



CICV 国汽智联

The Challenges and Development Strategies for Intelligent & Connected Vehicles in China

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- 1 **The Challenges of ICV Development**
- 2 The Strategies for ICV Industrialization
- 3 The Future Prospect

1. Challenges of ICV Development

1.1 Insufficient ICV Standards and Regulations

- ICV in China is just beginning. Standards and regulations of ICV are **not sufficient and complete**. The existing standards are **difficult to meet** the demand for ICV rapid development.
- So far, “Road Traffic Safety Law”, “Highway Law”, “Insurance Law”, and other regulations do **not involve ICV**. “Network Security Law”, “Surveying & Mapping Law”, and other regulations are **not applicable** to the industrialization of ICV technology.



1. Challenges of ICV Development

1.2 Incomplete Industrial Chain, and Insufficient Core Technologies

- Lack of Chips, Operating Systems, Computing Platforms, and another key components in industrial chain.
- No sufficient in core technologies such as high-performance perception, control-by-wire, AI Computation, and Simulation Tool Chains.

	Radar	Camera	Chip/Computing	Software	Mapping/Location
China					
Worldwide					

1. Challenges of ICV Development

1.3 High Cost and Long Construction Cycle to Build ICV Infrastructure

- Road infrastructure is an important foundation for ICV, which requires the construction of **intelligent infrastructure network, wireless communication network, high-precision location service network** and another infrastructure networks.
- The construction requires cross-department and cross-industry coordination, and is **costly and long-term**. The **return on investment business model** is not clear.



1.4 Unclear Business Model and Incomplete Industrial Ecosystem

Operating Direction

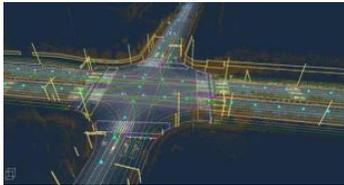
Commercialization Difficulties Analysis

ICV Commercial Operation



- The High CAPEX in ICV.
- The High OPEX in operations.
- Regulations and Use case Scenarios Limitation.
- The tremendous investment in early stage.

Map Acquisition and Application



- Limited license model for map acquisition and application.
- Personal privacy security problems of data collection process.
- Restrictions of regulations and testing qualifications, etc.

Approving Ground Operation



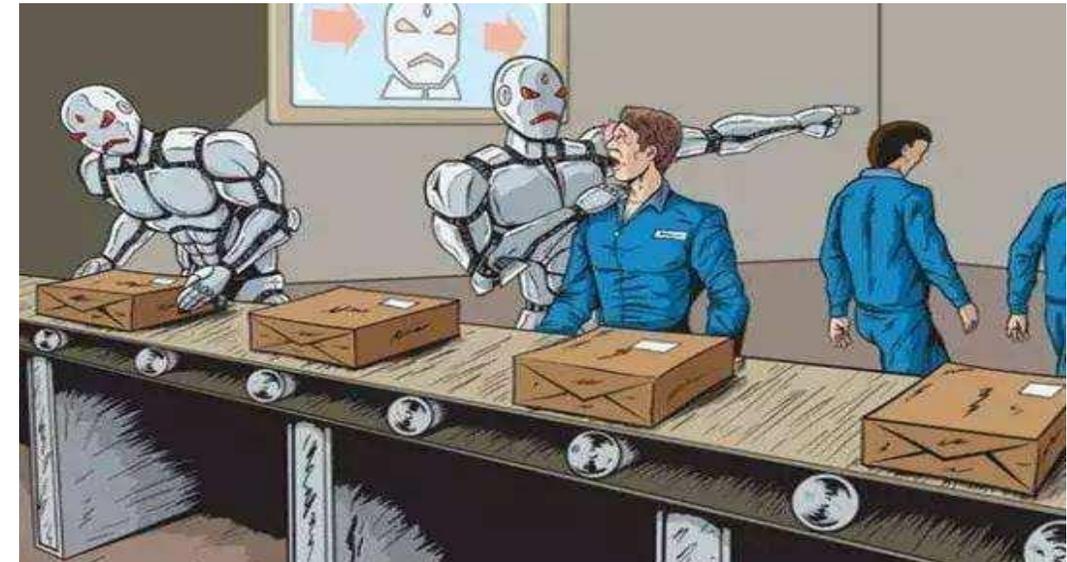
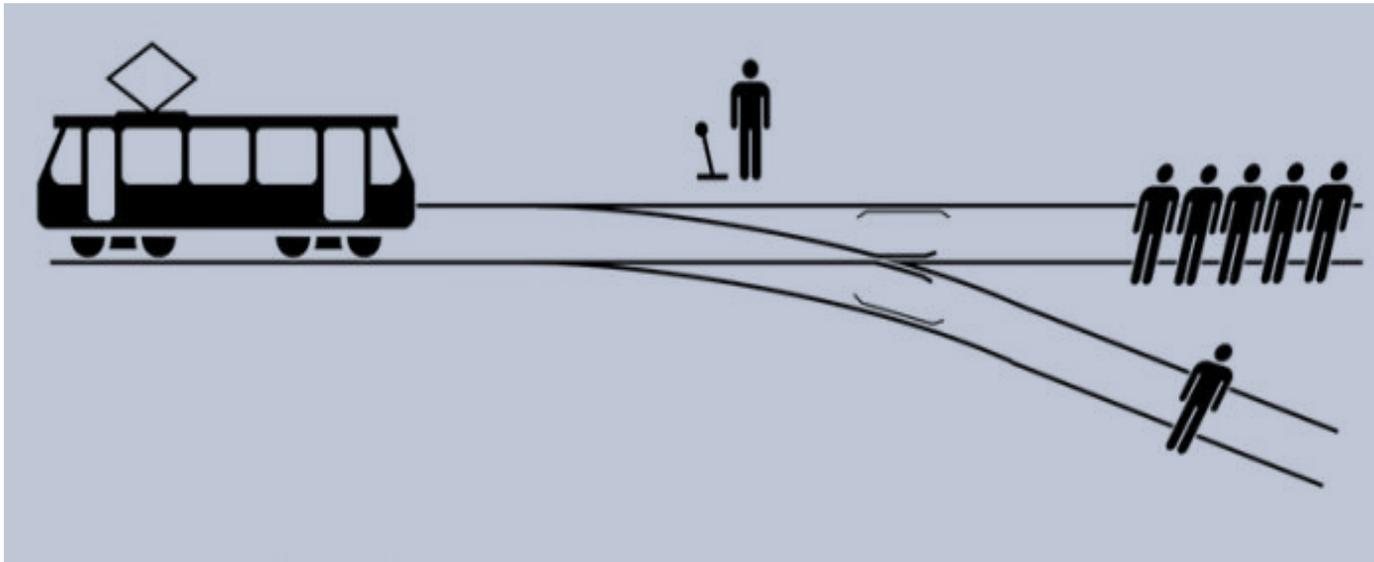
- The Costly construction investment of ICV approving ground.
- Limited testing capacity and scenarios.
- The low utilized rate of ICV approving ground.
- The limited income model of ICV approving ground.

ICV Infrastructure Construction

- Unclear return on investment business model.

1.5 The Uncertainty on Social Acceptance of ICV

- **Ethical and Moral Discussions, Social Security, Unemployment** etc. will go with ICV development for a long time.
 1. The Trolley Problem.
 2. The Determination of Civil Liability.
 3. Privacy Security and Trust Issues.



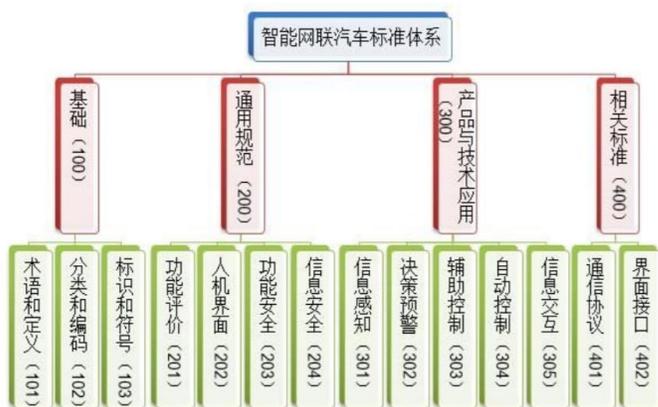
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- 2 **The Strategies for ICV Industrialization**
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1. Actively Promote the Policies and Regulations of ICV

To establish Cross-department Coordination Process & Top-level Design

- ❑ The Ministry of Industry and Information Technology launched ICV Development Action Plan
- ❑ The Development and Reform Commission issued ICV Innovative Development Strategies
- ❑ The Ministry of Transport strengthens Product Application and Pilot Demonstration
- ❑ The Ministry of Natural Resources expands Market of Map and Position Applications



The Regulations of ICV

In 2020
The new ICV proportion will reach 50%, and the market application of medium and high-level ICV will be realized.

