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

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

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01 Introduction of C-SAE and CAICV

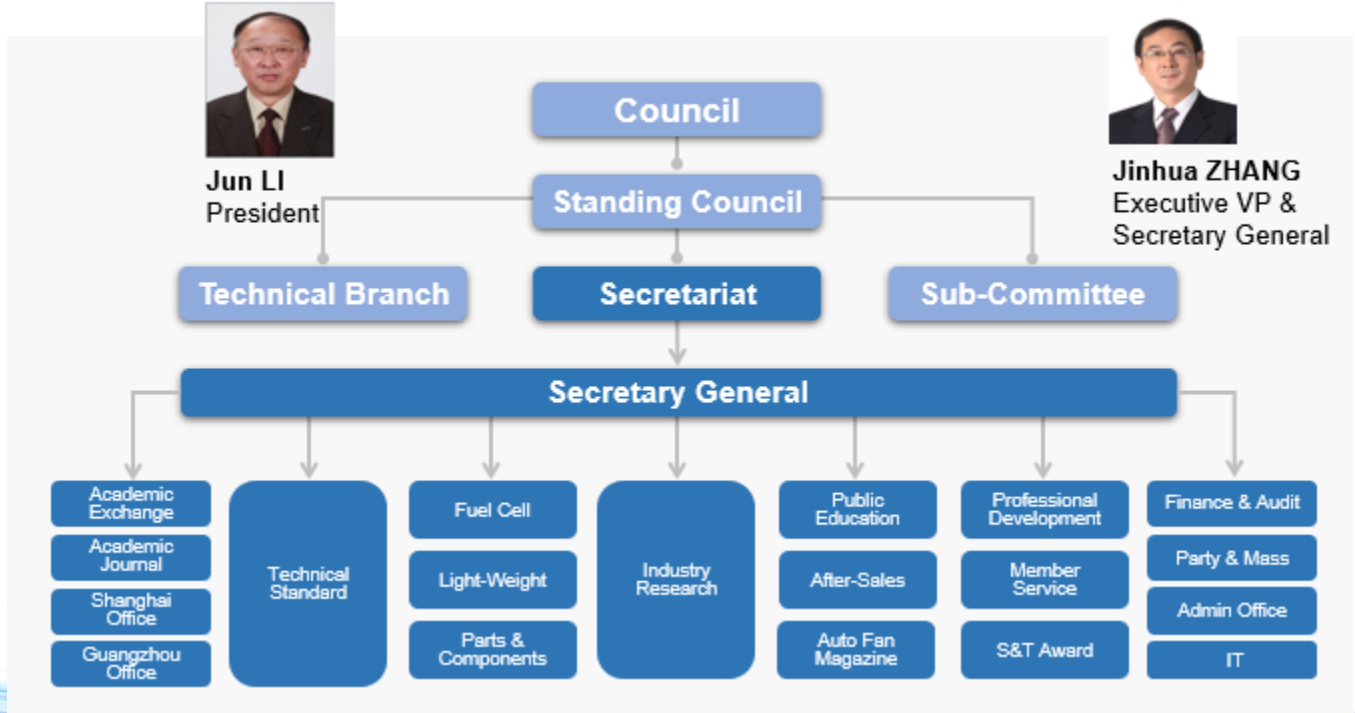
02 CAICV Activity and Research Project

03 CSAE Standards

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:	**1,900+**

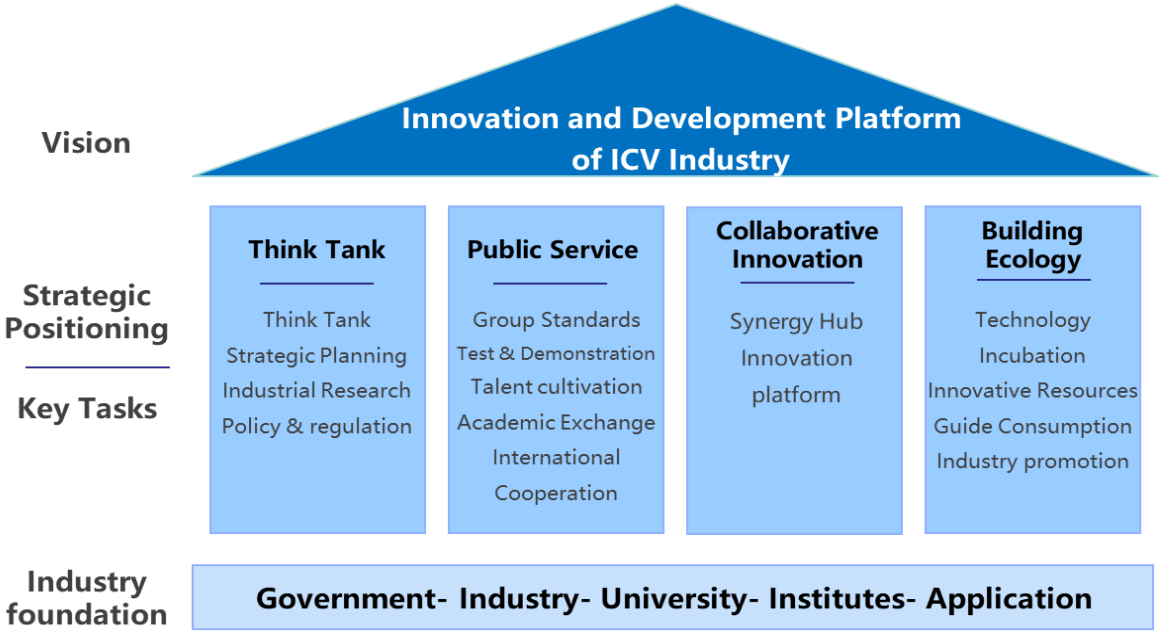


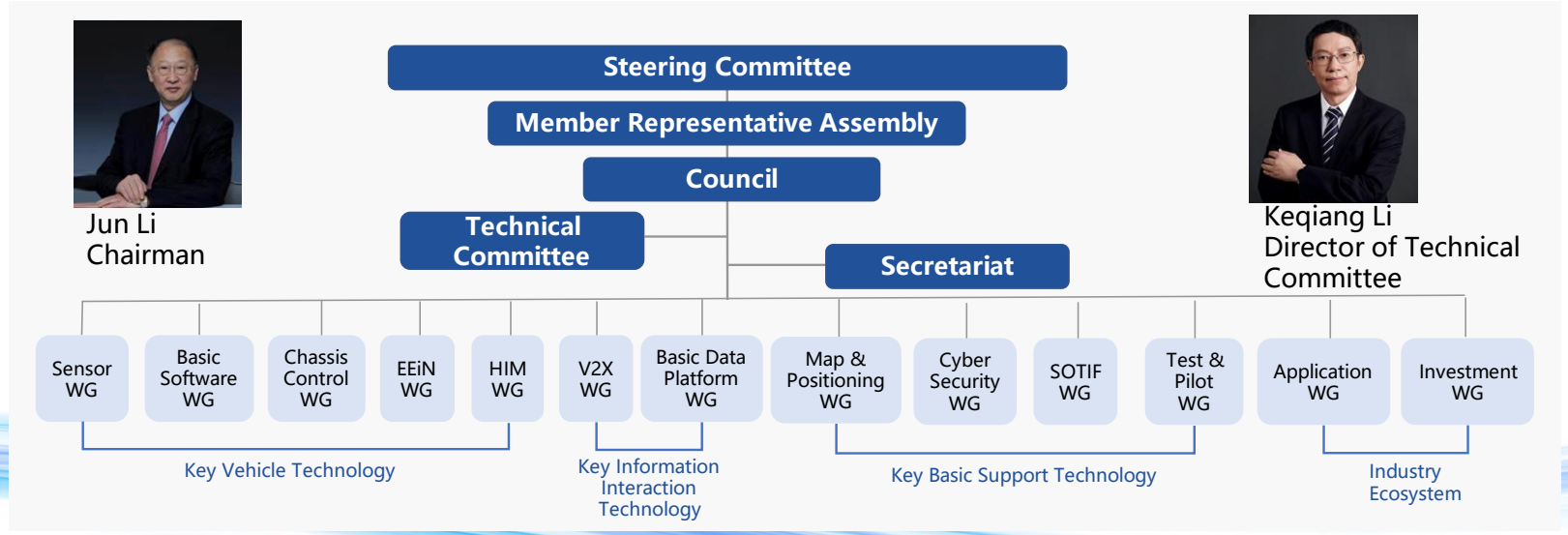
CAICV

- **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 500 members, including companies, universities, and institutes from the automotive, telecommunication, transportation, and internet industries.

- CAICV has 13 working groups for different technical fields.





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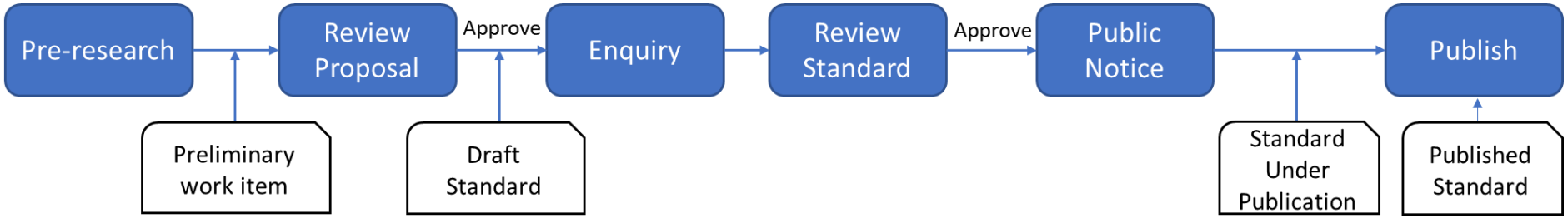
CSAE Standards

CSAE Standard Research Process



