

5G, The Next Decade Starts in 2019

5G Global Industry Trend & Market Insights

Sevilla, 2019.06.11

Alessio Franci, Huawei Solution Manager



Expected Mobile Applications Versus Reality



Video Call
iPhone

3G

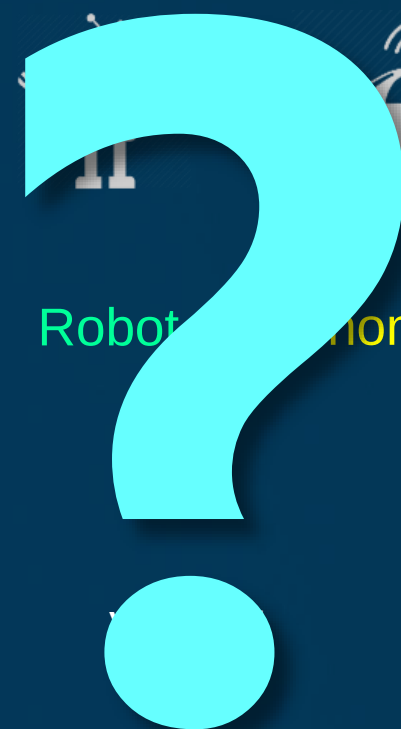


Mobile Live Video
SoLoMo Apps

4G



360 VR



Robot



Autonomous Car

5G

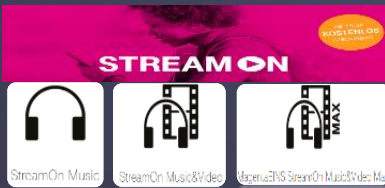
MBB Trend: Evolved Tariffs Rocketing MBB Traffic

Speed Based

XS	S	M	L	XL
1 Mbps 0.2 Mbps	10 Mbps 2 MB/s	50 Mbps 10 MB/s	High-speed	High-speed
CHF 59 -	CHF 69 (extra CHF 54)	CHF 89 (extra CHF 54)	CHF 119 (extra CHF 68)	CHF 179 -