In 2025
A system of ICV industrial ecology, road facilities, laws & regulations, supervision & cyber security will be set-up.

In 2035
A safe, efficient, green and civilized ICV society will be build.

The Roadmap for ICV



ICV Closed Field Test Base



Enterprises with Qualifications

□ OEMs Accelerate Implementation of ICV Industrialization Plan



中国一汽

FAW i.Rflag 旗偲计划

- In 2019 realize L3 ICV Production
- In 2020 realize L4 ICV Production
- In 2025 realize L5 ICV Production



东风汽车

“五化” 技术路线规划

- In 2019 realize L2+AVP+AR+HuD
- In 2020 realize ICV HMI
- Build driverless minibuses Sharing-VAN



长安汽车

北斗天枢 战略

- In 2020, 100% production with ADAS
- In 2025, realize driverless vehicle



上汽集团
SAIC MOTOR

SAIC 新四化

- Publish L4 5G driverless vehicle Vision
- Publish MARVEL X Pro, with L3 function such as Valet Parking.



北汽集团
BAIC Group

“海豚+” 战略

- In 2022, 100% production with Autonomous and Connected driving function



广汽集团
GAC GROUP

GIVA计划与Adigo系统

- Open GAC Intelligent Driving Platform
- New energy Vehicle Aion LX with Adigo system (L3 level)



吉利汽车
GEELY AUTO

G-Pilot战略

- In 2020, realize L3 ICV Production
- In 2022, publish L5 Shuttle Bus
- Realize Valet Parking



比亚迪汽车

打造D++生态圈

- Strategic partnership with AutoX
- BYD 宋PRO with L2 driving assistance

2. Development of Core Technologies of ICV

Component Suppliers Accelerate R&D, and Explore Applications for OEM

Key components of ICV, including computing platform, domain controller, sensors, actuators, are in R&D stage, and some suppliers have implemented in OEM.

Sensor

Invo Technology, Tsingtel Technology, Anzhi Auto, Autoroad etc. companies have implemented pre-assembly.



Automatic Driving

Idriverplus, Uisee, TuSimple etc. companies have completed several rounds of financing, and completed real car debugging.



Computing Platform

Huawei MDC 600, 352 TOPS, Functional Safety ASIL D. Neusar-Adaptive Autosar for Automatic driving and Intelligent Cabin.



Chassis Actuator

BTL, Global, APG, Wanxiang Group etc. companies have implemented pre-assembly with ABS, ESC, EPB, EPS.



□ ICT Companies Participant into ICV Market Competition



Apollo and Map

- Launched Apollo system, running in Changsha by RoboTaxi



Automated Driving and High Precision Positioning

- Combining with AliYun ET urban brain and AliOS



Autonomous Vehicle

- Build a ICV development team in Silicon Valley

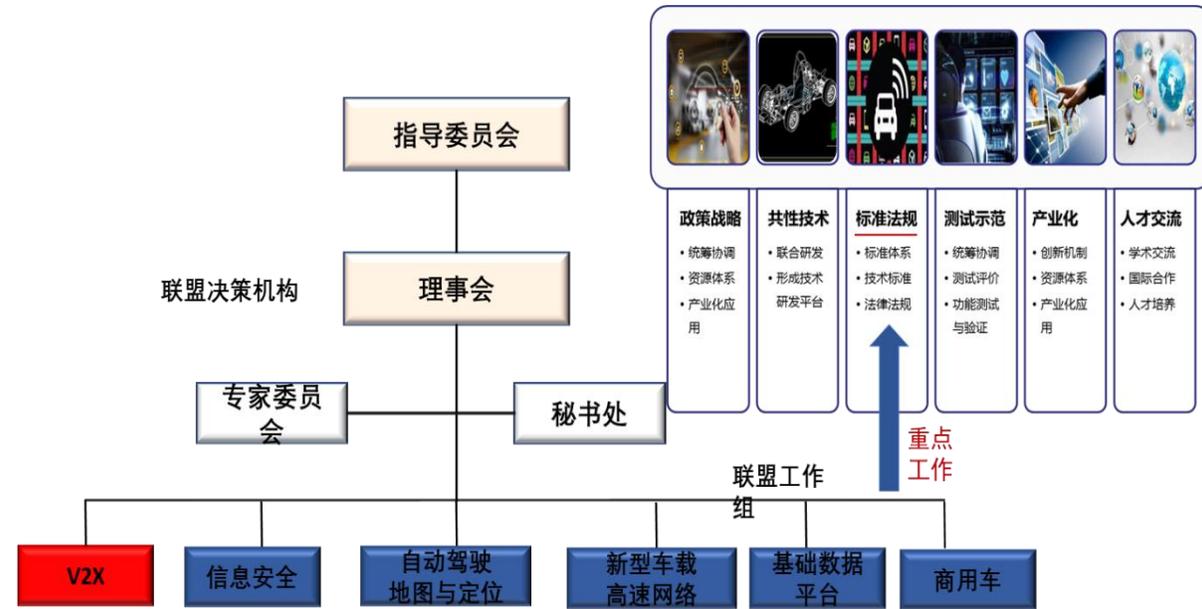


Deep Integration with ICV

- Released MDC600 computing platform, Communication terminal, RSU solutions.

3. Establish Industrial Collaborative Innovation Platform

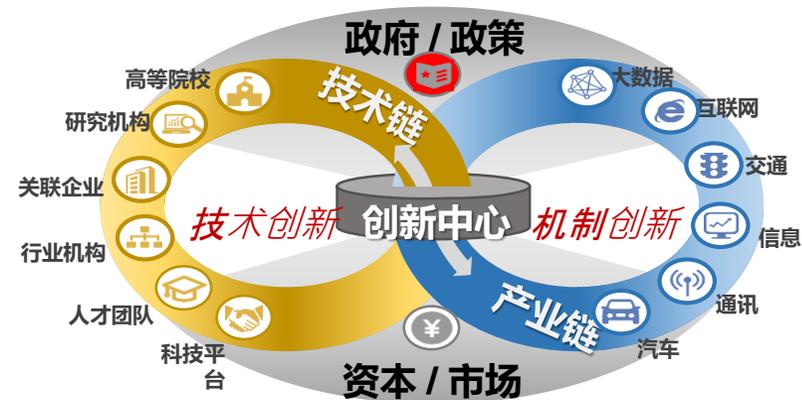
China Industry Innovation Alliance for ICVs



At present, the Alliance has 64 council members and more than 269 ordinary members covering auto, information, communication and transportation.

National Innovation Center for ICVs

On May 30th, 2019, CICV was approved as the “National Innovation Center for ICVs” by the Ministry of Industry and Information Technology.

