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China C-V2X Recent Progress

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Recent CSAE ICV Standards

Introduction of CSAE

➤ Established in 1963;

Promote the healthy and sustainable development of China's automotive industry

Service Aim

- Promote scientific and technical progress in automotive industry;
- Train automotive talents;
- Push forward technical exchange between domestic and international automotive industry;
- Popularize the knowledge of automotive industry
- Spread the culture of automotive industry;
- Build a home for scientists and engineers;

个人会员

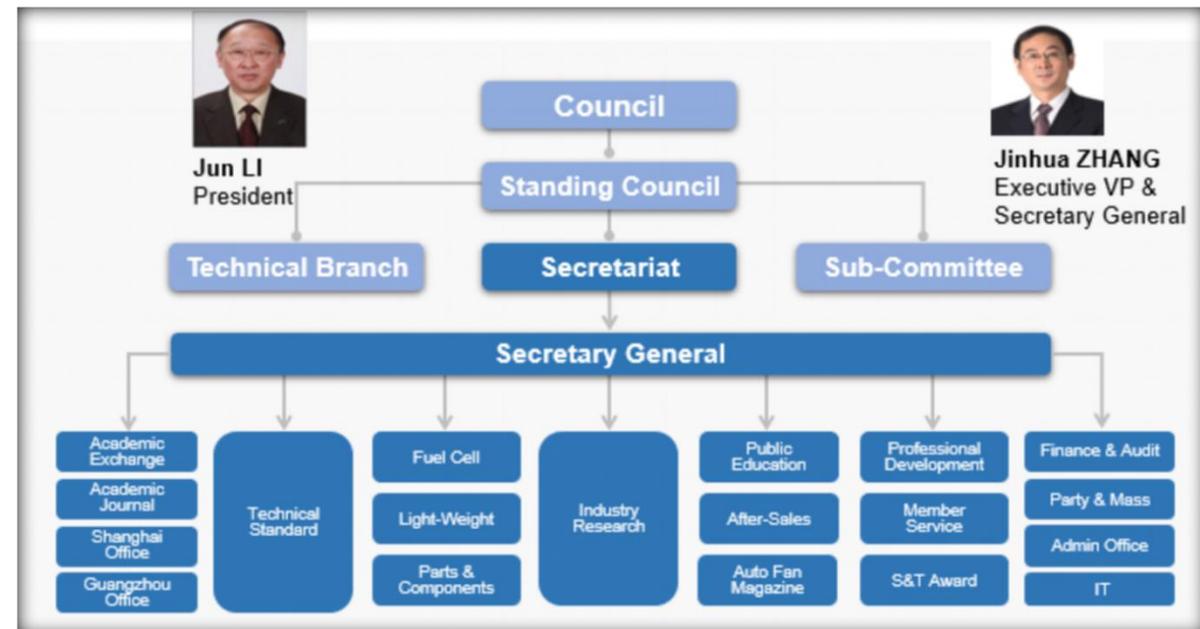
Individual members: **62467**

注册会员

Registered members: **101775**

单位会员

Unit members: **1765**

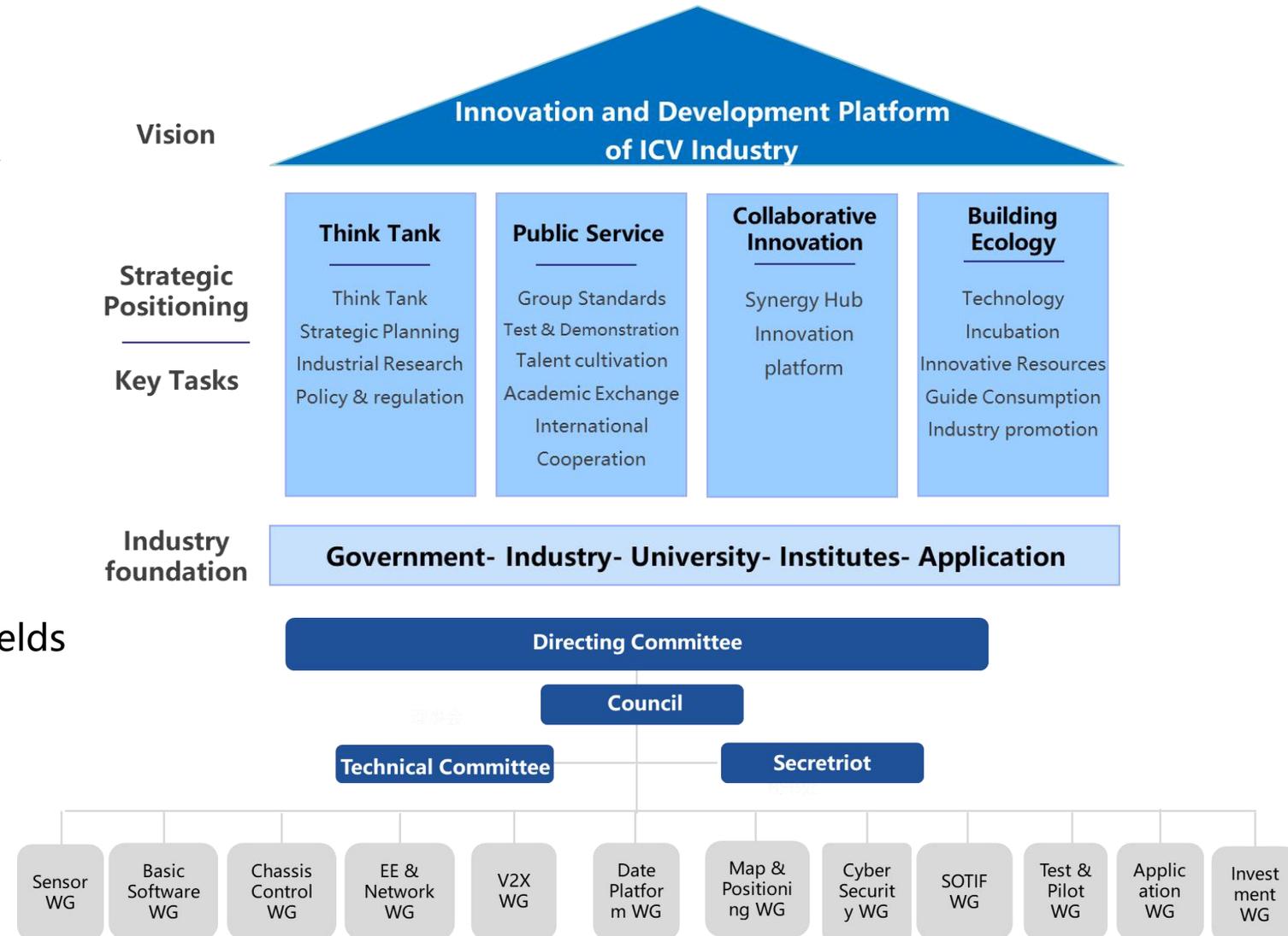


Introduction of CAICV

China Industry Innovation Alliance for the Intelligent and Connected Vehicles

CSAE carries out the intelligent and connected vehicles related research work through **CAICV**.

- Established in 2013
- Supported by MIIT
- Over 500 members, including companies, universities, institutes from automotive, telecommunication, transportation and electronics industries
- 12 working groups for different technical fields



