

New Mobility Technologies based on 5G and Autonomous Driving

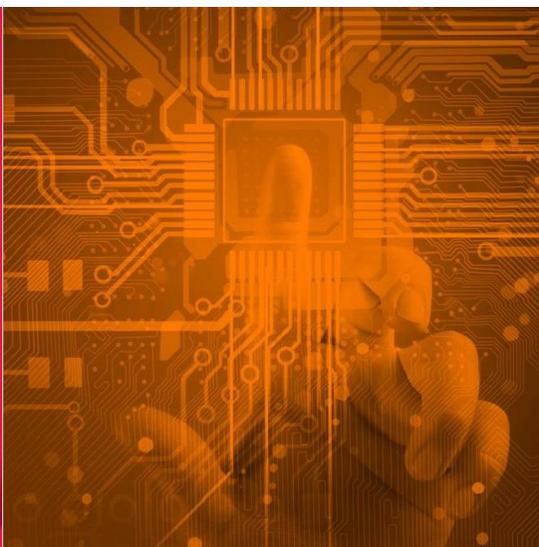
2019. 5. 10



5G plays an important role in 4th industrial revolution because of advent of new business phase through convergence of various technologies



Human Intention



Cyber space Transformation

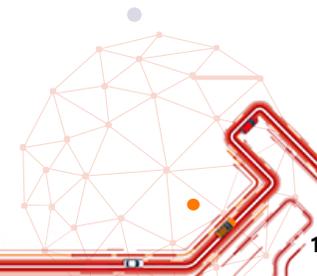


Physical systems execution

Huge Data Transmission and Analytics

5GNETWORK

All connected / Ultra Low latency / Ultra High speed / Ultra Secure



SKT is aimed at making everything in offline transform Online/Mobile by 5G and providing differentiated Speed, Connectivity, Stability and Security

