Edge computing research, standardization and roll-out practices in CVIS and Automative Networking Area

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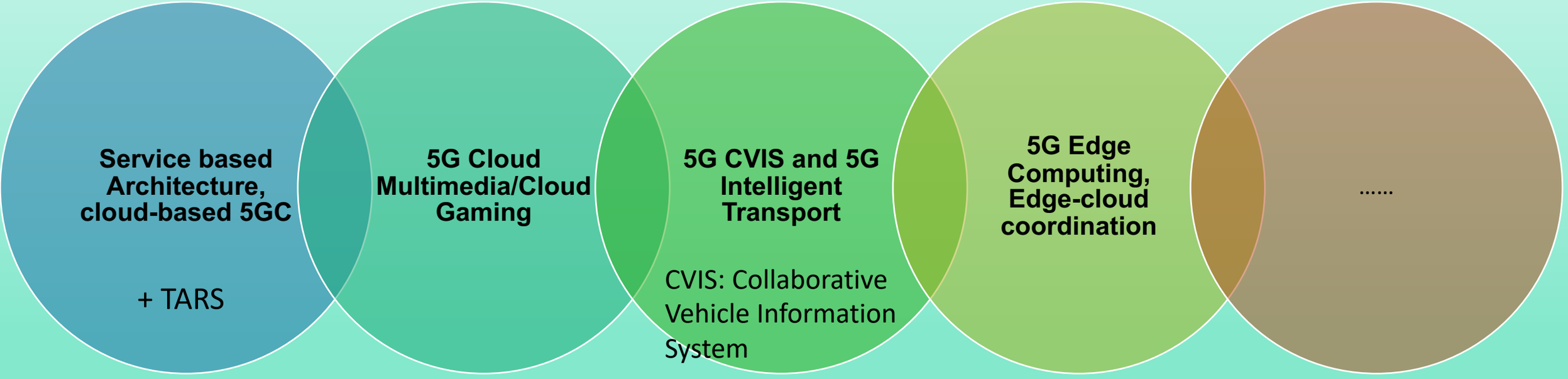
Technical Areas of Global/Domestic standardization & open-source activities

- Tencent has been actively contributing to 3GPP standardization in edge computing, V2X and service-based architecture topics since 2018.
- Tencent MEC/V2X/SBA standard contributions ranks Top 10 in 2020 in 3GPP Release 16.
- Tencent acts as 3GPP Release 17 WID rapporteur in 3GPP SA2 (who is in charge of 5G architecture and key group for edge computing/MEC.)