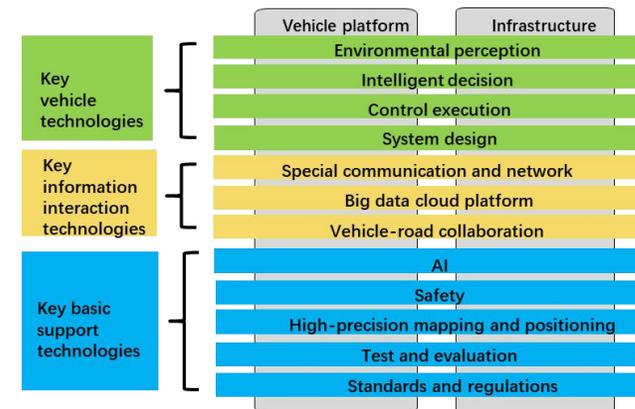
Main Tasks of CAICV

National ICV Innovation Center

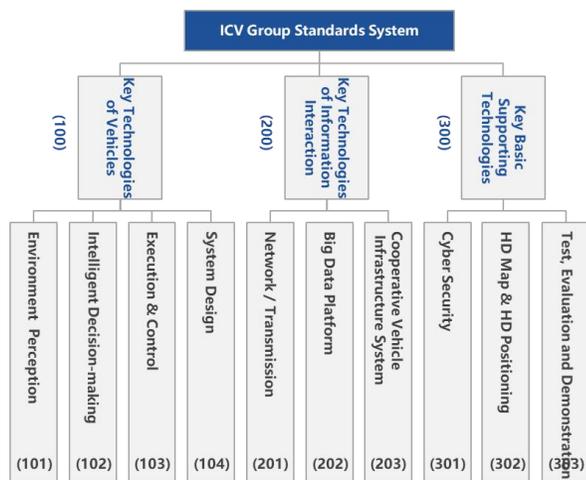
National ICV Innovation Center
"Corporation+ Alliance"



Industry Research



Group Standards



Test and Demonstration



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Introduction of CSAE and CAICV

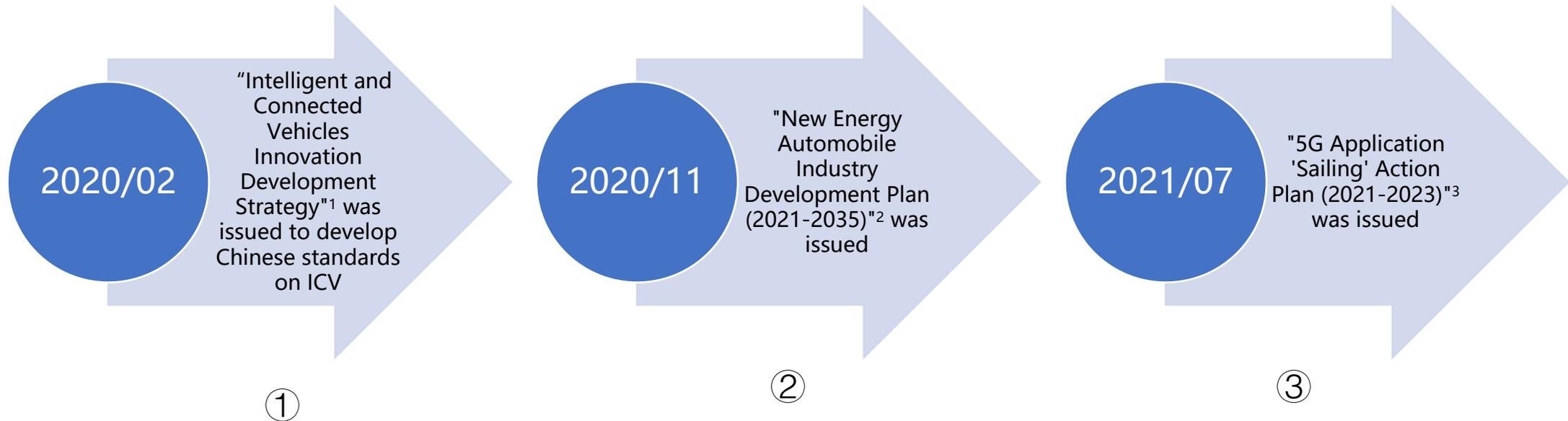
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China-C-V2X Recent Progress

