



5G Wireless Goes Beyond Smartphones

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Envision

A BETTER CONNECTED WORLD



The Horizon

Everything on Mobile



Everything Connected



Everything Virtualized



A connected world is just a beginning

Next Wave of
Digital Society

5G will Revolutionize all the Verticals

400MHz

Open OTT

D2D

IoT

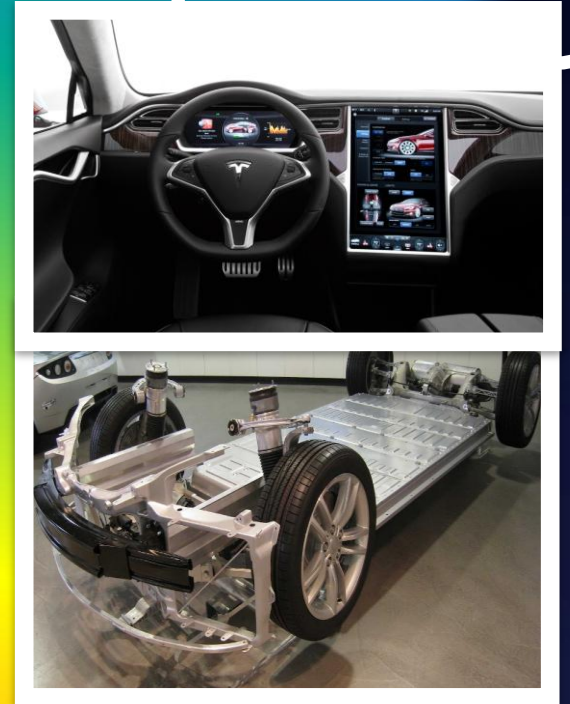
SDN-RAN

10GHz

MBB

Verticals

100GHz



Fibre-Like User Experience

"Zero Distance" to the World



Macro:
1Gbps~4Gbps

Micro:
3Gbps~10Gbps

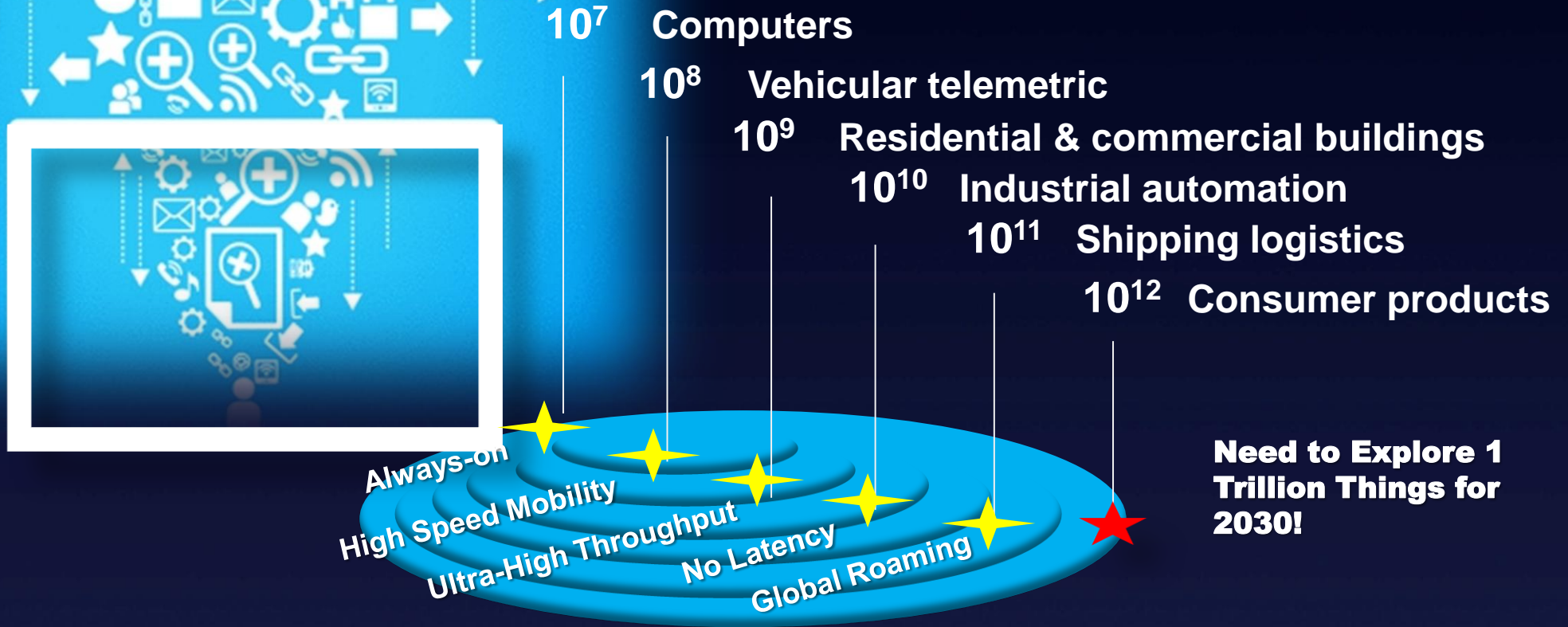
Local:
10Gbps~100Gbps



5G is for Massive Capacity



