Future Mobility Vision

ICT R&D Center

2019. 11.21
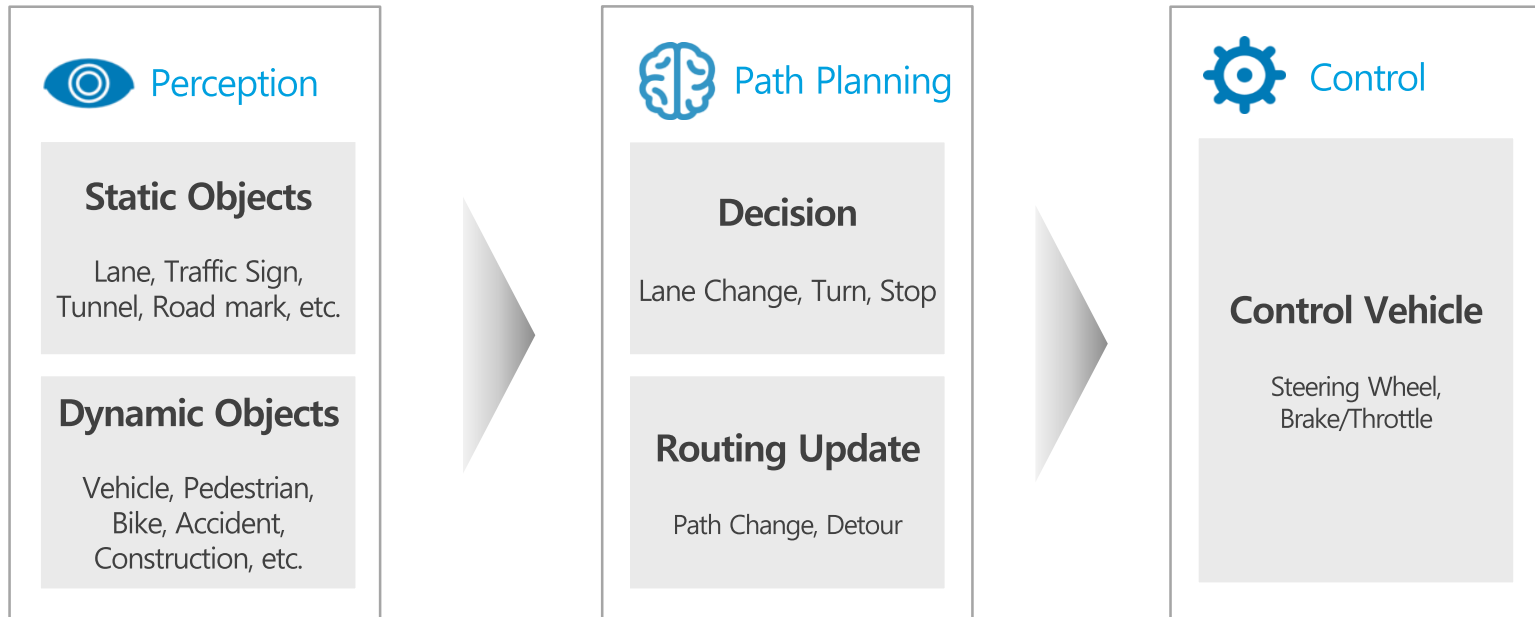
Autonomous Driving and Daily life

Autonomous driving will change your daily life !

You can enjoy shopping, movie, game while driving

SKT 5GX

Main Steps for Autonomous Driving

Perception and path planning is improved by deep learning technology.

Perception

Static Objects

Lane, Traffic Sign,
Tunnel, Road mark, etc.

Dynamic Objects

Vehicle, Pedestrian,
Bike, Accident,
Construction, etc.