No	WG	Standard Name	Current Stage	Future Stage	
				Enquiry	Publish
1	V2X	Cooperative Intelligent Transportation System—Vehicular Communication Application Layer Specification And Data Exchange Standard （Phase I）	Published	/	/
2	V2X	Cooperative Intelligent Transportation System—Vehicular Communication Application Layer Specification And Data Exchange Standard （Phase II）	Published	/	/
3	V2X	Data Exchange Standard For High Level Automated Driving Vehicle Based On Cooperative Intelligent Transportation System	Published	/	/
4	V2X	LTE-Based Vehicular Communication—Direct Communication System Roadside Unit Technical Requirements	Published	/	/
5	V2X	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 sharing and Cooperation	Proposal Approved	2022/9	2023/01

No	WG	Standard Name	Current Stage	Future Stage	
				Enquiry	Publish
7	V2X	Technical Requirement of Scenario Database and Simulation Testing for V2X Communication Application	Proposal Approved	2022/10	2023/01
8	Basic Data Platform	T/CSAE 211-2021 Security Requirements for Data Sharing of Intelligent and Connected Vehicles	Published		
13	Basic Data Platform	Technical Requirements of Regional Cloud Application of IOV Based on Public Communications Network	Standard Reviewed		
9	Basic Data Platform	ICV Cloud Control System Part 1: System Composition and Infrastructure Platform Architecture	Proposal Approved	2022/07	2022/12
10	Basic Data Platform	ICV Cloud Control System Part 2: Vehicle-Cloud Data Exchange Specification	Proposal Approved	2022/07	2022/12
11	Basic Data Platform	ICV Cloud Control System Part 3: Road-Cloud Data Exchange Specification	Proposal Approved	2022/07	2022/12
12	Basic Data Platform	ICV Cloud Control System Part 5: Platform Service Scenario Specification	Proposal Approved	2022/07	2022/12