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Recent CSAE ICV Standards

Vigorously promote the development route of connected technology



① https://www.ndrc.gov.cn/xxgk/zcfb/tz/202002/t20200224_1221077.html

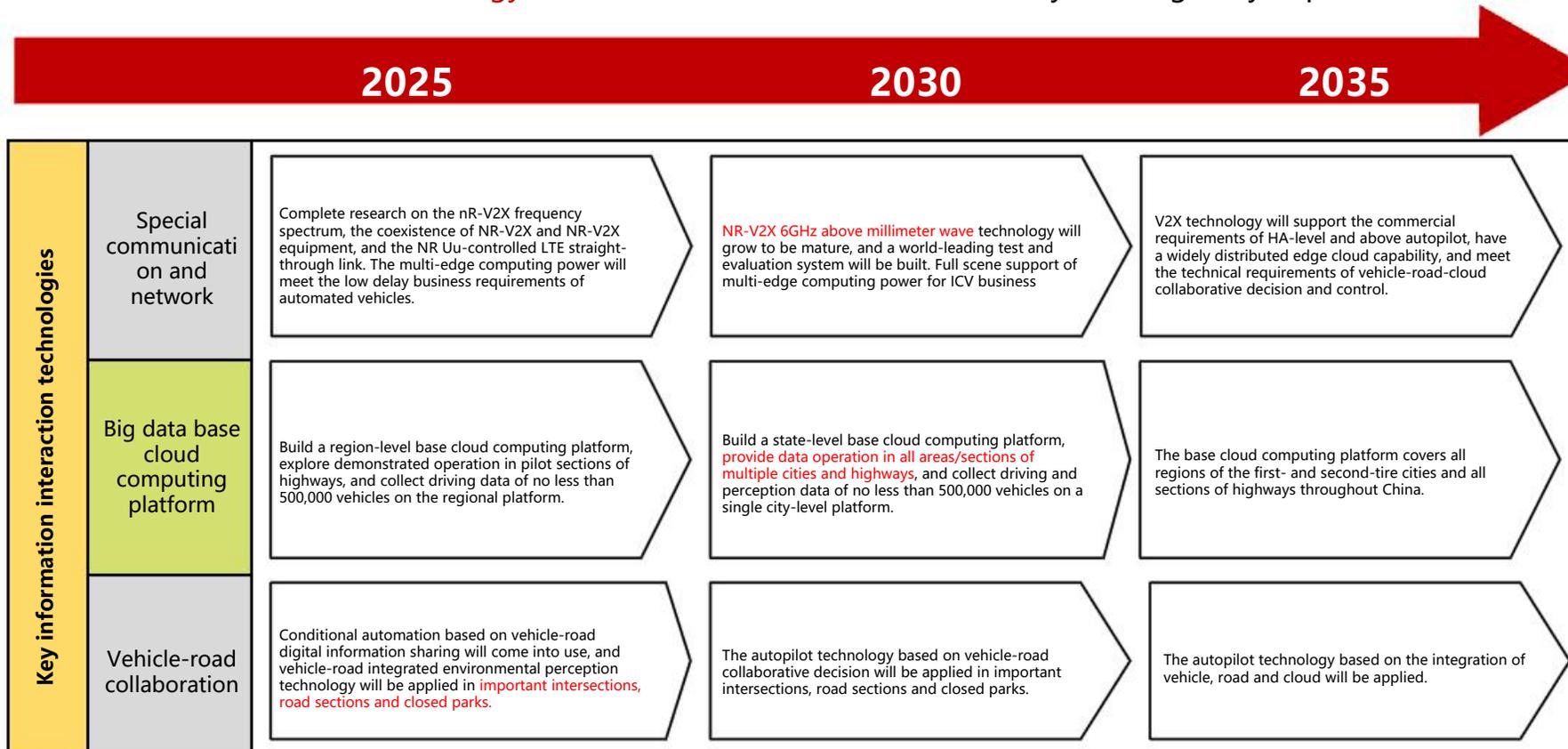
② http://www.gov.cn/zhengce/content/2020-11/02/content_5556716.htm

③ http://www.gov.cn/zhengce/zhengceku/2021-07/13/content_5624610.htm

ICV Technical Roadmap 2.0 sorting out development path of key information interaction technologies

including special communication and network, big data base cloud computing platform, and vehicle-road collaboration, etc.

- In 2025, NR-V2X frequency spectrum will be finished; the region-level base cloud computing platform will be built; and vehicle-road integrated perception technology will be applied to important intersections, road sections, closed parks and highways;
- In 2030, NR-V2X 6GHz above millimeter wave technology will be mature; the base cloud computing platform can provide data operation in/on many cities and highways; and the vehicle-road-cloud collaborative decision technology will grow mature;
- In 2035, the base cloud computing platform will cover all regions of the first- and second-tire cities and all sections of highways throughout China; the vehicle-road-cloud collaborative decision technology will be mature; and the traffic efficiency will be greatly improve.