【 SKT's Perspectives 】

By transforming offline objects into mobile ones,

5G realizes CPS* in 4th industrial revolution era



【 Value Proposition 】

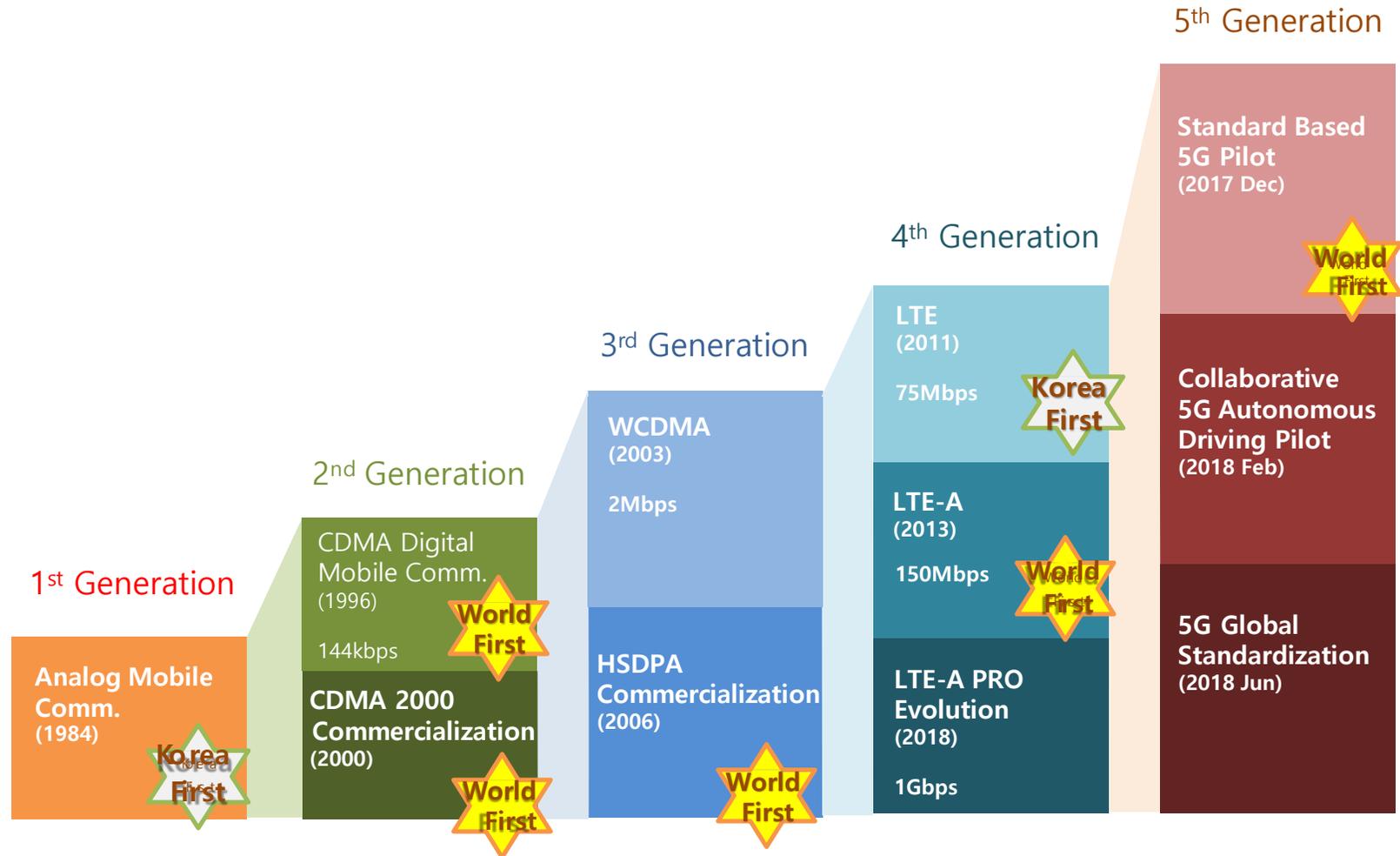


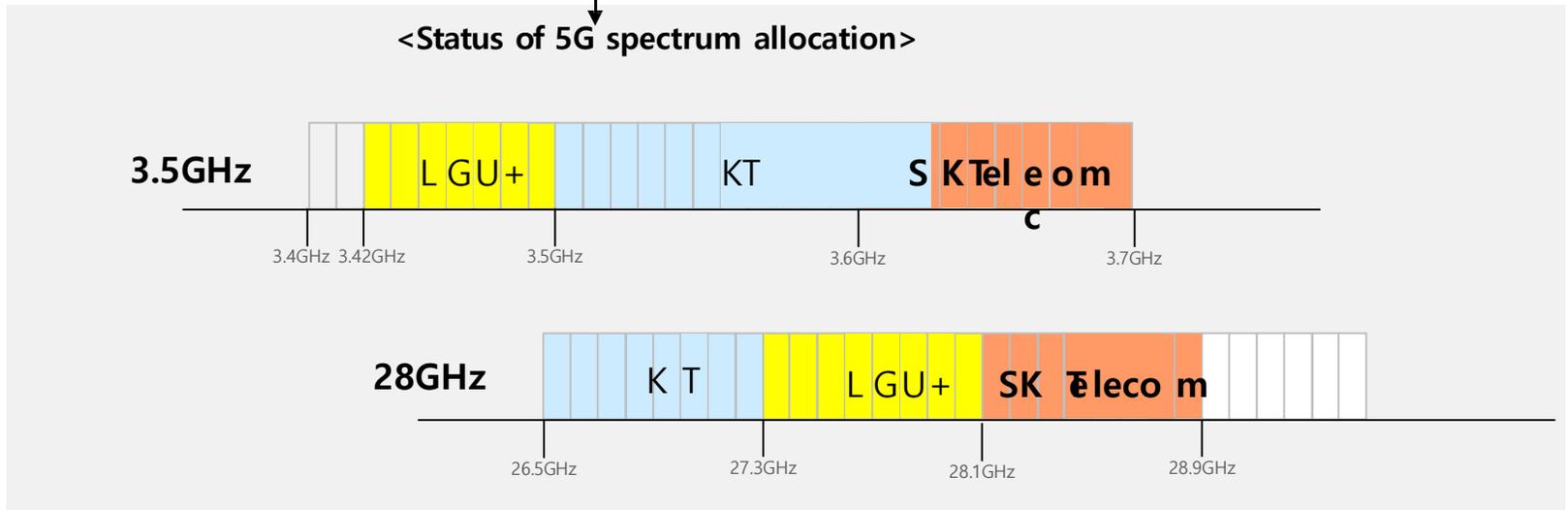
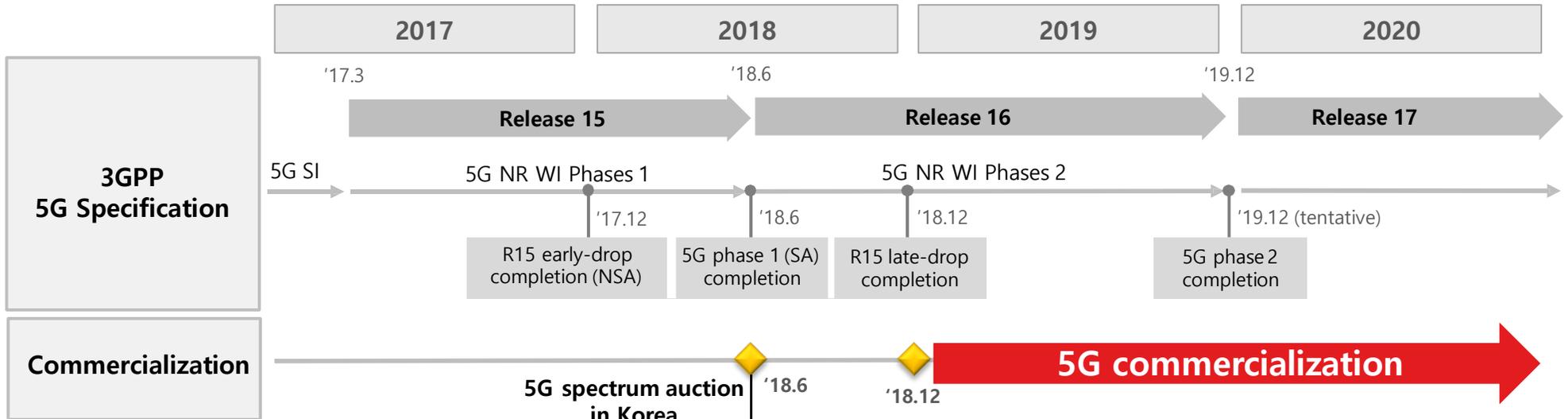
SKT's
Brand-new 5G

- ① *Speed*
- ② *Latency*
- ③ *Connectivity*
- ④ *Security*
- ⑤ *Stability*

* CPS: Cyber Physical System

As the largest MNO in Korea, SKT holds top-level technical expertise from 1st generation to 5th generation





SKT has prepared for 5G commercialization through various demonstrations combined 5G with vertical services such as connected car, AR/VR, game, etc.