CSAE Standards

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

No	WG	Standard Name	Current Stage	Future Stage	
				Enquiry	Publish
1	Test & Pilot	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 — Test Field Design Technical Specification	Published	/	/
3	Test & Pilot	Technical specifications of intelligent and connected vehicles public road test supervision system	Published	/	/
4	Test & Pilot	Intelligent and Connected Vehicles—Field Test Methods and Requirements for Automated Driving Functions in Special Scenarios	Proposal Approved	2022/9	2023/01
5	Test & Pilot	Intelligent and Connected Automobile Products Evaluation Guidelines	Proposal Approved	2022/9	2022/12
6	Test & Pilot	Intelligent and Connected Vehicle—Technical Requirements and Test Methods for the Automatic Driving Systems on Highway	Proposal Approved	2022/6	2022/9
7	Test & Pilot	General Requirement of Roadside Infrastructure for Vehicle Infrastructure Cooperative System	Proposal Approved		
8	Test & Pilot	Intelligent And Connected Vehicle—Method and Requirements for Naturalistic Driving Scenario Extraction	Proposal Approved	2022/04	2022/07

No	WG	Standard Name	Current Stage	Future stage	
				Enquiry	Publish
12	Innovation & Application	Memory Parking System Technical Requirements	Proposal Approved	2022/9	2022/12
10	Innovation & Application	General Technical Requirements of Automated Valet Parking Systems	Published		
11	Innovation & Application	Automated Valet Parking —Field Test Methods and Requirements	Enquiry	2022/9	2022/12
13	Innovation & Application	Data exchange contents of communication between vehicle and parking lot of AVP system	Proposal Approved	2022/10	2023/02
14	Innovation & Application	Automated valet parking—Technical requirements of parking lots （garage）	Proposal Approved	2022/12	2023/4
15	Innovation & Application	Functional unmanned vehicle — Part 1：Terms and definitions	Proposal Approved	2022/9	2023/2
16	Innovation & Application	Functional unmanned vehicle — Part 2：General technical requirements	Proposal Approved	2022/9	2023/2
17	Innovation & Application	Functional unmanned vehicle—Technical Requirement of Autonomous Driving Function Field Test	Proposal Approved	2022/9	2023/2

Cooperative intelligent transportation system Technical requirements for application layer interaction Part 1: intention sharing and cooperation

- **Purpose: Enhance the 12 scenarios listed in T/CSAE 157-2020 (Phase II).**
- **Scope: This document specifies the technical requirements for application layer interaction in the intention and cooperation classification, including general requirements, scenario requirements, process requirements, data interaction requirements and message sets based on sidelink communication.**

12 scenarios (T/CSAE 157-2020)

No	Application name
1	Sensor Data Sharing
2	Cooperative Lane Change
3	Cooperative Vehicle Merge
4	Cooperative Intersection Passing
5	Differential Data Service
6	Dynamic Lane Management
7	Cooperative High Priority Vehicle Passing
	7.1 Lane Reservation Scenario
	7.2 Lane Prohibition/Closure Scenario
	7.3 Cooperative Signal High Priority Passing Scenario
8	Guidance Service in Parking Area
9	Probe Data Collection
10	Vulnerable Road User
11	Cooperative Platooning Management
12	Road Tolling Service

Scenario classification based on functional purpose (It is also the name of series standards)

- Part 1:Intention sharing and cooperation
- Part 2:Perception data sharing
- Part 3:Management
- Part 4:Advanced information services
- Part 5: Vulnerable road user