100 Billions of Connections

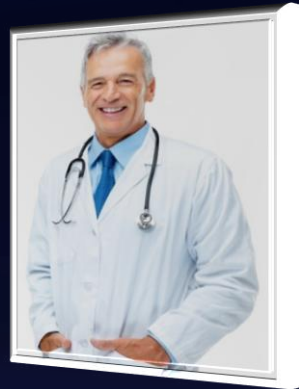


5G is for Massive Connectivity

Industry and Enterprise Innovations



Auto-drive



**Medicare
Personalized
Medicine**



**Robots
Industry 4.0**

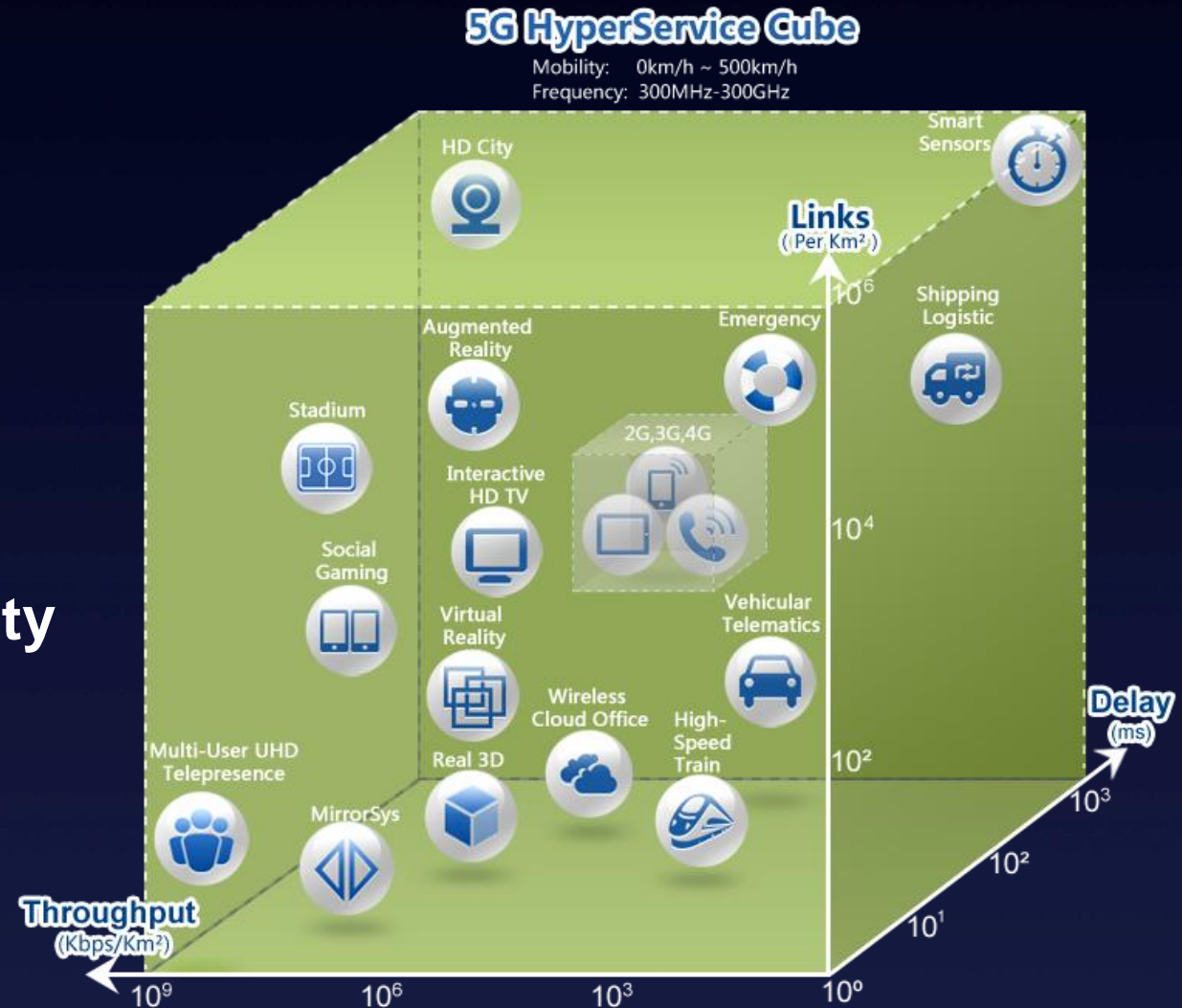


**Meters
Sensors**

5G will Transform the Industry Verticals