China C-V2X Standard System Status

A relatively complete LTE-V2X standards system has been built in China.

The LTE-V2X standards system covering **access layer, network layer, message layer and security layer** has been set up. A cross-industry standards coordination mechanism has been set up as well.



Nov 17th, 2018, National Technical Committee in **Automotive, Intelligent Transportation System, Communication and Traffic Management** sign *Framework Agreement on Enhancing Cooperation on C-V2X Standards for Automotive, Intelligent Transportation, Communications and Traffic Management*

Category	Standards Name	Standards Type	Standards Organization	Progress
Overview	Overall technical requirements for LTE-based IoV communications	Industry standards	CCSA	Released
Application layer	Cooperative intelligent transportation system – Dedicated short range communications – Part 3: Technical requirements for the network layer and application layer	China national standards	TC/ITS and CCSA	Released
	Cooperative intelligent transportation system – Application layer and application data interaction standards for vehicle communications	Alliance standards	SAE-C and C-ITS	Under Released
Network layer	Cooperative intelligent transportation system – Dedicated short range communications – Part 3: Technical requirements for the network layer and application layer	China national standards	TC/ITS and CCSA	Under Released
Air interface	Technical air interface requirements for LTE-based IoV communications	Industry standards	CCSA	Released
Security	Technical security requirements for IoV communications based on the public LTE network	Industry standards	CCSA	Under Released

T/CSAE 53-2020 & T/CSAE 157-2020

The application layer standards Phase I and Phase II define different scenarios, including basic application scenarios and enhanced application scenarios in the following two tables.

The scenarios can be divided into four types, like **safety, efficiency, information service and traffic management**.

	Type	Communication Type	Application
1	Safety	V2V	Forward Collision Warning
2		V2V/V2I	Intersection Collision Warning
3		V2V/V2I	Left Turn Assist
4		V2V	Blind Spot Warning
5		V2V	Do Not Pass Warning
6		V2V-Event	Emergency Brake Warning
7		V2V-Event	Abnormal Vehicle Warning
8		V2V-Event	Control Loss Warning
9		V2I	Hazardous Location Warning
10		V2I	Speed Limit Warning
11		V2I	Red Light Violation Warning
12		V2P/V2I	Vulnerable Road User Collision Warning
13	Efficiency	V2I	Green Light Optimal Speed Advisor
14		V2I	In-vehicle Signage
15		V2I	Traffic Jam Warning
16		V2V	Emergency Vehicle Warning
17	Information Service	V2I	Vehicle Near-field Payment

	Type	Communication Type	Application
1	Safety	V2V/V2I	Sensor Data Sharing
2		V2V/V2I	Cooperative Lane Change
3	Safety/ Efficiency	V2I	Cooperative Vehicle Merge
4		V2I	Cooperative Intersection Passing
5	Information Service	V2I	Differential Data Service
6	Efficiency/Traffic Management	V2I	Dynamic Lane Management
7	Efficiency	V2I	Cooperative High Priority Vehicle Passing
8	Information Service	V2I	Guidance Service in Parking Area
9	Traffic Management	V2I	Probe Data Collection
10	Safety	P2X	Vulnerable Road User Safe Passing
11	High Intelligent Driving	V2V	Cooperative Platooning Management
12	Efficiency/Information Service	V2I	Road Tolling Service

Carry out industrialization-oriented testing and verification activities

CAICV and IMT2020 (5G) C-V2X Organize related companies carry out C-V2X three layers, four layers and new four layers cross industry including communication tips, terminal, automotive, Certificate Authority, map and positions and password.

The activities fully verify LTE-V2X technology and related standards, promote the industry development.