Swisscom,
Sunrise,
Salt

Service Based



TDG, Proximus,
SFR, BYT, NOS,
MEO, O2 UK,
VDF ES, TIM,
VDF Italy, TO2

Data Unlimited



TMNL, Free,
H3G, Tele2

Unlimited data package becomes a trend

25
↑
2016

55
↑
2017

120
↑
2018

150
↑
2019

More and more operators are
introducing unlimited data packages



Netherlands



10x traffic
growth by 2021

Thailand



6x traffic
growth by 2020

Kuwait



50G
DOU

Difficult by the Legacy 4G
to Tackle the Traffic Growth



4G Empowered
with

5G

NR
M-MIMO

MBB Trend: From Data Volume Based to Experience Based



EXPERIENCE
UNLIMITED

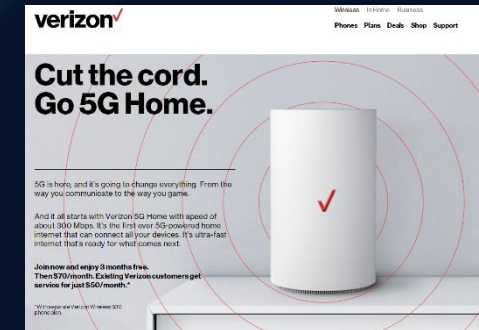
5G New Experience Attributes

Internet Speed

Video Resolution

Low Latency

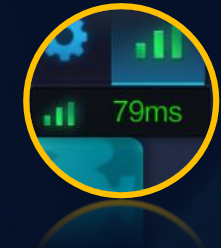
Speed Based Packages



\$50/300Mbps

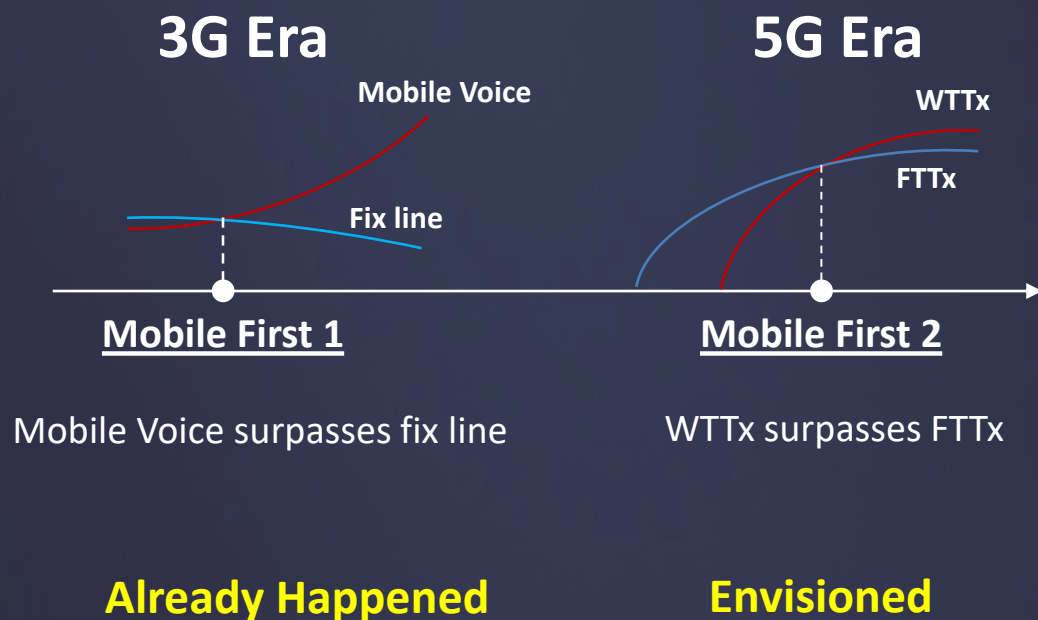