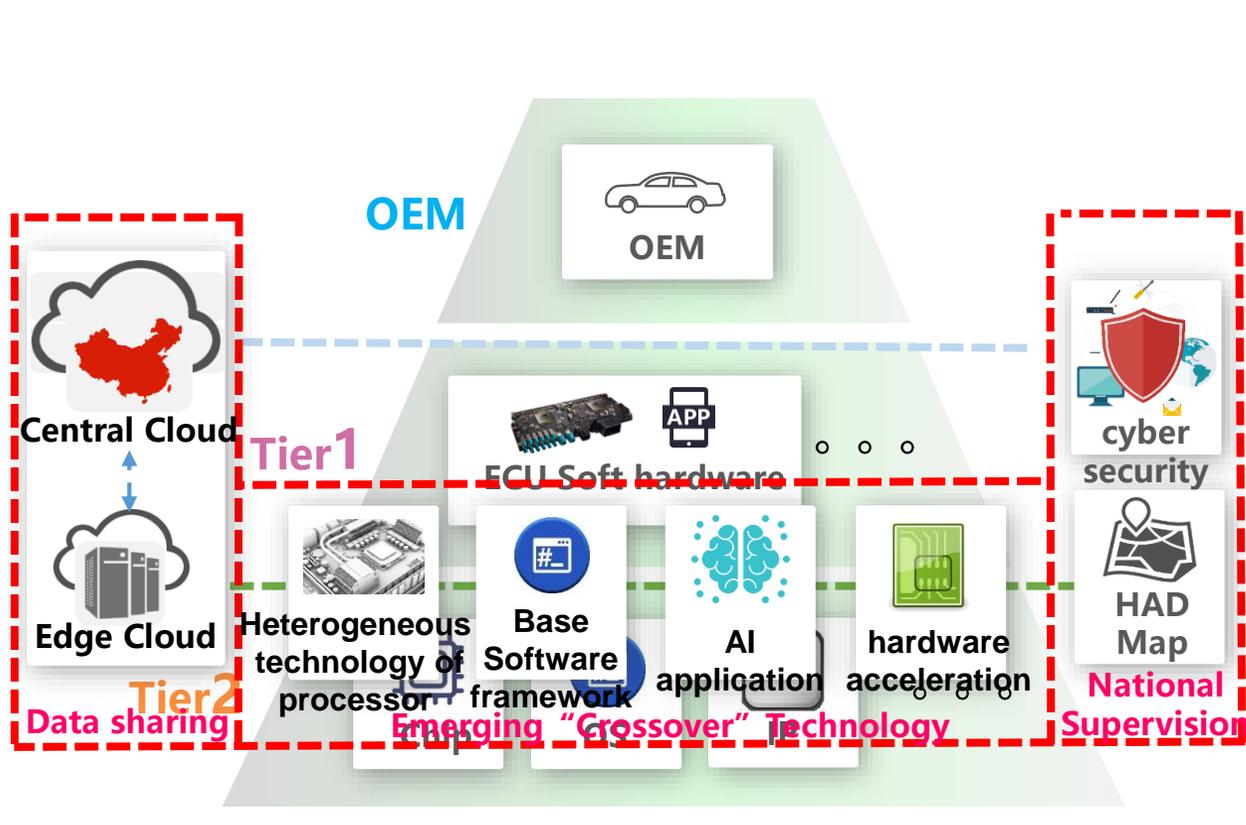


Development Target: Aim to make breakthroughs in key technologies, enhance innovation ability, incubate ICV enterprises with competitiveness, efficiently keep supporting industry going forward.

4. Explore New Industrial Ecosystem

Build New Tier 1.5 Component Suppliers

Industrial Chain of Automated Driving Electronics



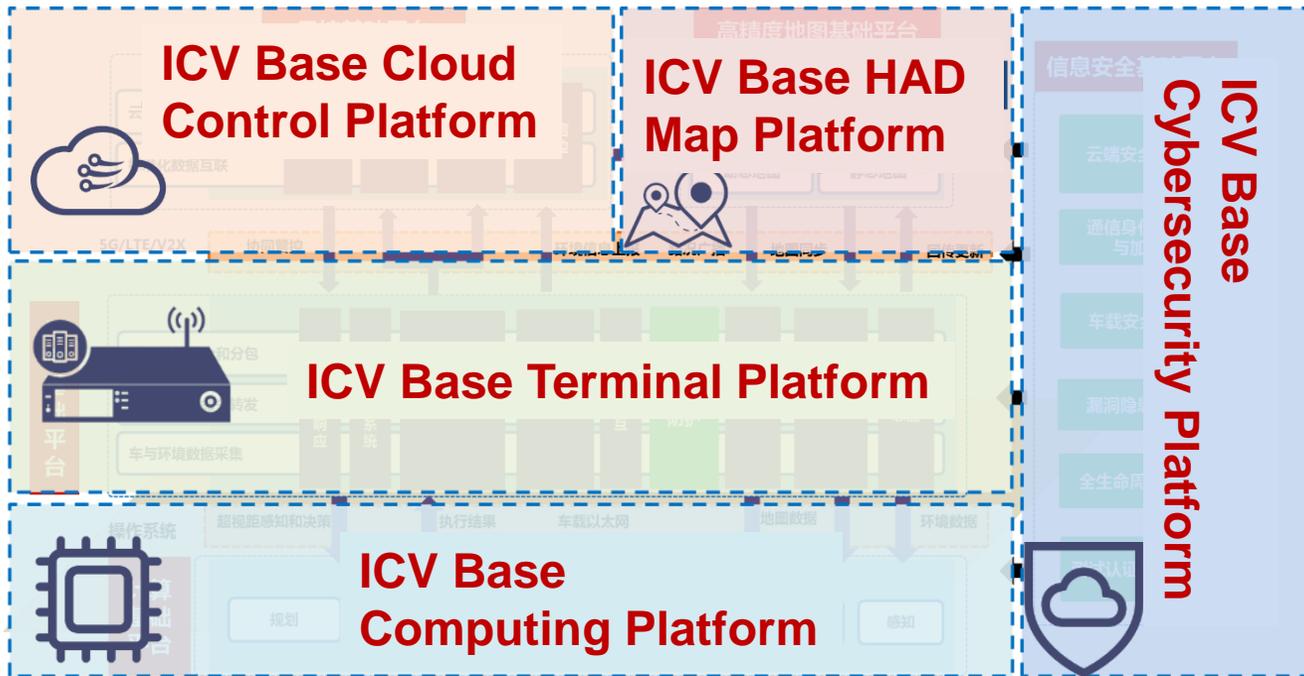
5 Base Platforms of ICV System

- ICV Base Computing Platform 
- ICV Base Terminal Platform 
- ICV Base Cloud Control Platform 
- ICV Base HAD Map Platform 
- ICV Base Cybersecurity Platform 

4. Explore New Industrial Ecosystem

Build New Tier 1.5 Component Suppliers

CICV carries out in-depth cooperation with the research and development of ICV-based common technologies. Actively build new platform companies in ICV industry chain, and trying to build new Tier1.5 Component Suppliers.



5. The Demonstration of ICV Operations

□ Special Use-case Scenario Application of ICV is Implemented widely

Give higher priority to the demonstration and operation of ICVs in specific Scenarios, such as parks, ports, logistics distribution, high-speed queues and autonomous valet parking, so as to form a new applying path for ICV with Chinese characteristics.