5G Connected Car ('16.11)



5G AR/VR Stadium ('17.3)



5G Igloo for AR/VR Winter Sports ('18.1)



5G Autonomous Driving ('18.2)



5G Press Center for Inter-Korean Summit ('18.4)



5GX Game Festival ('18.8)

SKT is specially interested in Connected/Automotive car among 5G services

Virtual Experience Anywhere Anytime

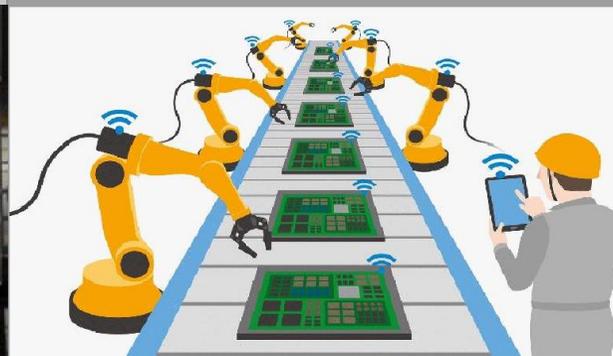
- Immersive Tele-presence
- Super Multi-view Display
- AR/VR based Interaction



Iron Man 2

Massive Internet-of-Things (IoT)

- Smart Metering
- Smart Factory
- Personal Wearable Sensors



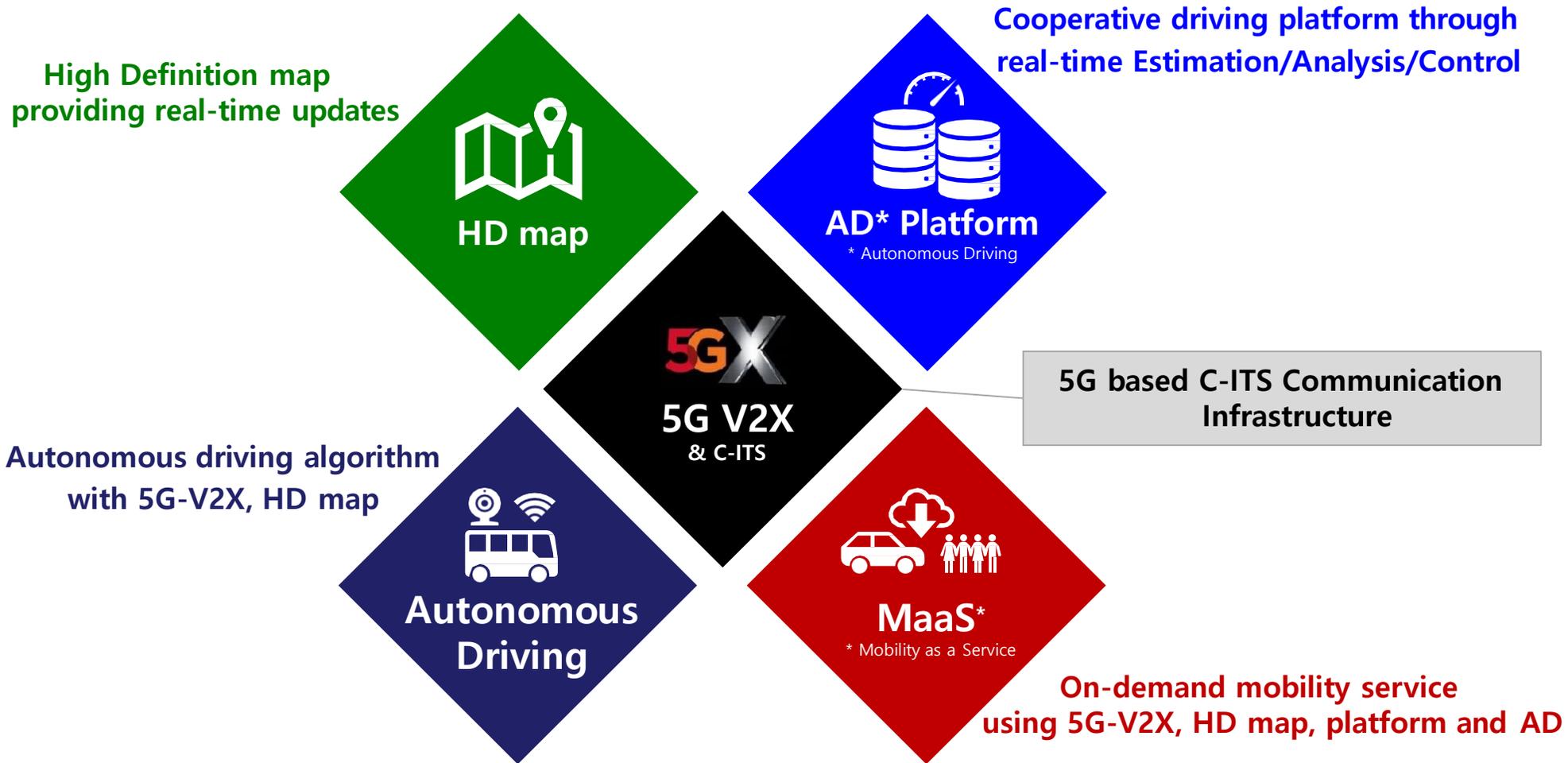
Mission-Critical Internet-of-Things (Automotive)