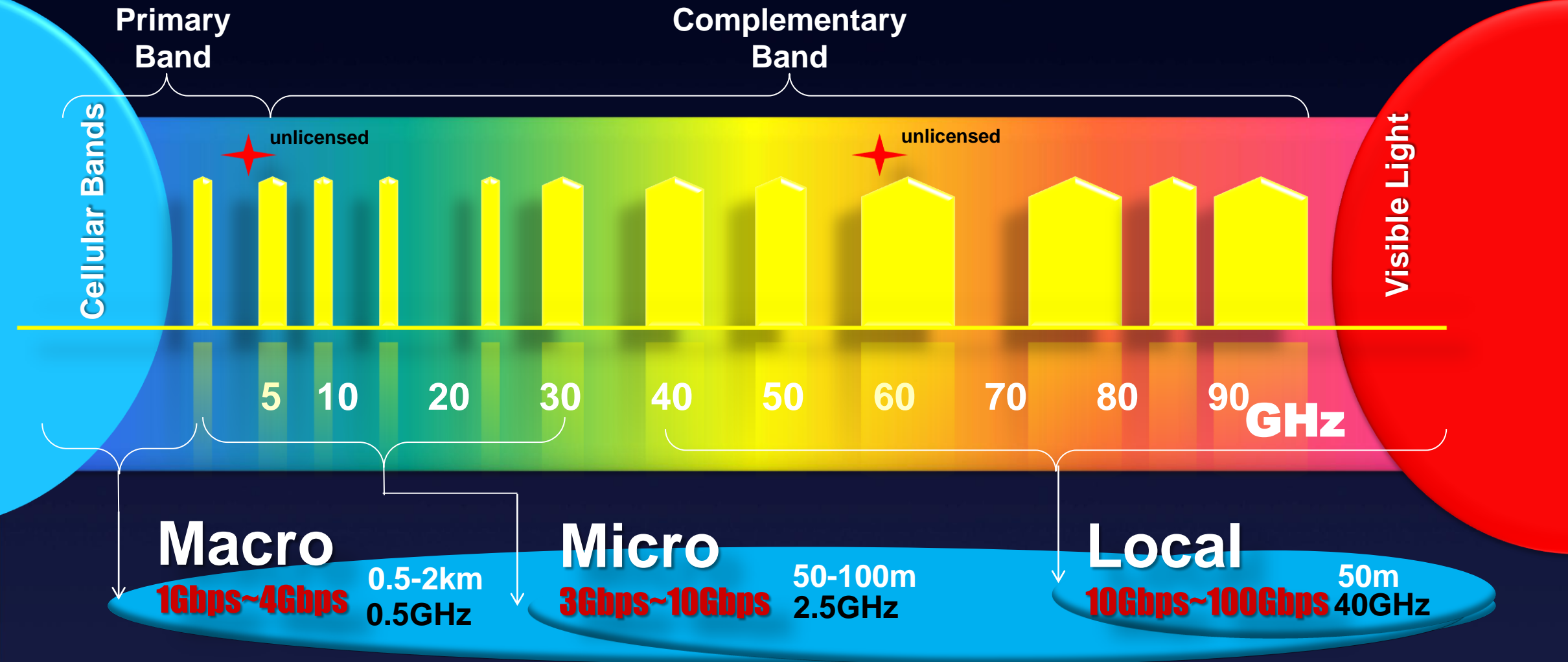
The 5G Radio Technology Challenges

- Stretched in 3 Dimensions
 - Speed
 - Links
 - Response
- Spectrum Efficiency
- Virtualization of RAN
- Software Defined and Simplicity
- Service Aware and Monetize

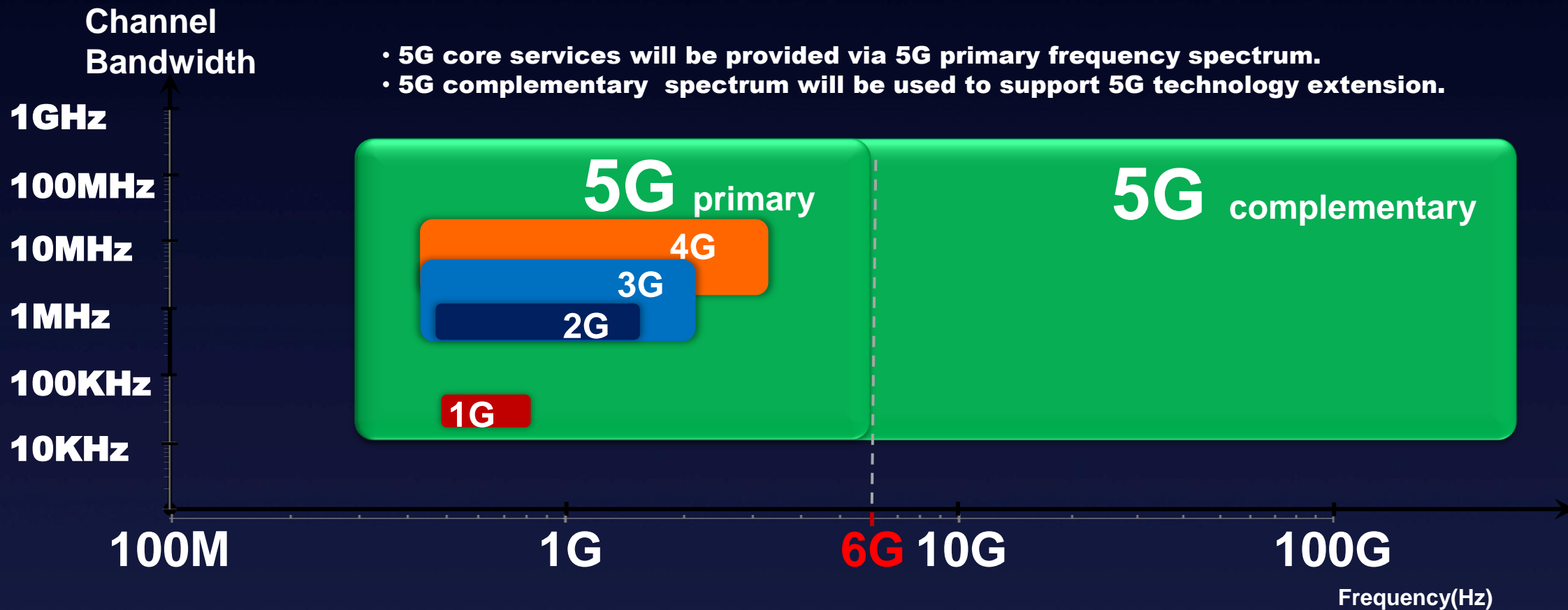


Single & Unified Air-Interface (Software Defined)