Path Planning

Decision

Lane Change, Turn, Stop

Routing Update

Path Change, Detour

Control

Control Vehicle

Steering Wheel,
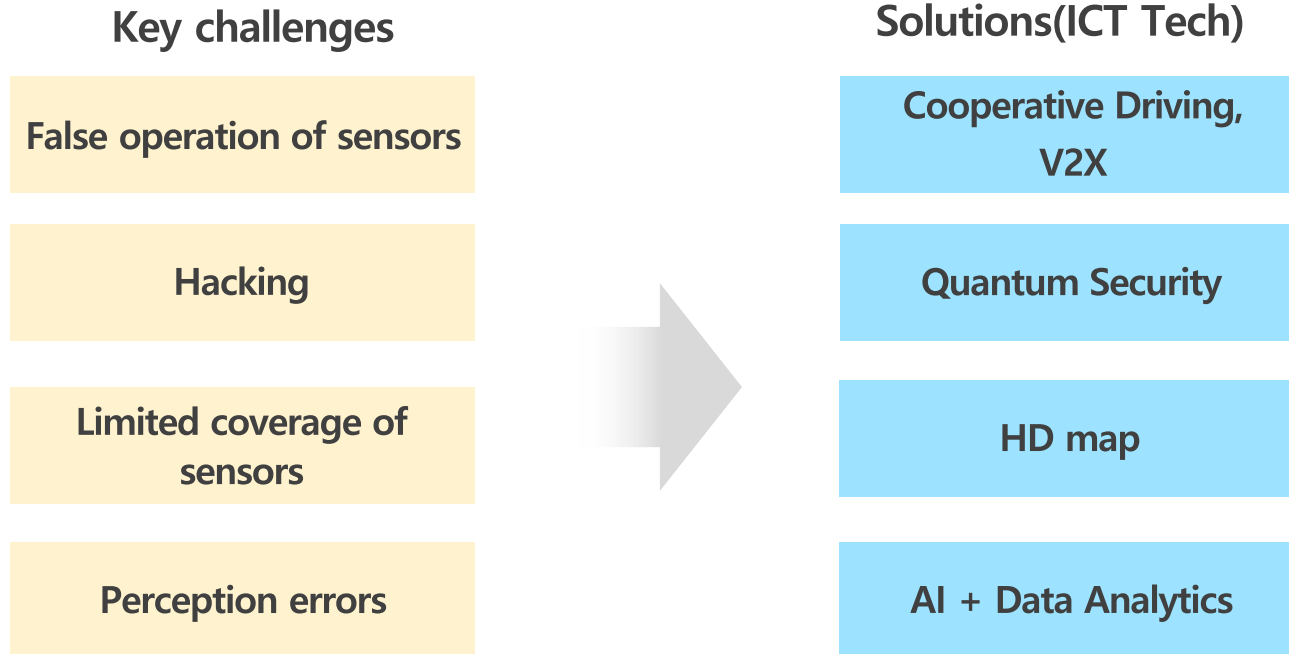Brake/Throttle

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Risk of Accidents

There happen Errors of perception in a bad condition

Challenges of Autonomous Driving

**Requires ICT technologies to overcome the limitations of sensors**

Key challenges

- False operation of sensors
- Hacking
- Limited coverage of sensors
- Perception errors

Solutions(ICT Tech)

- Cooperative Driving, V2X
- Quantum Security
- HD map
- AI + Data Analytics

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Autonomous Driving and Mobile Network

Autonomous driving with mobile network will improve safety level

Level 2	Level 3	Level 4	Level 5
2017	2021	2025	

4G, IoT   5G, V2X

Co-pilot   *Highly autonomous driving*   *Fully autonomous driving*

Level 1	Level 2	Level 3	Level 4	Level 5
Driver Assistance (Steering, acceleration)	**Partial Automation** (One or more driver assistance systems)	**Conditional Automation** (Monitoring of driving environment)	**High Automation** (Fallback performance of dynamics by system**)**	**Full Automation** (Support all driving mode)

ICT for Safety Enhancement ① V2X

V2X will send emergency messages, real-time information to prevent the accident.
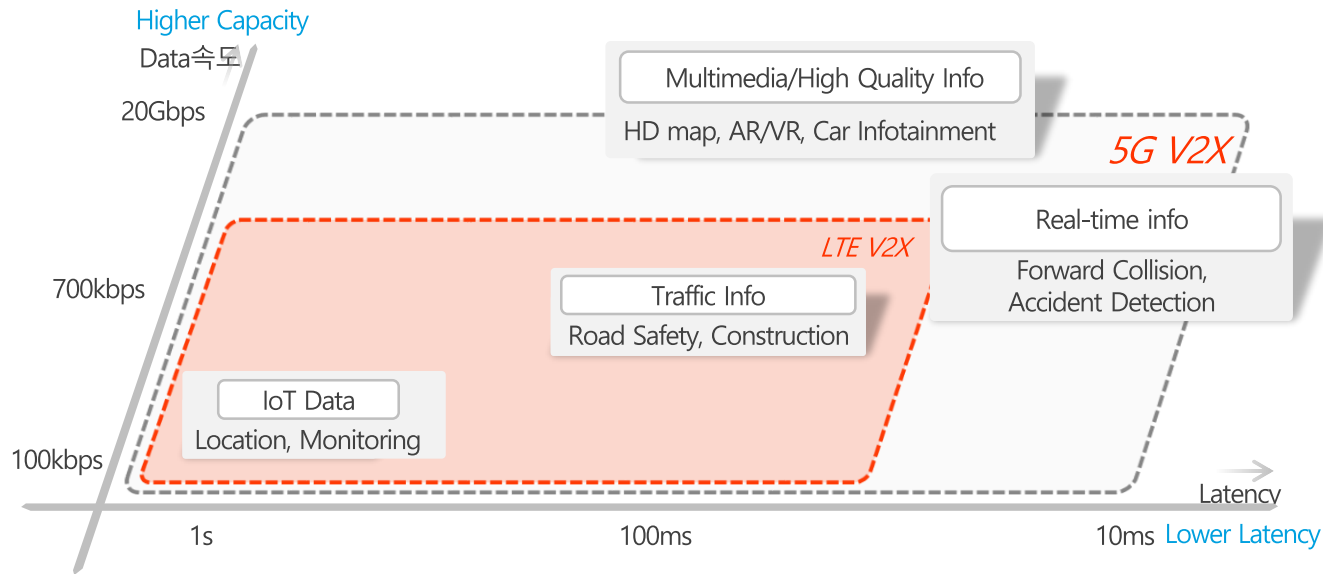
ICT for Safety Enhancement ② V2X Effects