Latency Based Packages



MBB Trend: “Mobile First” for Internet and Video

WTTx to become mainstream



All Video to become Mobile

Monitor Smartphone HD TV VR/AR/Holography



Resolution

2D

3D

720P

~1.5Mbps

-

1080P

~4Mbps

-

2K

~10Mbps

-

4K

~25Mbps

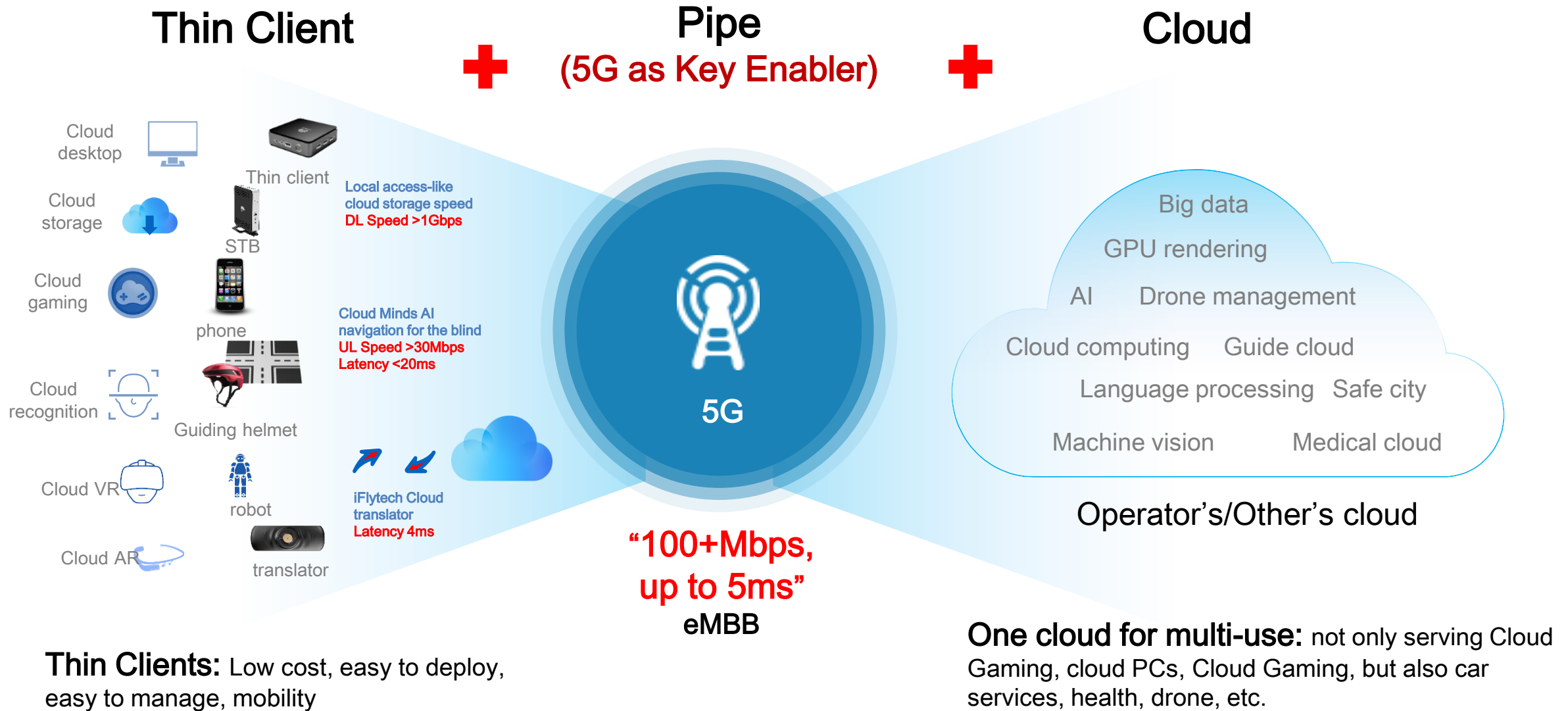
~50Mbps

8K

~100Mbps

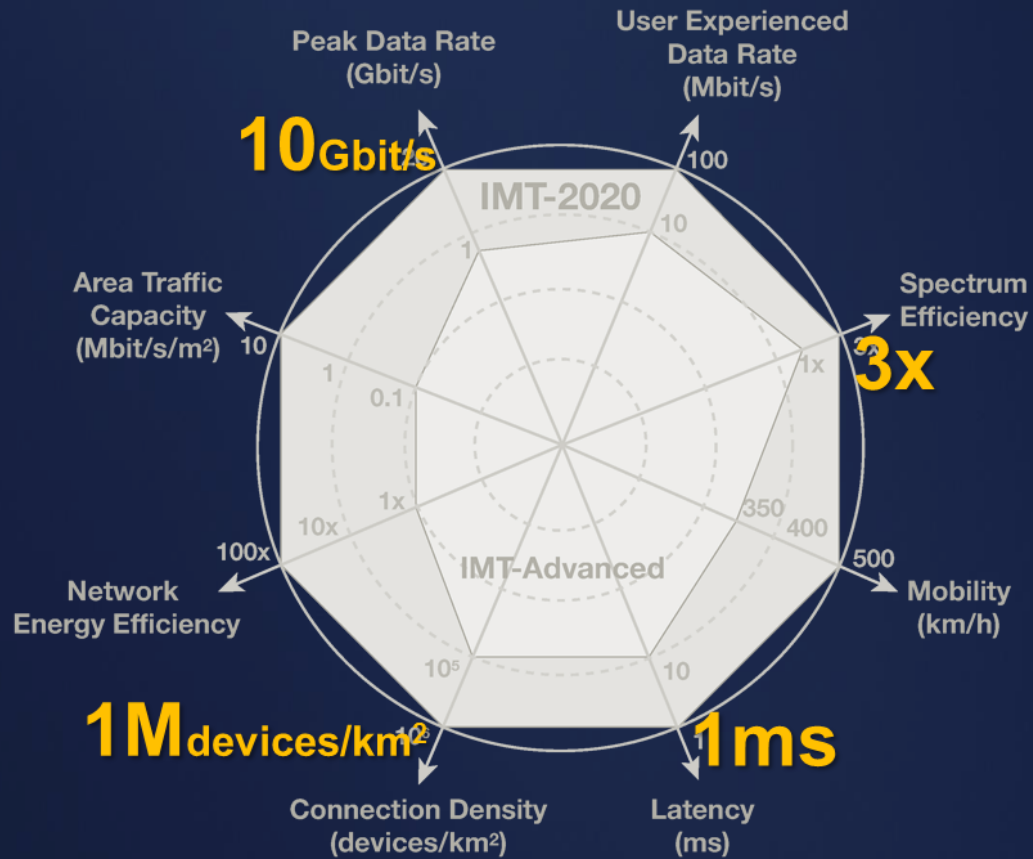
~200Mbps

MBB Trend: Cloud X Thin Client, Broad Pipe, Cloud APP

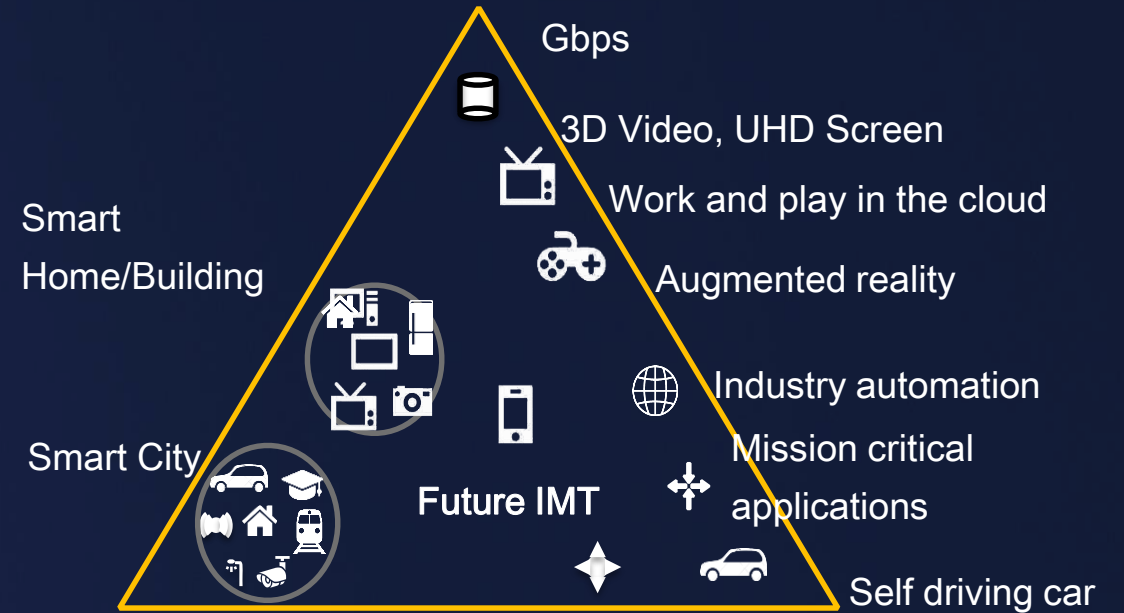


Key 5G Capabilities – IMT2020

ITU-R



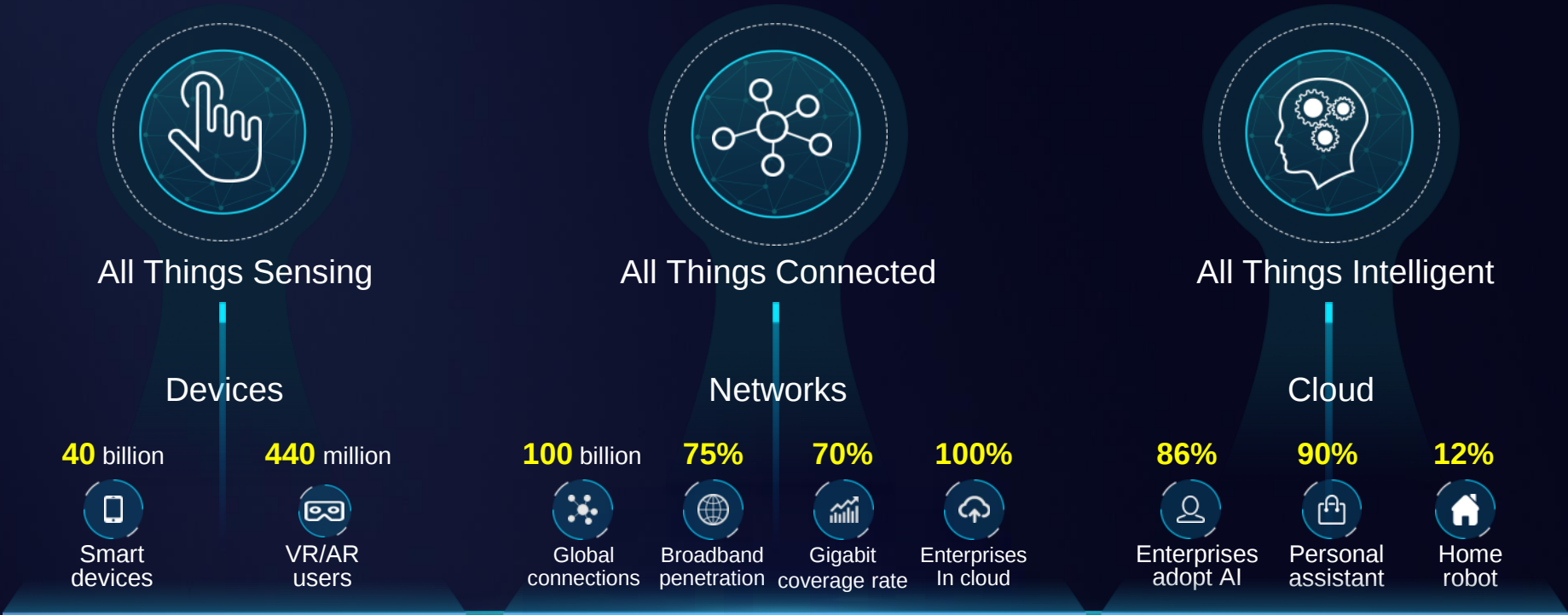
eMBB Enhanced Mobile Broadband



mMTC
Massive Machine Type
Communications

uRLLC
Ultra-reliable and Low-latency
Communications

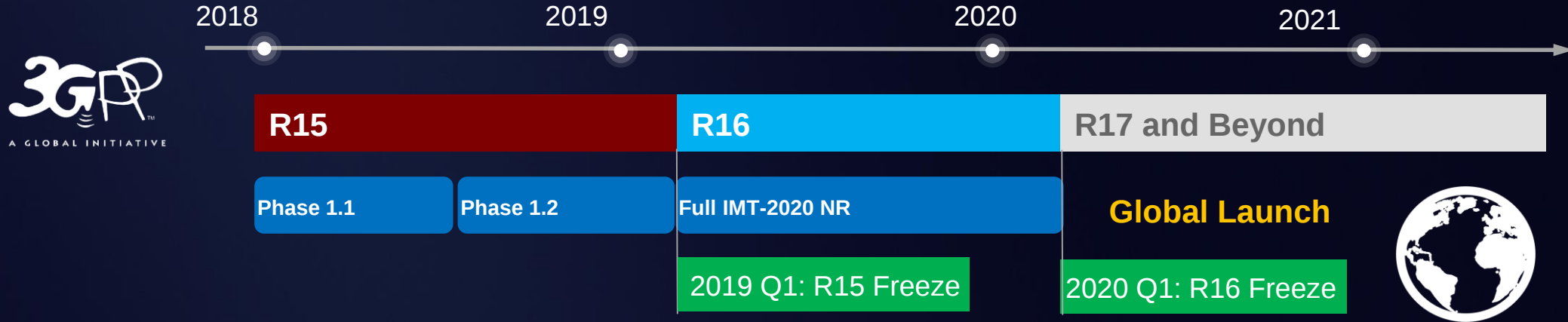
5G will be the foundation of a fully connected world