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

NTCAS 全国汽车标准化技术委员会 National Technical Committee of Auto Standardization

中国通信标准化协会 China Communications Standards Association

C-ITS 中国智能交通产业联盟 China ITS Industry Alliance

3GPP A GLOBAL INITIATIVE

THE LINUX FOUNDATION

IETF

IMT-2020 (5G) 推进组

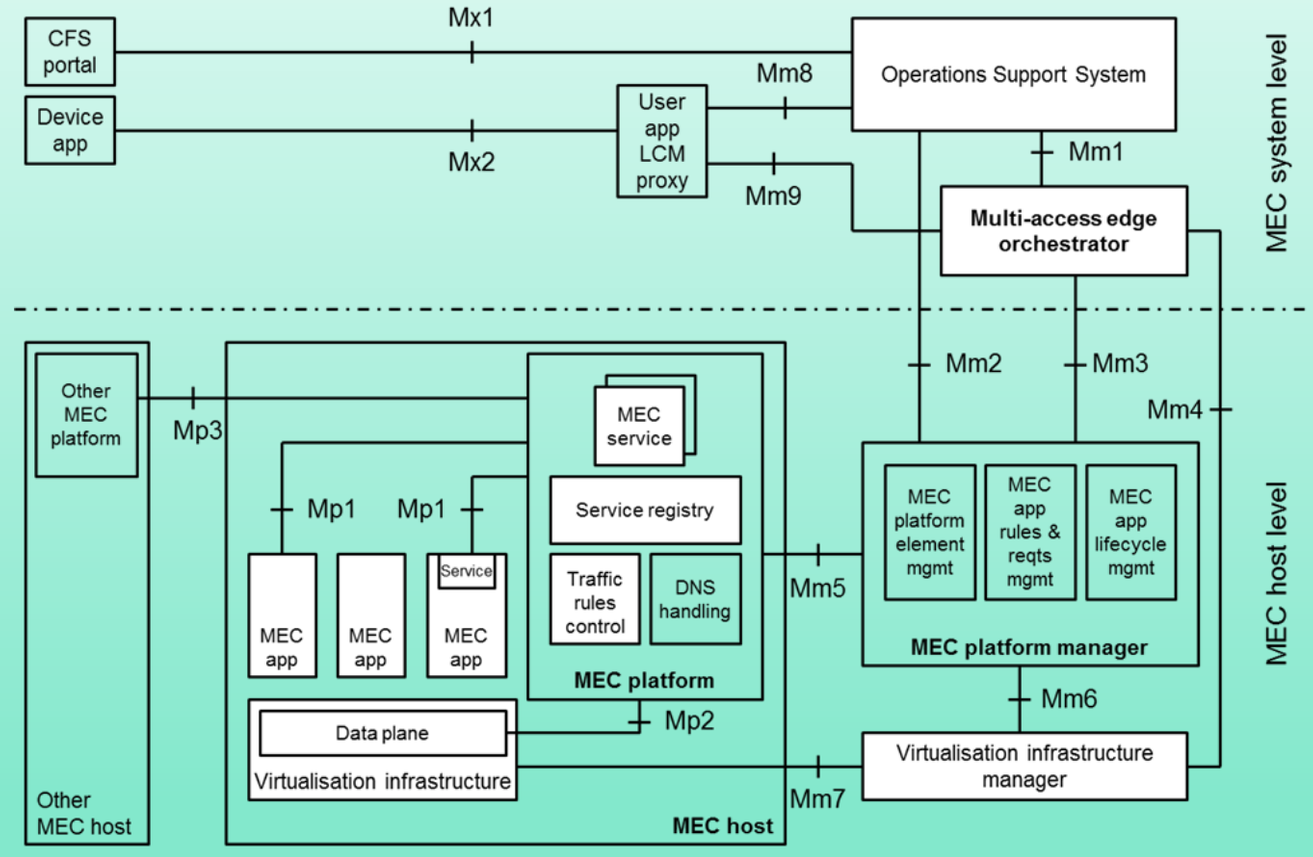
5GAA Automotive Association

Tencent Standard Activities on 5G, V2X & MEC

Technical Area	Key Topics	SDO
5G Service based Architecture, cloud-based 5GC	• 3GPP R16 5G eSBA • TARS open-source roll out with eSBA	3GPP SA2
5G Cloud Multimedia/Cloud Gaming	• SA1 req, SA2 arch & SA4 multimedia for cloud gaming and XR, rapporteur of SA2 Rel-17 WID 5G-AIS. • Application and network interaction and integration	3GPP SA1，SA2，SA4, IETF, IMT2020
5G V2X and Intelligent Transport & Autonomous Driving	• 3GPP: ICV related SA1 req and SA2 architecture • 5GAA:Tele-operated Driving and Precise Positioning XWI • CCSA TC10/CSAE/C-ITS V2X application layer message set • Co-lead CCSA TC10 5G ToD，ST9 high accuracy positioning • Lead C-ITS V2X-based AD testing standard • NTCAS, lead research project: Interaction between ICV and Smart Phone	3GPP SA1,SA2, 5GAA, IMT2020/C-V2X working group, CCSA TC10， TC5，ST9, China SAE, C-ITS, NTCAS SC34
5G Edge-Cloud Collaboration，Edge Computing	• Edge computing related standards, key issues and solutions • CCSA TC5WG 12, domestic/industrial standards	3GPP SA2，SA6，SA1, CCSA TC5 WG12

ETSI ISG – Mobile Edge Computing

- **Initiated in Oct. 2014**
  - Huawei, IBM, Intel, Nokia, NTT DoCoMo, Vodafone
- **Defining**
  - Use cases
  - Deployment scenarios
  - Infrastructure
    - APIs in June, 2017
    - Whitepaper in June, 2018
- **ETSI MEC covers many verticals like automotive, as well as other industrial use cases.**

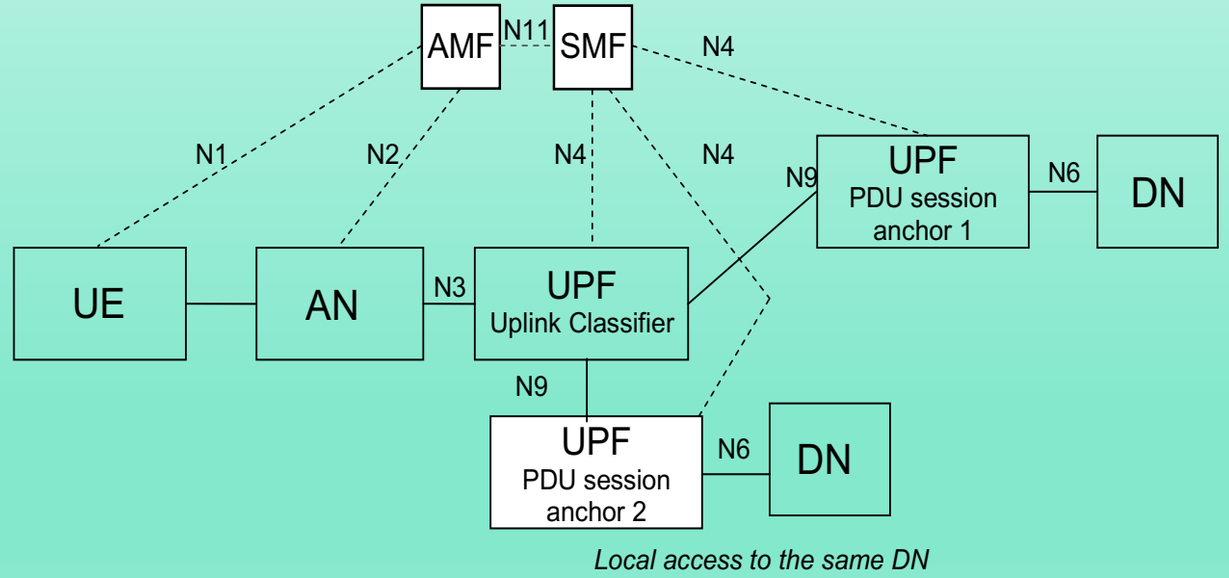


Multi-access edge system reference architecture

In ETSI, MEC is changed from mobile Edge Computing to multi-access Edge Computing from 2015.

3GPP Edge Computing – Release 15

- *Documented in Clause 5.13 of TS 23.501 Release 15.*
- *Native function of the 5G and is commonly recognized as an important technology for 5G.*



Local access to the same DN

3GPP Key Enablers for Edge Computing

Local routing and traffic steering
- A PDU session may have multiple N6 interfaces

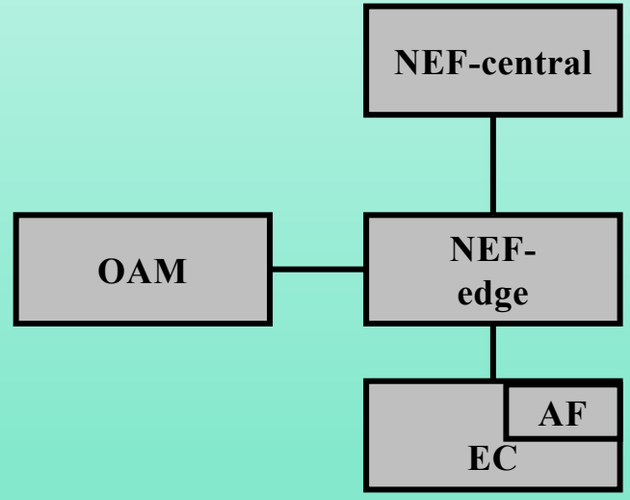
Application function to influence UPF (re)selection
- By Policy Control Function
- Indirectly by Network Exposure Function

