中國移動 China Mobile

大灣區5G產業聯盟 The Greater Bay Area 5G Industry Alliance

5G 未來無限可能

5G – Accelerator of Digital Transformation

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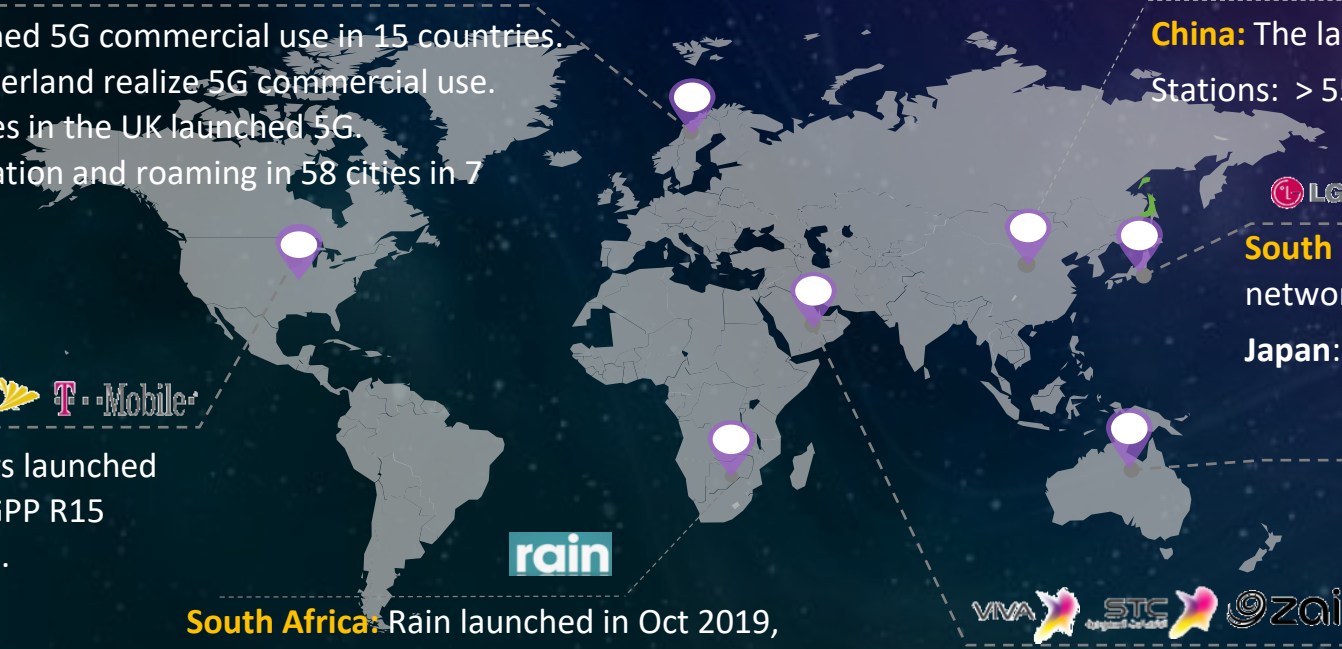
Disclosure to other party is prohibited.

5G Commercial Launch

Europe: 27 operators launched 5G commercial use in 15 countries.
Sunrise: 300+ towns in Switzerland realize 5G commercial use.
BT/EE: 1500+ sites in 16 cities in the UK launched 5G.
Vodafone: 5G commercialization and roaming in 58 cities in 7 countries in Europe.

U.S.: 4 major operators launched 5G, complying with 3GPP R15 international standard.



South Africa: Rain launched in Oct 2019, mainly in core cities.

China: The largest in scale and with largest number of users.
Stations: > 550,000 by the end of 2020. Covers 340 major cities.

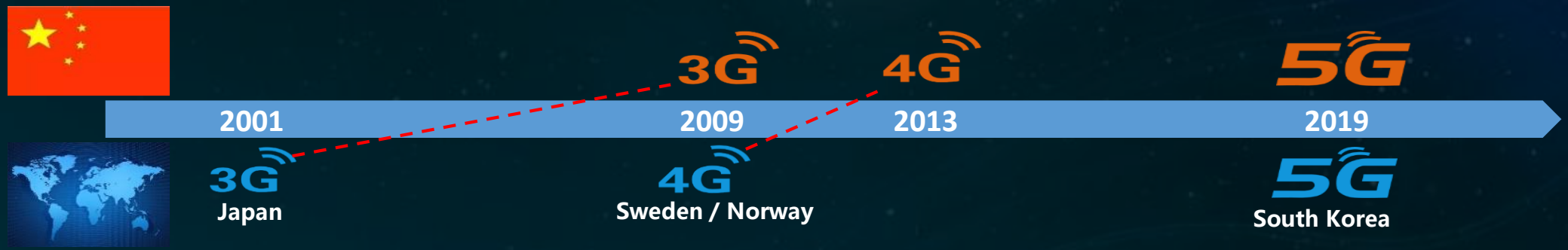
South Korea: The world's first 5G commercial network with more than 5 million users in 2019.