By 2025, Source: Huawei GIV

5G

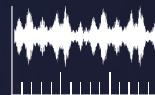
3GPP 5G Standard Evolution Timeline



- **R15** 3GPP 5G Protocol Release mainly focuses on eMBB scenarios and freezes most of the eMBB key features.
- **R16** Enhances eMBB Capability and Establishes uRLLC/mMTC Commercial Ability:



eMBB Capability Enhancement

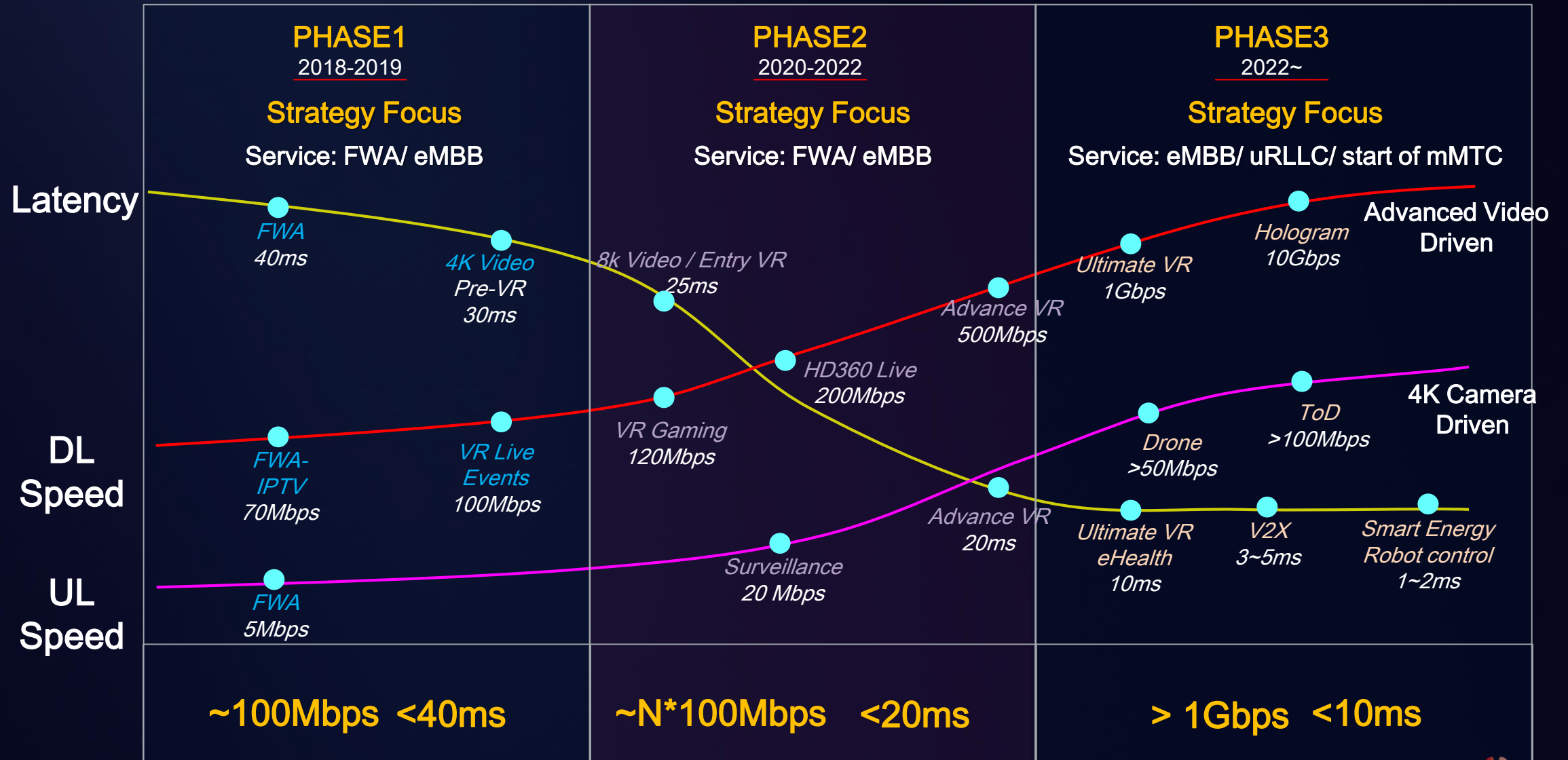


Improve Spectrum Efficiency & Flexibility

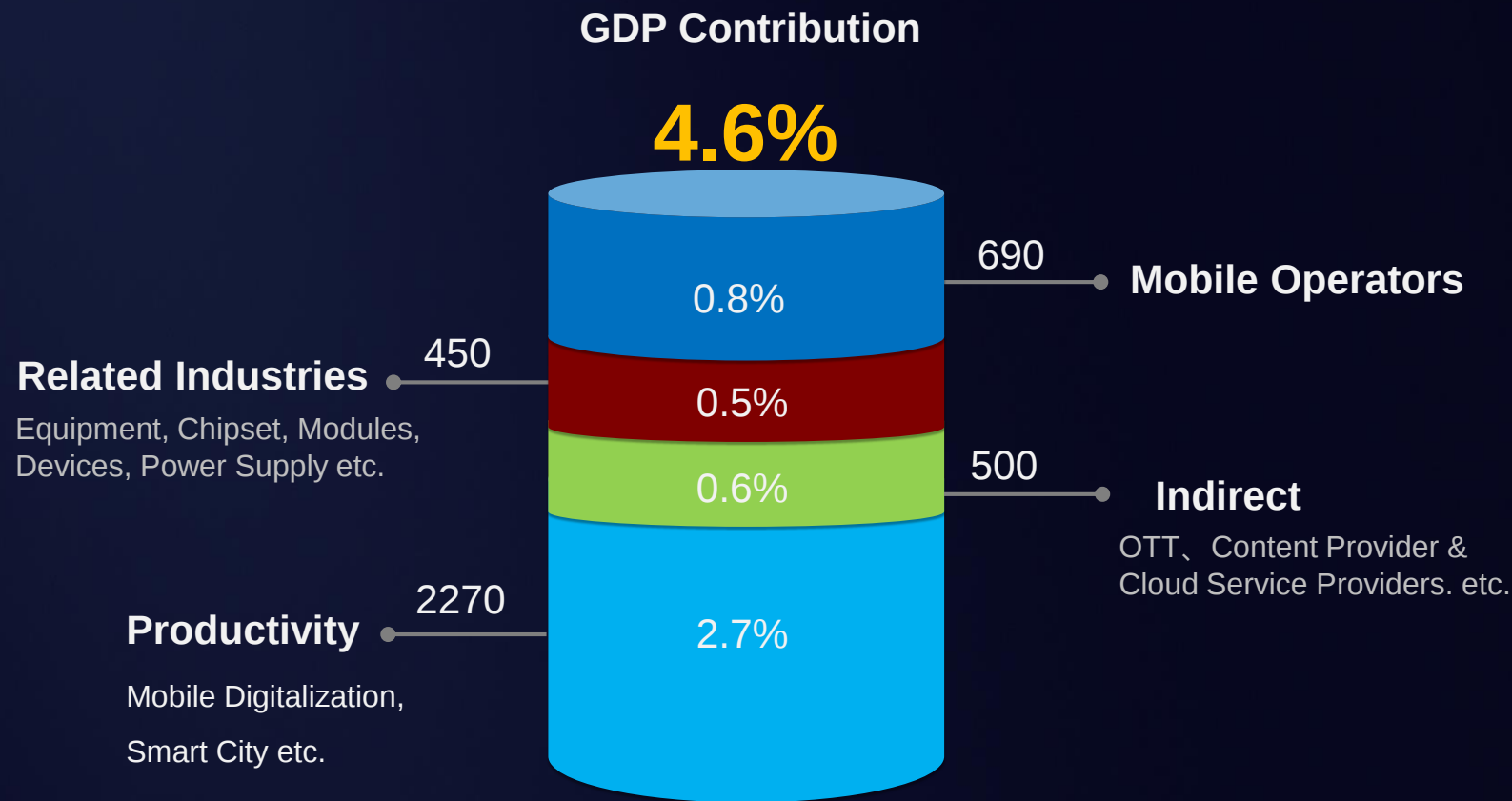


Vertical Industries Commercialization

5G Evolution: from eMBB to Digital Society in Phases