Xiong' an New Area



Guangzhou Baiyun International Airport



Tianjin Hua 'ming High-tech Zone



FAW Hongqi



SAIC Motor



Tianjin Xiqing Development Area



Point-to-Point Logistics



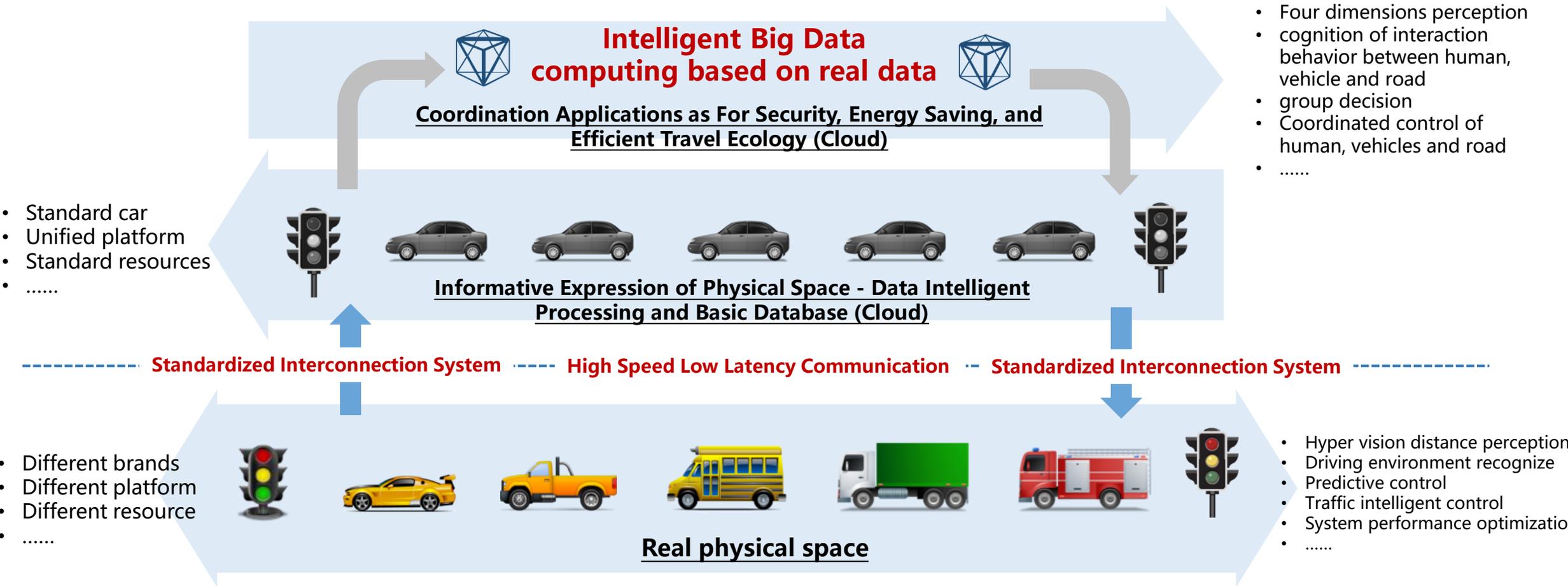
Port Logistics in Shanghai & Tianjin



Tsinghua Library

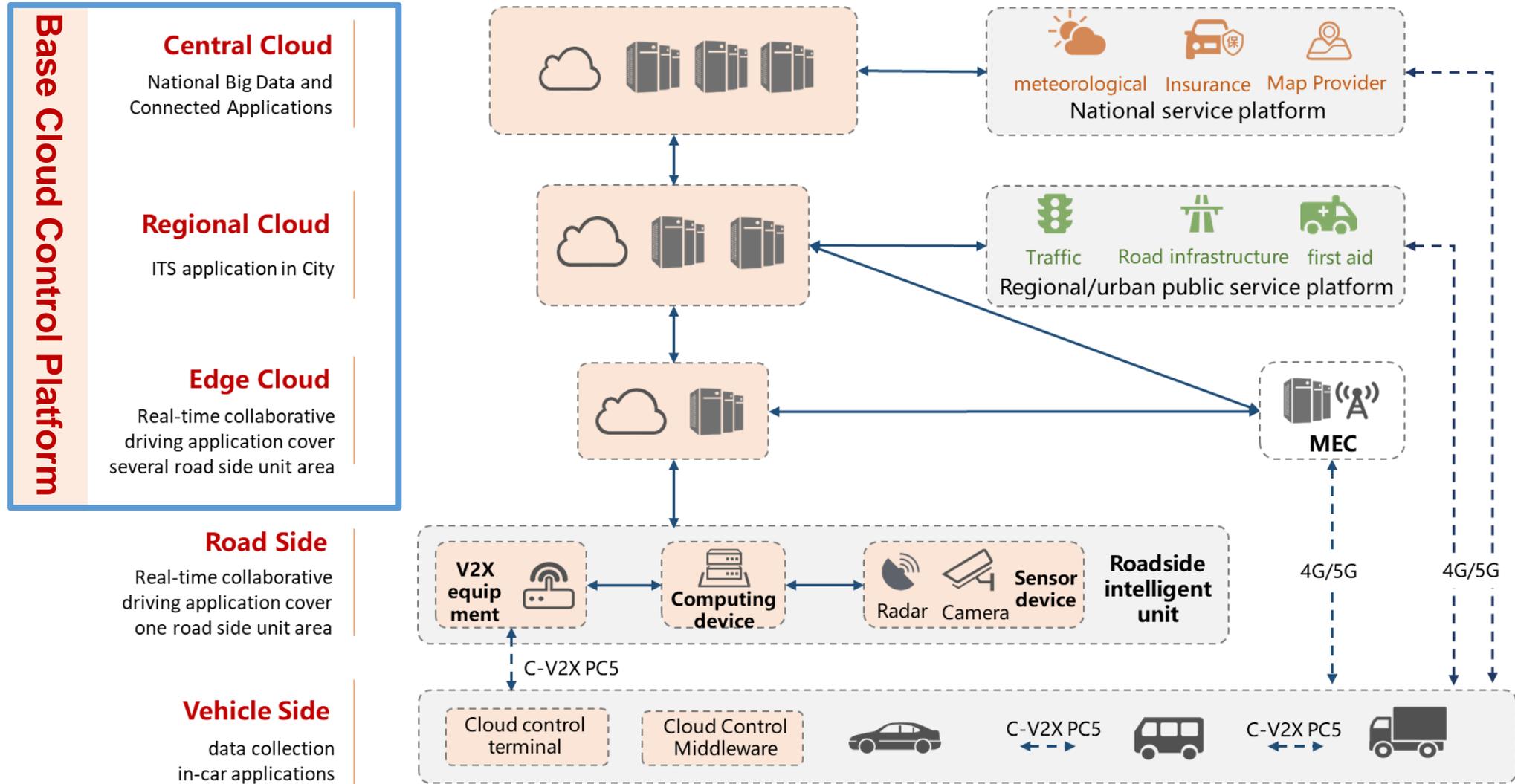
5. The Demonstration of ICV Operations

□ The Practical System of "Cloud Control" is Gradually Setting Up



5. The Demonstration of ICV Operations

□ The Infrastructure of C-V2X Cloud Control System



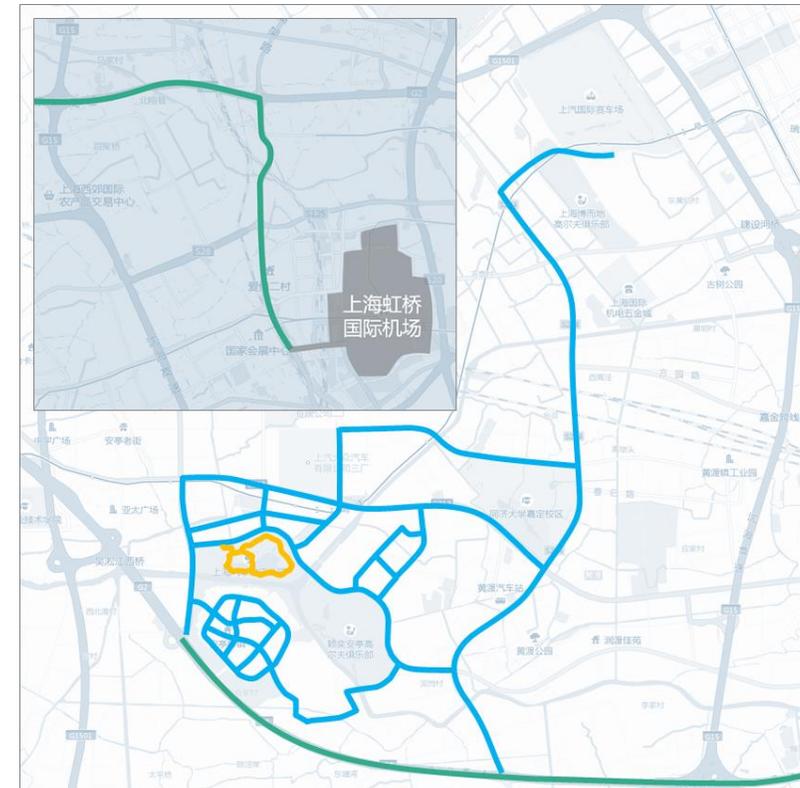
5. The Demonstration of ICV Operations

□ The Demonstration of Cloud Control System in Shanghai

The Project supported by NDRC(National Development and Reform Commission)

