

The background of the slide is a futuristic highway scene. In the foreground, the side mirror and part of the door of a dark-colored car are visible. The road ahead is a multi-lane highway with white lane markings, receding into the distance. The sky is a vibrant mix of blue, purple, and orange, suggesting a sunset or sunrise. Numerous glowing digital lines and patterns, including a prominent yellow and orange grid-like shape, are scattered across the sky, representing data or connectivity. The overall atmosphere is high-tech and forward-looking.

Development of Intelligent Connected Vehicle (ICV) and Smart Highway in China

**Transportation Planning and
Research Institute(TPRI), MOT**

Kun CHEN

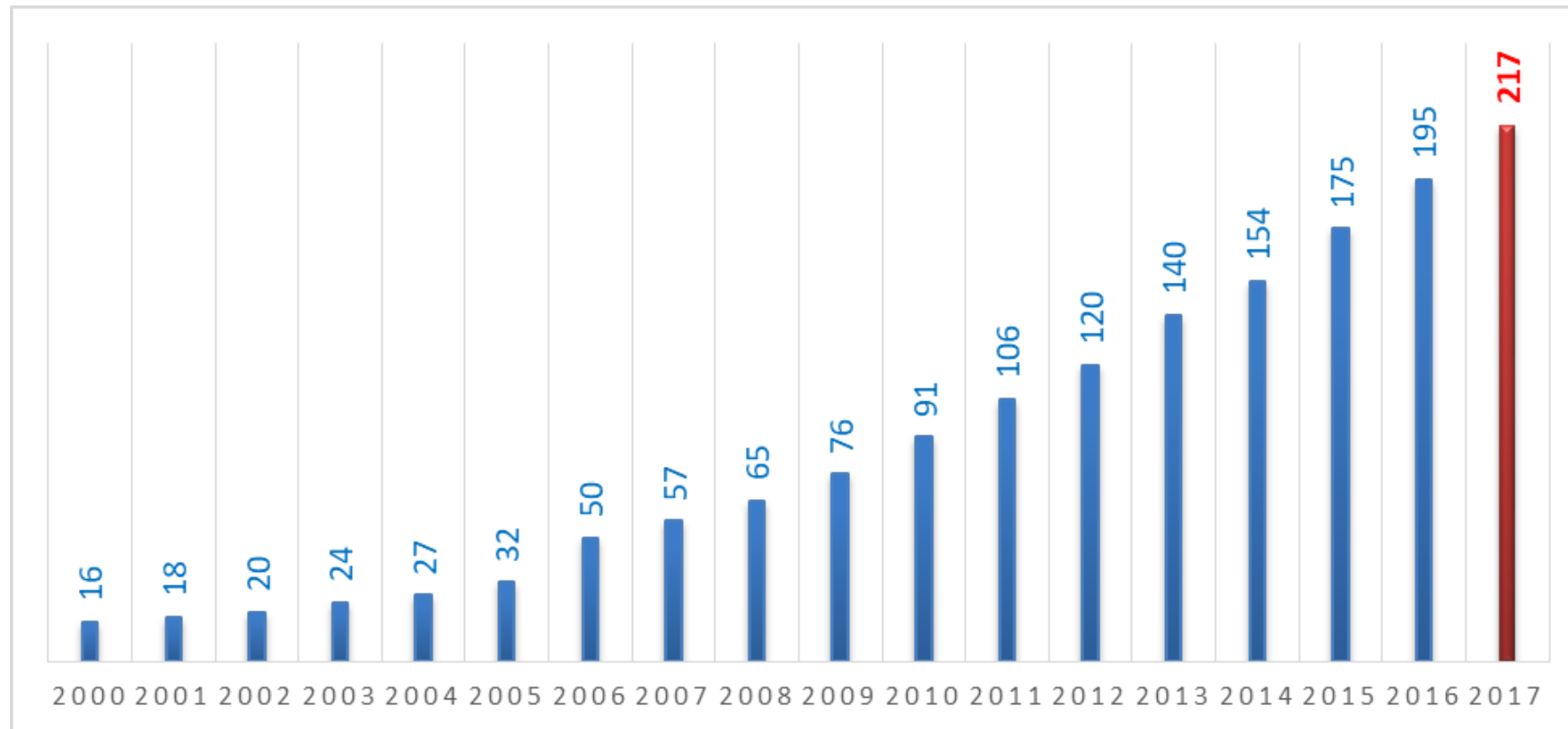
Dec.4 2018, Geneva

-  **Challenges of Road Traffic**
-  **Development of ICV**
-  **Development of Smart Highway**
-  **What Next Steps**

1. Challenges of Road Traffic



- By 2017, the national total number of vehicles reached 217 millions, which is 13.5 times of those in 2000, with an average annual growth rate of 14.3%.



National Quantity of Vehicles in China (Unit: Millions)