Session and Service Continuity (SSC)
- Mobile scenarios

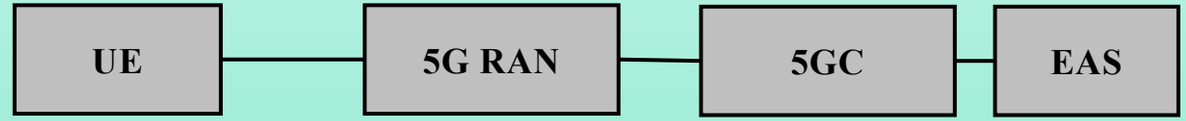
Support of Local Area Data Network
- Serving PLMN providing services to UEs by Tracking Area

3GPP Edge computing in Release 17

- Control-plane based solution
  - Acquire radio network information with localize NEF and interaction with OAM



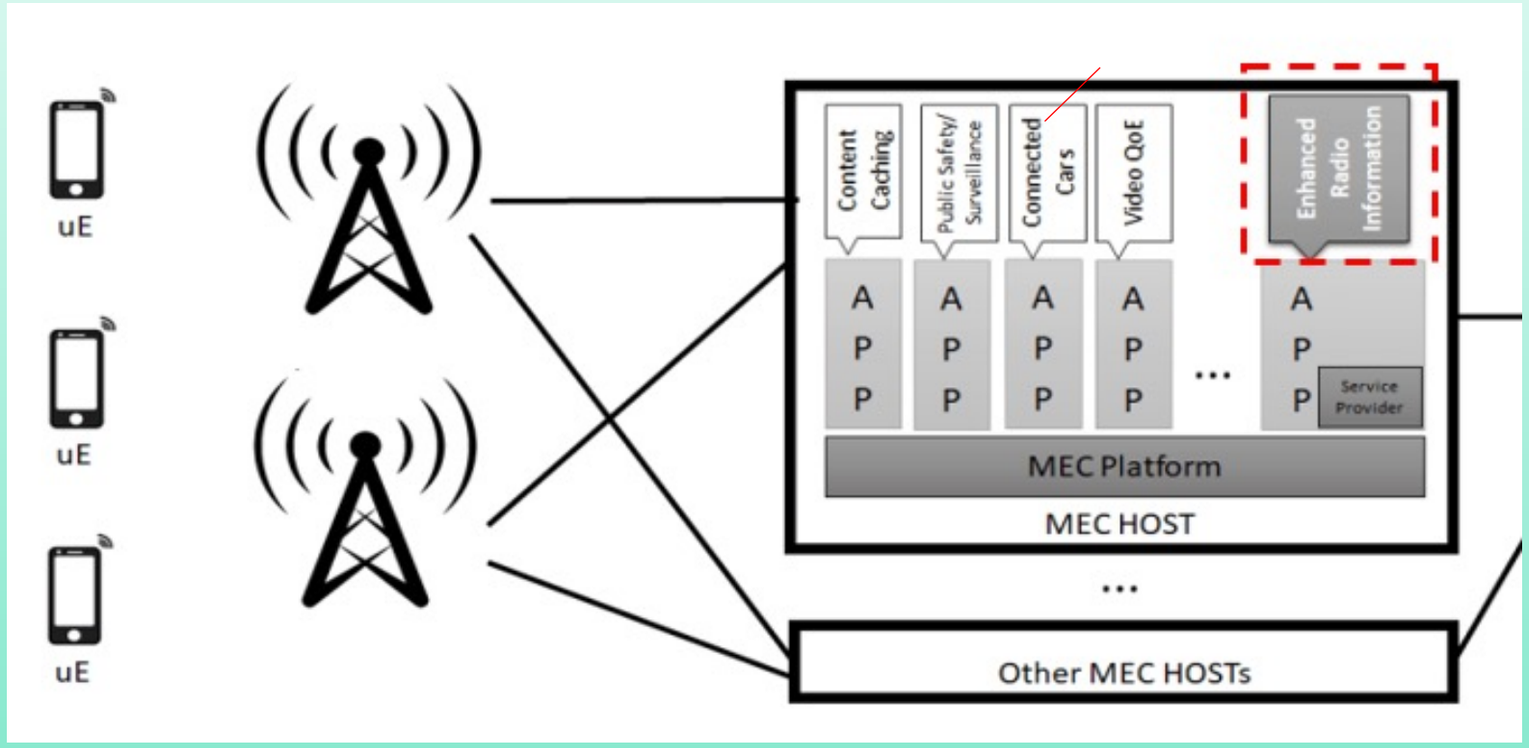
- User-plane based solution
  - Acquire radio network information via UPF



AF: application function
EAS: edge application server
NEF: Network Exposure Function

www.3gpp.org/dynareport/23748.htm

Tencent promotes MoWIE based on MEC in IETF



MoWIE for Network Aware Application
draft-huang-alto-mowie-for-network-aware-app-02

MoWIE v.s. RNIS

- RNIS： Radio Netwokr Information Service,
  - Cell capacity
  - User location
  - Cell id
  - User bearer id
  - Handover status
  - QoS flow release indication
  - Uu delay

MoWIE: Mobile and Wireless Network Information Exposure

- MoWIE+ MEC+ RNIS provide generic network capability exposure.
- Supports various apps on MEC platform and improves user experiences.