V2X will reduce the accident by connecting vehicles, pedestrians, Infra, two-wheels

By Connecting Vehicle
to Everything(V2X)

2 5 %

Reduction of Accidents

※ Source: US Department of Transportation(US DOT)

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ICT for Safety Enhancement ③ 5G

5G will provide higher throughput, lower latency for the autonomous driving.

Higher Speed
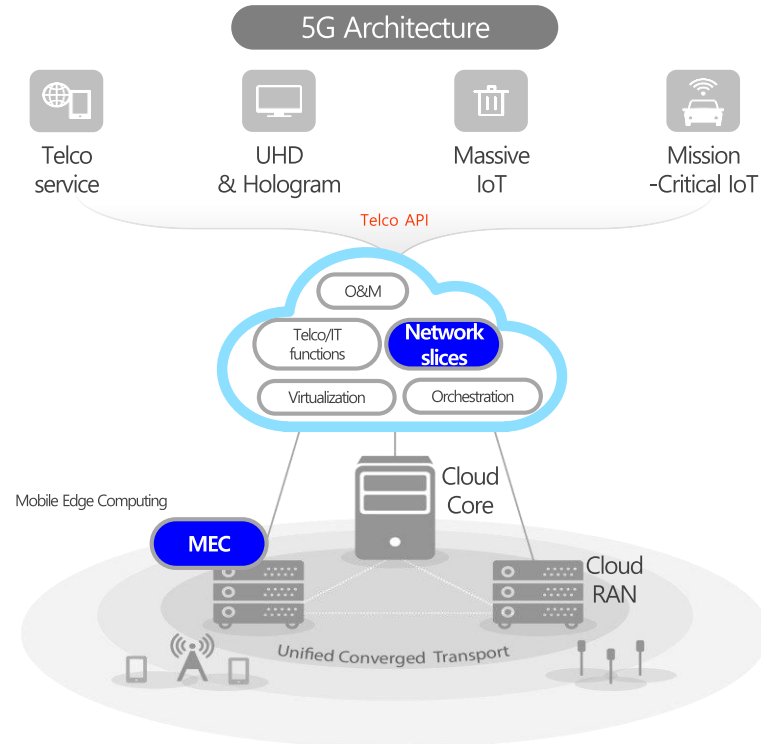**Maximum 20Gbps**

Lower Latency
Radio: 1ms, E2E: 10ms

More Devices
Thousands of Connections/Cell

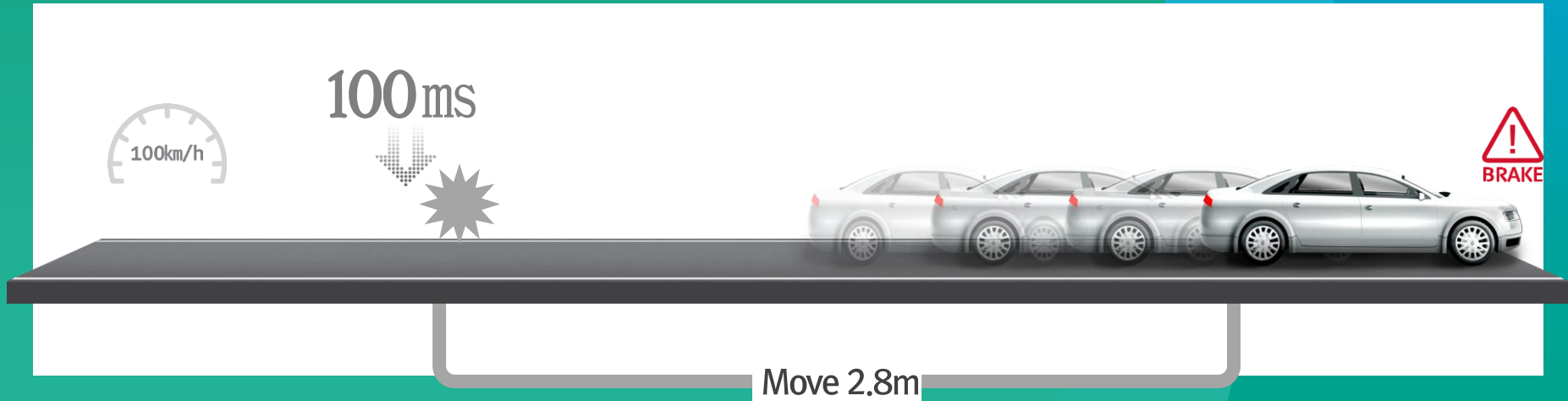## Optimized QoS
N/W Slicing for each service