Japan: Realize 5G commercial use in March 2020.

Australia: Optus and Telstra achieved 5G commercial use in Q2 2019.

Middle East: a total of 12 operators launched 5G commercial services, such as Kuwait, UAE, Qatar, Saudi Arabia, Bahrain.

* Data source: GSA report, Mar 2020

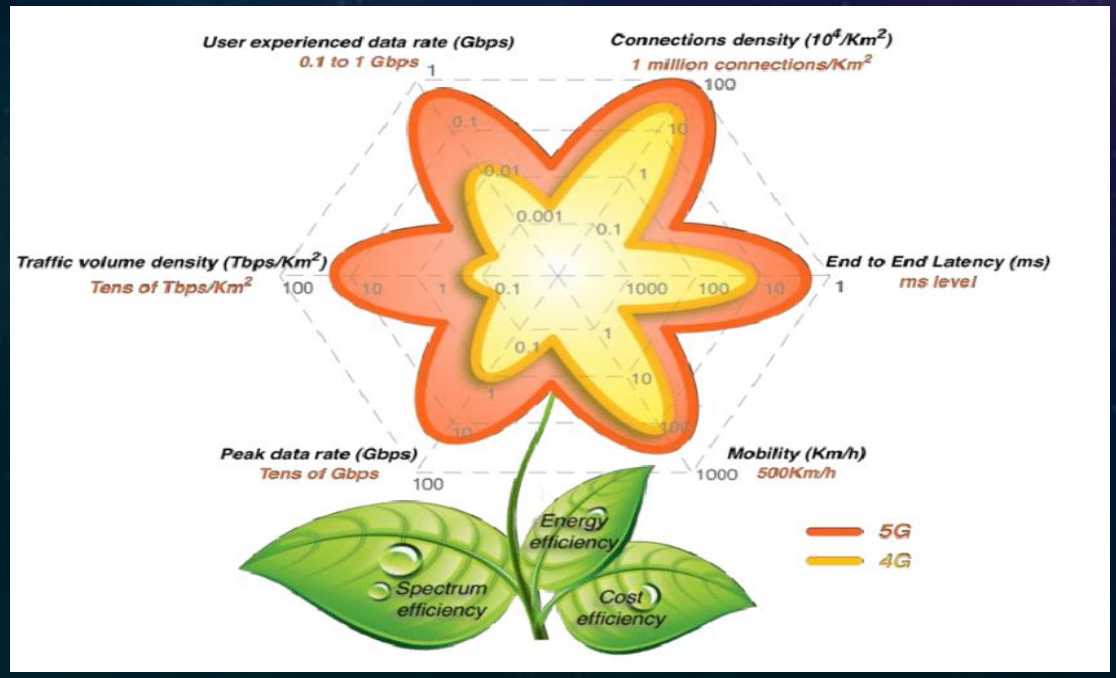


Industry 4.0 Enablers

A	B	C	D	E	FG
AI	Block Chain	Cloud Computing	Big Data	Edge Computing	5G

Performance Requirements

Efficiency Requirements



5G Leads "New Infrastructure"

Data Centers

Capability

Industrial Internet

Smart Factory

UHV Power Facilities

Smart Grid

Power Supply

5G Networks

Computing Power
Data
Scenarios

AI

Smart Transport

IoT

Inter-city Transport
& Rail System

Vehicle Charging Stations

Digital Economy

New Infrastructure

Superior 5G Network

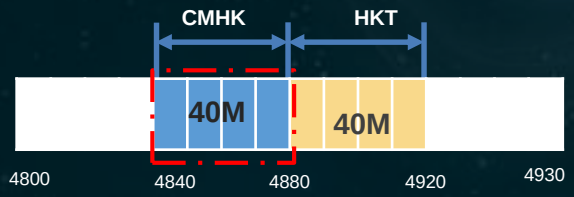
- **Apr-1 of 2020**, CMHK took the lead in commercially launching 5G service
- **Nov-26 of 2020**, commercially launched **1st 5G SA** network in HK
- **The MOST 5G roaming partners**: Mainland China, Taiwan China, South Korea, Thailand, Switzerland, Finland, etc.