Open Source & Standardization: Two-Wheels to drive EC roll-out

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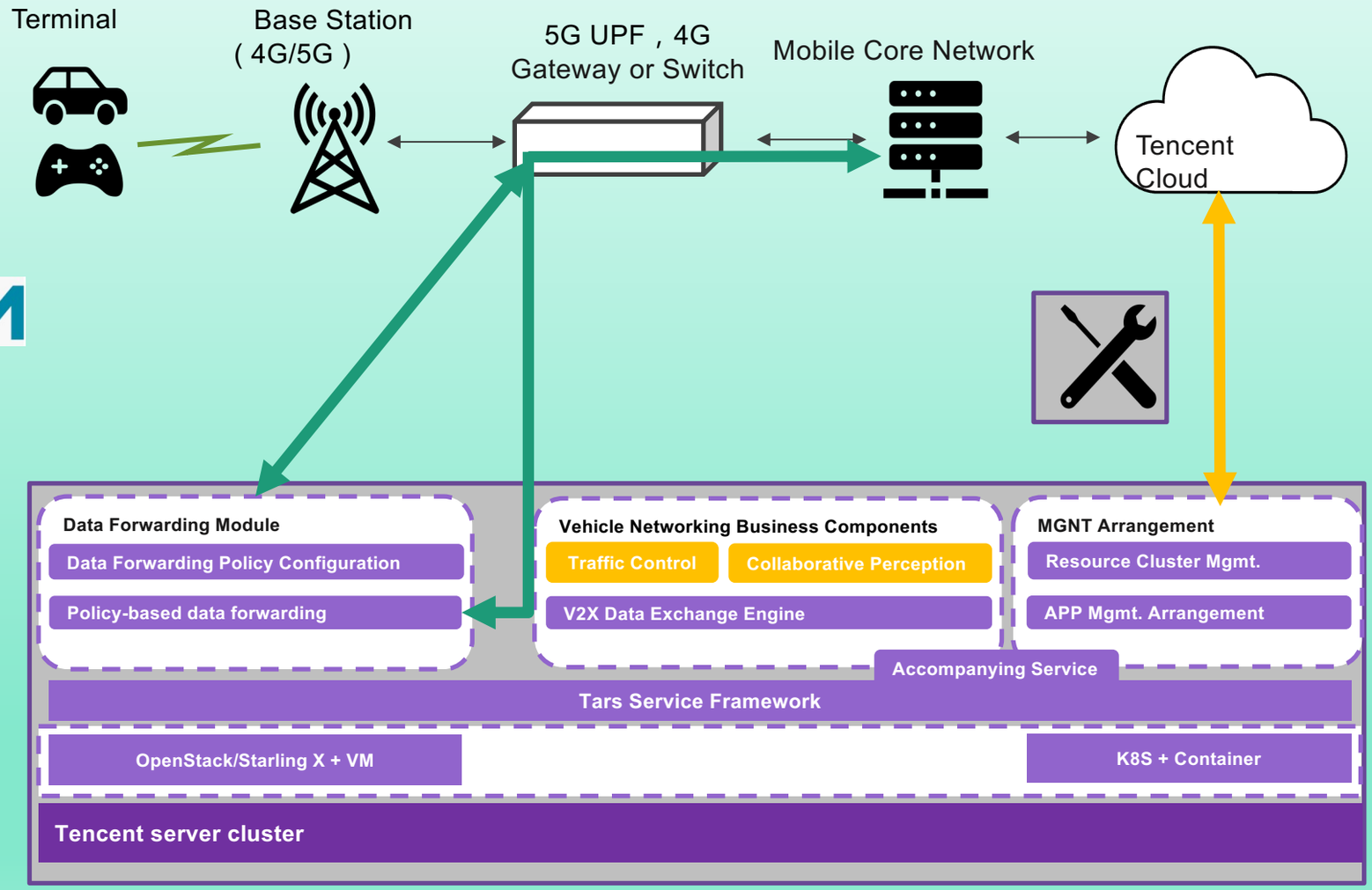
5G-V2X Edge Computing platform

Tencent 腾讯 intel NOKIA ARM

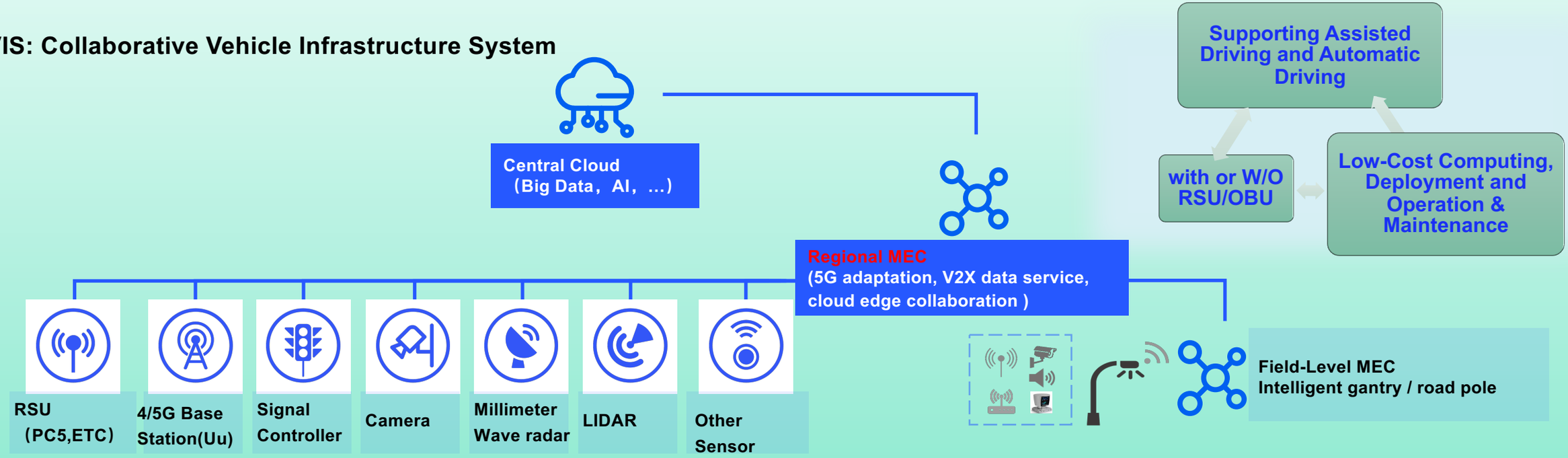


Tencent CVIS/EC Platform

Tencent CVIS

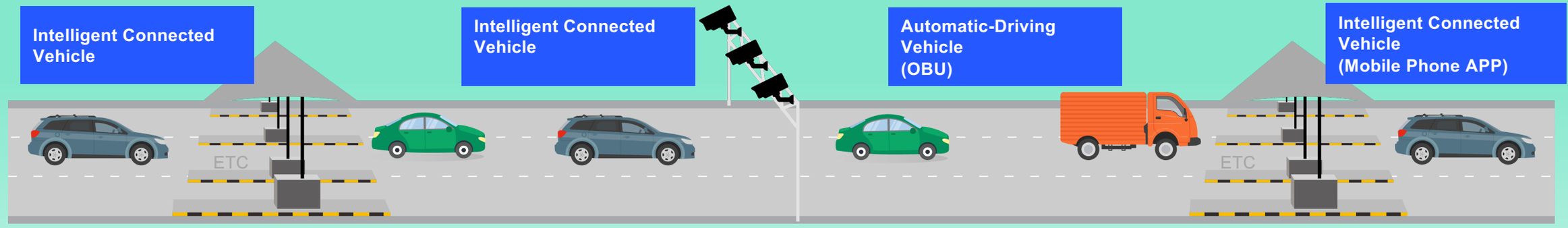
—Loop of information among people, vehicles, roads, networks and clouds