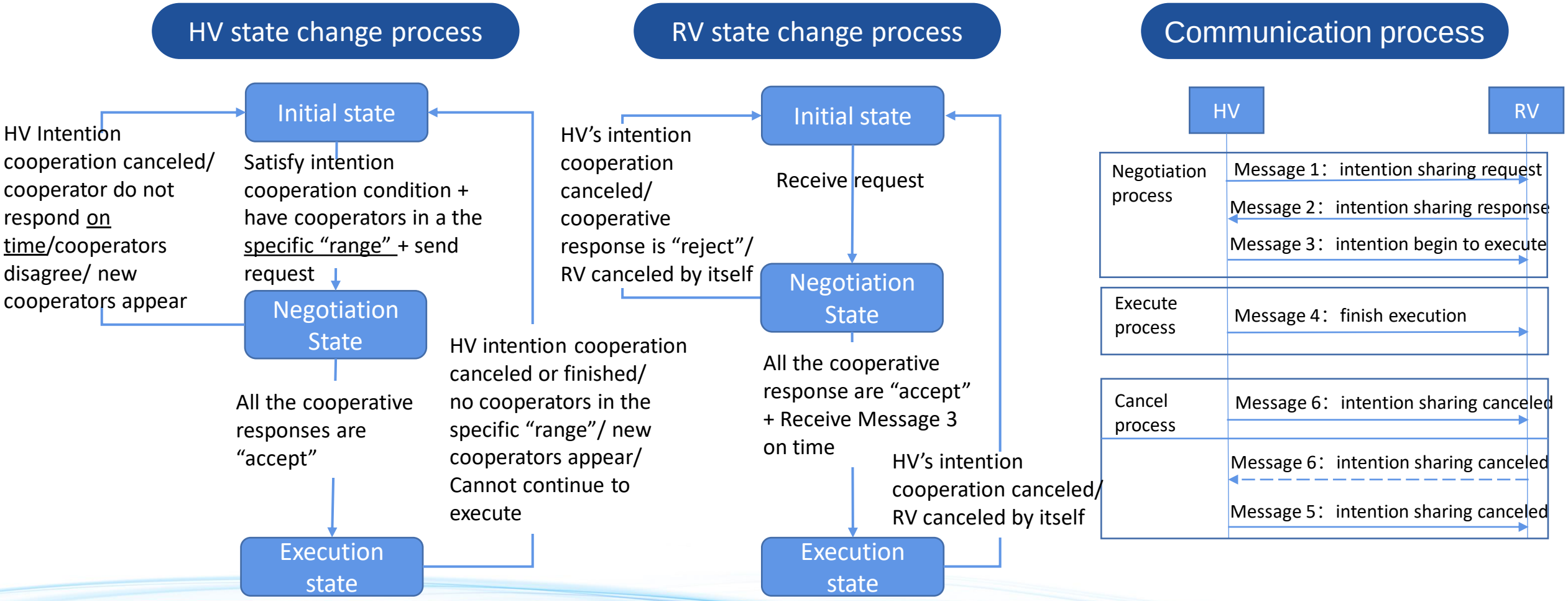
2 ways of cooperation

- HV who sending the intention cooperation request can achieve **vehicle-vehicle cooperation** by interacting with the collaborator RVs;
- HV can achieve **vehicle-road cooperation** by interacting with the roadside device.
- This standard does not prescribe which kind of interaction should be triggered in the scenario.

Scenarios	**Road**	**V-V**	**V-I**
Cooperative lane change	Highway, suburban area, closed park	√	√
Cooperative Vehicle Merge	Highway/city expressway entrance, service area exits, merging lanes	√	√
Cooperative Intersection Passing without signal	Intersection of urban road, suburban area, closed park	√	√
Cooperative Intersection Passing with signal	Intersection of urban road, suburban area, closed park		√

Cooperative intelligent transportation system Technical requirements for application layer interaction Part 1: intention sharing and cooperation

Example: vehicle-vehicle collaboration



*Did not specify the detection range of communication RVs at present
*Did not specify the time range

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International Communication and Cooperation Committee of ICV Roadmaps

- The Committee was officially established on June 7th and held 1st International Conference of ICV Roadmap in Beijing on August 2nd.
- The Committee is a long-term international communication platform for the ICV roadmaps, aiming to promote international communication, conduct joint research, and boost multi-lateral collaboration.

Co-Chairs:

Prof. Li Keqiang
Academician, China Academy of Engineering
CTO of CICV
Chairman of Technical Committee of CAICV
Professor, Tsinghua University

Mr. Armin Graeter
Co-Chair of ERTRAC
Chair of CCAM
Leader of Connected, Cooperative and Automated Mobility Roadmap

Dr. Edward Straub
Vice President of SAE Industry Technologies Consortia (SAE ITC)
Managing Director of SAE International' s Office of Automation

Members:

中国汽车工程学会 China Society of Automotive Engineers
CICV
CAICV
5GAA Automotive Association
acea DRIVING MOBILITY FOR EUROPE
BMW
China Association of Automobile Manufacturers
中国汽研 CAERI
CAICT 中国信息通信研究院
CATARC
CCAM
CICT 中国信科
DFM
DRIVE SWEDEN
ERTICO ITS EUROPE
ERTRAC
FISITA
GAC MOTOR
gm
HUAWEI
KSAE 한국자동차공학회 The Korean Society of Automotive Engineers
交通运输部公路科学研究院 RESEARCH INSTITUTE OF HIGHWAY MINISTRY OF TRANSPORT
RIRS 公安部道路交通安全研究中心 RESEARCH INSTITUTE FOR ROAD SAFETY OF MPS
SAE INTERNATIONAL
TRB Transportation Research Board
VDA Verband der Automobilindustrie
ZENZIC SELF-DRIVING REVOLUTION

Series of C-V2X Demonstration Activities

☐ CAICV and IMT2020 build a cross-industry collaborative testing and verification platform

2018 Three Cross-Industry
- Modules
- Terminals
- OEMs

2019 Four Cross-industry
- Modules
- Terminals
- OEMs
- Certificate Authority
- Open Road

2020 New Four Cross-industry
- HD Map & Positioning
- Cloud Control Platform
- Industrialization and enhanced scenario
- Closer to the actual travel scenario

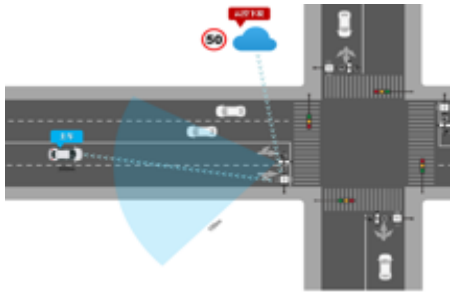
2021 Pioneer Application Demonstration
- Multi-location scenario demonstration
- Integration of intelligence and connection
- Mass application

2022 Application Demonstration
- Vehicle mass production
- Best practice
- Innovation application

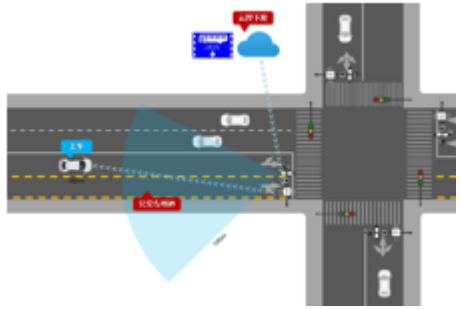
☐ Fully verify LTE-V2X technology and related standards and further promote the industrialization of C-V2X in China.

2022 Application Demonstration Details

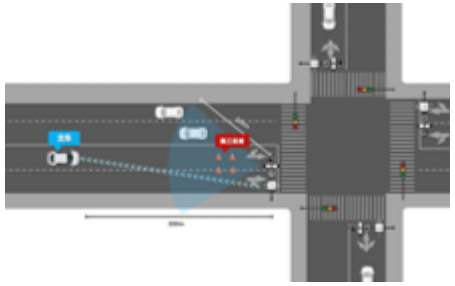
Test scenarios



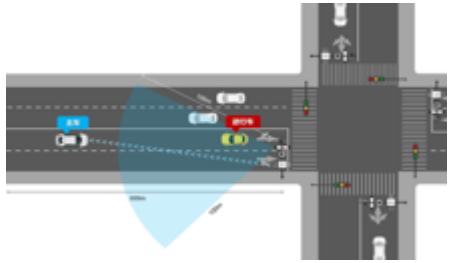
Speed limit warning



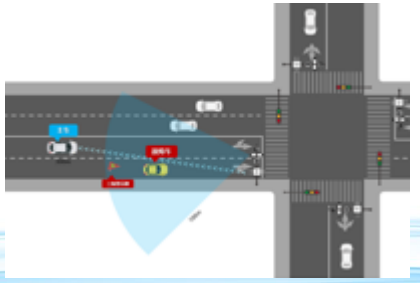
Bus lane warning



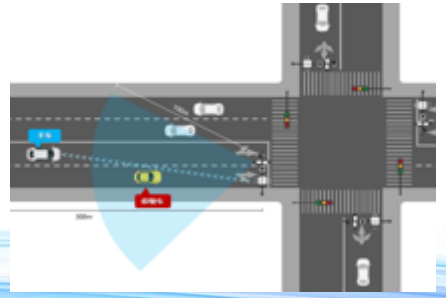
Road occupation for construction warning