3.3GHz spectrum
3.5GHz spectrum

CMHK has 80MHz contiguous bandwidth
- 60 MHz for Outdoor use
- 60+20 MHz for Indoor use

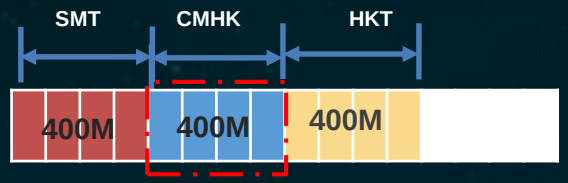
The most C-Band spectrum resource!

4.9GHz spectrum



High capacity covers the entire Hong Kong area, including **restricted areas of satellite stations**,

28GHz spectrum



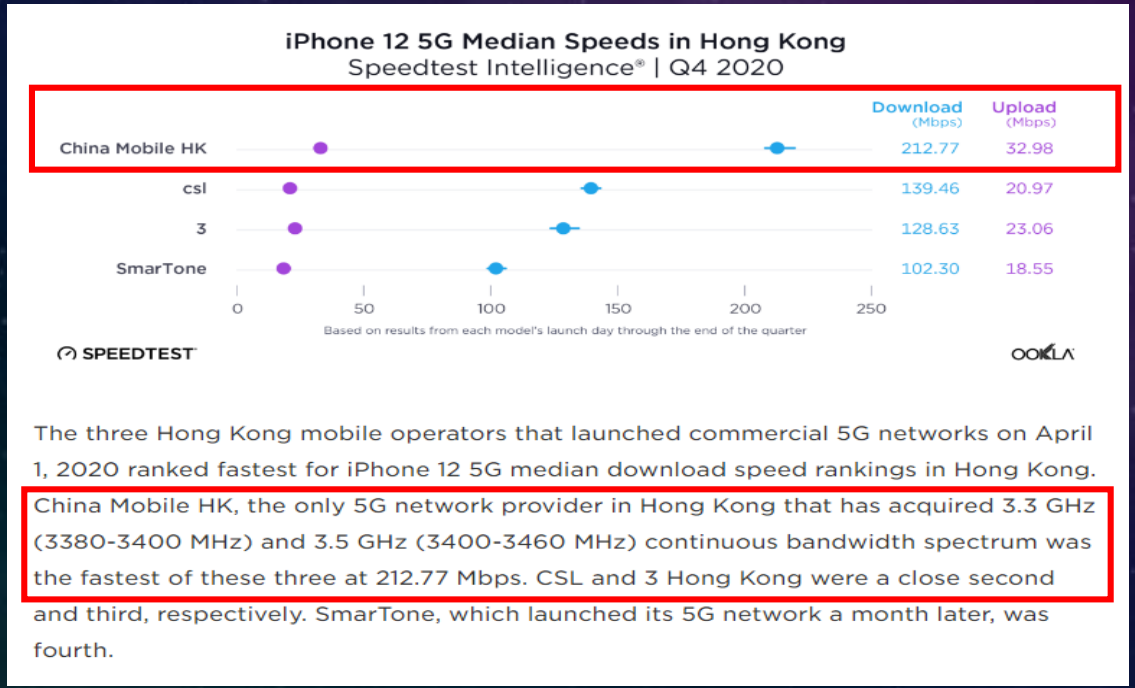
400MHz of bandwidth provides the high capacity and speed services

Source: public information from OFCA

Superior 5G Network

<***e-zone***> evaluation in Oct-2020:

- The Best 5G Network Award
- The Best Cross-Border Roaming Service Award



The three Hong Kong mobile operators that launched commercial 5G networks on April 1, 2020 ranked fastest for iPhone 12 5G median download speed rankings in Hong Kong. China Mobile HK, the only 5G network provider in Hong Kong that has acquired 3.3 GHz (3380-3400 MHz) and 3.5 GHz (3400-3460 MHz) continuous bandwidth spectrum was the fastest of these three at 212.77 Mbps. CSL and 3 Hong Kong were a close second and third, respectively. SmarTone, which launched its 5G network a month later, was fourth.