1. Challenges of Road Traffic



Congestion



Accidents & casualties



Air pollution



Parking

Aged person mobility
Search parking

Bad experience

Congestion

Accidents

Car Sharing

Safety

Fatigue & distraction

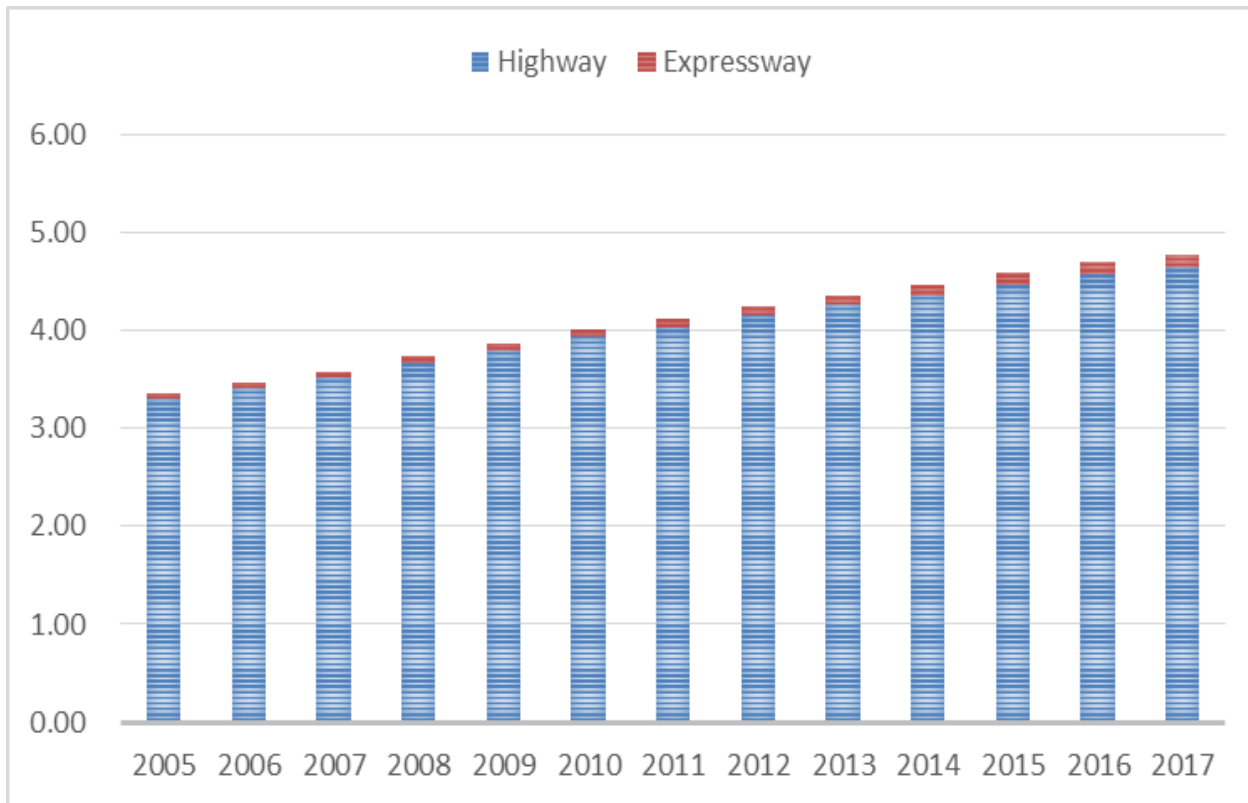
emission & pollution

Natural disasters

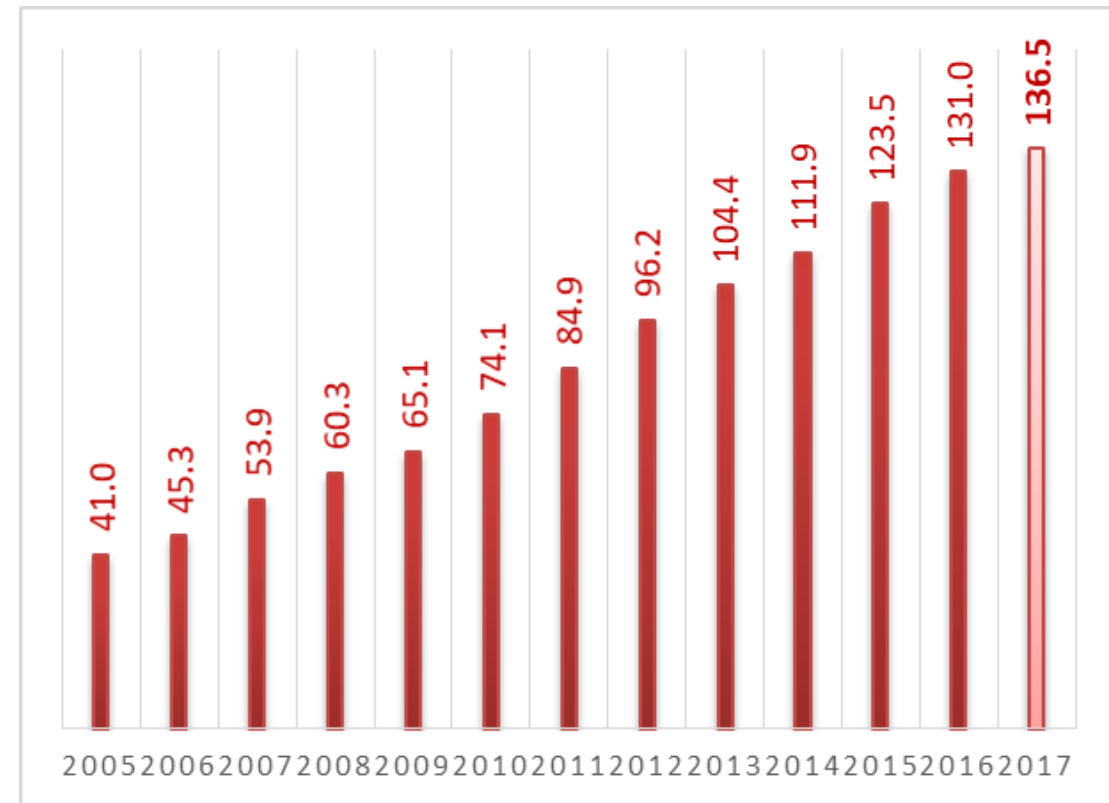
1. Challenges of Road Traffic



- By 2017, the total mileage of the highway is 4.77 million km, including 136.5 thousand km expressway, connecting 98% cities whose population is more than 200 thousands.



Mileage of the highway (Unit: Millions KM)



Mileage of the Expressway (Unit: Thousands KM)

2. Development of ICV



- Pilot Zones of Connected Vehicle and ITS Based on Broadband Mobile Internet.