Large-scale construction of C-V2X achieve initial results

The MIIT has approved four pilot zone of internet of vehicle, the construction target is gradually evolve, **from enriching internet of vehicle application scenario, cross industry standardization, whole road network large scale deployment to summarize reproducible experience and practices.**



JiangSu(Wuxi)

实现**规模部署C-V2X网络、路侧单元**，装配一定规模的车载终端，完成**重点区域交通设施车联网功能改造和核心系统能力提升**，**丰富车联网应用场景**；



Tianjin(Xiqing)

发挥在**标准机构、测试环境**等方面的优势，积极探索**跨行业标准化**工作新模式，加快行业**关键急需标准制定和验证**；



Hunan(Changsha)

在重点高速公路、城市道路**规模部署蜂窝车联网C-V2X网络**，结合5G和智慧城市**建设**，完成**重点区域交通设施车联网功能改造和核心系统能力提升**，带动**全路网规模部署**。



Chongqing(Liangjiang)

在**重点高速公路、城市道路规模部署蜂窝车联网C-V2X网络**，做好与5G和智慧城市发展的**统筹衔接**，完成**重点区域交通设施车联网功能改造和核心系统能力提升**，带动**全路网规模部署**。

Mainstream auto enterprises have released mass-produced models equipped with C-V2X technology



 Huawei MH5000

 Qualcomm 9150

 Qualcomm SA515M

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ICV standards formulation

- Up to now, CSAE has issued **222** standards and more than **120** standards under research. **In ICV field, China-SAE group standards focus on driving assistance and active safety, security, automated driving scenario, V2X, new in-vehicle high speed network, test and evaluation, HD Map and HD Positioning, the V2X related standards are widely used.**
- Including **13** standards issued and **28** standards under research about intelligent connected vehicles (ICV) . involving 7 v2x related standards.
- In 2021, The English version of these four issued v2x standards has been started.

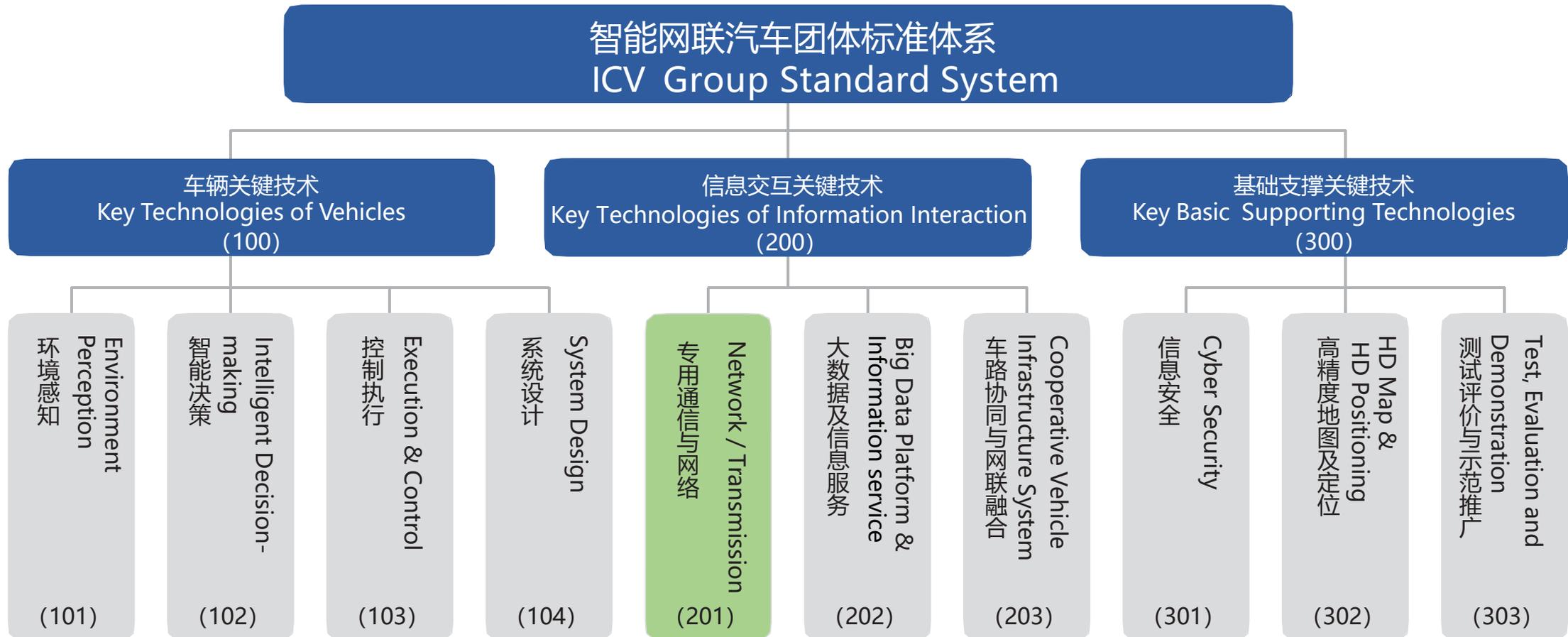
1	Cooperative intelligent transportation system—Vehicular communication application layer specification and data exchange standard (Phase I) (T/CSAE 53-2020)
2	Cooperative intelligent transportation system—Vehicular communication application layer specification and data exchange standard (Phase II) (T/CSAE 157-2020)
3	Data exchange standard for high level automated driving vehicle based on cooperative intelligent transportation system (T/CSAE 158-2020)
4	LTE-based vehicular communication—Direct communication system roadside unit technical requirements (T/CSAE 159-2020)