Speedtest indicated CMHK achieved the best 5G network performance

Evaluation from the independent provider SpeedTest. (14 Jan 2021)
https://www.speedtest.net/insights/blog/apple-iphone-12-launch-5g-speeds/

Joint Innovation Enables Vertical Application

Open | Innovation | Ecology | Application | Collaboration

CMCC Industry Research Institutes

Shanghai

- Industrial Energy
- Transport
- Finance

Xiong'an

- Smart City
- AI
- New technologies

Chengdu

- Education
- Health Care
- Agriculture

5G Innovation Centre

Vision

Create a 5G trillion market
Become a 5G innovation incubator
Create a new business community

700 Industry partners
25 Open labs
3 Corp joint labs

6 Industry alliances
9 Vertical industry chains
5 Universities joint labs

The GBA 5G Industry Alliance

- 131 Industry partners
- 5G Application and Innovation Challenge
- 5G Industry Alliance Seminars
- TVB - 5G change our Lives Working Title

5G Contributes Smart Hong Kong

CMHK x HKIA
5G Private Network

CMHK x FDB Assets:
1st **5G Smart Building**

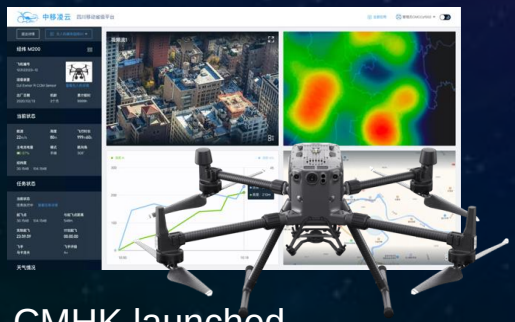
CMHK x ICBC (Asia)
1st **5G Smart Bank**

CMHK launched
5G Streaming Solution

CMHK x ASTRI
5G Autonomous Driving

CMHK x TVB
Miss Hong Kong Pageant with 5G VR

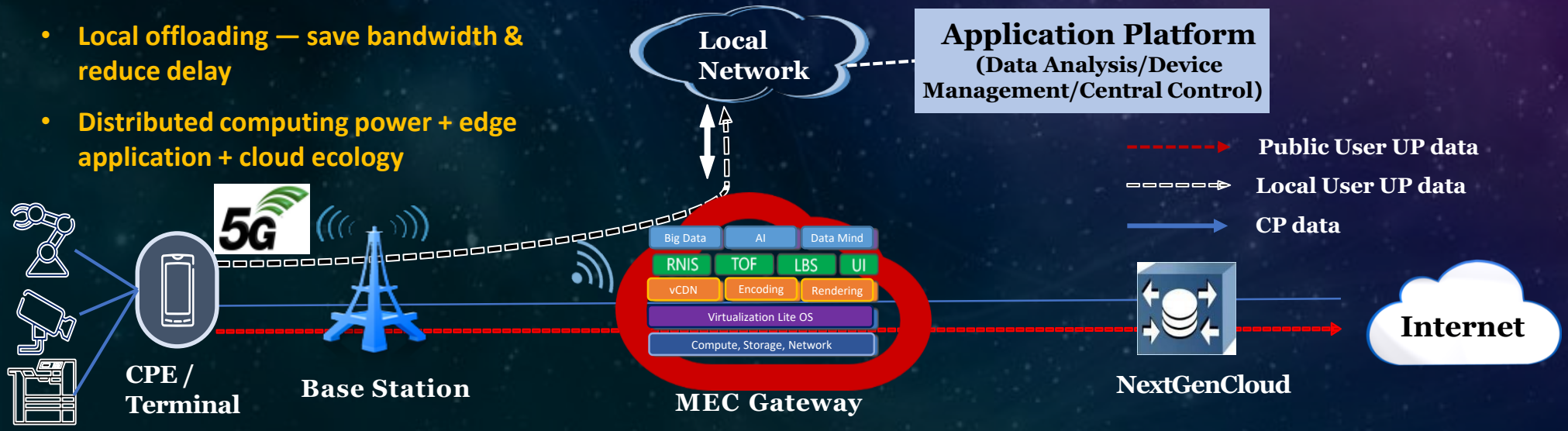
CMHK x SINOPEC
5G CCTV Surveillance



CMHK launched
5G Drone Solution

5G Mobile Edge Computing

- High-level data protection
- Local offloading — save bandwidth & reduce delay
- Distributed computing power + edge application + cloud ecology