- Vehicle to Anything
- Autonomous Driving
- Remote Controlled Machines



Data source: Tesla

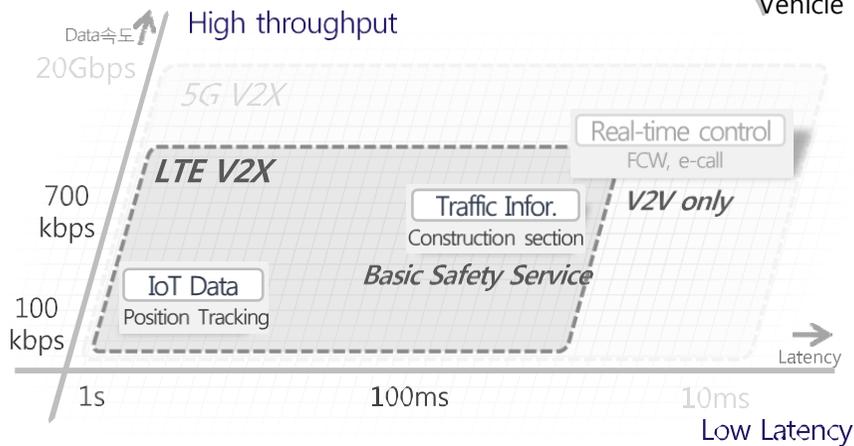
5GX New Mobility from SKT perspective





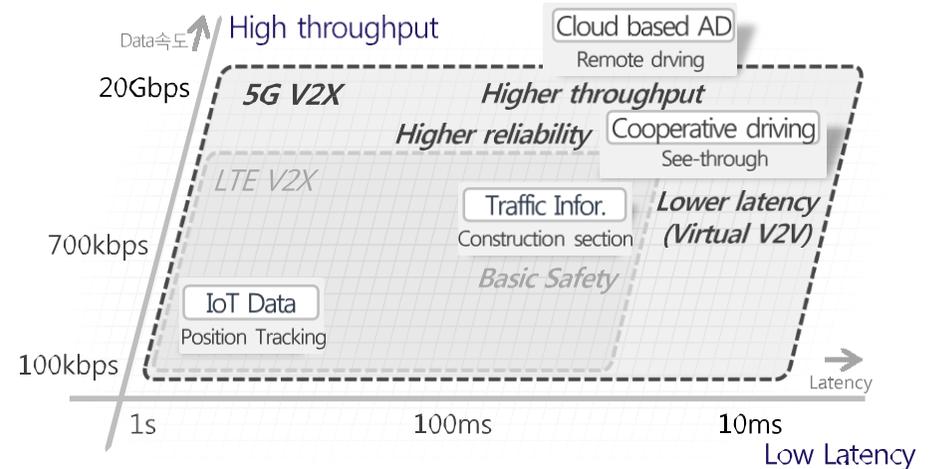
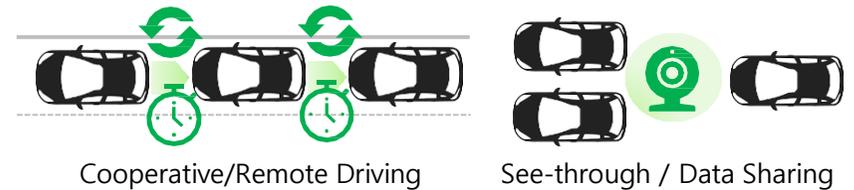
Based on 5G with ultra low latency and high throughput, providing autonomous driving infrastructure through V2N^{Virtual V2V/V2I}

Connected Car service focused on safety



- ❖ Latency 100ms → Basic Safety satisfaction
- ❖ Exchanging information, ADAS, etc.