Best Connectivity for Autonomous Driving

5G Architecture

Telco service

UHD & Hologram

Massive IoT

Mission -Critical IoT

Telco API

O&M

Telco/IT functions

Network slices

Virtualization

Orchestration

Mobile Edge Computing

MEC

Cloud Core

Cloud RAN

Unified Converged Transport

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While driving at the speed of 100㎞/h,

Detecting emergency situation after 10㎳, vehicle moves 28cm
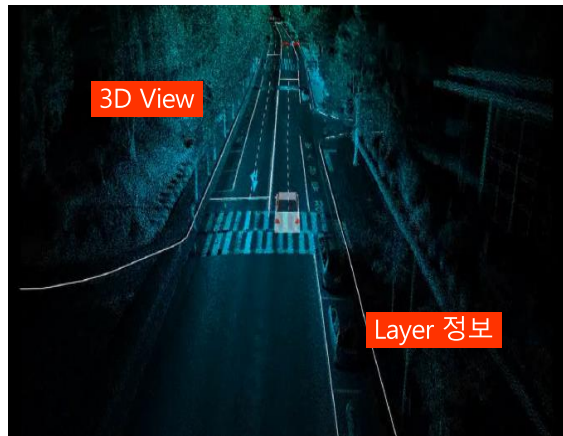
After 100㎳, Moves 2.8m

100㎳

100㎞/h

BRAKE

Move 2.8m

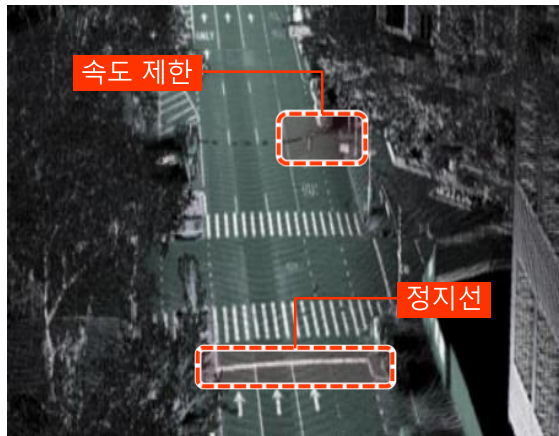# ICT for Safety Enhancement ④ HD map

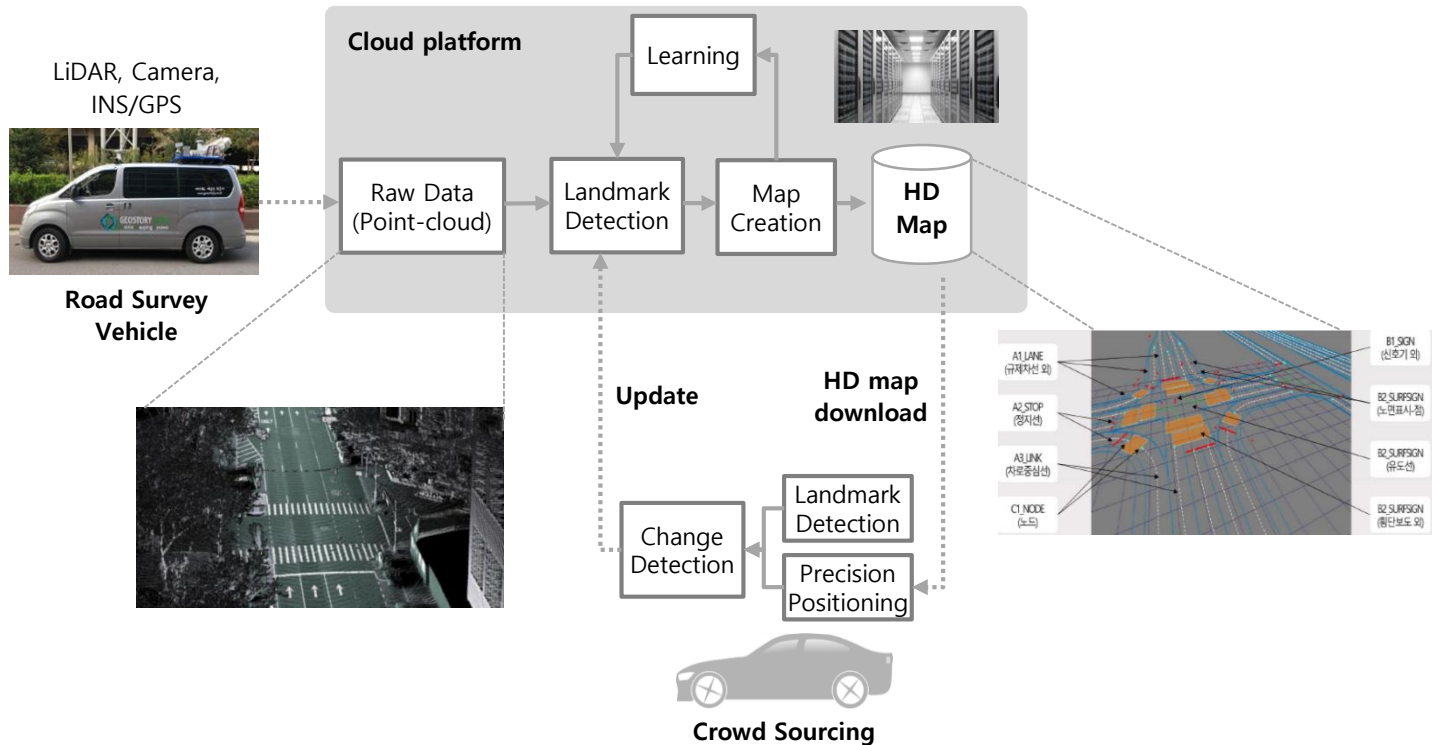**Integrated Platform combined with V2X, POI, and Dynamic Road Data for Autonomous Driving**