Smart Hospital

Industrial network

Smart Port

Smart Industry Park

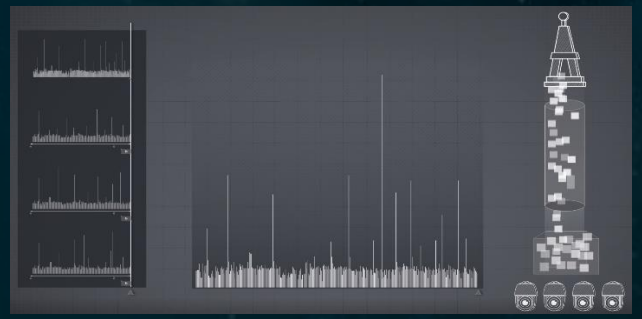
全程智能
FULL INTELLIGENCE

Smart Warehouse

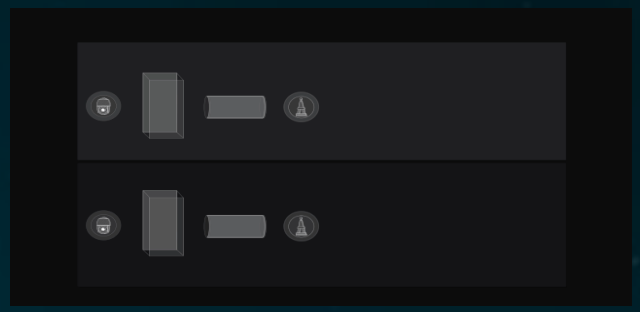
5G MEC + Smart Warehouse

5G Smart Camera

- Built-in 5G module, support 5G NSA/SA.
- Support 4k resolution, efficient H.265.
- Support flexible multi-camera networking.
- Optimization of 5G codec and transmission mechanism.
- Built-in AI chip, x Tops level algorithm.



Intelligent flow control, effectively controlling the peak flow of I frames



Overcome the influence of TCP flow control & increase the effective rate

All-connection Scenes (Fast Installation, No Wiring, Low Cost)

Harbor Remote Control

Traffic monitoring & Management

Site Supervision

Park/Venue

Mobile Scenes (Anytime/anywhere, High-speed Mobility)

Vehicles

Ships

Patrolling Robot

Event-motivated (On-demand and Agile Deployment, Smart Recognition)

Major Festivals

Emergency Measures

Disaster Monitoring

Dangerous Operation Monitoring

5G Connected Drone

5G Terminal for Drone

Flight Control Management Platform

5G network

HD video transmission
Low-latency control

- Flight control management
- Air traffic management
- Video/image processing
- Data analysis
- Load management
- Weather docking
- GIS engine
- Resource Scheduling