CVIS: Collaborative Vehicle Infrastructure System

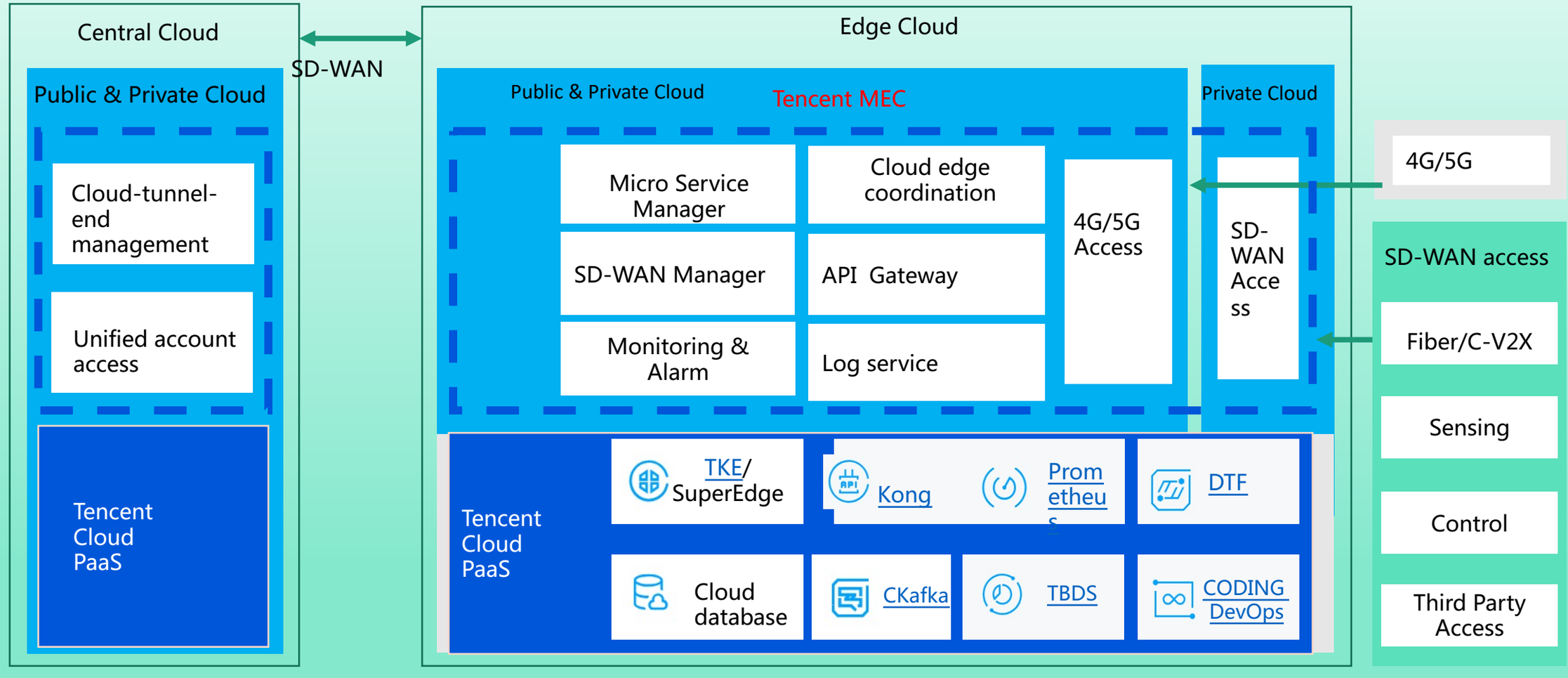


- Open ecosystem, verified with 3rd party DP and on-board unit vendors

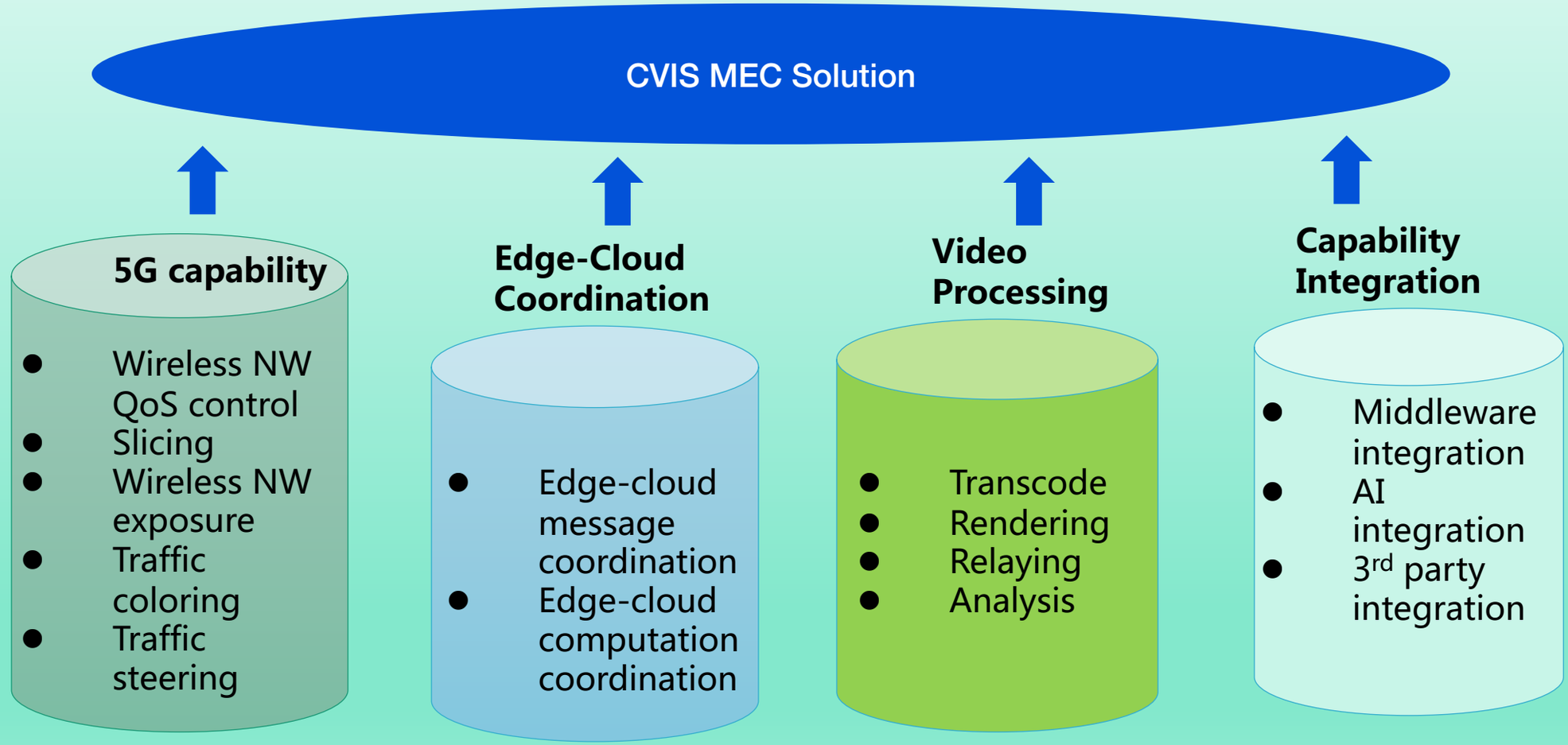
- V2X data service engine with information cleaning, modeling and reuse
- Distribution V2X with/without RSU/OBU