Autonomous Driving with real-time and high-reliability

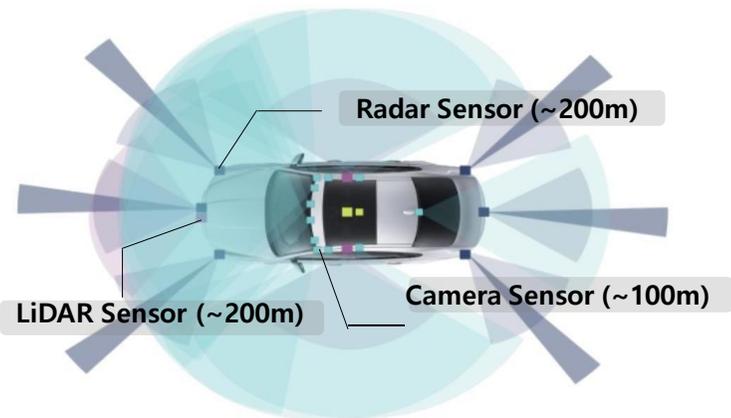


- ❖ Latency 10ms → Autonomous driving satisfaction
- ❖ See-through, Remote Driving, etc.



5G-V2X based cooperative and autonomous driving beyond the limitation of sensors

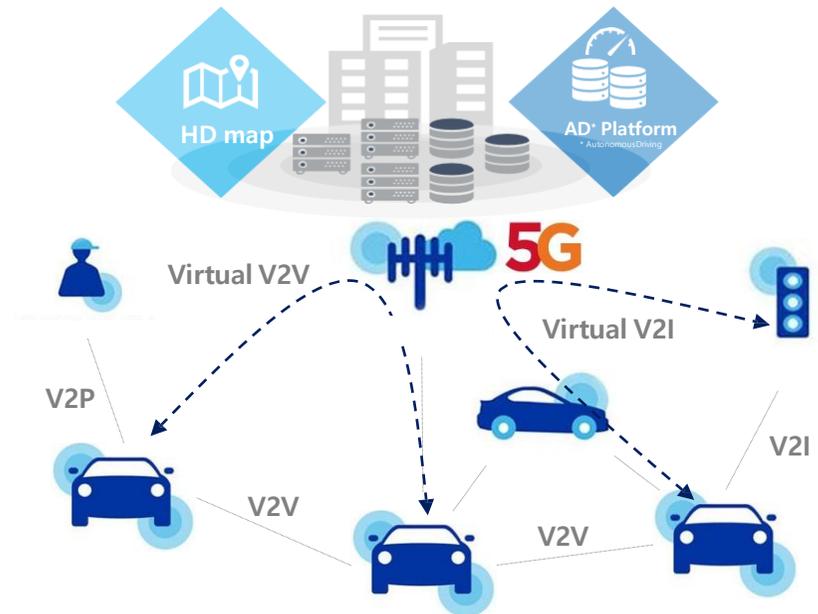
Sensor based autonomous driving



- NVIDIA Autonomous Car - Sensor Configuration**
 - 11 Camera, 6 Radar, 3 LiDAR, 1 GPS & INS, 1 IMU
- UBER Autonomous Car - Sensor Configuration**
 - 7 Camera, 10 Radar, 1 LiDAR, 1 GPS & INS

- ❖ Using sensors such as LiDAR, Radar, Camera, etc.
- ❖ Possible accidents in blind spot

5G V2X based cooperative and autonomous driving



- ❖ HD map update for real-time traffic information
- ❖ Accident rate decrease owing to cooperative driving



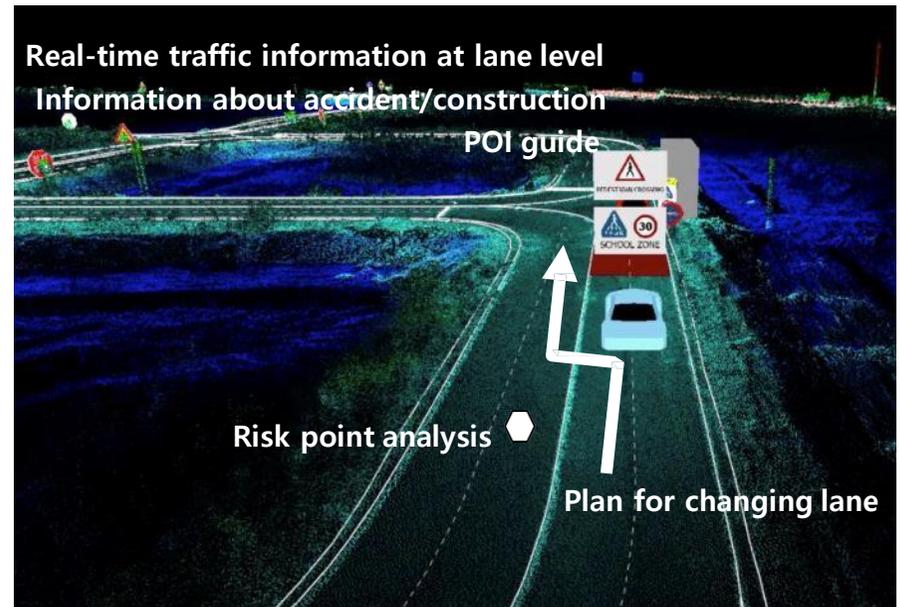
HD map have high precision level because the self-driving cars need precise instructions on how to maneuver themselves around 3D space.