Technology Research

- Intelligent electric vehicle
- Chip in vehicle
- Smart computing platform
- Automotive cyber security
- Vehicle infrastructure Integration (VII)
-

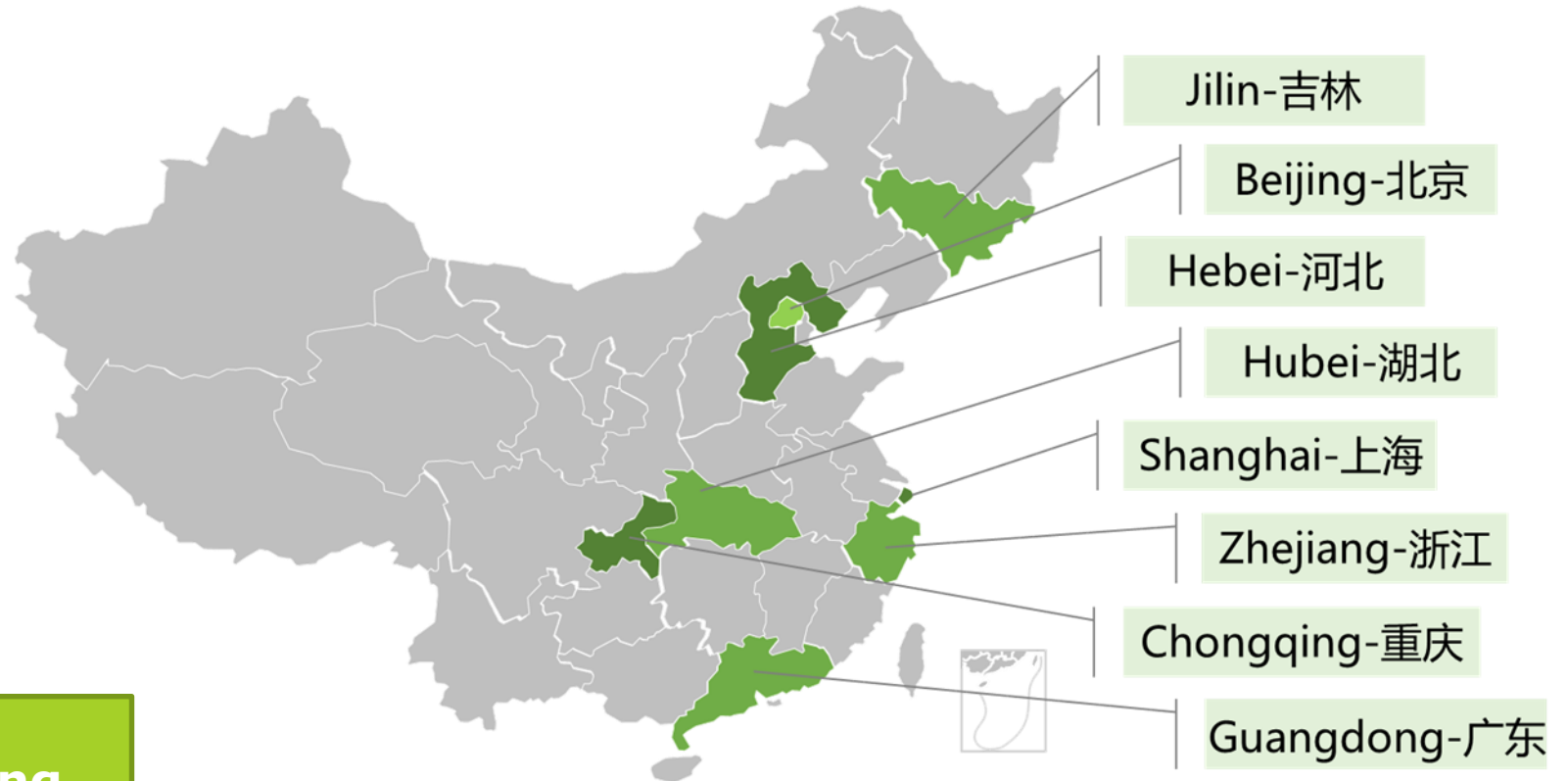
Closed Test Fields



Opening Test Roads

Test and Certificate

Standards



National ICV (Beijing) Pilot Zone



Phase 1: Jan. 2016- Dec. 2017
Closed Fields & Certification Center

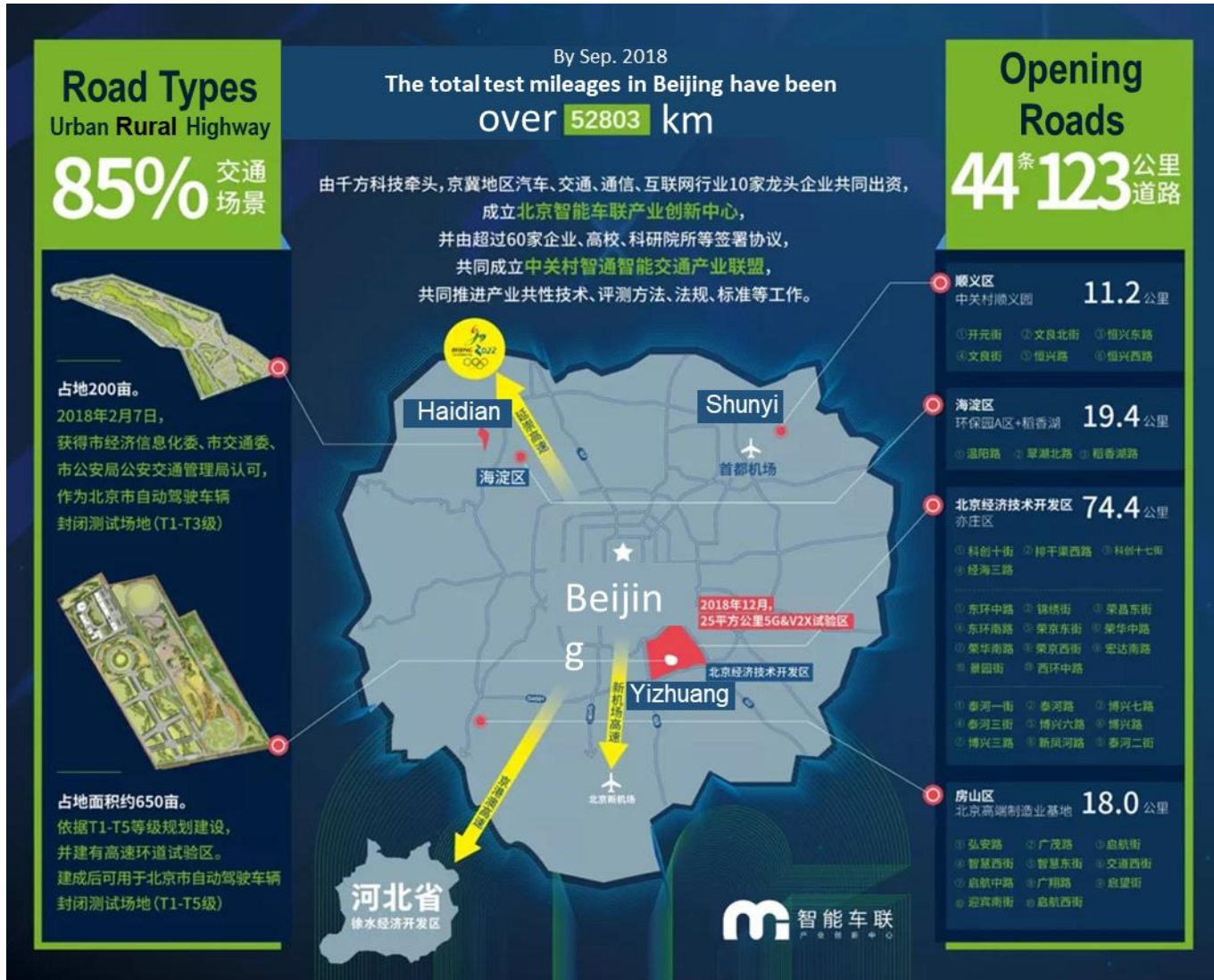
Phase 2: Dec.2017-Jan.2019
Opening Roads