Traffic Governance

Search and Rescue

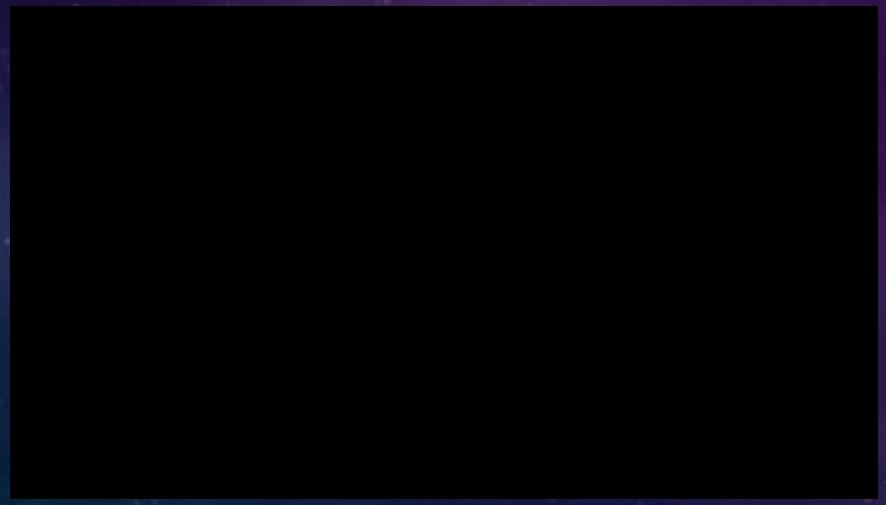
Disaster Inspection

Fire Rescue

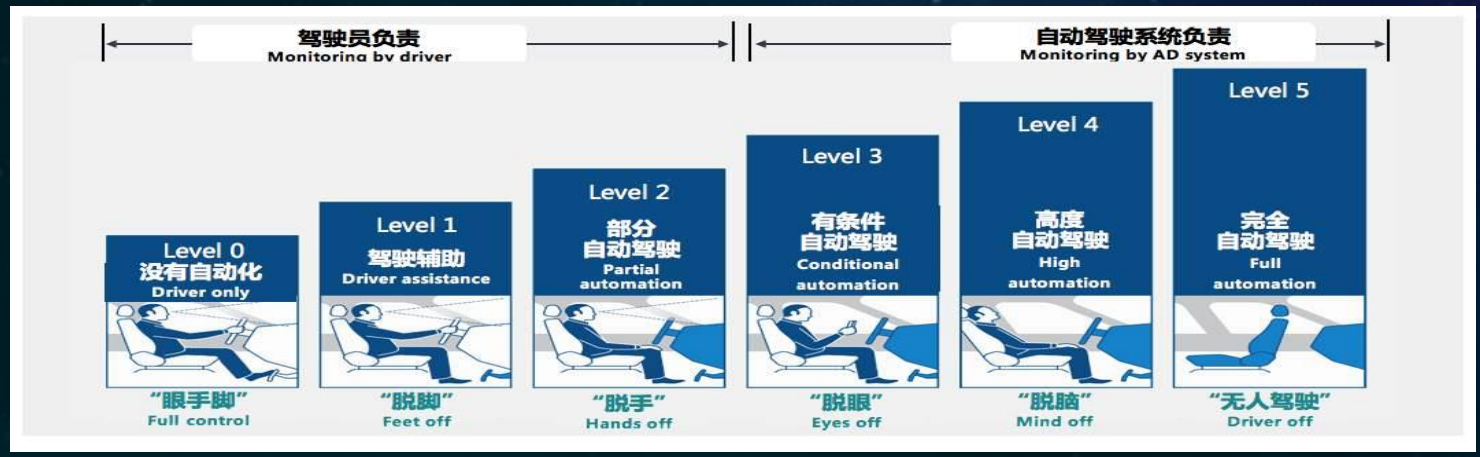
Site Survey

Smart Transport

L4 Autonomous RoboTaxi



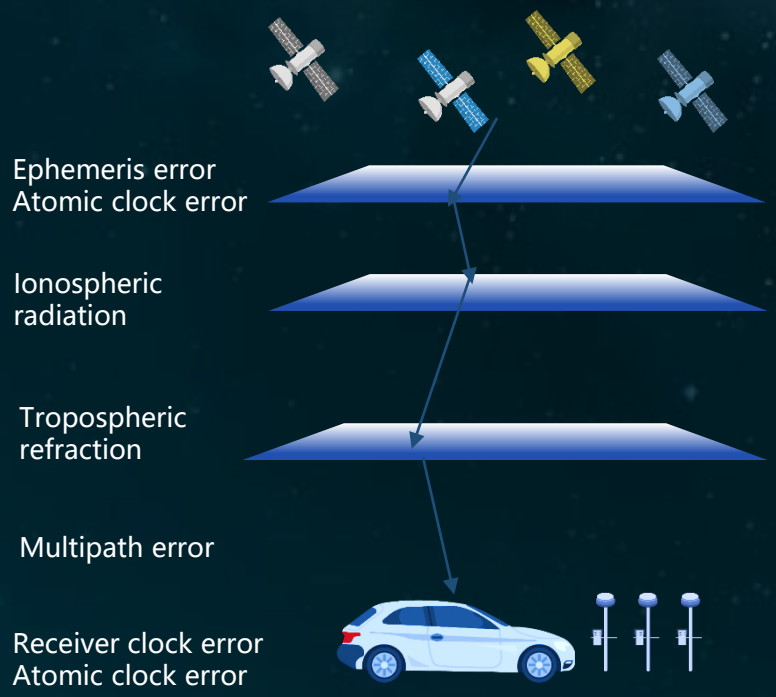
L4 Unmanned MiniBus



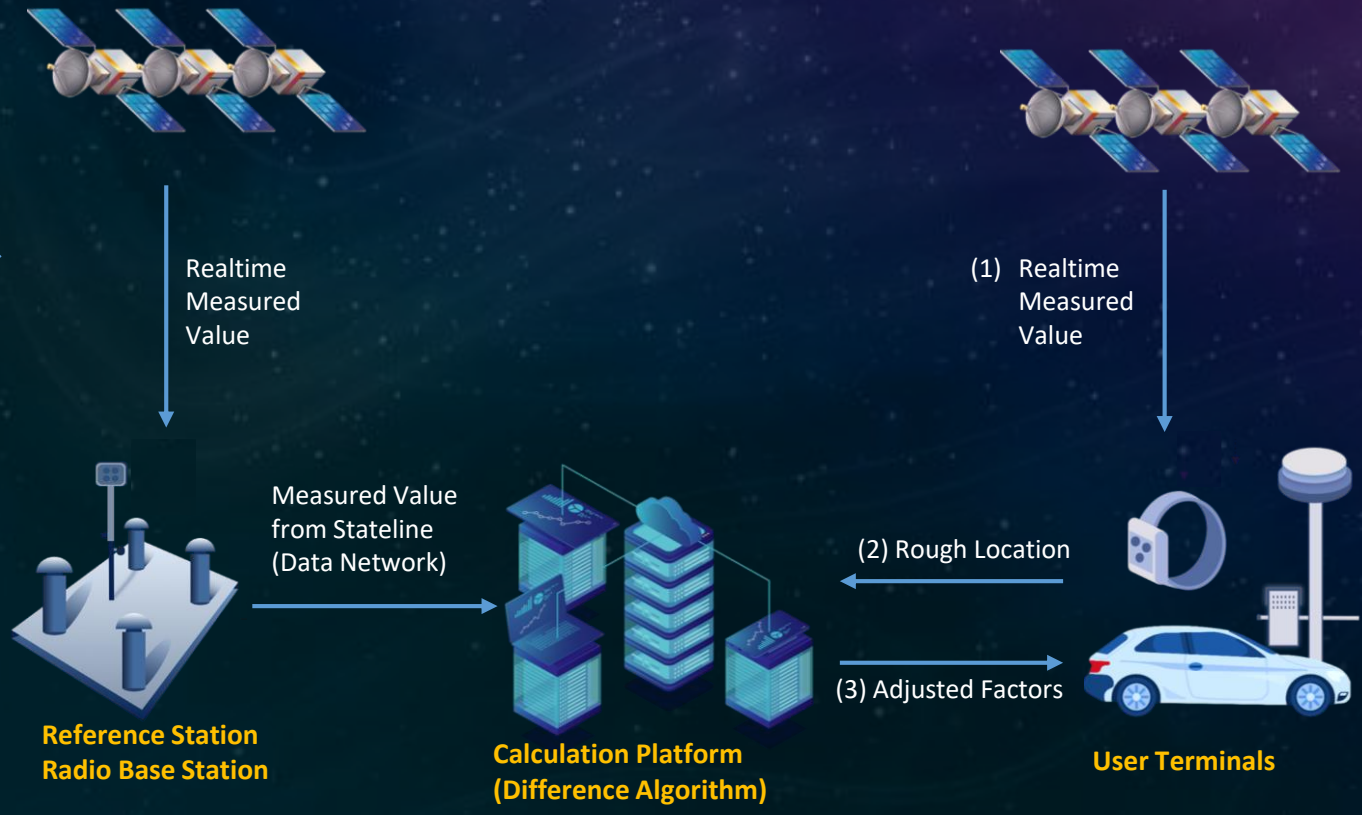
Single Vehicle Intelligence vs. **V2X**

5G+Beidou High Precision Positioning

Through the ground-based enhancement system, use differential information to achieve sub-meter and centimeter-level positioning accuracy



General Positioning Process



5G + AR / VR

5G + AR / VR

(Cloud Processing + Click & Play)

Massive Resources

Cloud Processing

5G Network

Video stream

User Terminal

AR remote support: real-time monitoring & data exchange with expert support at back office.

VR for gaming, education: get rid of VR helmet cables, protect content copyright and reduce VR local processing power through 5G network.