Simple driving related information



- ❖ Navigation, notification about accident or construction
- ❖ Point of Interesting, Rout planning

Using high precision at centimeter level

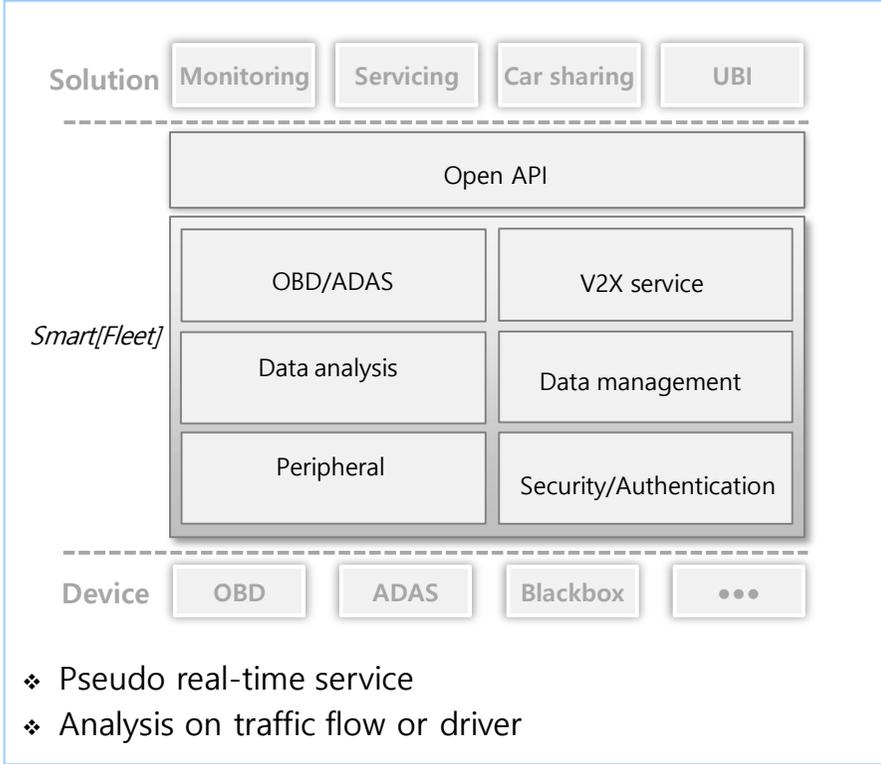


- ❖ Real-time traffic information at lane level
- ❖ Information about accident/construction
- ❖ Simultaneous localization and mapping

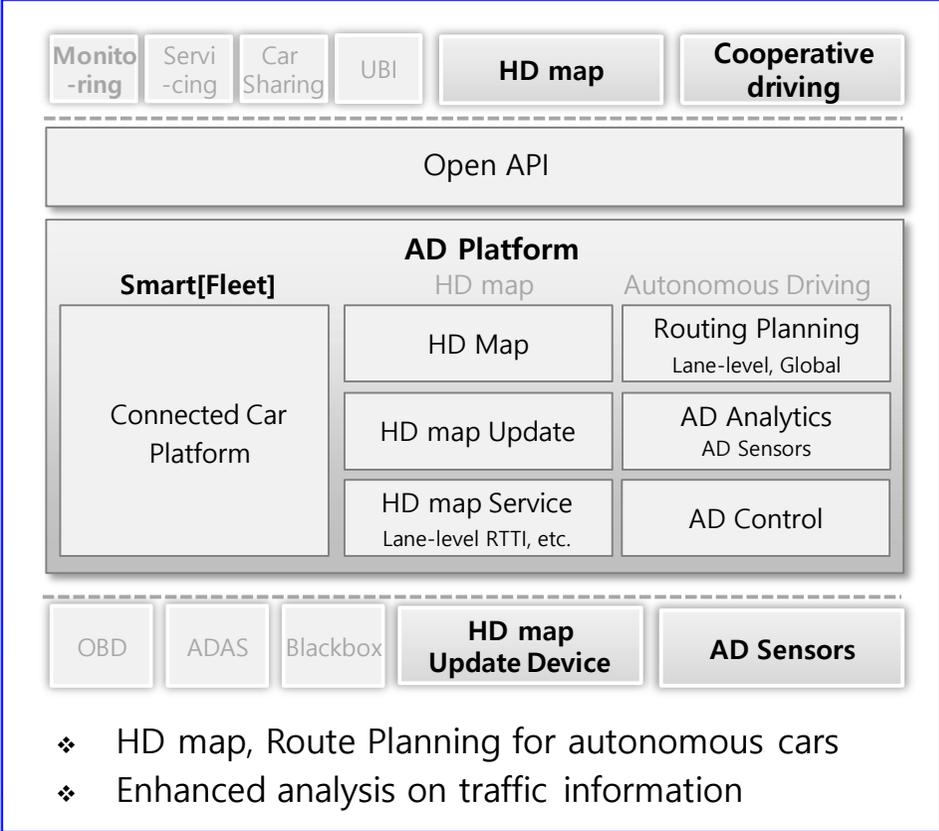


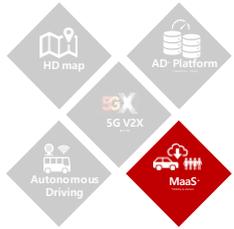
Platform to Predict/Estimate/Analyze autonomous vehicles in real time