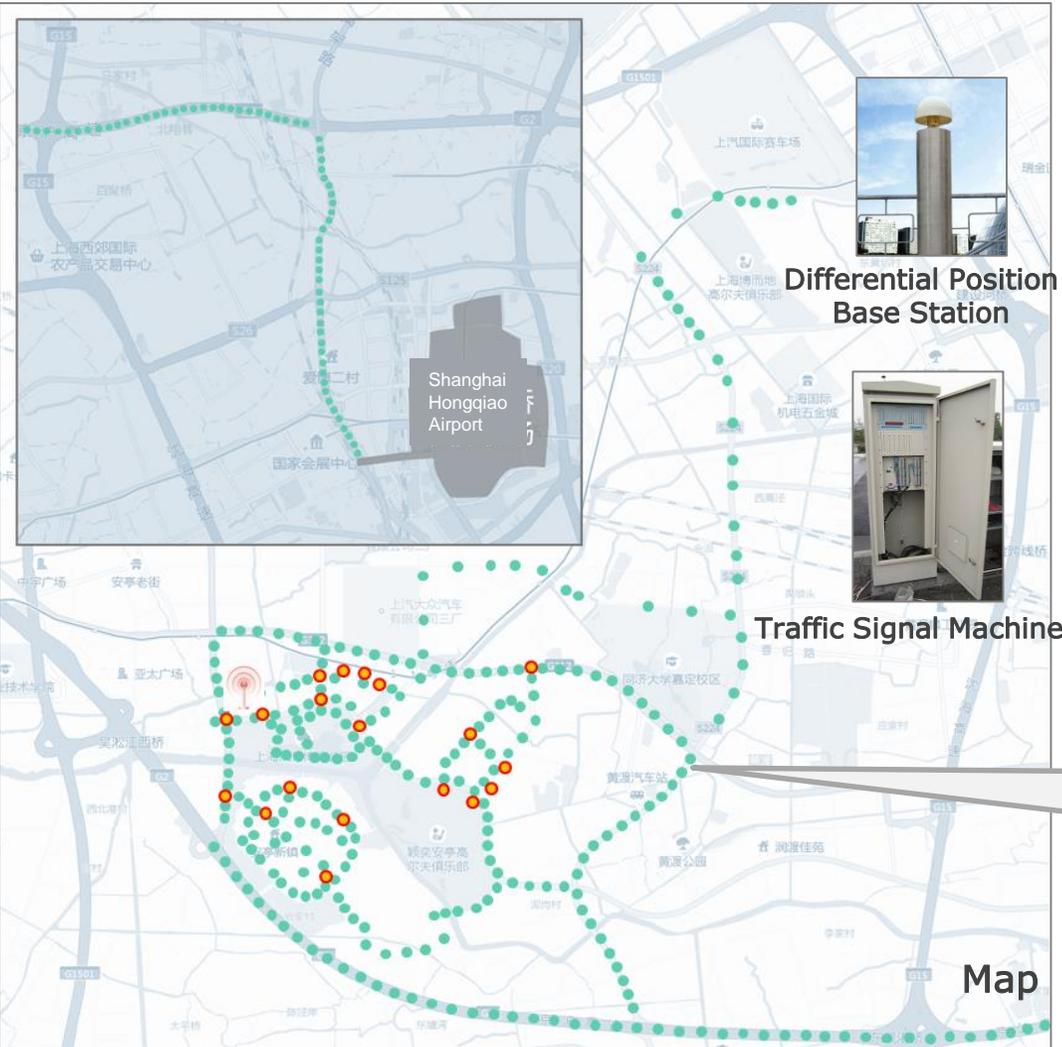
- **The China first large-scale cloud control system city-level demonstration project.** In the 70-kilometer road covering all grades of highways, the basic operational facilities including roadside facilities, network conditions and cloud computing platforms are deployed to realize the cloud control service capabilities such as collaborative sensing and collaborative decision-making and control.
- **This project is the first demonstration project in China for the actual application of intelligent and connected vehicles.** The first phase of the project is expected to reach 1,200 vehicles and more than 300 roadside intelligent terminals (the capability is sensing、 edge computing and communication in LTE-V).
- **The whole range is covered by LTE-V and 4G network.**
- **5G network is covered one road.**

- 47.8 km autopilot test road in the open road
- Internal road 4.0 km in Shanghai Auto Expo Park
- 20.0 km Expressway from Hongqiao Airport to Shanghai Au



5. The Demonstration of ICV Operations

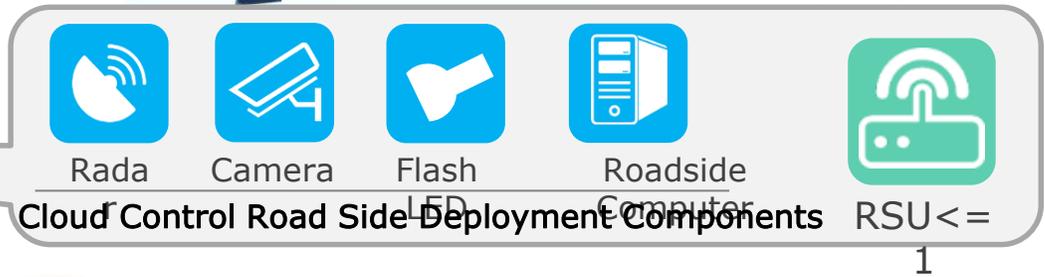
□ The Demonstration of Cloud Control System in Shanghai



Construction principle

Roadside equipment performance indicators

- Set new or reused original road side pole frame, the height should be 6-12 meters
- 1 set at each intersection, 1 set at each corner of the curve, and 1 set for each 150-200 meters in one direction.
- Vehicle pedestrian detection accuracy is $\geq 98\%$
- Maximum positioning error: lateral $< 0.2\text{m}$; longitudinal $< 0.6\text{m}$;
- The speed error is $< 0.3\text{m/s}$, the update is $\geq 10\text{HZ}$; the maximum delay of calculation processing is $< 200\text{ms}$;
- Meet the L3-L4 level of automatic driving needs



- Differential Position Base Station
- Cloud Control Unit & RSU
- Traffic Signal Control System

5. The Demonstration of ICV Operations

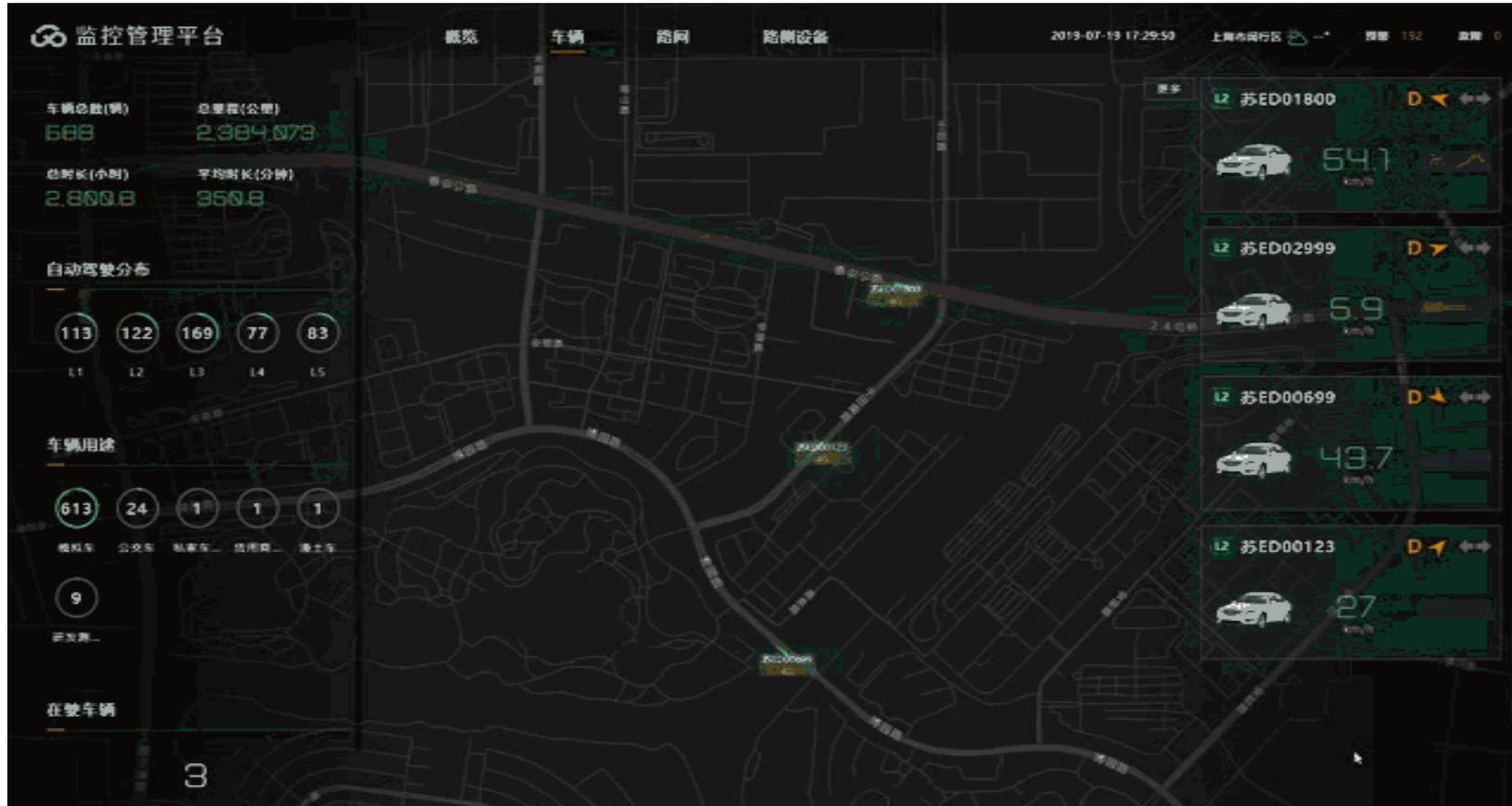
□ The Demonstration of Cloud Control System in Shanghai



Cooperative Perception: Roadside camera and radar to sense the real-time status of traffic (the direction of the speed of pedestrians, motor vehicles, and non-motor vehicles), combined with high-precision maps, sent to vehicles

5. The Demonstration of ICV Operations

□ The Demonstration of Cloud Control System in Shanghai



Overview View: number of vehicles, total travel, average driving duration, vehicle distribution, on-going vehicles, etc.
Display vehicle location information in real time on the map.
Analysis the vehicle data including such as active time analysis, driving time analysis, etc.