3D View

Layer 정보

실시간 3D 가시화

속도 제한

정지선

자율주행 인지/판단 연동

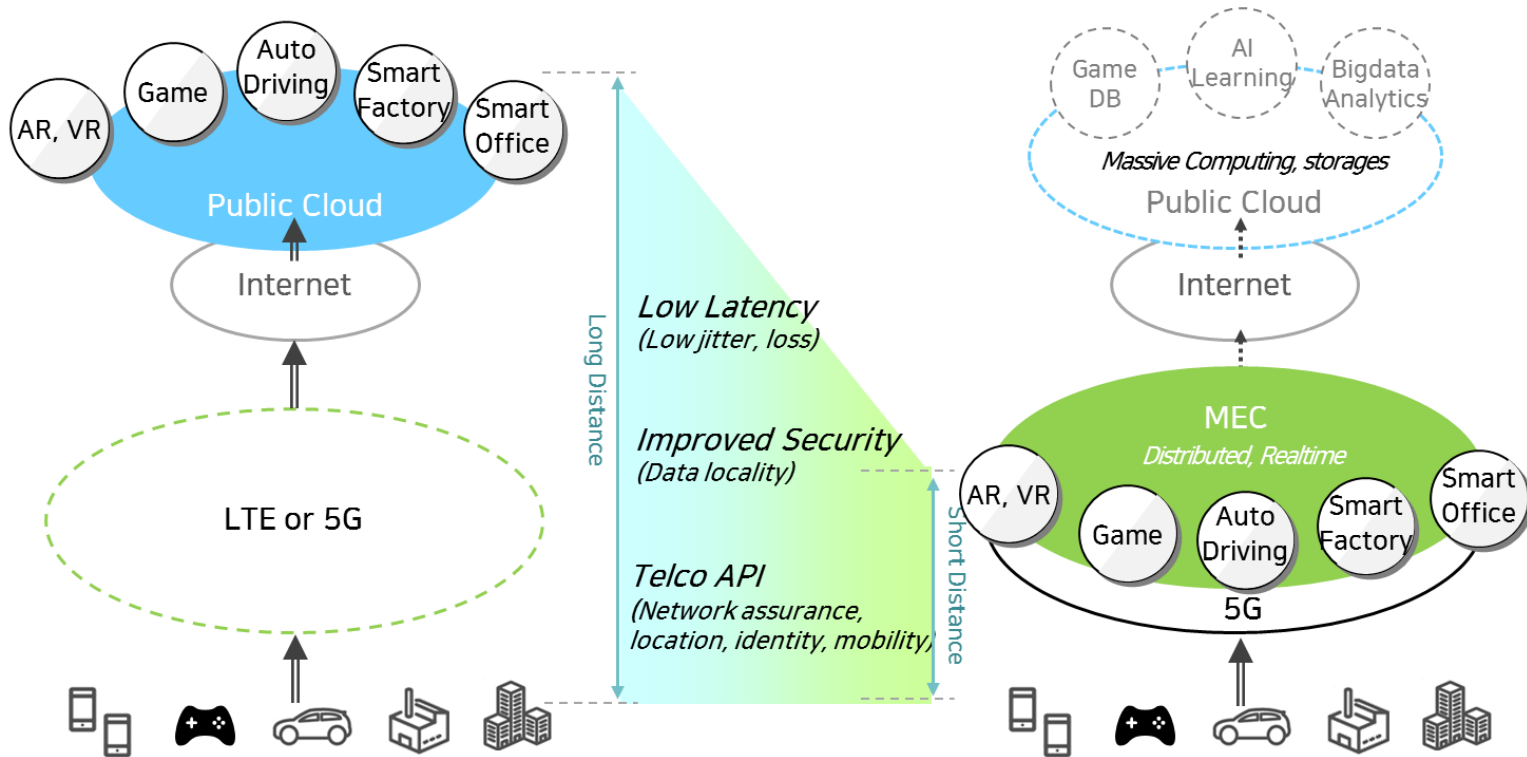실시간 신호정보

공사 정보

동적 정보 제공

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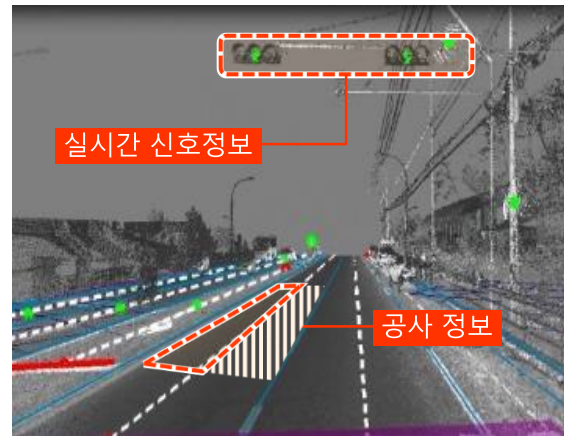
ICT for Safety Enhancement ⑤ HD map Update
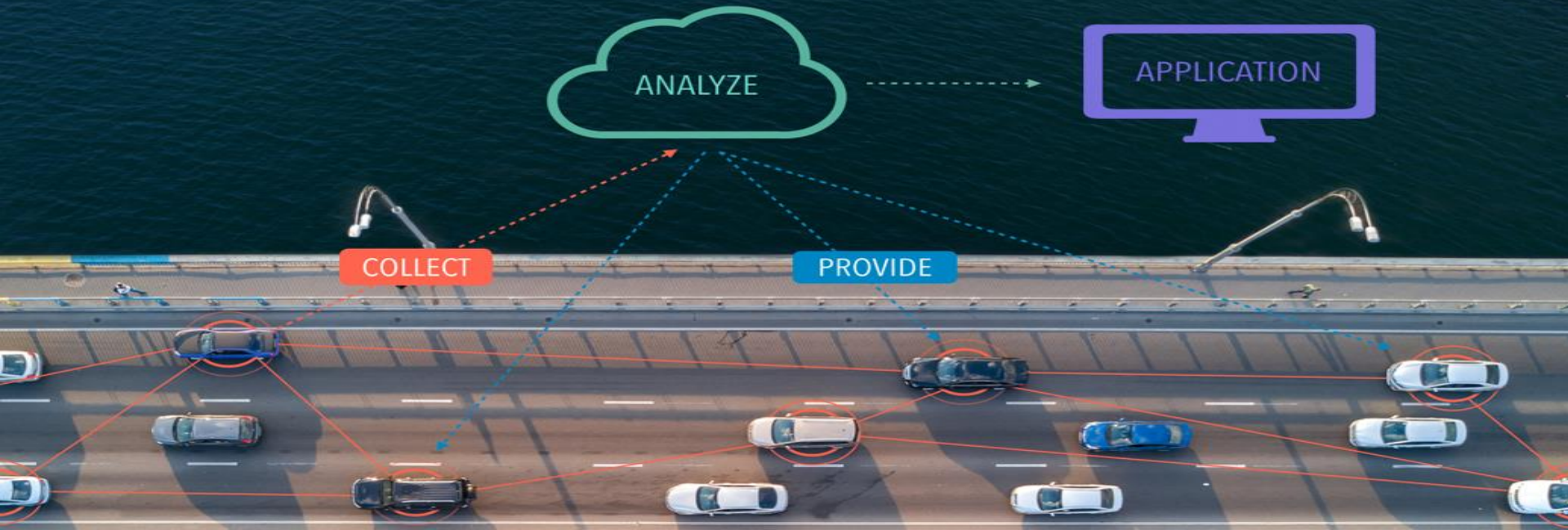
Live Update with Crowd Sourcing vehicles

Mobility Vision ① 5G MEC

Cloud computing environment nearest to vehicles, is very reliable for ultra-broadband and real-time V2X service

Collect dynamic road data, analyze and provide to the all vehicles connected to SKT platform