Monitoring system for Connected Car



Estimation/Analysis system for Autonomous driving



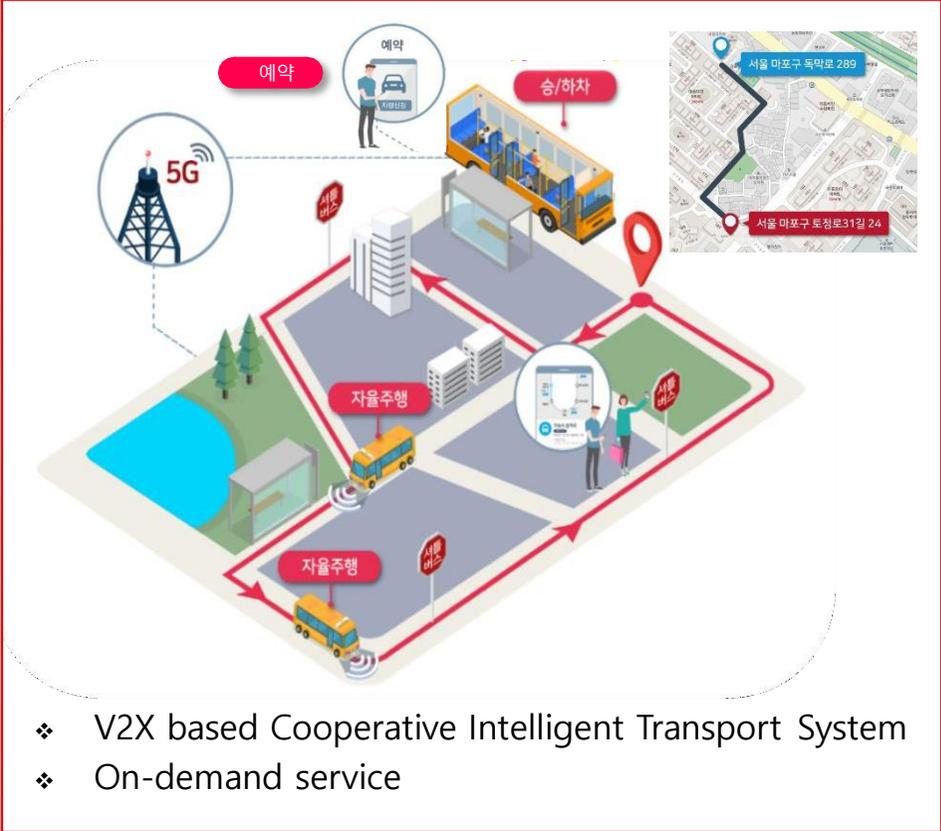


Firstly, development of the on-demand autonomous driving shuttle bus service

Public transit(BUS) service

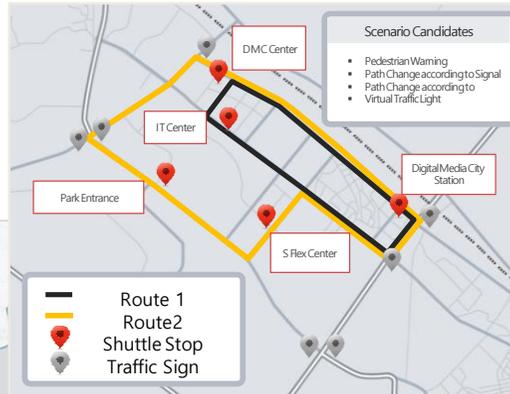


Autonomous driving shuttle bus service

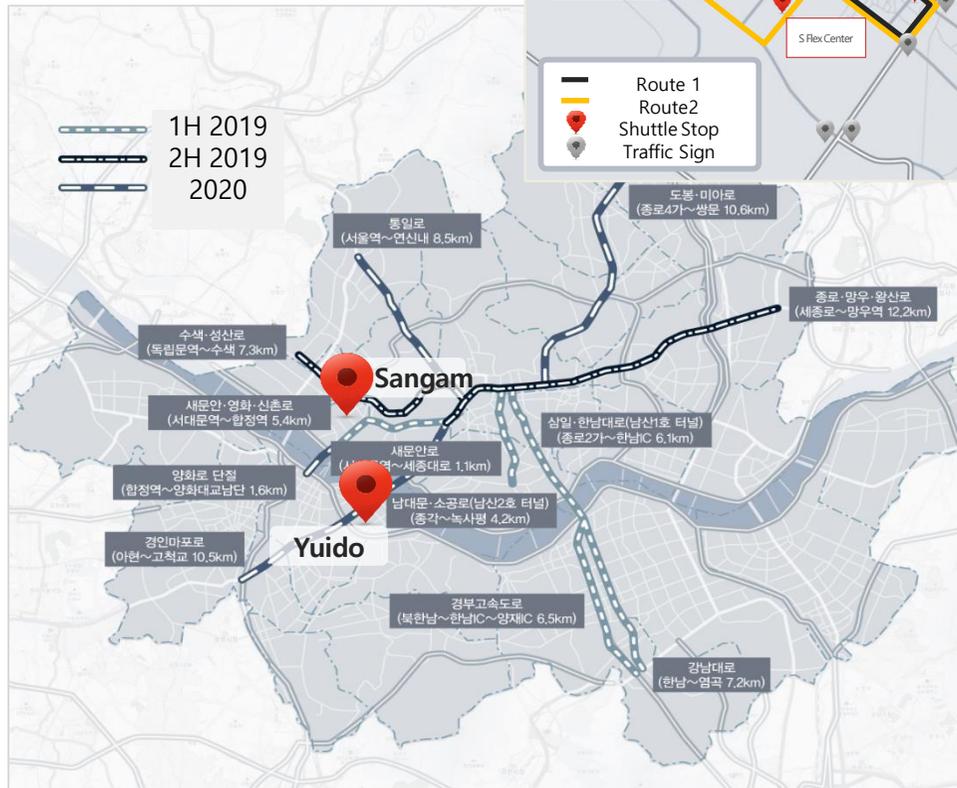


World-first downtown autonomous shuttle service will be launched as a part of Seoul C-ITS Project
 Future mobility services such as traffic safety, 5G connected car will be achieved via C-ITS/V2X

Autonomous Driving Testbed @Sangam



Seoul C-ITS Overview



- **5GX autonomous driving testbed on public roads near Sangam DMC**

- World-first 5G based autonomous driving and connected car testbed (June 2019)
- 5G devices based on SKT 5G infra, HD map, and mobility platform

- **Experience event with periodic autonomous shuttle service**

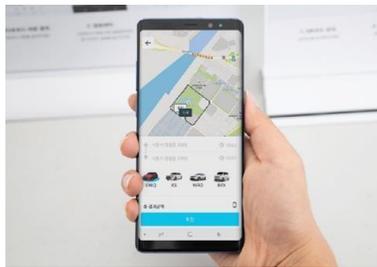
- Autonomous shuttle service between June and November 2019
- Experimental events including Seoul Autonomous Vehicle Festival in June 2019