5. The Demonstration of ICV Operations

2019 C-V2X “Four Layers” Interoperability Application Demonstration

OEM	JAC 江淮汽车	Audi	BMW	北汽集团	PSA GROUPE	长城汽车 专注 专业 专家	长安汽车 CHANGAN
	东风柳州汽车有限公司 DONGFENG LIUZHOU MOTOR CO.,LTD.	东风汽车 DONGFENG MOTOR	FCA	Ford	广汽乘用车	Brilliance Auto 华晨汽车	吉利汽车 GEELY AUTO
	SAIC VOLKSWAGEN MOTOR	CHERY	JETOUR 捷途	奇瑞控股 CHERY HOLDING	SAIC 上汽集团 SAIC MOTOR	蔚来	上汽大众 SAIC VOLKSWAGEN
	上汽通用五菱 SAIC GM WULING	GENERAL MOTORS	NISSAN	奇瑞 CHERY	雄博科技 LION TECH	红旗 HONGQI	中国一汽
Module	ALPSALPINE	Fluotalks	MORNINGCORE 晨芯科技	高鸿股份	gosuncn 高新兴	HUAWEI	Qualcomm
	REDIATOR	QUECTEL	ZTE中兴	HARMAN			
Terminal	ALPSALPINE	Fluotalks	聚利科技 JULITECH	千方科技 China TRAFFIC	万集科技	NEBULA LINK 星云	Cohda Wireless
	CIDI 睿迪智驾	高鸿股份	大唐移动 DTmobile	Neusoft	REACH	gosuncn 高新兴	HARMAN
	SMARTWAYS	HUAWEI	吉利汽车	千寻位置 QIANXUN POSITIONING	REDIATOR	preh	SAVARI
	PATEO	GENVICT 金固科技	ECARX	ZTE中兴	中国移动 China Mobile	Faro	
CA Platform	高鸿股份 SOT 兴泰公司	CICV 国漫智联					
Security Chip	华大电子	THINKTECH	晨安信息	CPK 信长城	信大捷安		

26 OEMS

11 Chipsets & Module

28 Terminals & Software

2 CA platform

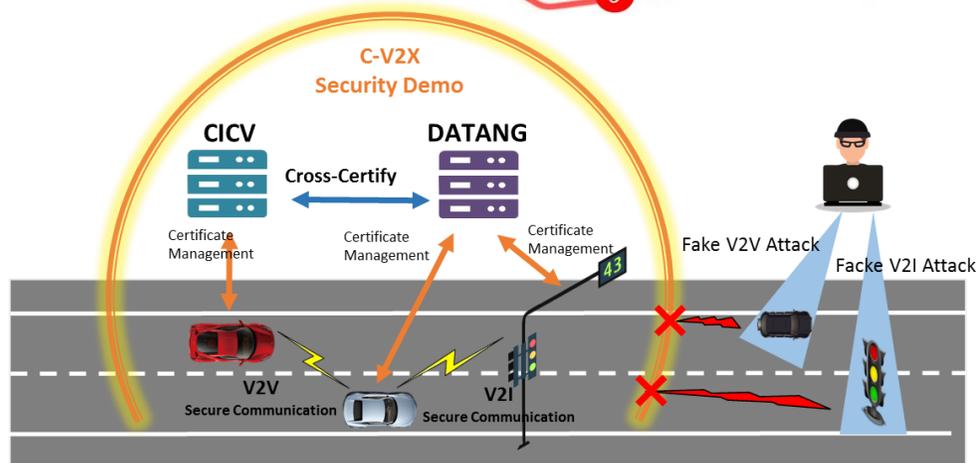
5 Security Chipsets & Solutions

Positioning system & others



5. The Demonstration of ICV Operations

□ 2019 C-V2X “Four Layers” Interoperability Application Demonstration



The demonstration was successfully held at the Shanghai International Automobile City open road, with total length of 11.4km. 50 cars formed **25 groups to demonstrate V2X application.**

□ V2I scenarios

- SLW (Speed Limit Warning)
- HLW (Hazardous Location Warning)
- RLVW (Red Light Violation Warning)
- GLOSA (Green Light Optimal Speed Advise)

□ V2V scenarios

- FCW (Forward Collision Warning)
- BSW (Blind Spot Warning)
- AVW (Abnormal Vehicle Warning)

□ V2P scenarios

- VRU (Vulnerable Road User Collision Warning)
- 【OPTIONAL】**

□ Attack scenarios

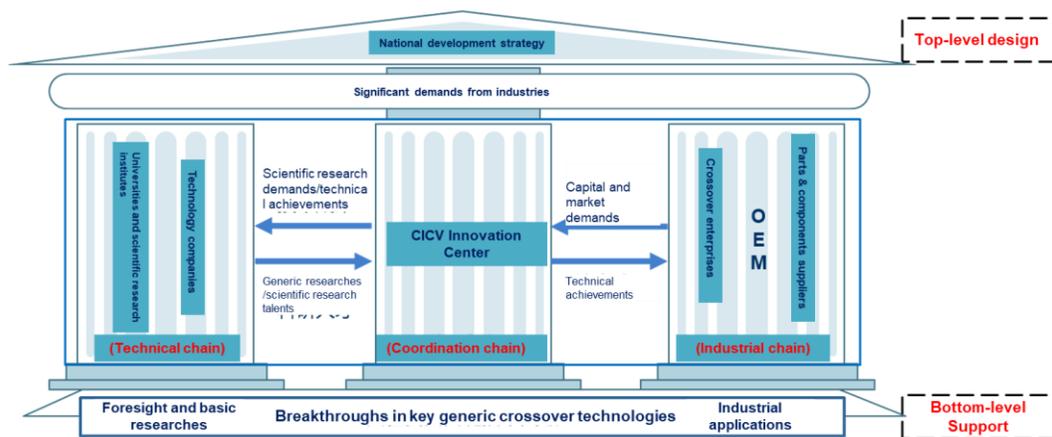
- Untrusted RSU and OBU will forge RSI and BSM messages to demonstrate V2X security

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1. Develop Strategic Consensus and Top-level Design