Mobility Vision ③ Collection of High Quality Road Data

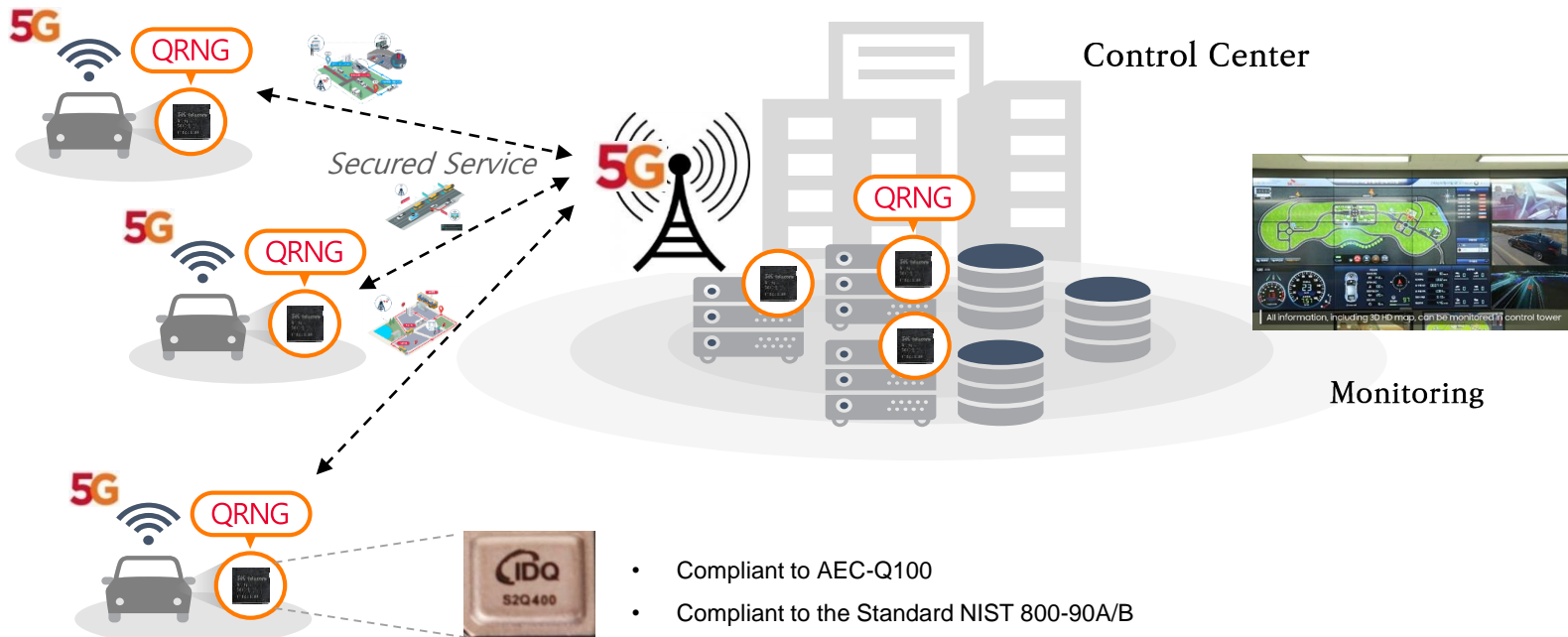**Real-time Detection and Recognition for HD map Update and Smart City**
- Understanding Road Semantics(traffic sign/signal, road marker, emergency event, and so on)

Mobility Vision ④ QRNG for V2X

True Random Number Generator by Quantum technology

QRNG

5G

Secured Service

Control Center

QRNG

5G

QRNG

Monitoring

5G

QRNG

IDQ
S2Q400

- Compliant to AEC-Q100
- Compliant to the Standard NIST 800-90A/B

SKT 5GX

Mobility Vision ⑤ C-ITS

Seoul will build the 5G based connected car system and autonomous car test bed by 2020 in C-ITS project

- **'19.03~'20.12(3 phases)**
  * 1st phase: ~'19.6, 2nd phase: ~'19.12, 3rd phase: ~'20.12

- **5G V2X Connected car infrastructure & services**
  * V2X + ADAS + HD map Update
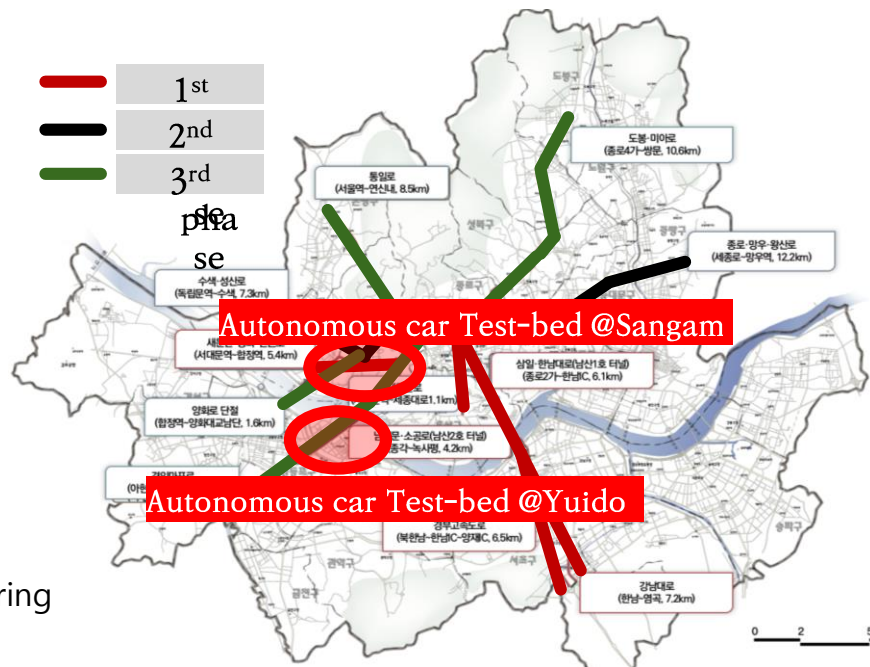 * 30 C-ITS services(Safety, Traffic/Road/Bus Mgmt.)