- **Connected Car service by T-map® (SKT navigation service)**

- Safety services such as virtual traffic signal and crossroad safety, emergency electric brake will be provided by T-map in 2020.
- Data analysis services such as traffic pattern, road hazard warning

Trial of autonomous driving based car sharing service ;recruitment of 100 people for satisfaction survey

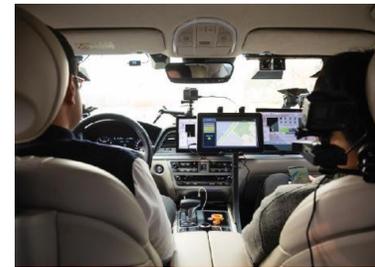
- **Date & Location:** 7, Nov., '18, Baegot park, Gyunggi-Do, Korea
- **Participants:** SK Telecom, Korea Expressway Cor., SNU, YSU, SWM.AI, CEST
- **Recruitment:** 100 people for satisfaction survey
- **Autonomous Driving(AD) Cars:** SK Telecom(G80), SNU(IONIQ, K5, NIRO), YSU(Ray)
- **Service Scenario**



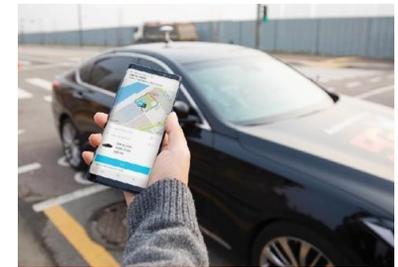
<Call a AD car by app.>



<AD car arrives >

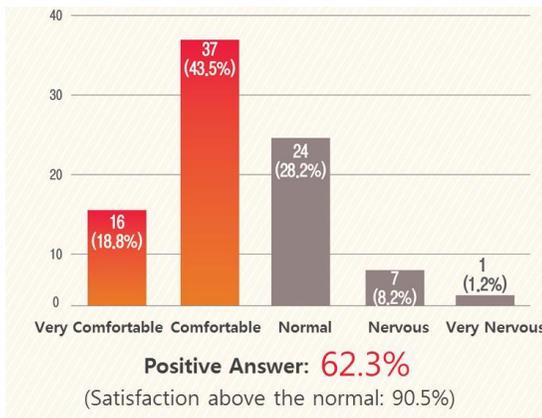


<Get in & AD>

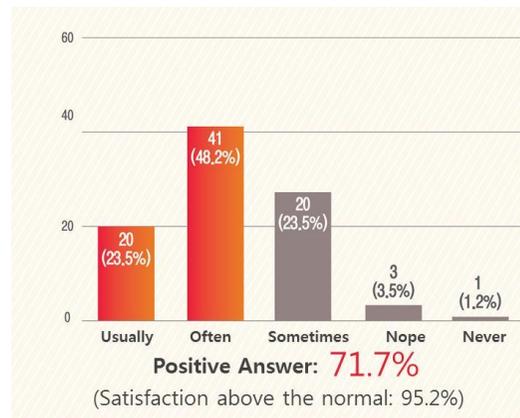


<Get off & Return >

Results of Satisfaction



Monitoring System



SK Telecom's test made use of two self-driving vehicles which engaged in cooperative driving, navigating the K-city while simultaneously sharing data with each other