Mobile Industry has Contributed 4.6% of Global GDP in 2018



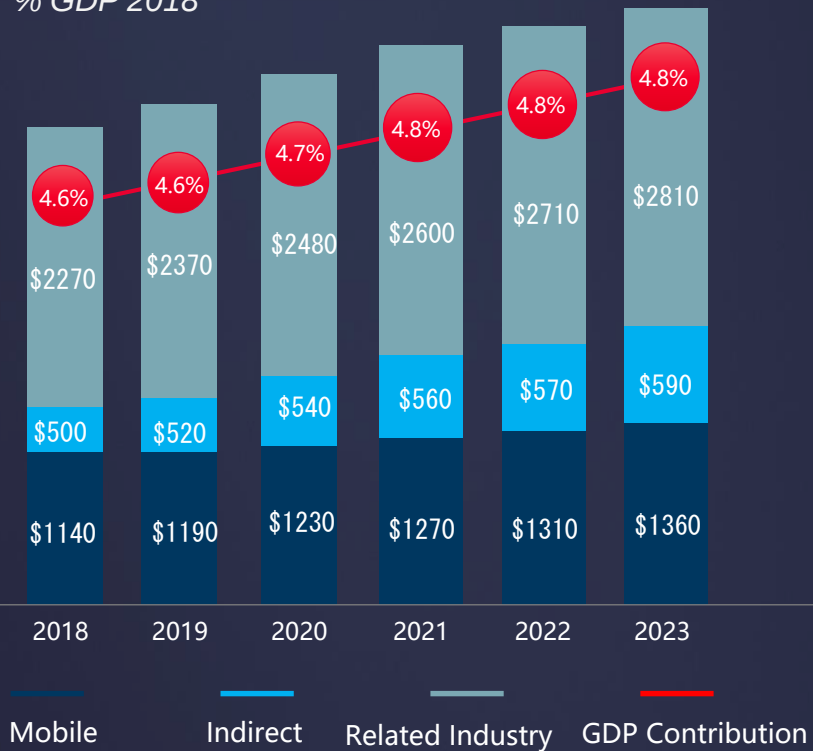
\$ billion, % GDP 2018

Source : GSMA Intelligence , Feb,2019

5G will become a driving force to contribute to Global GDP

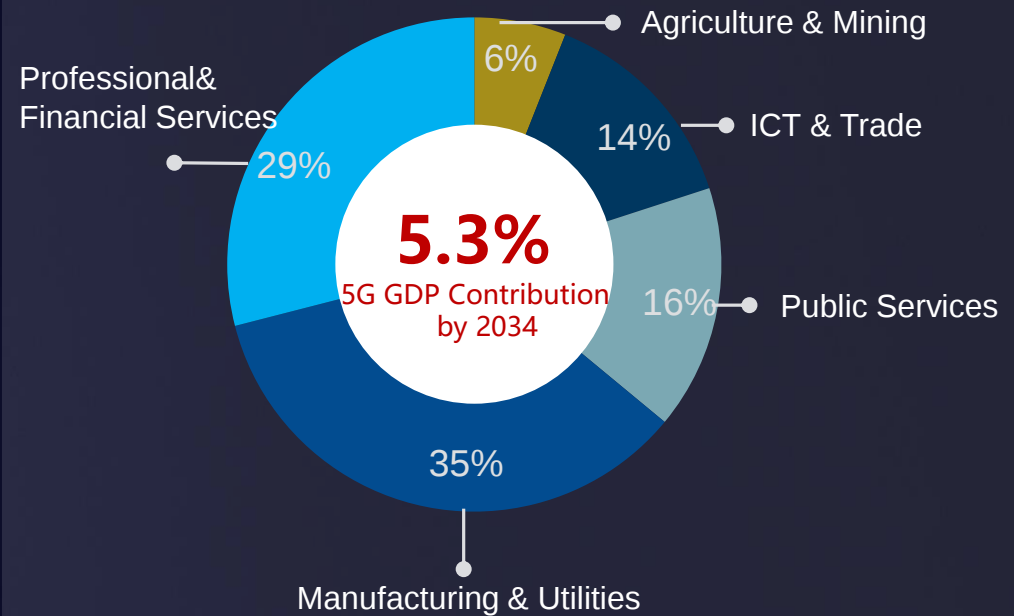
Mobile Industry's Contribution to GDP Will Increase Year by Year

\$ billion, % GDP 2018



Source: GSMA Intelligence, 2019年2月

5G will drive 5.3% GDP growth in 15 years



Source: GSMA Intelligence, Feb, 2019

Why are the leading Telcos going for 5G?