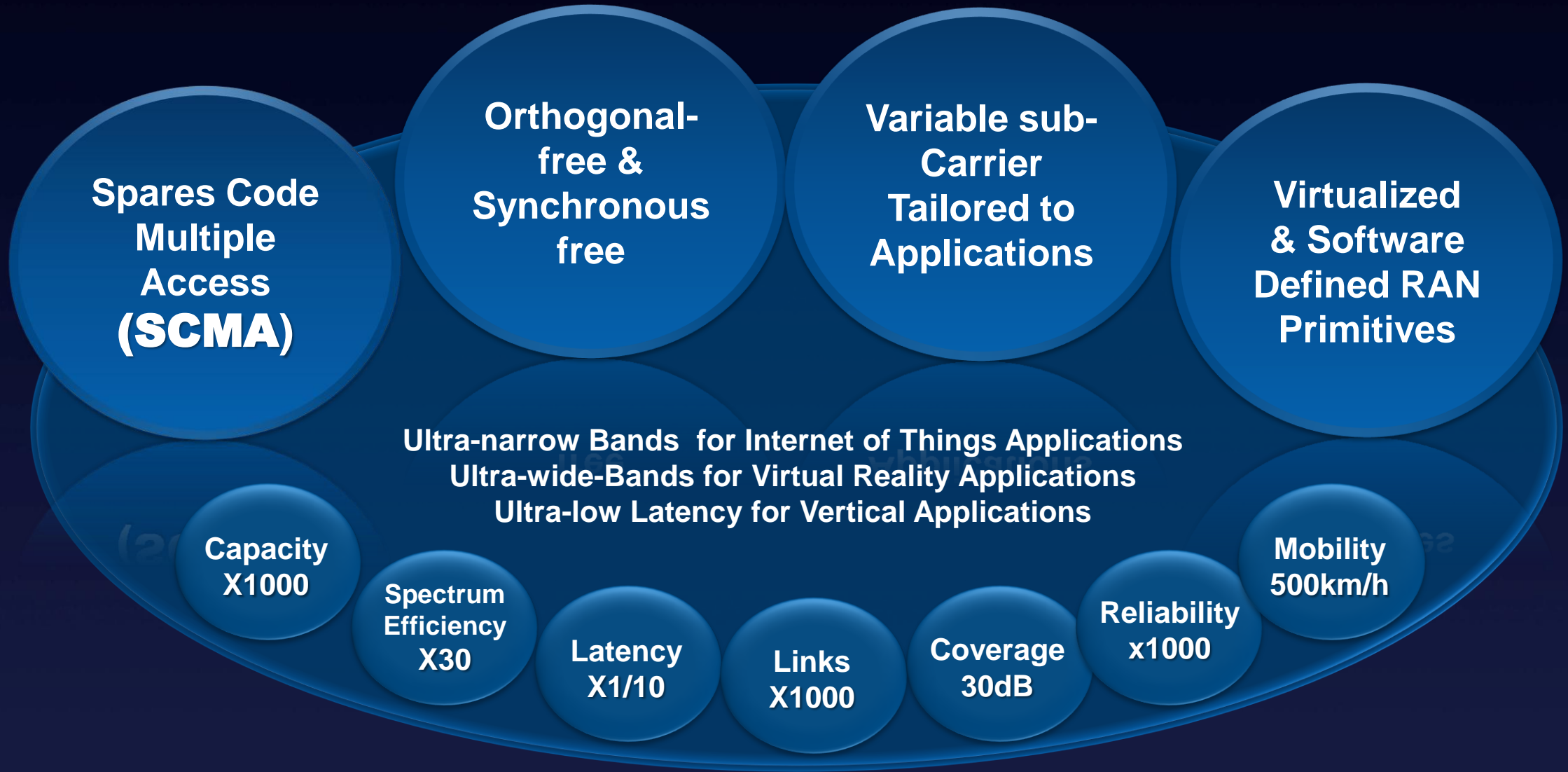
5G Supports All Spectrum Access to Avoid Market Fragmentation