Phase 3: Jan.2019-Dec.2020
Whole City



Vehicle number:	300 (270 for backdrop)	1000 (900 for backdrop)	10000 (9000 for backdrop)
Road mileage:	42 km	217 km	800 km
Road type:	Urban + Rural	Highway + Urban + Rural	Highway + Urban + Rural
Application scenarios:	50	180	300

National ICV (Beijing) Pilot Zone



- Opening Roads: **123 km** on 44 roads

- Companies with Test



DAIMLER



- Test mileages in Beijing: over **52803** km

National ICV (Shanghai) Pilot Zone



封闭测试与体验区

2016/12 开放道路测试示范区

2017/12 典型城市综合示范区

2019 示范城市+共享交通走廊

2020



5平方公里

27平方公里

100平方公里

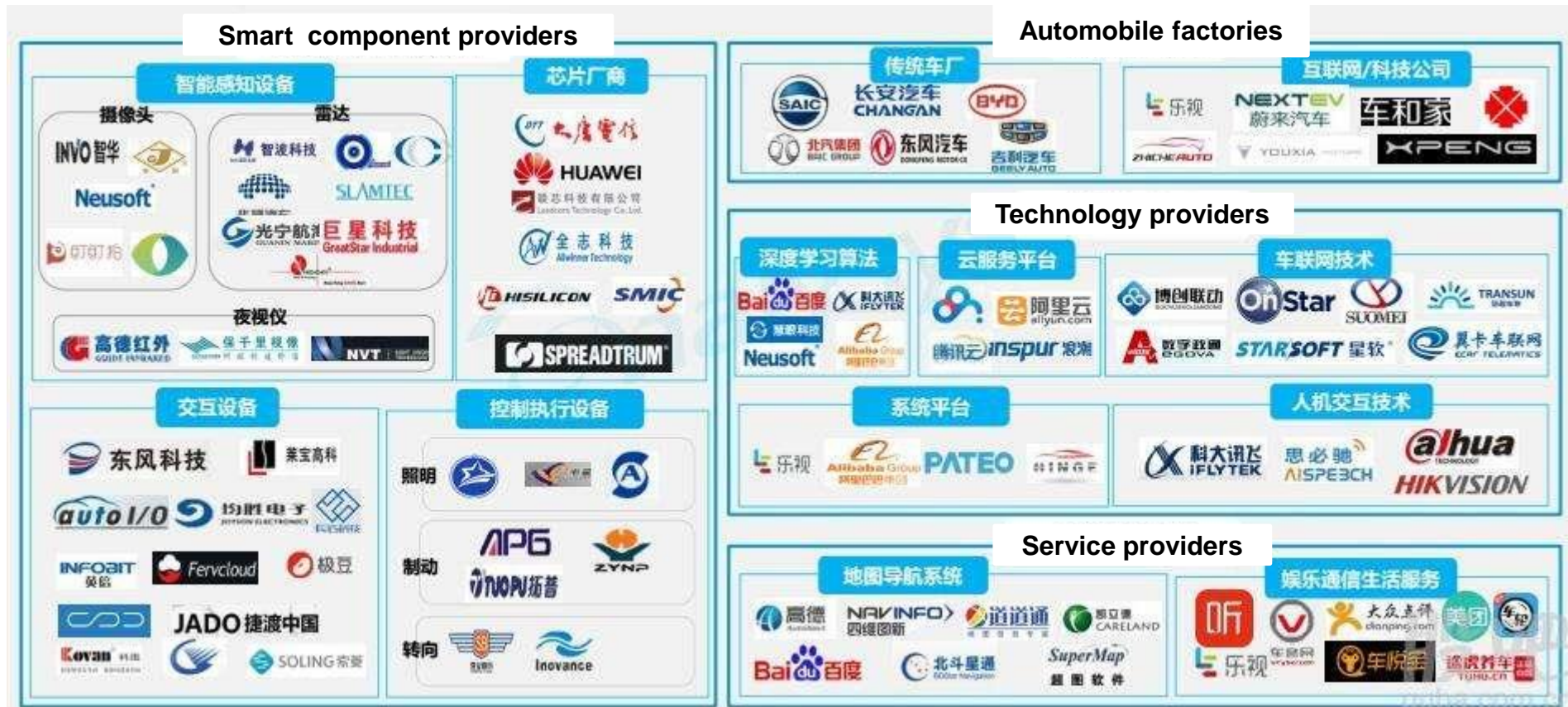
150平方公里

Vehicle number:	200 (160 for backdrop)	1000 (900)	5000 (4500)	10000 (9000)
Road mileage:	15 km	73 km	466 km	500 km
Road type:	Urban + Rural	Highway + Urban + Rural	Highway + Urban + Rural	Highway + Urban + Rural
Application scenarios:	36	68	86	150+

Draft Development Strategy of Intelligent Vehicles



- The National Development and Reform Commission (NDRC) issued a draft Strategy for the **Innovation and Development of Intelligent Vehicles** in Jan. 2018.