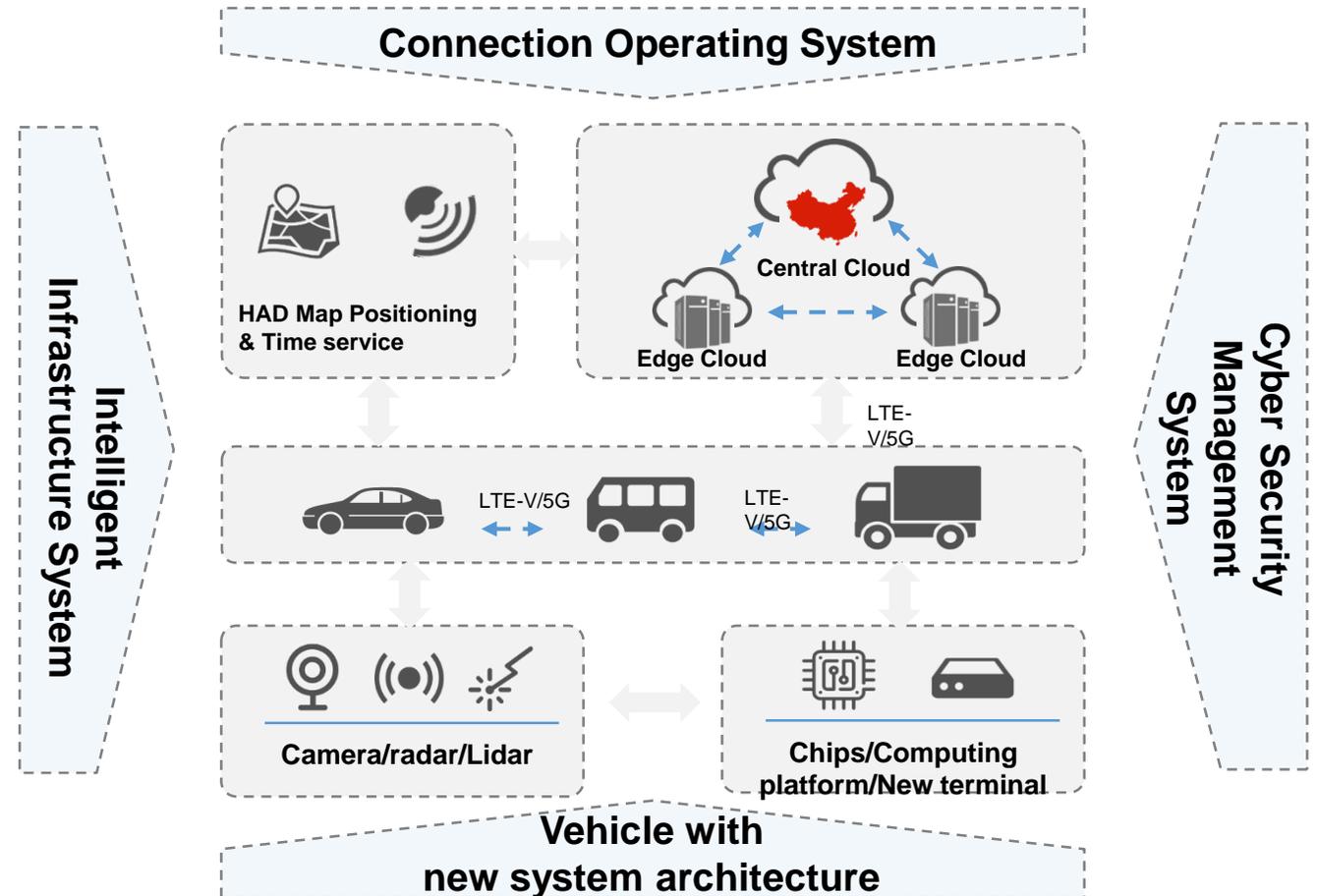
- **Improvement of laws and regulations**, collaborative construction of infrastructure, formulation of technical standards, safety testing and certification.
- **Complete system architecture** research and **business model design** for ICV development .
- **Attract leading enterprises of industries** to participate in the construction of the basic platform company and share the results of the platform company.
- **Promote joint R&D** of basic technologies and **project implementation**.



2. Create ICV Solutions for Chinese Market

China Solution of ICV

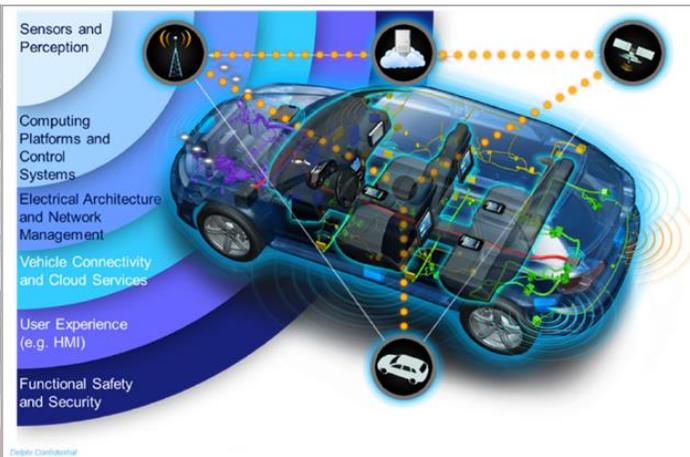
- **Meet the infrastructure standards in China**
Meet standards of infrastructure including road, mapping data, V2X communication and transportation rule in China.
- **Meet the connection operation standard in China**
Meet the standards of ICV admittance qualification, network operation supervision, cyber security in China.
- **Meet the new architecture standards of automotive product in China**
Meet the standards of the new architecture of automotive product in China, such as the standards of intelligent terminal, communication system, cloud platform, gateway.



3. Build Independent Technological Innovation System of ICV

Strengthen the R&D of Key Components Technology

- Key components **technology and value chain**.
- The **core technology system** of ICV.
- Product definition, development process, system integration, manufacturing in OEM areas.
- **Cooperation** in artificial intelligence, Internet, information and communication, and algorithm developments.



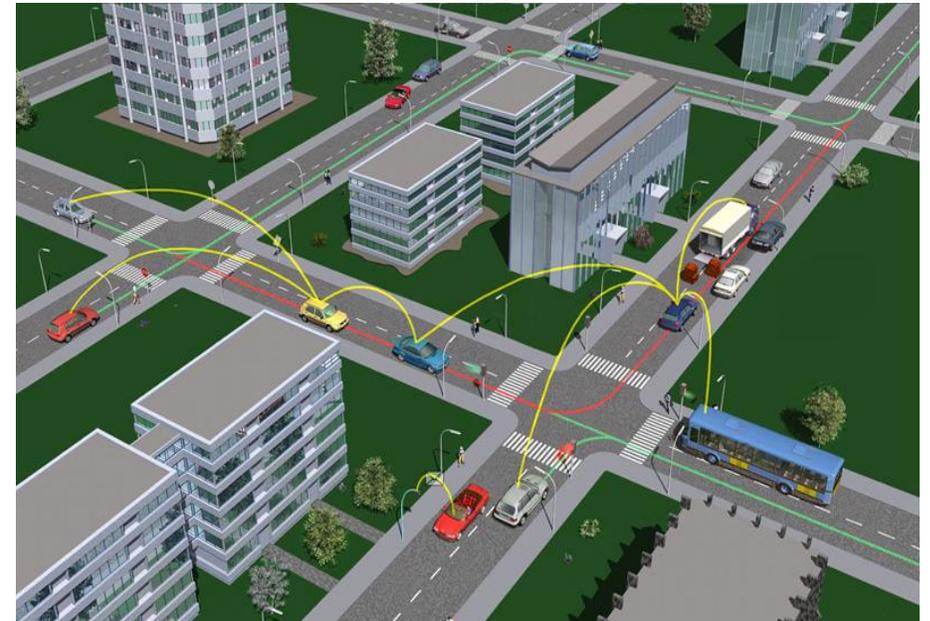
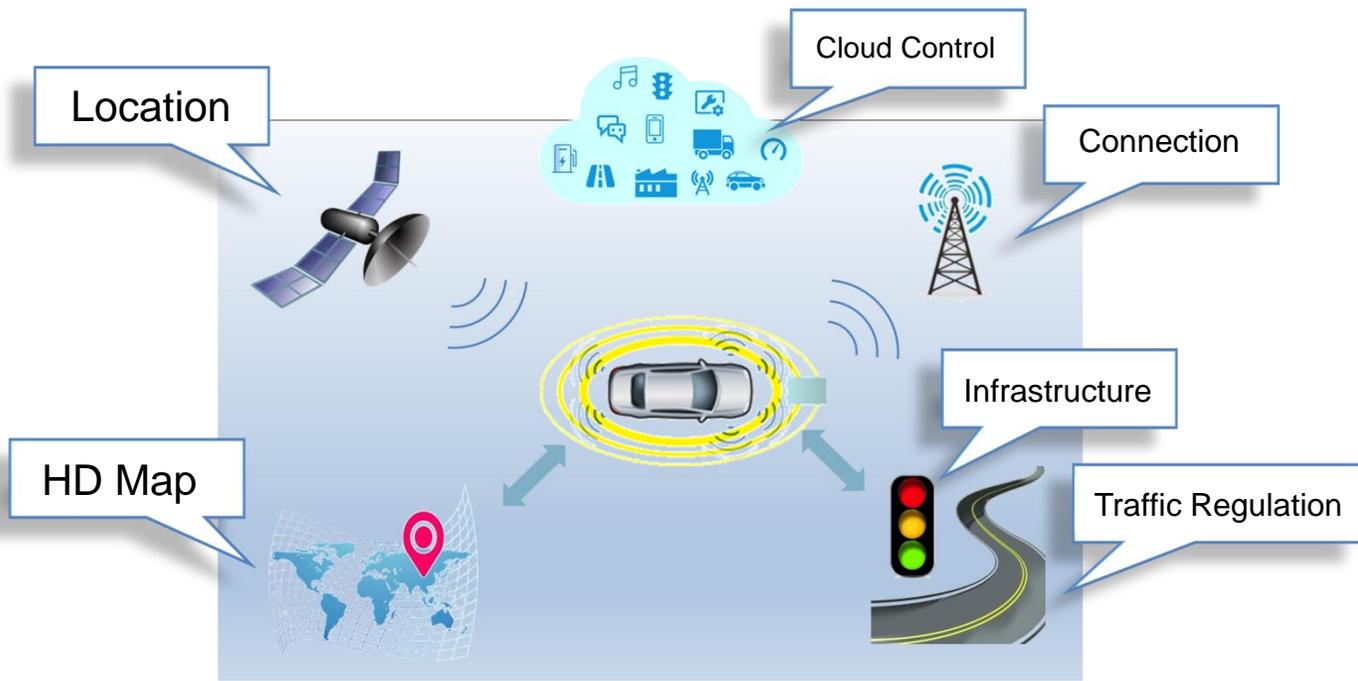
4. Construct ICV Industry Chain Adapted to Chinese Market

- Promote core components **technological innovation and transfer**.
- Accelerate **industrial chain layout** and technology key parts and components.
- Build a **cross-regional ICV industry** area.