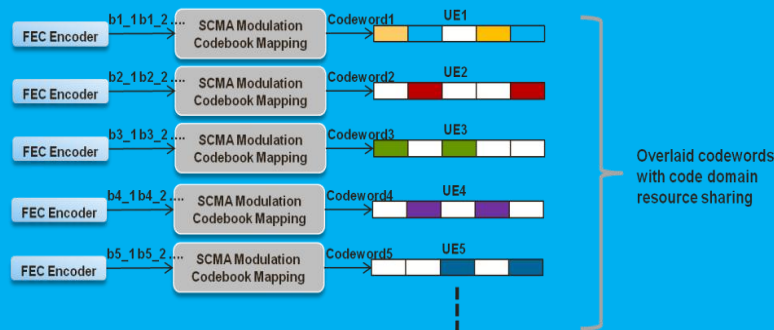
5G Primary Bands and Complementary Bands



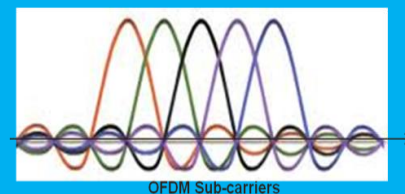
SCMA: the 5G Radio Technology



Adaptive Waveform

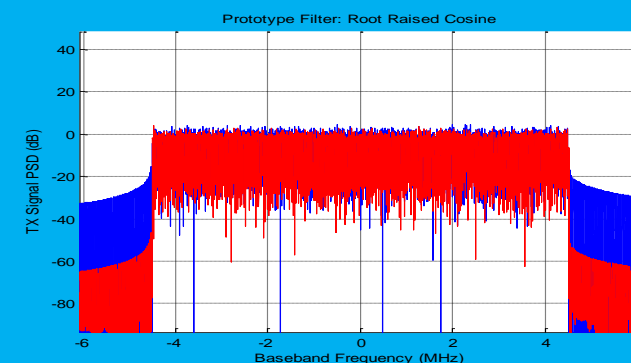
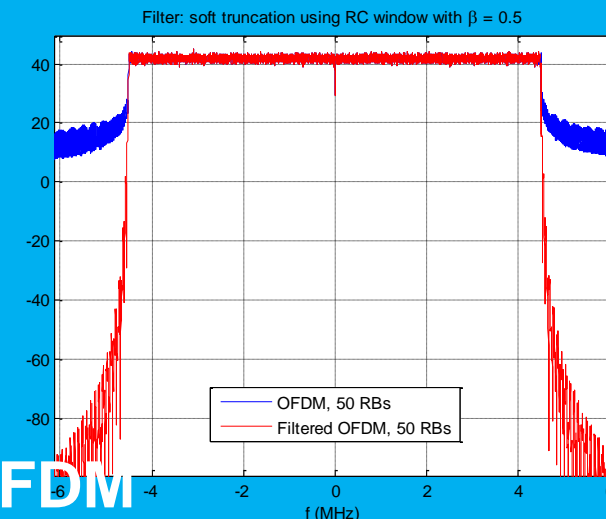


SCMA



FTN

f-OFDM



FBMC

5G Wireless Requirements For FEC

Human Centric Communications:

The user data rate: **10Gbps**

iPhone, iPad, iGlass, iWatch

The base station data rate: **1Tbps**

cloud computing blade

Machine Centric Communications:

The sensor data size: **10~100Bytes**

meters, telemetric, RFID,

The industry control: **10^{-4} second latency**

Could-drive-car, factory control

Human Centric Visual Communications with Future Media

Power Consumption Barrier at Device

1 Device 1 Day \rightarrow 1 Hour 5G video call

10Gbps \rightarrow 3600×10^{10} bits/Hour

1 Device \rightarrow **10 Watts/Hour** video call

Today LDPC FEC Decoder: 10^{-9} J/bit

\rightarrow Require 100 times simplified encoding/decoding techniques, *yet approach Shannon Limit*

Machine Centric Communications with Sensors

Power Consumption Barrier at Machine Sensor

AAA Battery \rightarrow 4000J (1000J for FEC)