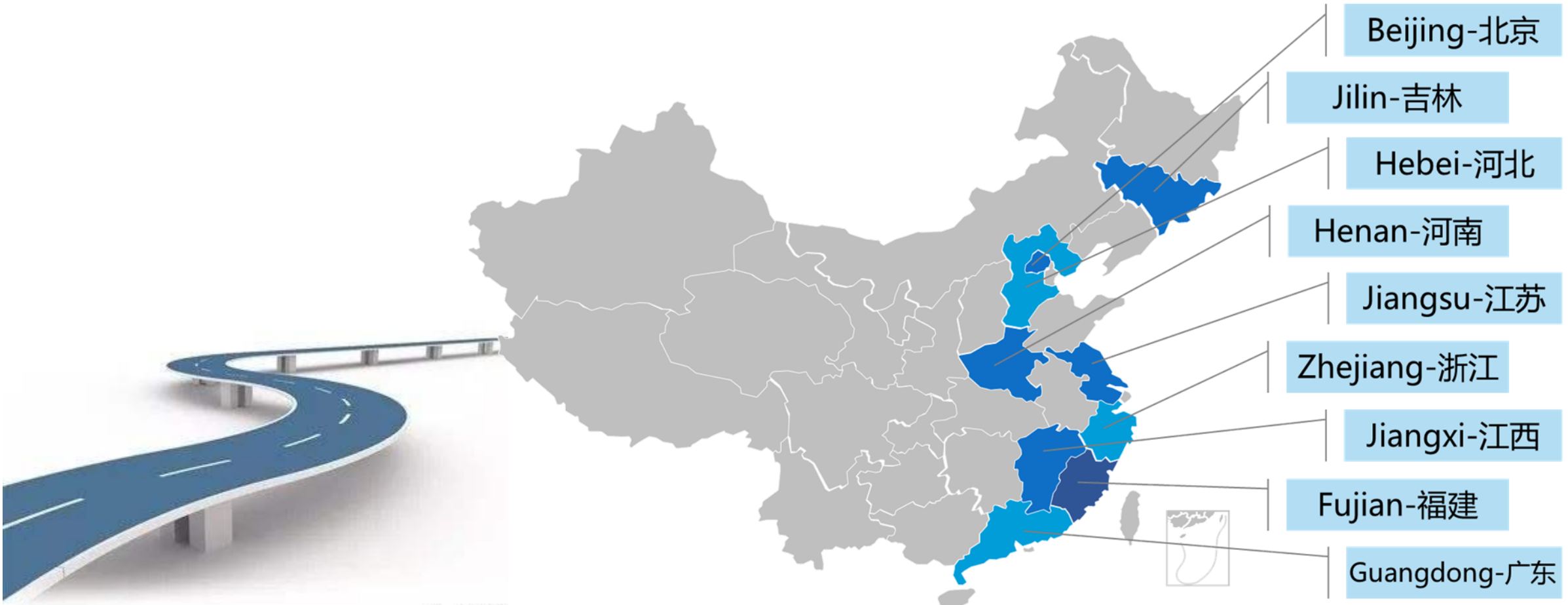


Picture from **Analysys 易观**

3. Development of Smart Highway



- Pilot Project: **New Generation Traffic Control System and Smart Highway.**



3. Development of Smart Highway



- Pilot Project: **New Generation Traffic Control System and Smart Highway.**



- Beijing
- Hebei
- **Yanchong Expressway for 2022 Winter Olympics**



- Zhejiang: **West Expressway around Hangzhou**
- Jilin: **Huiwu Expressway**
- Fujian: **Xiarong Expressway**
- Jiangxi: **Changjiu Expressway**
- Henan: **Jixi Expressway**