- **Autonomous car test bed**
  * Sangam (autonomous shuttle bus)
  * Yuido (providing traffic signal information)
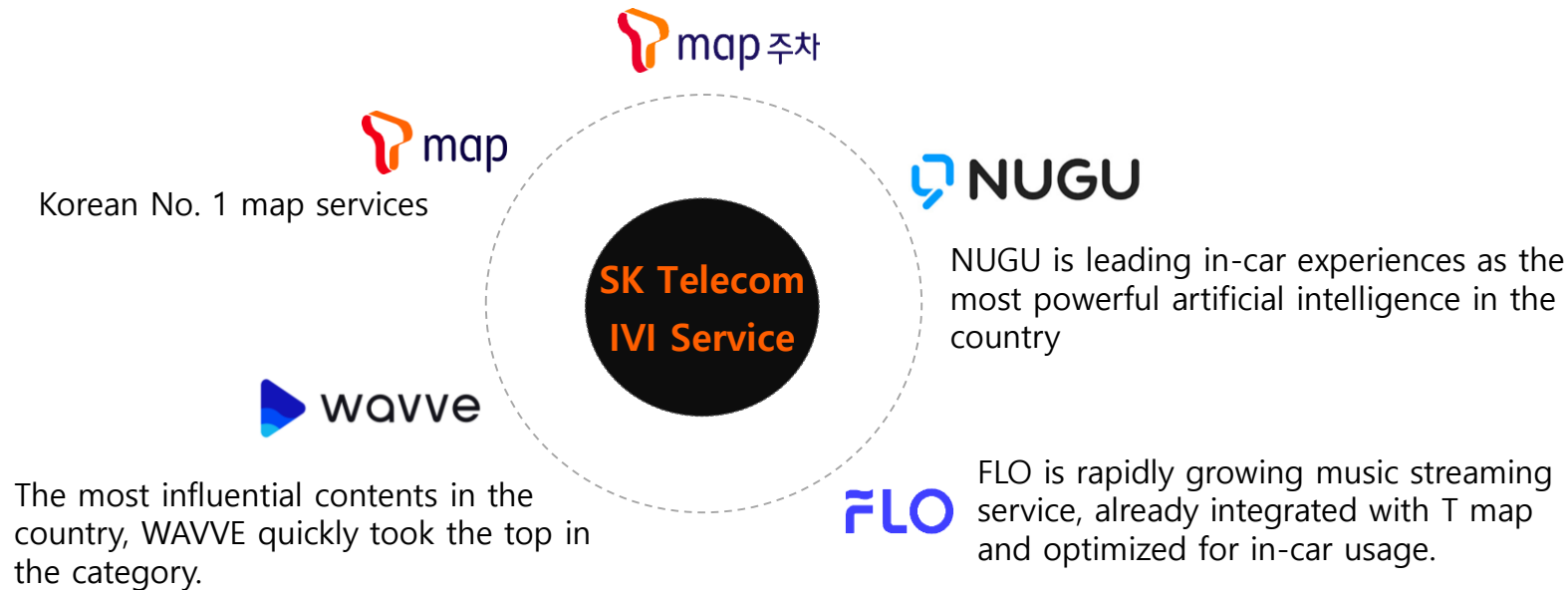
- **Sharing platform for ITS information**
  * Supporting R&D activity for small business via data sharing

- **1,700 Vehicles (Bus:1,600, Taxi:100)**

1st
2nd
3rd phase

Autonomous car Test-bed @Sangam

Autonomous car Test-bed @Yuido

Mobility Vision ⑥ IVI Service

SKT is developing next gen. connected IVI platform with integrated infotainment services

T map 주차

T map

Korean No. 1 map services

SK Telecom IVI Service

NUGU

NUGU is leading in-car experiences as the most powerful artificial intelligence in the country

wavve

The most influential contents in the country, WAVVE quickly took the top in the category.

FLO

FLO is rapidly growing music streaming service, already integrated with T map and optimized for in-car usage.

SKT 5G X

Thank You