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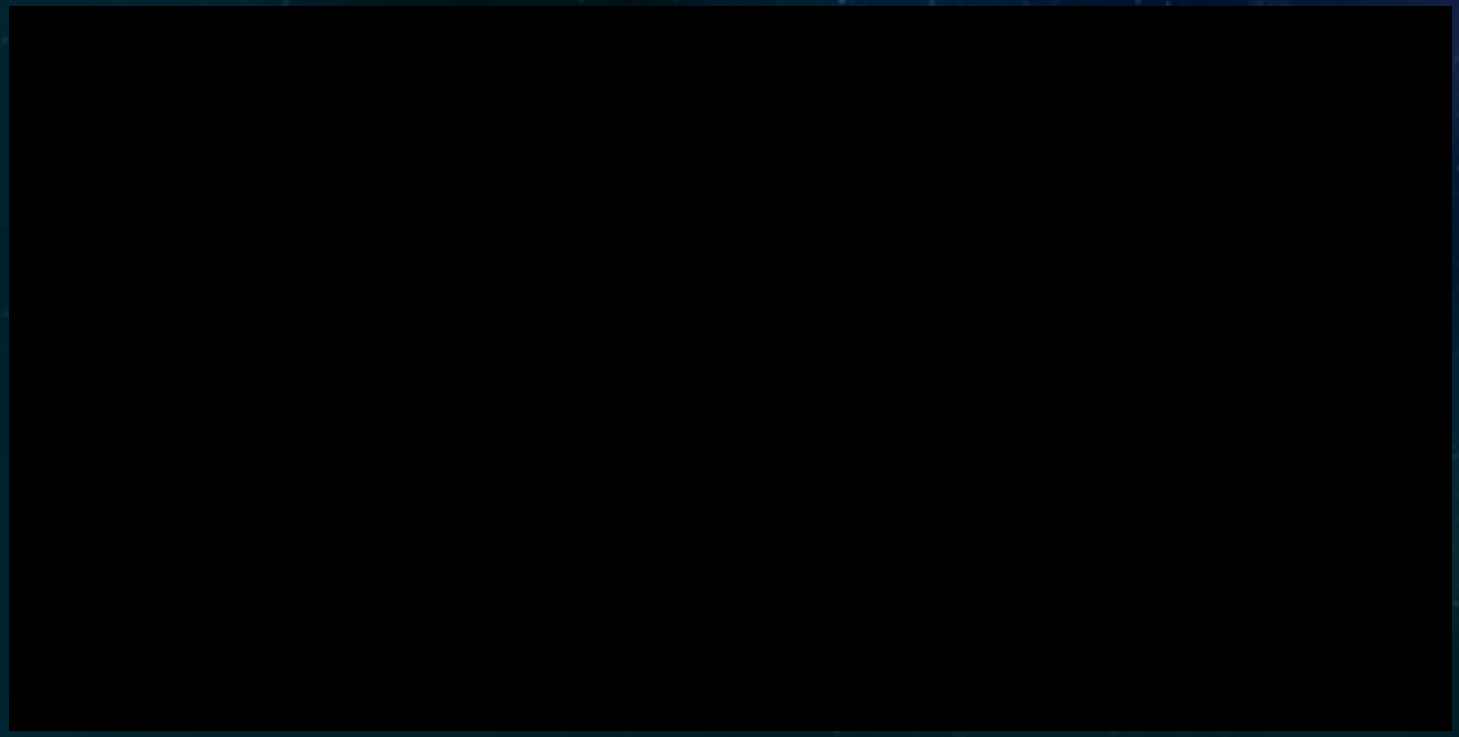
Comparison of 5G / WiFi5 / WiFi6

	5G	WiFi5	WiFi6
Range	• Radius up to 100-300 Meters	• Radius up to X Meters	• Radius up to 35 Meters
Speed	• Supports theoretical speeds up to 10Gbps; • Current downlink speed is 400Mbps~600Mbps	• Supports theoretical speeds of 2.34-3.47Gbps • Typical speed of 100+ Mbps	• Supports theoretical speeds up to 9. 6Gbps ; • Currently device in use can only support up to 2.4Gbps with download speed about 300Mbps
Latency	• Air interface latency <1ms, D2D latency <5ms	• >30ms	• <20ms
Tech & Security	• Massive MIMO • Beamforming • 3GPP Security	• MU-MIMO: Download Only • ISM Unlicensed Access	• MU-MIMO: Upload & Download • OFDMA • ISM Unlicensed Access
Modulation	• 1024 QAM	• 256 QAM	• 1024 QAM
Frequency	• 3.3GHz, 3.5GHz, 4.9GHz, and 26GHz-28GHz; Licensed spectrum	• 5GHz; Unlicensed spectrum	• 2.4GHz & 5GHz; Unlicensed spectrum
Use Cases	• Supports autonomous cars, AR/VR and IoT, etc.	• Wireless display, rapid upload/download, etc.	• Supports business, residential and IoT services, etc.

Smart City

The new infrastructure built with 5G IoT, through the call of cloud and edge capabilities, uses AI and big data engines to drive the deployment of innovative applications to build a sustainable, win-win, and credible ecosystem to provide security for smart cities , Efficient and intelligent integrated intelligent operation system.



Intelligent Operation Center (IOC)

Smart Transport

V2N, V2I, V2P, V2V

Smart Healthcare

5G Ambulance, Remote Operation, VR Visit, AI Diagnose, Remote Consultation

Smart Environment

IoT based environmental data collection

Smart Governance

AI inspection, Surveillance, crowd management.

5G+X Opportunities in Hong Kong

- **The Four Key Industries** : Financial Services, Trading and Logistics, Tourism, and Professional and Producer services.
- **Selected Industries**: Cultural and Creative Industries, Medical Services, Education Services, Innovation and Technology, Testing and Certification Services, and Environmental Industries.

Smart City

Smart Tourism

Smart Building

Smart Medical

Smart Industrial Park

Smart Finance

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China Mobile Hong Kong

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