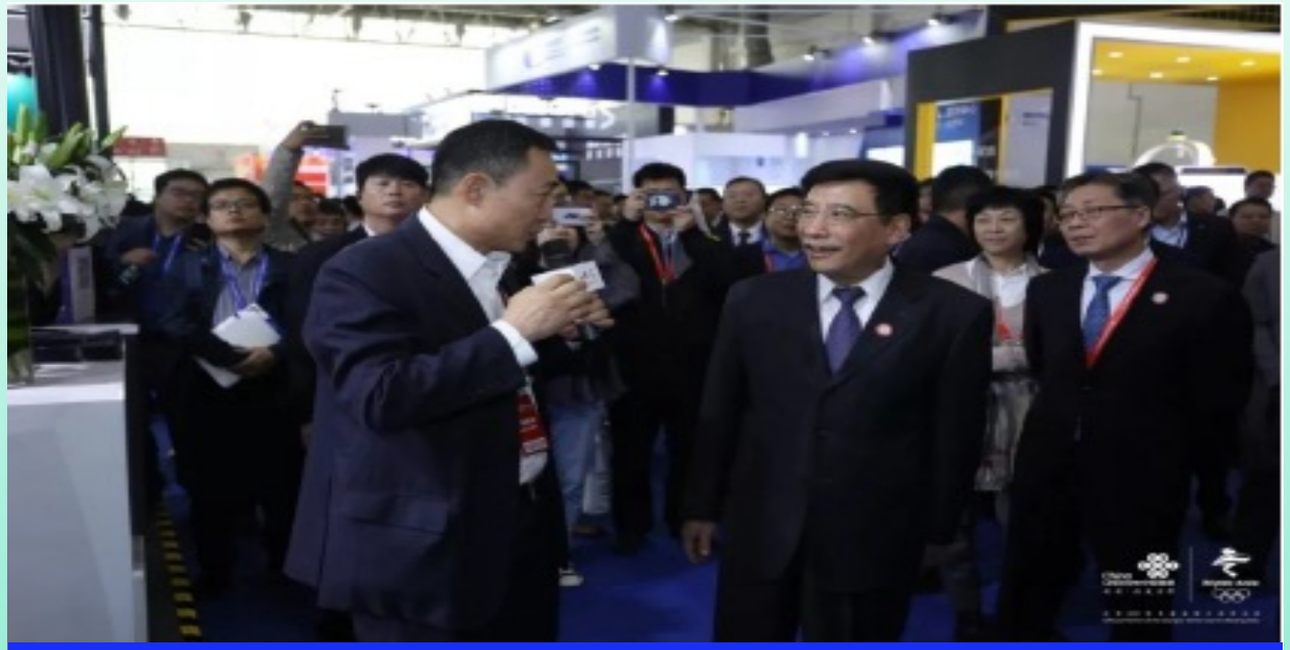
Tencent MEC platform for CVIS and ITS



Tencent MEC Solutions for CVIS

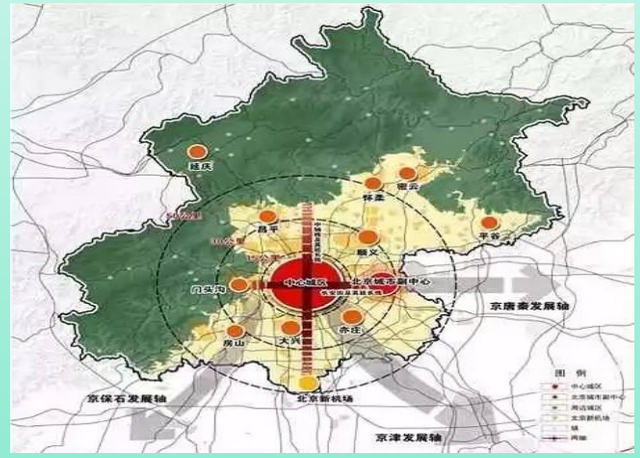


Rull-out Case：5G Shougang Park @ Beijing Winter Olympic 2022



2019 World Intelligent Connected Vehicle Congress

- 1st launched vehicle-road collaboration platform based on **commercial 5G networks**
- Supports full cycle of traveling services such as Driving Assistance (18 types of alerting services) and AVP