- Jiangsu: **Urban roads in Changzhou**

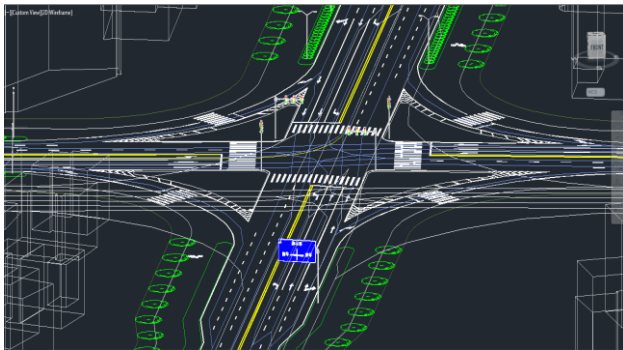
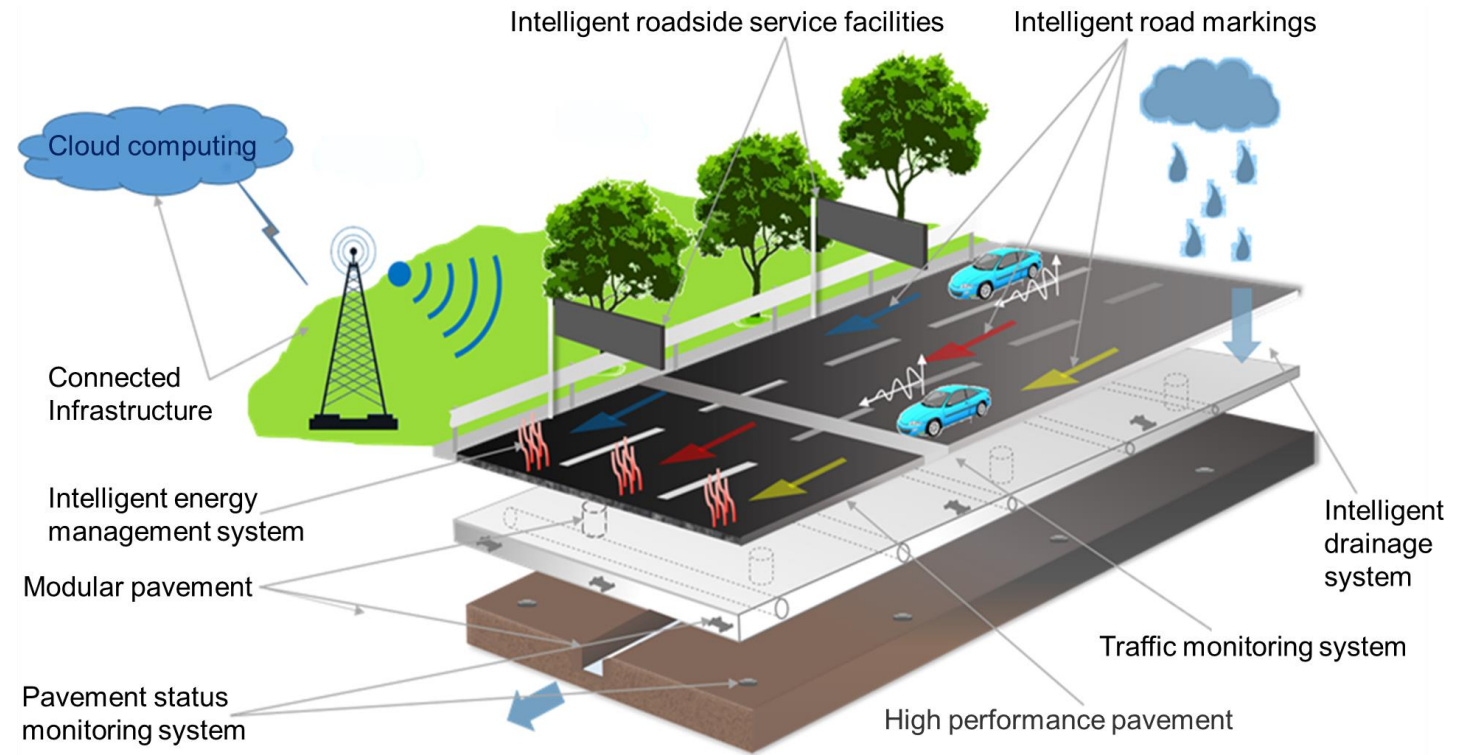


图片来源：视觉中国 www.vcg.com

3.1 Digital and Connected Infrastructure



- High-precision map
- Digital management of infrastructure and markings
- Communication:
 - DSRC/ WIFI/ LTE-V/ 5G
- Traffic, environment and infrastructure monitoring

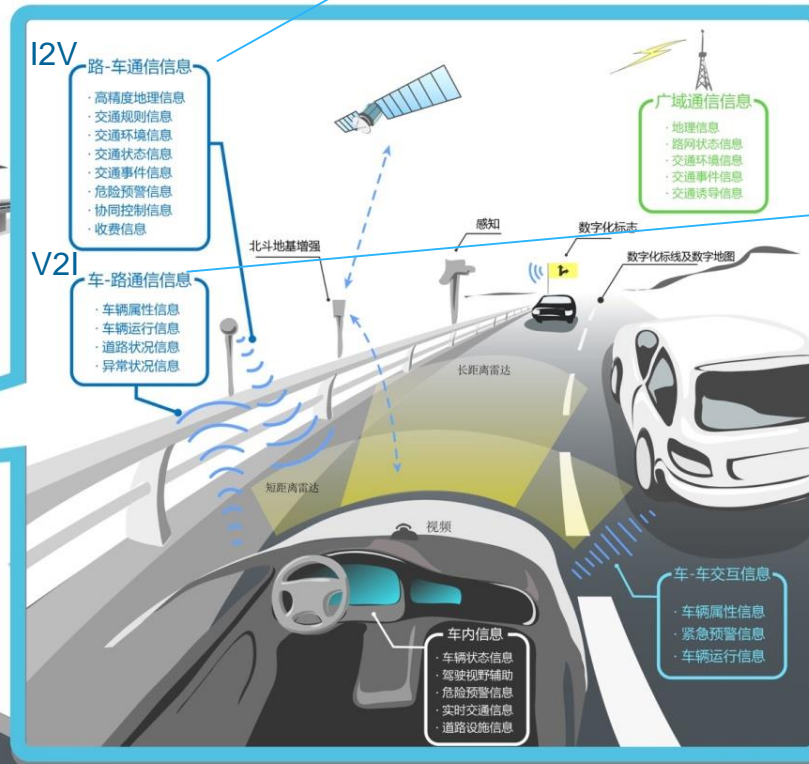
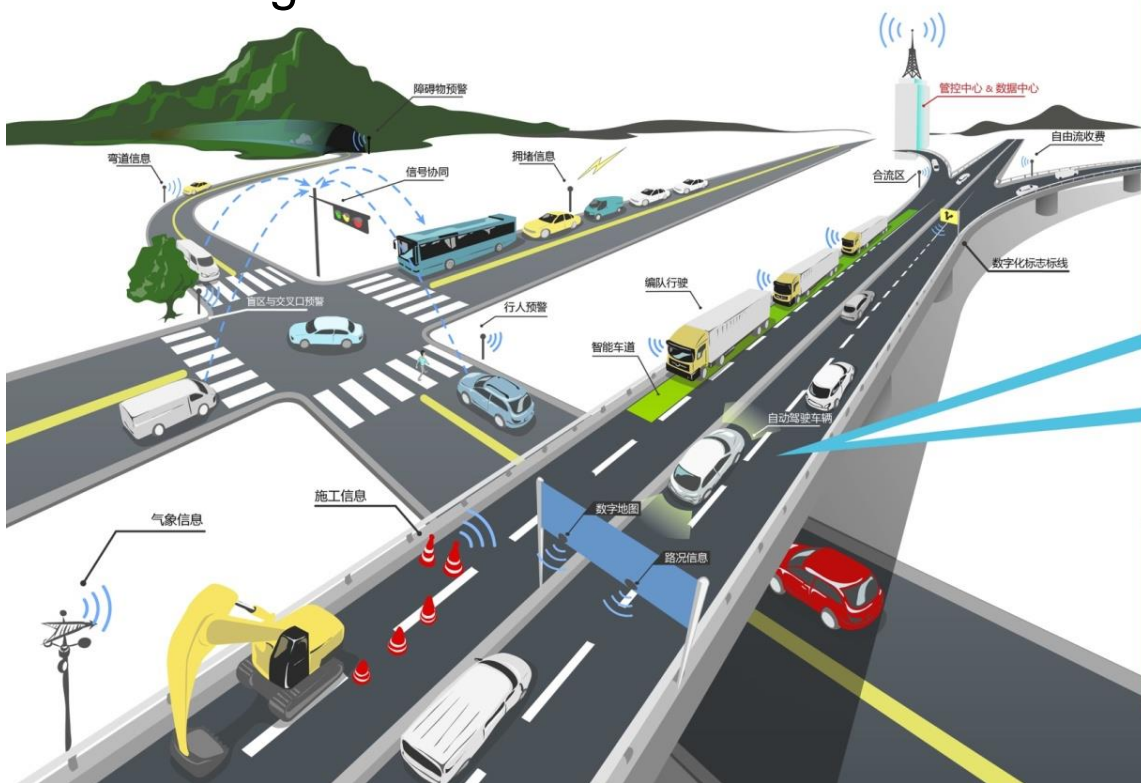
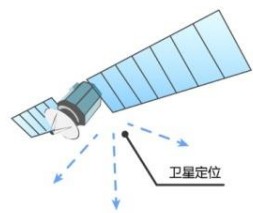


