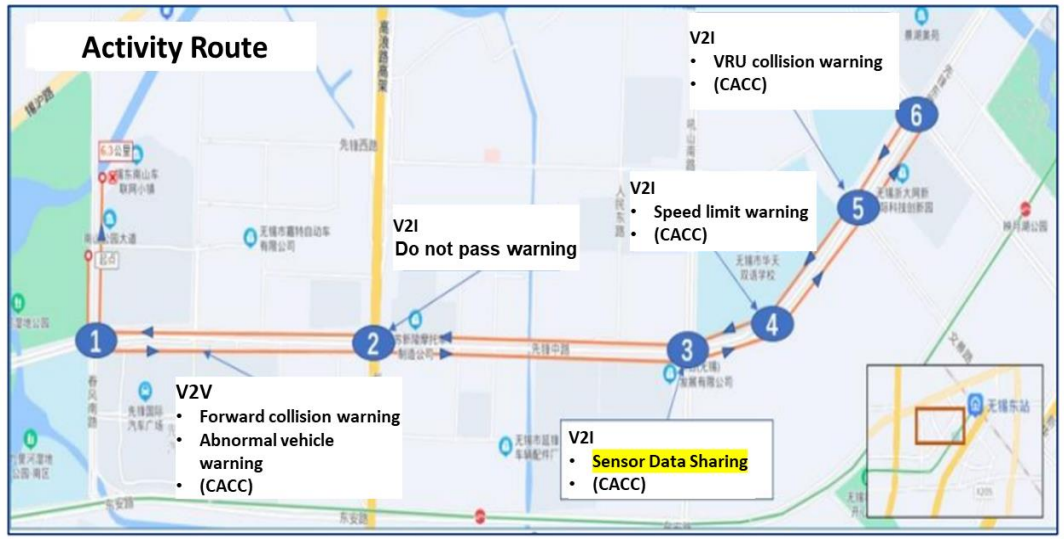
- Forward Collision Warning
- Blind Spot Warning
- In-vehicle Signage
- GLOSA
- Traffic light Reminder

DAY II

- Sensor Data Sharing （V2I)
- Digital payment for roadside information based on unicast communication

L2 AD achieve L4 autonomous driving with the sensing and planning data from roadside(uu).

2022.11 WuXi



DAY I Scenarios

DAY II

- Sensor data sharing

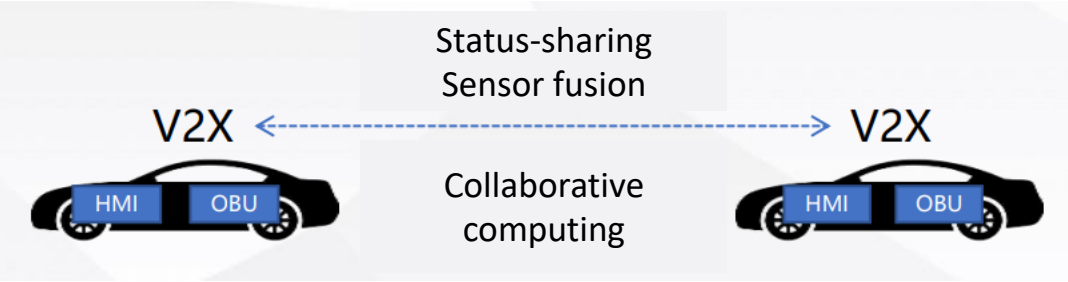
V2X+ADAS

- Cooperative ACC (ACC+AEB, Start and stop at traffic lights automatically)
- Cooperative Speed Control

Innovation Demonstration Scenarios

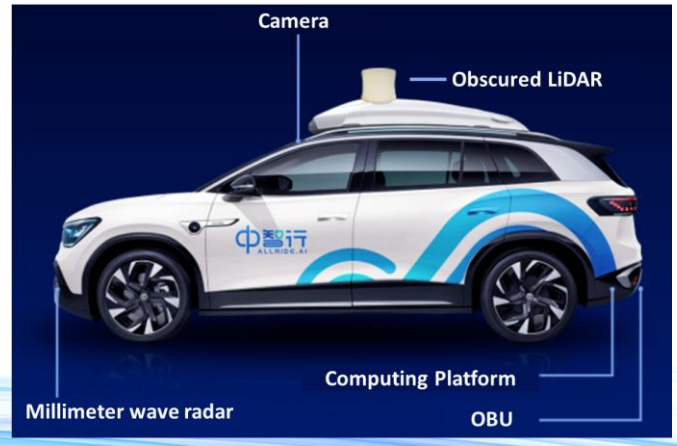
☐ V2V Collaborative Computing Scenario

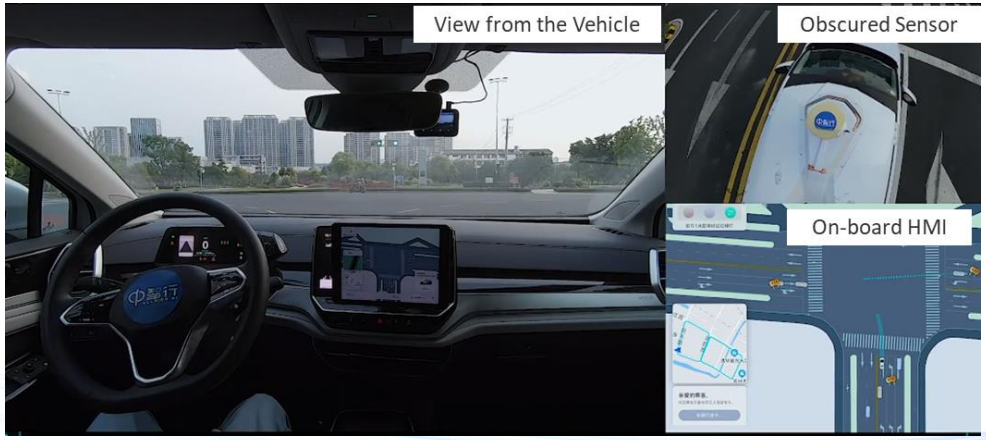
ACC function under V2V collaborative computing: rear vehicle which has limited computing resources, send vehicle status information to the front vehicle. The front vehicle executes the calculation logic of ACC and outputs the motion control results to the rear vehicle. The front and rear vehicles display the result through the HMI.



☐ V2I Message Enable L4 Autonomous Driving

The vehicle LiDAR is obscured and rely on the roadside sensor data which send by MEC and the Cloud. The vehicle does trajectory planning and control execution and can achieve L4 autonomous driving.





Thanks

CSAE

http://www.sae-china.org/

CAICV Alliance

http://www.caicv.org.cn/

CICV

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