1

National strategy



Made in China 2025



National Strategic Plan for Advanced Manufacturing

2

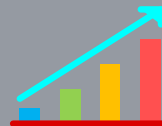
Branding competition

Win market by Best 4G

3

Reduce cost/bit

10x Traffic for Next 5Yrs



4

Capability preparing

Practise Rollout O&M in advance



5

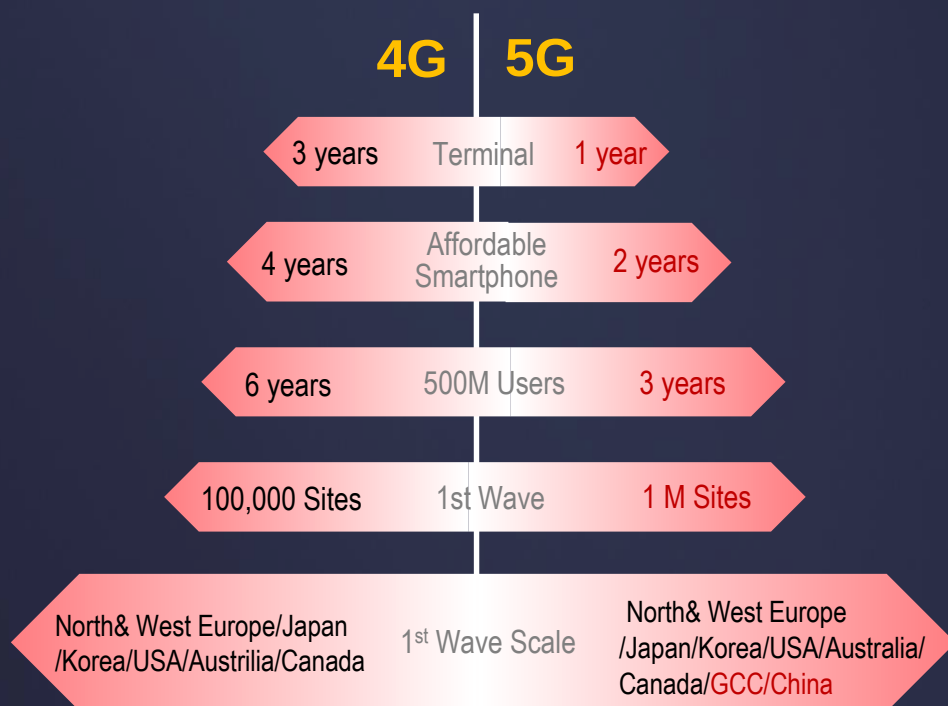
Transformation : Unlock new revenue



5G Arrives Faster than Expected

- **10** years to achieve 500M subscribers for 3G, **5** years for 4G, **3** years for 5G.
- For the first time, large scale commercial terminals and networks are available simultaneously with 5G.

5G Industry Development is Much Faster than 4G



50+ 5G Terminals been Released until May. 2019

- Quick Launch, Mass Release, Various Type & Affordable Price
- The Earliest Time to Market is **Apr, 2019**, the Lowest Price is **599 Euro**

Smart Phones



CPE Devices



hotspots



modules



snap-on dongles/adapters



USB terminals



Source: GSA, May 2019

Other Possible 5G Devices to Come:

VR goggle, Personal IoT devices, vehicle devices. No defined timeline.

VR goggle with Sim

Samsung Gear VR



Oculus Go VR



HTC Vive Focus



Personal IoT

Cameras



Personal Health



Pet Cams



Toys



Smart Watches



Child Trackers

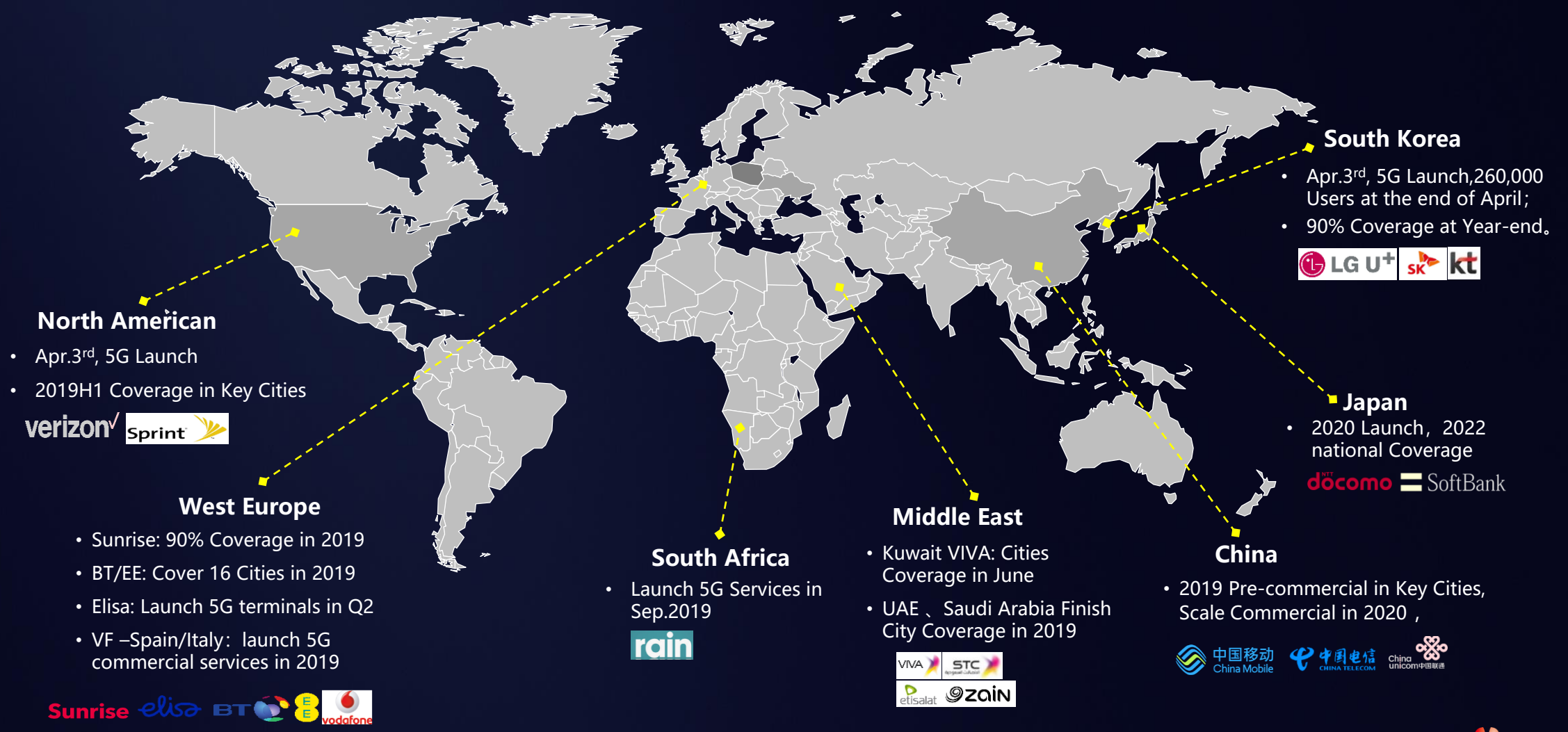


Plug-in vehicle devices



Emerging new devices in B2C might lead to new bundles and unlock possibilities for new revenue