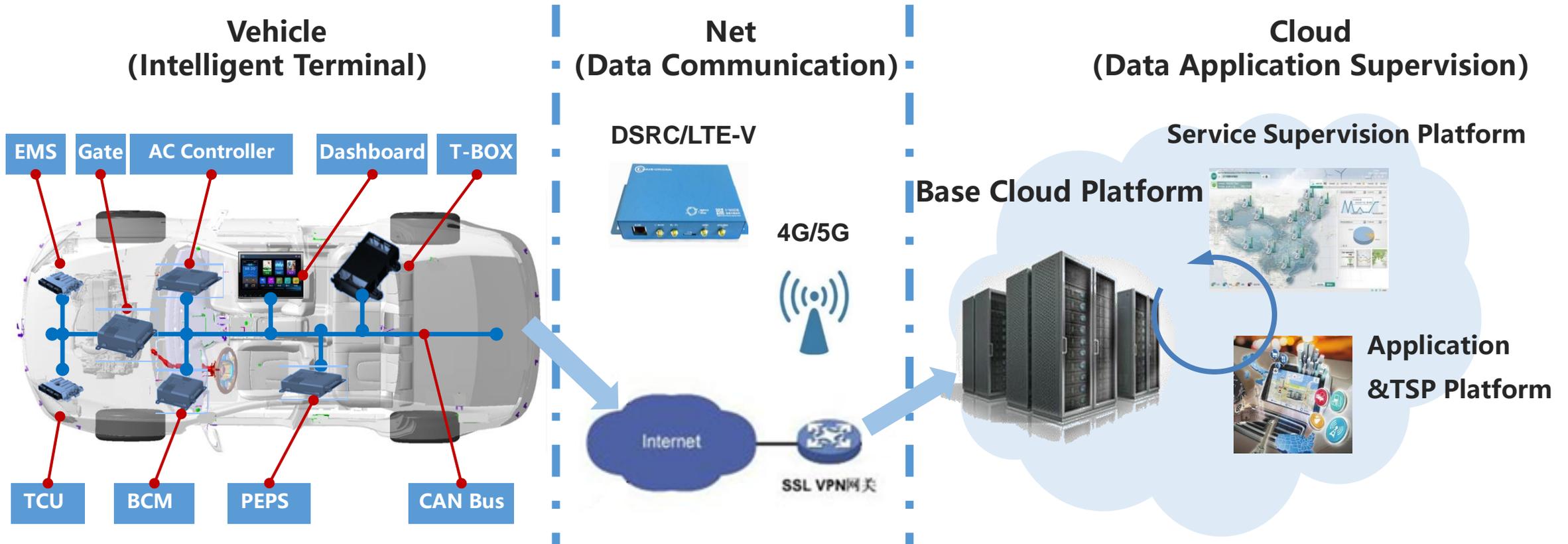
5. Promote the Construction of Intelligent Infrastructure

- Improve urban road planning, upgrade **Road Facilities** with **Intelligent Facilities**.
- Improve the coverage of **Communications Networks** upon **Road Network**.
- Improve the integral construction of **5G Connection** with **ICV**.
- Build ITS that integrates **Government Regulation**, **Business Operation**, and **Social Service**.



6. Strengthen Supervision to Ensure Cyber Security

- Promote the establishment of **China ICV Cyber Security Guarantee System**.
- Build **National ICV Big Data Center** for the operation, maintenance and supervision.
- Solve security issues of **ICV Application Data, User Privacy Data, Cross-border Data**.

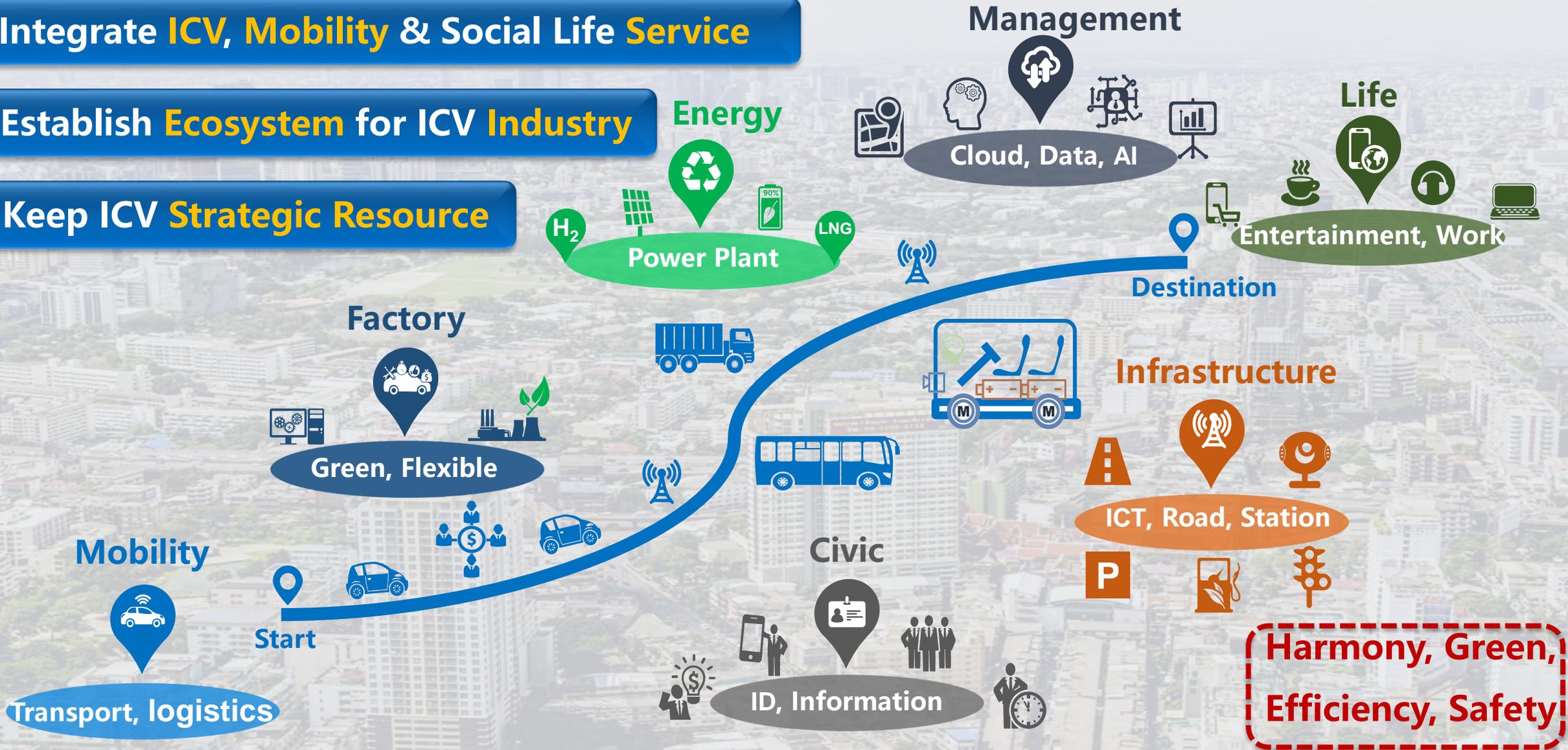


7. Construct ICV, ITS & Intelligent City Integration Ecosystem

➤ Integrate **ICV, Mobility & Social Life Service**

➤ Establish **Ecosystem** for ICV Industry

➤ Keep ICV **Strategic Resource**





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The End

Thank You for Your Attention !