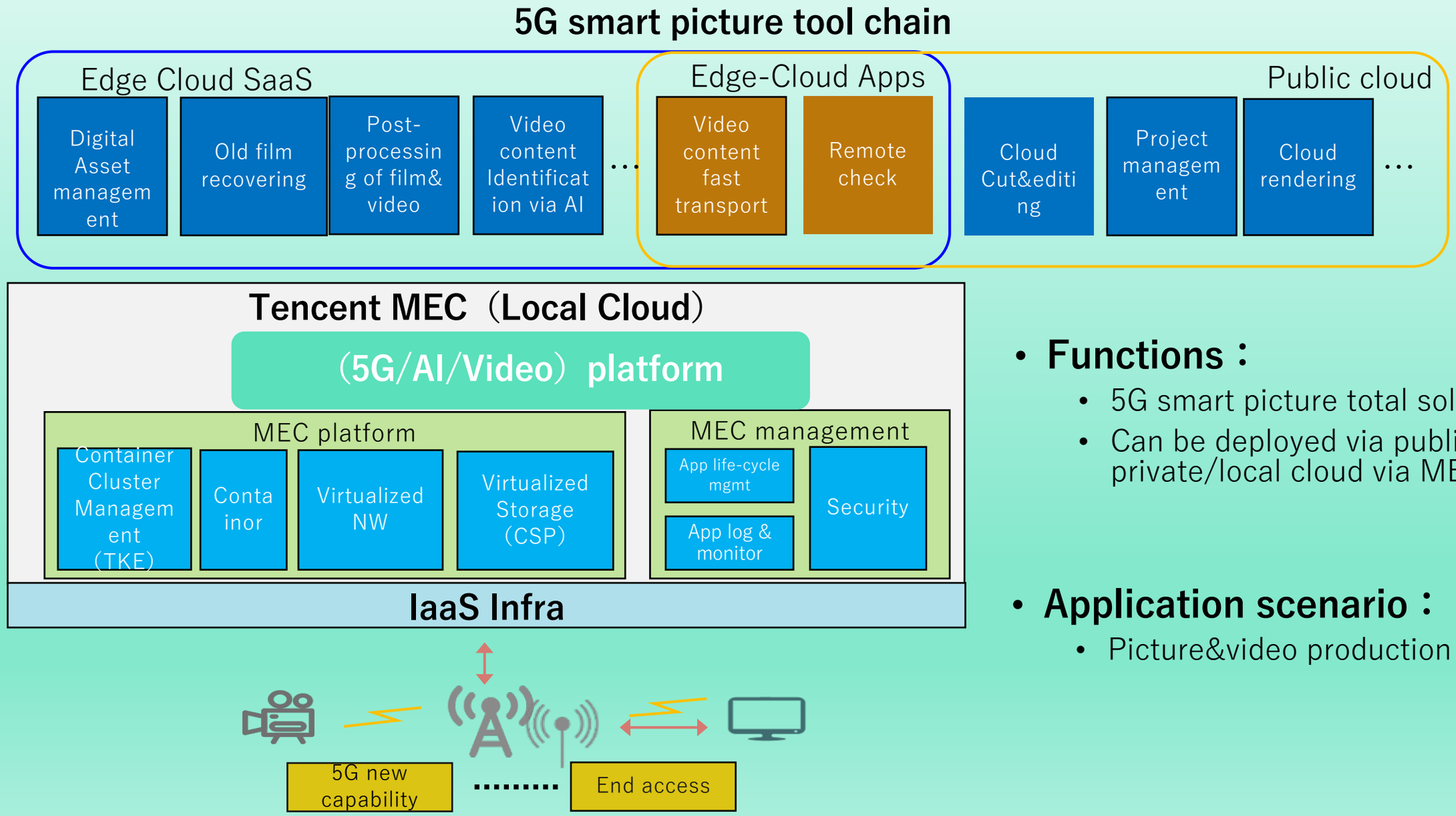
BEIJING 2022

Head Unit

WeChat Mini Program

AVP

Roll-out case, Smart Picture & Video Production

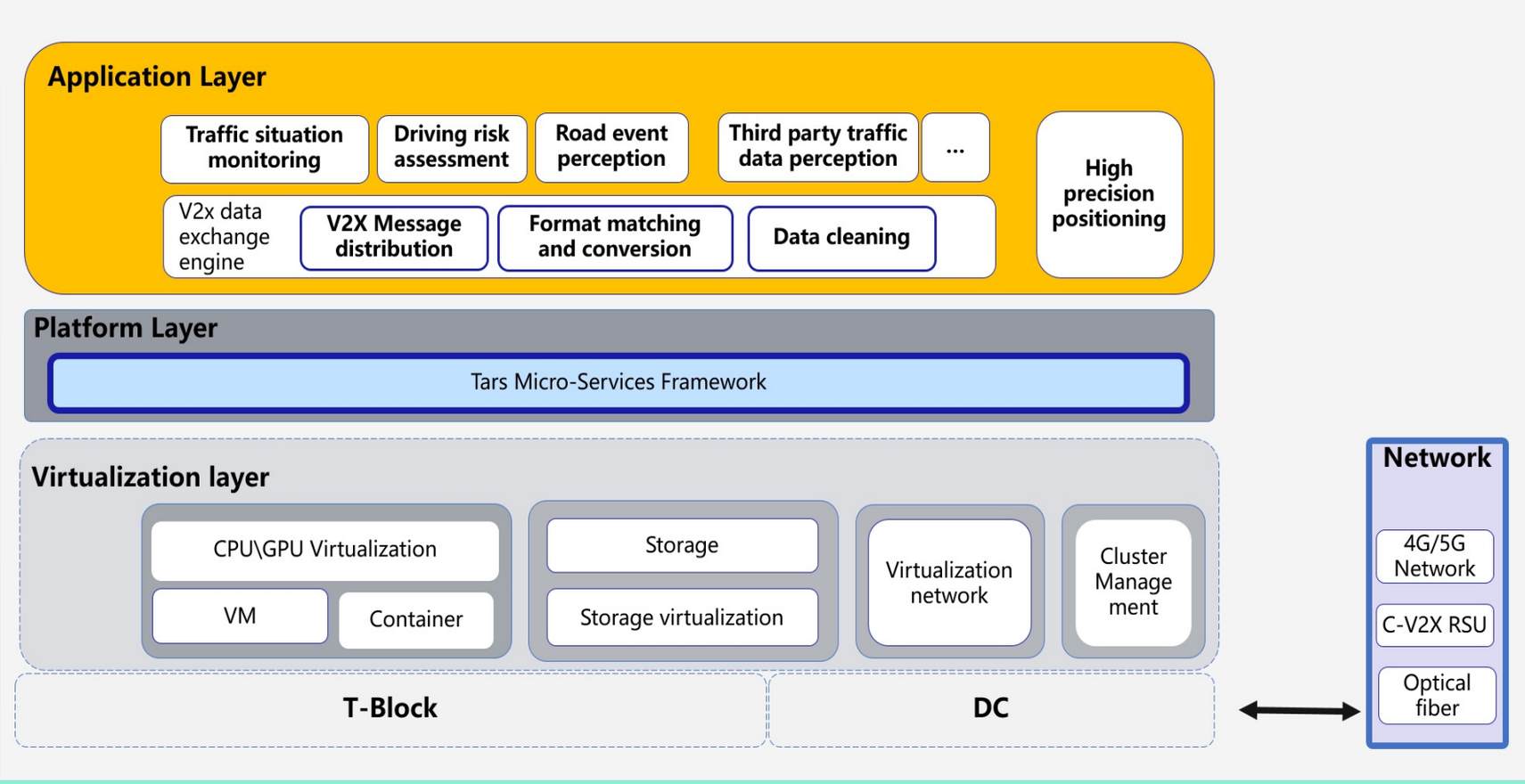


- **Functions：**
  - 5G smart picture total solution
  - Can be deployed via public plus private/local cloud via MEC platform

- **Application scenario：**
  - Picture&video production

Akraino CVB - Application Architecture

The Connected Vehicle Blueprint (CVB) focuses on establishing an open source MEC platform, which is the backbone for V2X application.



The application architecture of the CVB consists of the following key components:

- ✓ Commodity Hardware, Arm/X86 Physical Server.
- ✓ Virtualization Layer.
- ✓ Tars Microservice Platform layer.
- ✓ Connected Vehicle Applications layer.

Akraino CVB – Use Cases

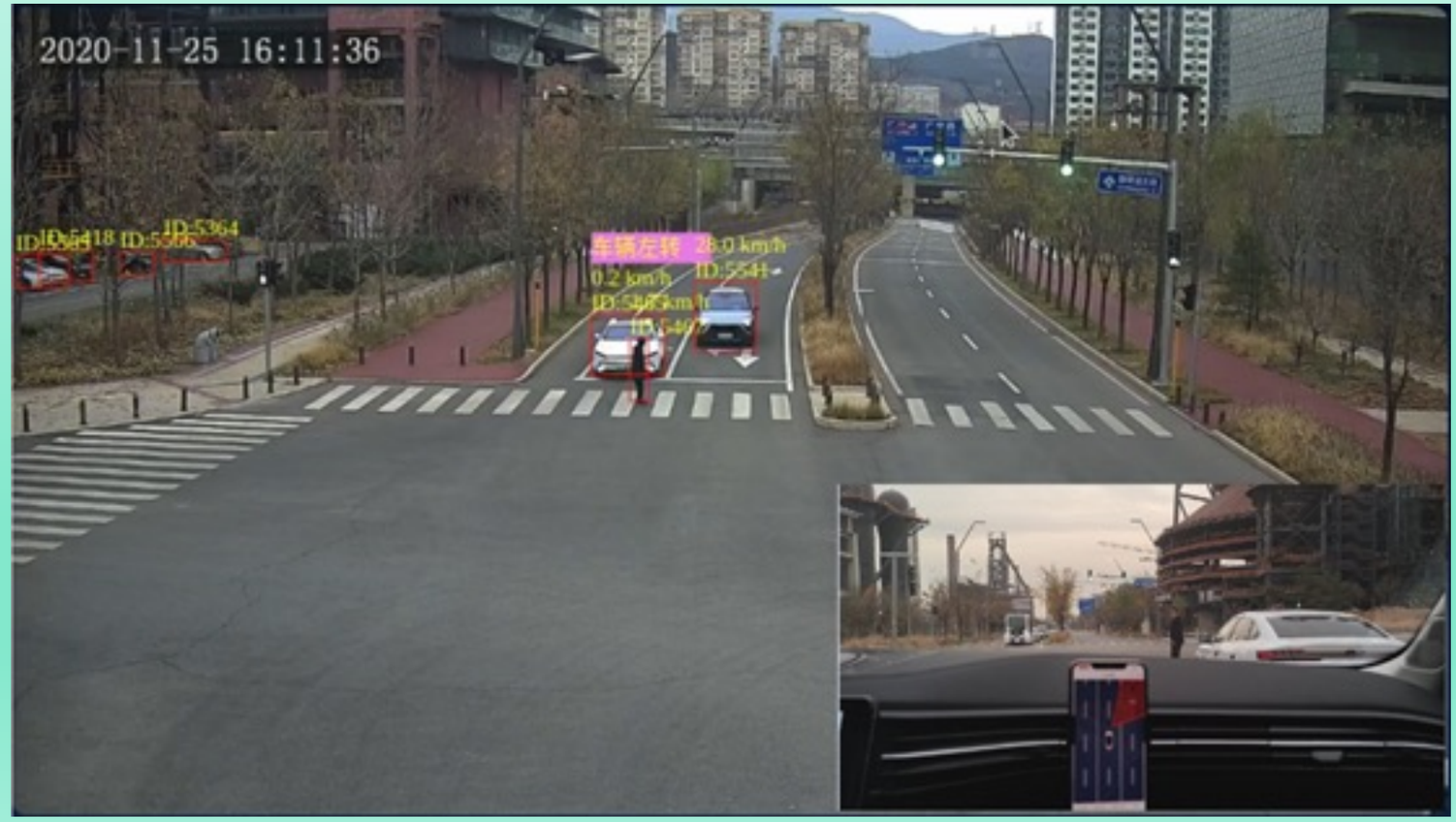
- Transportation efficiency improvement:
  - Real-time traffic information updates;
  - figures out the most efficient route for drivers
- Safe Drive Improvement:
  - Figures out potential risks which cannot be seen by the driver.
- Reduces traffic violations:
  - Conveys traffic rules of some specific area.
  - For instance
    - change the lane prior to a narrow street
    - avoid opposite way driving on a one-way road
    - avoiding the carpool lane when single driver, etc

Akraino CVB – Field Test

- Cooperative vehicle and infrastructure system：

✧ Roadside sensing system obtains and computes real-time traffic objects status；

✧ Based on the roadside sensing data, the host vehicle obtains the traffic warning and driving assistance information which threatens itself。



Thanks and Welcome to Join Akraino!