Released Intelligent and Connected Vehicle Standard List

NO.	Standard	Serial Number
1	Cooperative intelligent transportation system—Vehicular communication application layer specification and data exchange standard (Phase I)	T/CSAE 53-2020
2	IOV data acquisition standards	T/CSAE 100-2018
3	Intelligent and connected vehicle On-Board terminal cyber security test methods)	T/CSAE 101-2018
4	Intelligent and connected vehicles test field design technical specification	T/CSAE 125-2020
5	Technical requirements of automotive audio video bridging (AVB)	T/CSAE 152-2020
6	General technical requirements of automated valet parking systems	T/CSAE 156-2020
7	Cooperative intelligent transportation system—Vehicular communication application layer specification and data exchange standard (Phase II)	T/CSAE 157-2020
8	Data exchange standard for high level automated driving vehicle based on cooperative intelligent transportation system	T/CSAE 158-2020
9	LTE-based vehicular communication—Direct communication system roadside unit technical requirements	T/CSAE 159-2020
10	Intelligent and connected vehicles—Highly automated driving map—Acquisition element model and exchange format	T/CSAE 185-2021
11	Security requirements for sharing data of intelligent and connected vehicles	T/CSAE 211-2021
12	Requirements and methods for scenario data image annotation of intelligent connected vehicles	T/CSAE 212-2021
13	Requirements and methods for lidar point cloud data annotation of intelligent connected vehicles	T/CSAE 213-2021

Group Standard System Framework

Supplementing the National Standards (GB) and Industry Standards;
Organizing research and formulation of CSAE Standards in **foresight, cross-industry, and blank fields.**



CAICV Releases Standard System

To implement the cooperation with NTCAS, CAICV released the Guideline for the Construction of ICV Group Standard System on Sept. 15, 2020.



Standard Cooperation

Cooperation between National Standards and Group Standards

- Carry out multi-level cooperation with TC114 national standard
- Give play to the advanced role of group standard

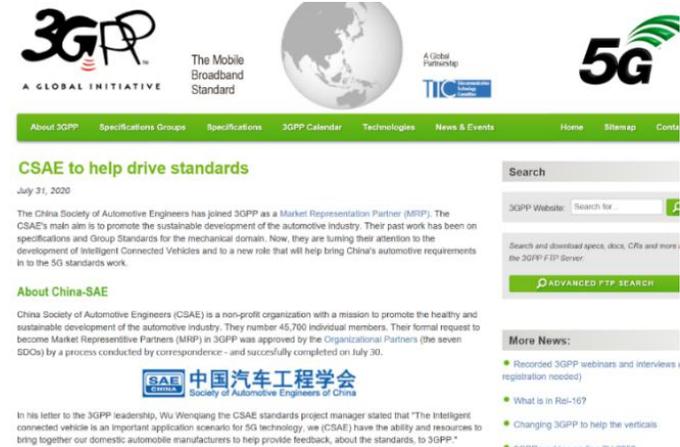
Cross-industry Cooperation

- Cross-industry and cross-field joint standard research,
- Jointly release of cross-industry standards



International Cooperation

- Promote coordination with international/foreign standards and regulations



2020.7.31 3GPP MRP



Talk to experts of ISO TC204/WG14 AVPS



CSAE

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



CICV

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



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