3.2. Vehicle Infrastructure Integration



- Obstacle detection
- Curve negotiation
- Signal coordination
- Drive Blind Area Forewarning

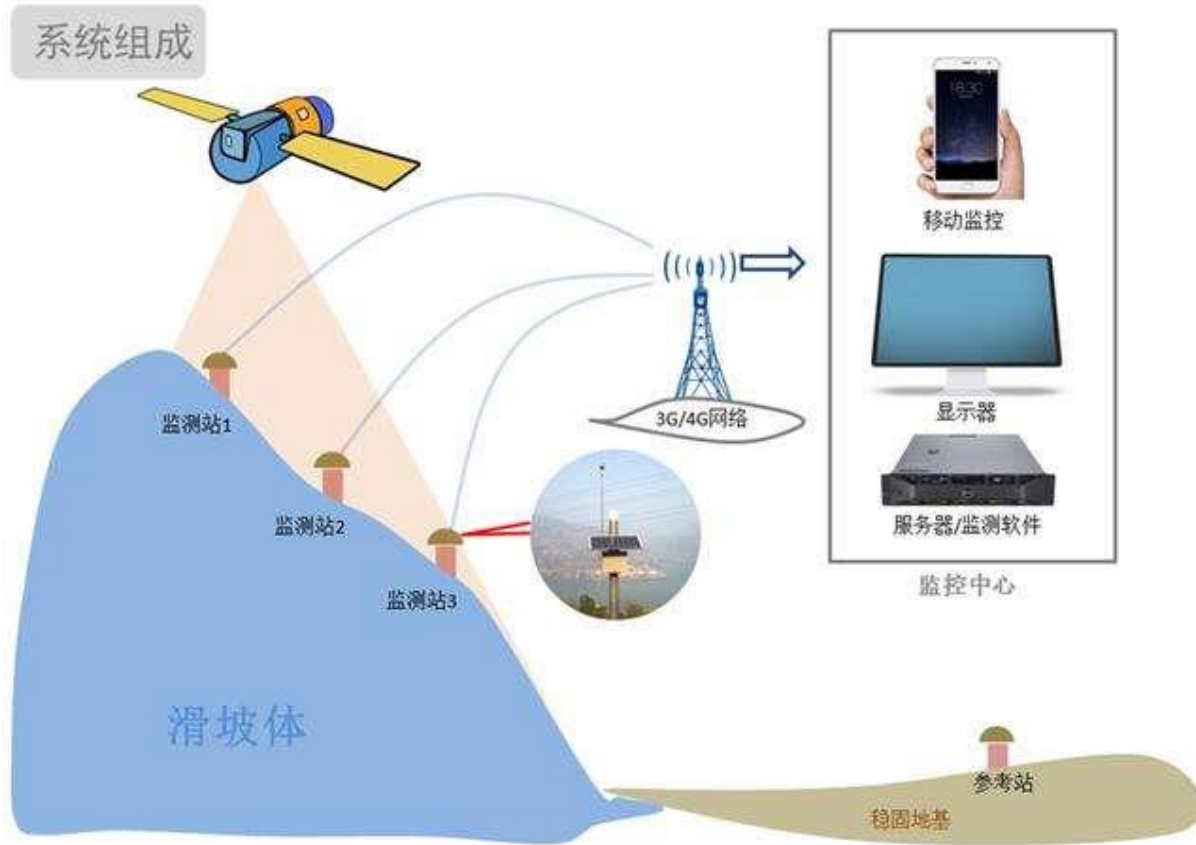
- Congestion information
- Accident information
- Construction information
- Weather alert



- I2V information**
- High-precision map
 - Traffic regulations
 - Traffic congestion
 - Accidents
 - Obstacle forewarning
 - Signal coordination
 - Toll information
 -

- V2I information**
- Vehicle information
 - Vehicle operation
 - Abnormal status
 -