Global Operators has released 5G Commercial Plan in Key Markets



5G for All Scenario: Unlimited Business Possibilities

Digital Crowded Area

 VR Live Stadium

 360 Concert

 AR Live Museum

 Crowd Management

Digital Community

 Home Broadband

 Public WiFi

 4K IPTV

 VR Entertainment

Digital Manufacturing

 Digital Oil Field

 Smart Grid

 Robotics

 Remote Control

Digital Transportation

 Tele-Operated Driving

 Autonomous Bus

 Autonomous Car

 Fleet Management

Digital Sky

 Flight WiFi

 Drone Logistics

 Drone Surveillance

 Drone Aid



Cloud VR



Fixed Wireless Access



Internet of Things



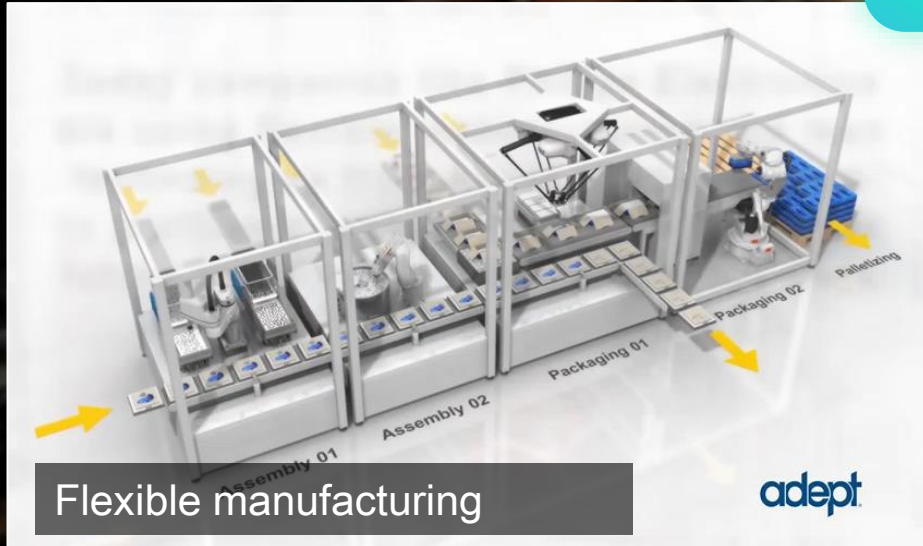
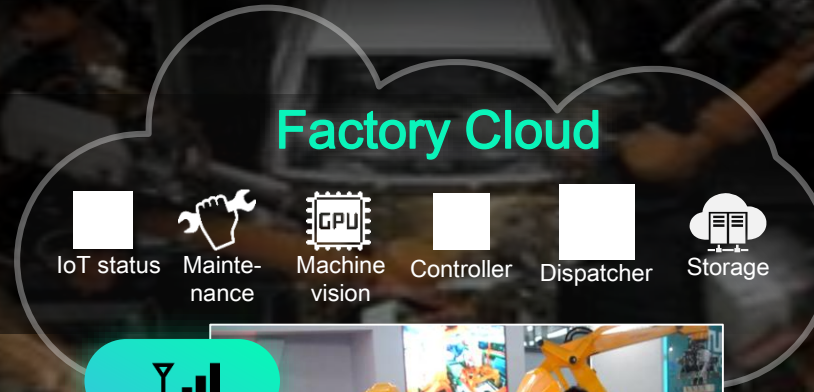
Connected Car



Service Drone

Digital Manufacturing

Wireless Connected Factory



Mobility + Cloud

Shell & KPN - Port of Rotterdam



- ① Inspection robot
- ② Wireless sensors
- ③ Connected worker (5G helmet, AR Glass)
- ④ Predictive maintenance
- ⑤ Automated Guided Vehicle (future)
- ⑥ Cellular-based HD positioning (future)
- ⑦ Remote crane operation (future)



Digital Transportation

Wireless Connected Vehicles



Connectivity is the enabler

Platooning ToD Self-Driving V2X



TOD Platform
Platooning Platform V2X Platform



C-V2X Field Demo @2018 GMMBF, UK



10ms E2E Latency
50 km distance to control center

No.	Use case
1	SLW: Speed Limit Warning
2	ICW: Intersection Collision Warning
3	EBW: Emergency Brake Warning
4	BSW: Blind Spot Warning

Vodafone, Jaguar Land Rover and Huawei have undertaken a live demonstration of a full Cellular Vehicle-to-Everything (C-V2X) connected car system with the potential to significantly improve road safety standards in the near future.

The 1st City-level IoV project @Wuxi, China

The 1st City-Level IoV Application Demonstration Project in the World

Demonstration zone scope

- Core urban area, Taihu New City, 240 traffic crossroads are built, cover 170 square kilometers, 1 elevated freeways.

Application scenarios

- Provide warning for traffic light guided pass, car speed guidance, priority to ambulance and traffic conflicts at crossroads.

V2X application platform

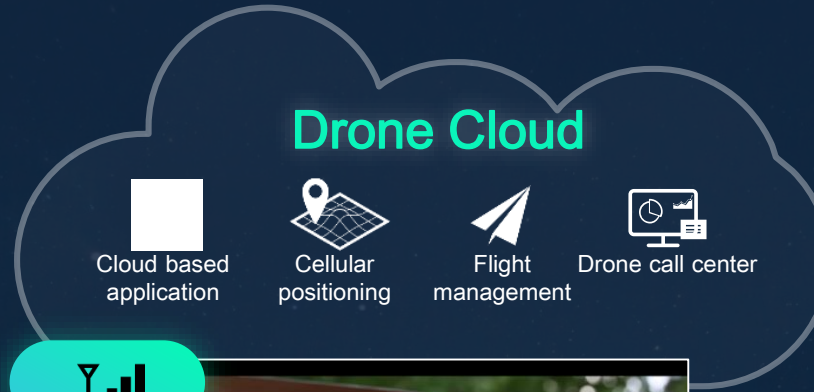
- Support 100,000 vehicles get connected simultaneously;
- Process 1 million data per second, shorter than 80ms of delay;
- Data sharing with traffic police platform, TSP platform and image business platform;
- Connect to ambulance, fire truck, bus and other social service vehicles, improve general efficiency.



Audi tested and demonstrated 15 different V2X functions together with partners: Huawei, China Mobile and the Wuxi traffic police. Audi also received its first test licence for autonomous driving (level 4) on public roads in Wuxi

Digital Sky

Wireless Connected Drones



Digital Sky 1.0

Remote control, safe flight

Agriculture & plant protection

10m

Power line & infra. inspection

50m

Digital Sky 2.0

Beyond vision line flight, HD video

Security & logistics

100m

Professional survey

150m

Digital Sky 3.0

Cloud intelligent and auto. fly

Fly Taxi & trunk logistics

>500m



Huawei supporting Vodafone for UAV tracking and security system based on AI algorithm to provide the Radio Positioning Technology (RPS).



Discussing with DT the ways improve low-altitude aerial coverage.



Huawei provides the low-altitude air coverage for the safe and flexible integration of initial U-space services in a real environment.