Vehicle reversing warning

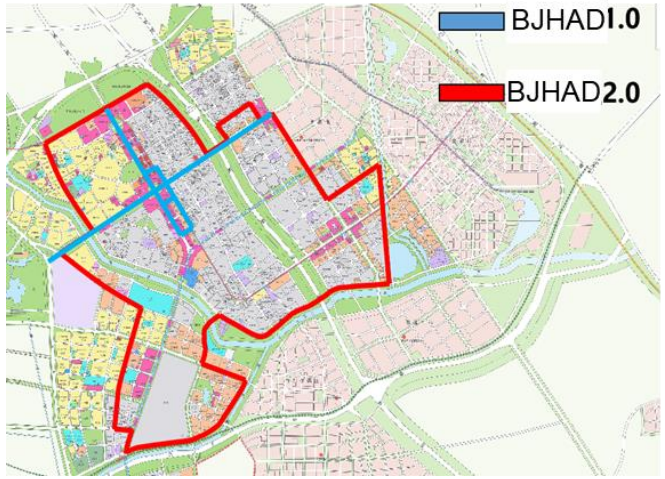


Vehicle malfunction warning



Abnormal parking warning

Beijing High-Level Autonomous Driving Demonstration Area (BJHAD) Construction Outcome



Distribution of RSU in the demonstration area

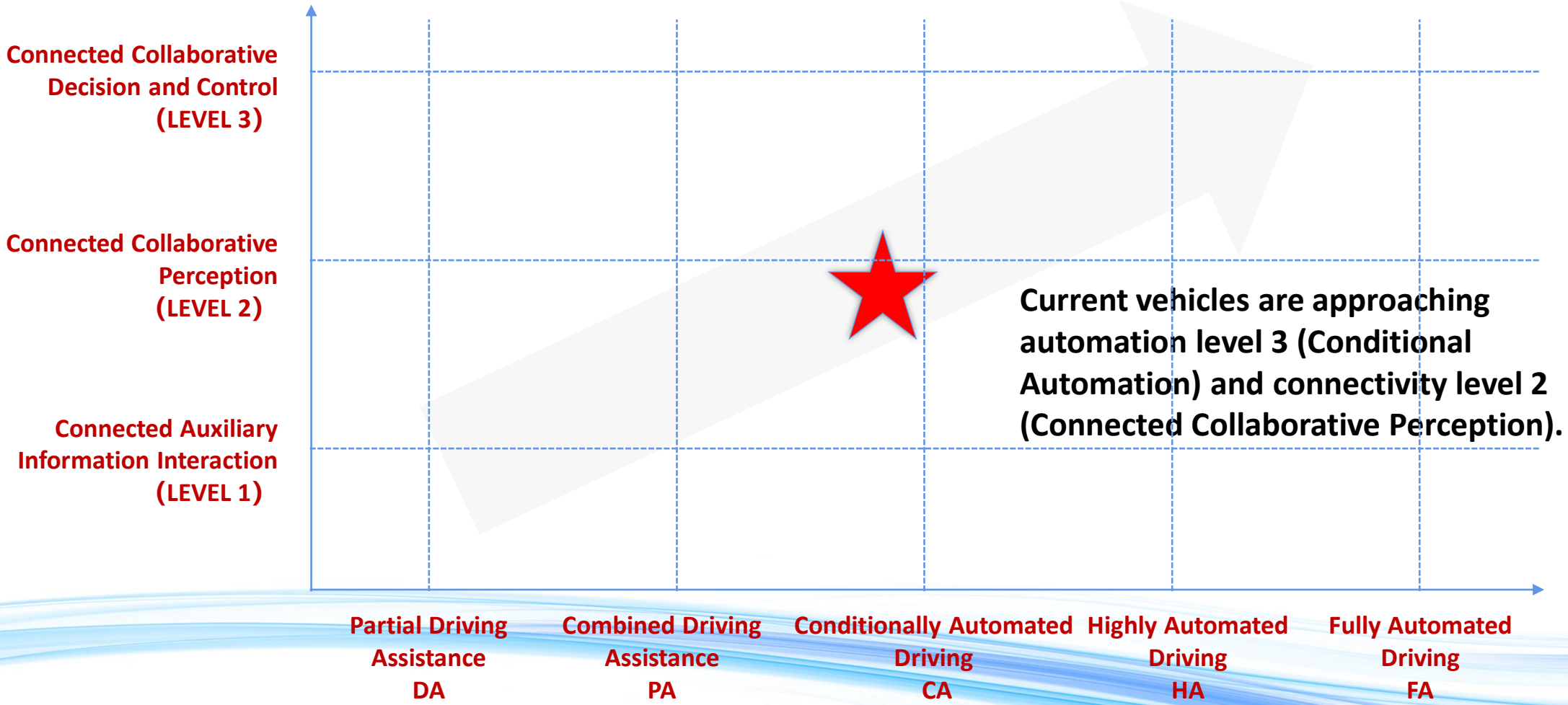
C-V2X for Automotive Market

- Some car makers launch mass production models equipped with C-V2X technology. But the market still faces the problem of how to improve the penetration rate.

Car Maker	Car Model	C-V2X Technology	Product type			Time to market	Price (,000 RMB)
			V2V	V21	V2N		
SAIC	Marvel R	5G-Celluar	●	●	—	2021.02	
GAC	AION V	5G-Celluar	●	●	—	2020.12	187.6-265.9
GWM	WEY DHT-PHEV	5G-Celluar	●	●	—	/	192.8-228.8
Hong Qi	E-HS9	LTE-V2X	●	●	—	2020.12	509.8-779.8
Geely	Xingyue L	5G-Celluar	—	(AVP)	—	2021.07	137.2-185.2
NIO	ET7	5G-Celluar	●	●	—	2021.01	448-526
VM Motor	W6	5G-Celluar	—	(AVP)	—	2021.04	190-260
Human Horizons	HiPhiX	5G-Celluar	●	●	—	2020.09	570-800
Audi	A7L A6L	5G-Celluar	●	—	●	2022.01	450-778
SAIC-GM (General Motors)	GL8 Avenir	LTE-V2X	●	●	—	2020.12	463-534
FORD	Edge Plus Explorer	LTE-V2X	—	—	●	2021.01	225-400

Technology Roadmap for Intelligent & Connected Vehicles (Version 1 & 2)

- In 2019, the Roadmap proposed a classification method of integrating automation and connectivity, with 5 levels of automation and 3 levels of connectivity.
- The fully autonomous Driving will realize by the convergence of automation and connectivity.



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

- ☐ **Provide guidelines of function development and application scenarios to enterprises.**
- ☐ **Promote cross-industry collaboration and facilitate policy implementation.**

Chapter 1 Current status
Chapter 2 Industrial development problems
Chapter 3 Objective and timeline of convergence development
- 3.1 Long-term objectives
- 3.2 Medium-term objectives
- 3.3 Objectives for 2025

Chapter 4 Convergence scenarios
Chapter 5 Main Task
- 5.1 Direction for technology development
- 5.2 Test and evaluation

Chapter 6 Recommendation for policy and regulation development

Example Typical function development path in highway

Basic (Warning/Reminding)	Short-term	Medium-term
Forward collision warning (V2V)	Connectivity-based AEB	Connectivity-based navigation guided pilot on highway
Emergency vehicle warning (V2V)		
Abnormal Vehicle Warning (V2V)	Cooperative lane change	
Hazardous location warning (V2I)		
Blind spot warning (V2V)		

Thanks

CSAE

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

CICV

http://www.china-icv.cn/

CAICV Alliance

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