3.3 Application of Beidou navigation



Monitoring the status of Infrastructure

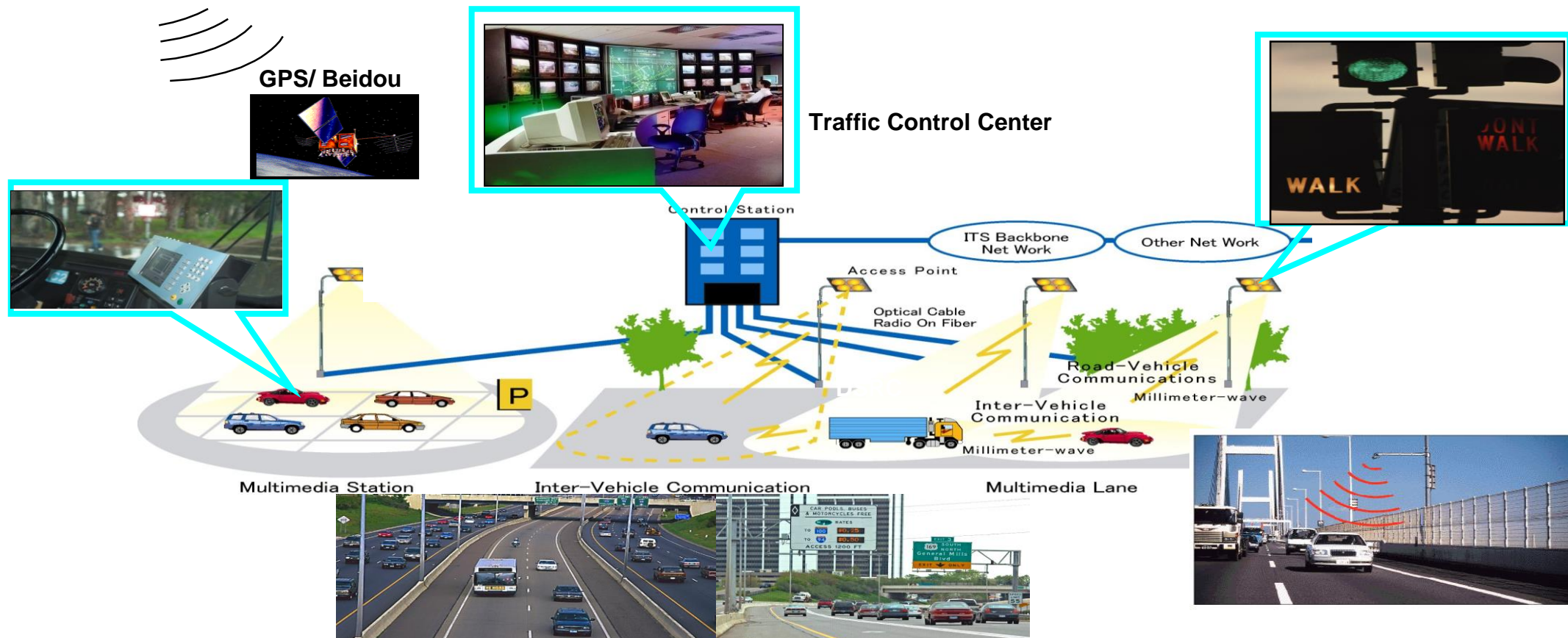


No Parking Electronic Toll Collection

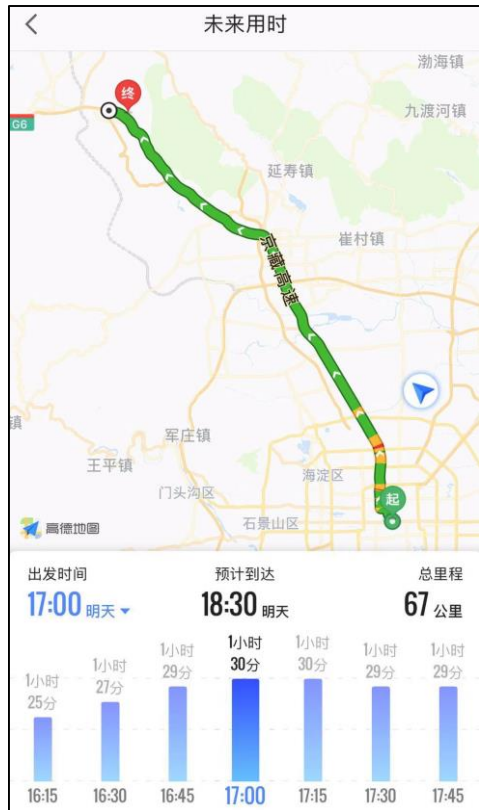
3.4 Highway Operation Based on Big data



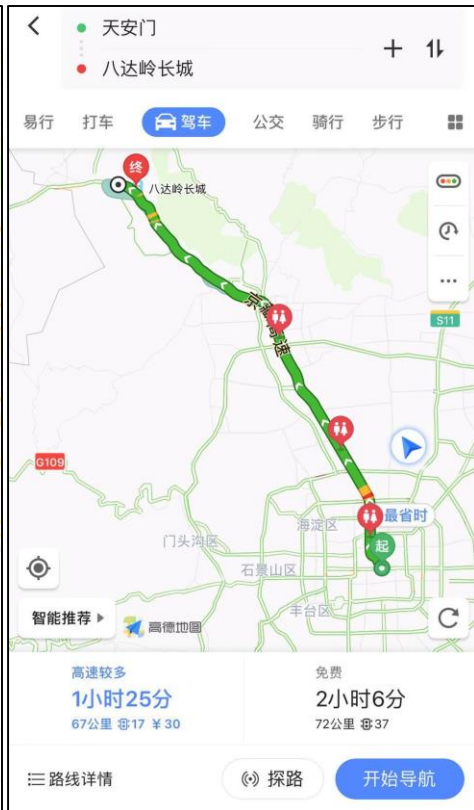
- Highway operation, management, maintenance
- Emergency command



3.5 Mobile Information service



Travel Time prediction



Search Places Near Your Road Trip



Search and Order Car Charging Point



Alipay & Wechat to pay for Highway Toll, Parking, Subway or Bus tickets

4. What Next Steps



- The Cooperative development of Smart Cities, Intelligent Transport System and ICV will building a new mobility system in the future.
- Promote the Digital and connected Infrastructure:
 - Establishing high-precision 3D traffic geographic information system (GIS-T),
 - Establishing a digital management system of highway route, pavement, markings, facilities and surrounding environment,
 - Monitoring, analysis, prediction, maintenance of the life-cycle performance of infrastructure, and
 - Collection and application of mobile location data and social media data for analyzing and predicting the transportation operation status.

4. What Next Steps



- Construction of new generation communication facilities along Highway, including 5G Base Stations and BeiDou Ground-Based Enhancing System.
- Research on standards for connected infrastructure, high-precision map, V2I communication, cloud computing platforms, information safety and so on.





Thank You!

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