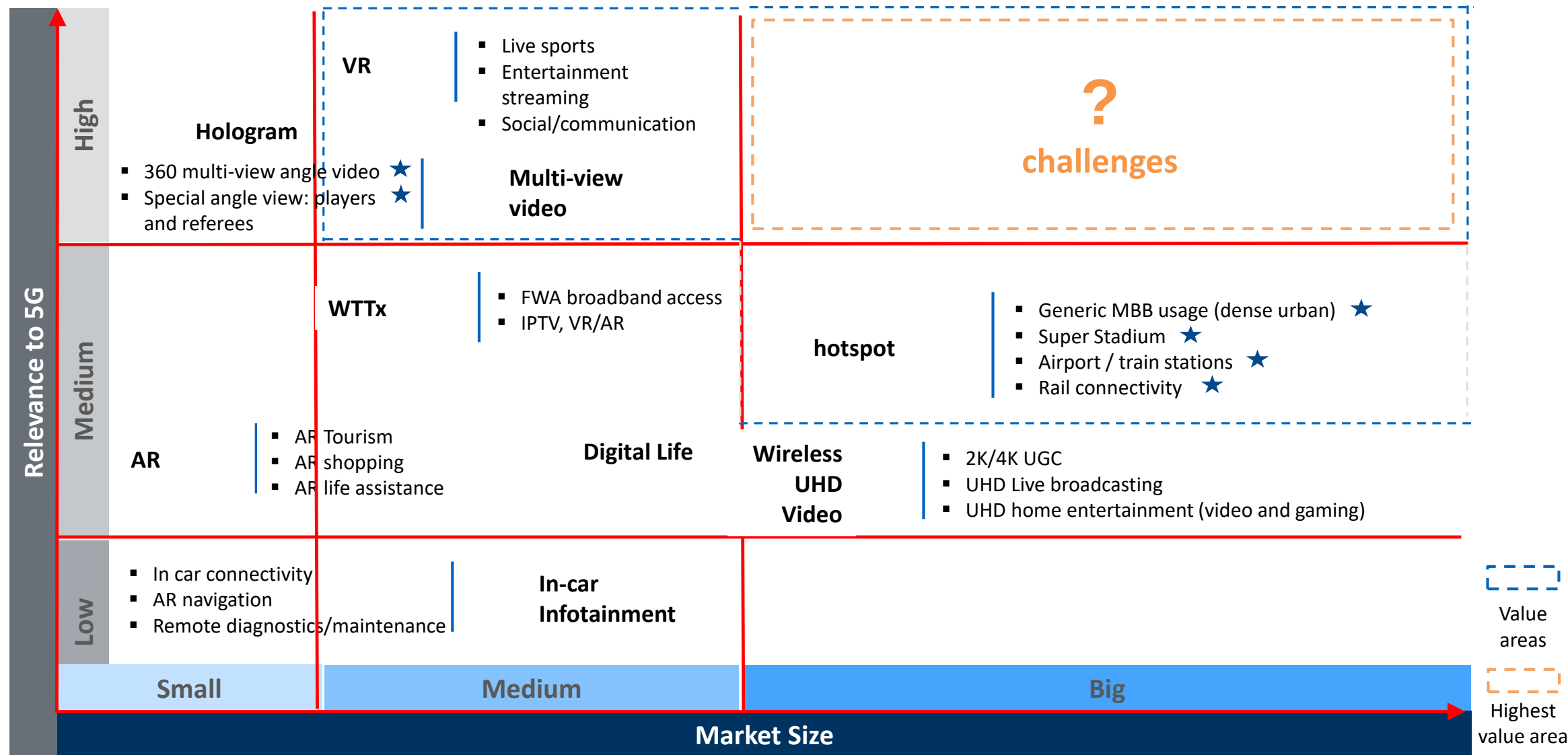
Huawei's technology to identify and locate drone users based on the operator's SIM card will be combined with Unifly's UTM platform to enable ANSPs to integrate drones into the airspace safely and securely.



- Deliver low airspace coverage
- Incubate drone application innovation
- Enable digital sky industry

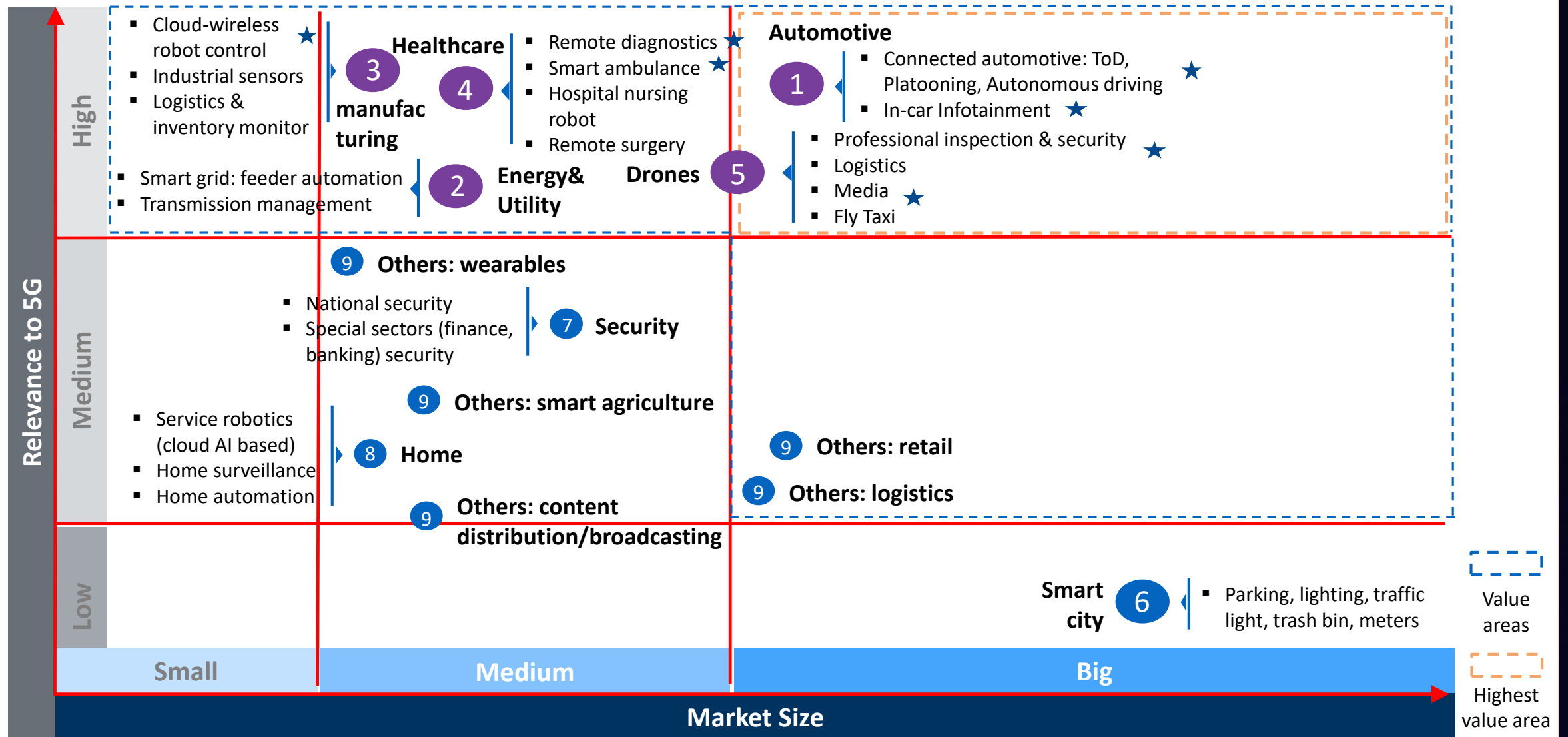
Summary on Initial 5G eMBB use cases: pre-launch around 2020

We see the challenges in finding use case and proposition in highest value areas in eMBB pre-launch



Post-launch 5G B2B use cases: 2022 and beyond

We see 5 main use case categories with priority to be considered for post-launch



Thank you!