100Bytes \rightarrow 8×10^2 bits

10^6 bits for 10^3 J budget

$\sim 10^3$ meter reading message

1 message per day \rightarrow 3 years battery life

5 years battery life and 1 message/minute

\rightarrow Require 1,000 times simplified offline encoding/decoding techniques

Minimum Encoding/Decoding Latency

0.1 ms is the target

Current technology is 1ms to 2ms

→ Require 10 times reduction

Huawei 5G Technology Breakthroughs

MPR-FullDuplex



50Gbps Base station



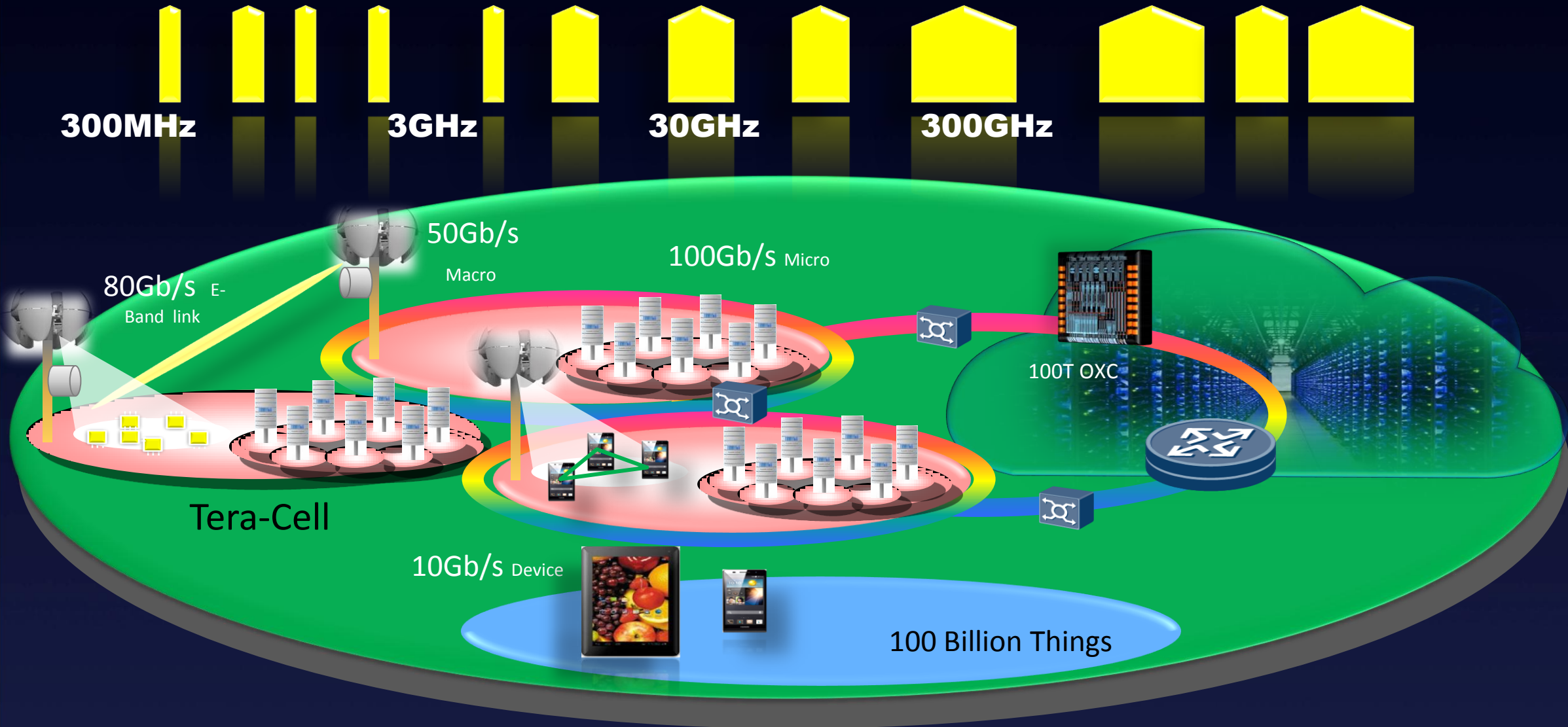
Virtualized Radio



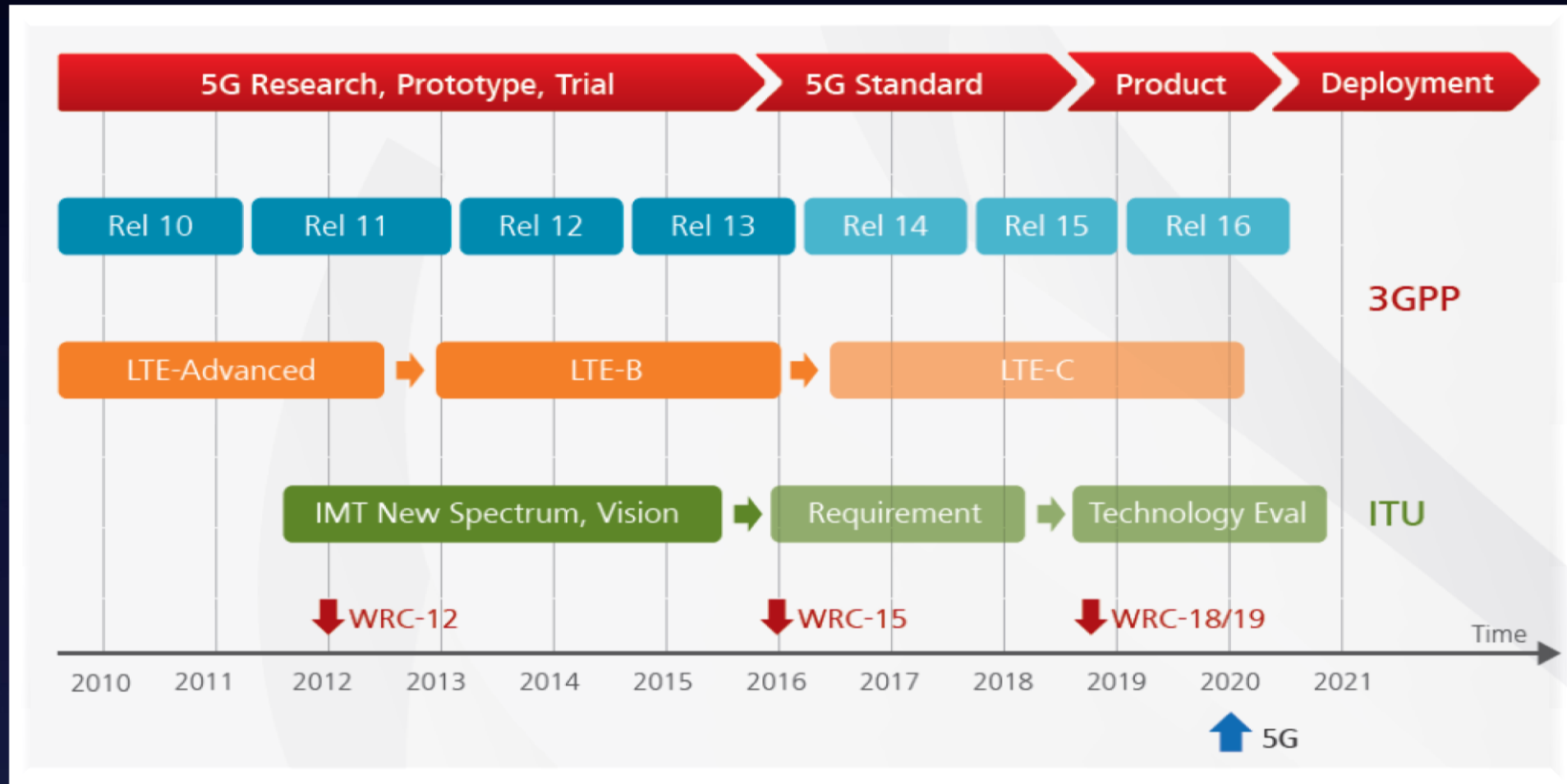
100Gbps Wireless



5G Wireless RAN



5G Timeline



THANK YOU

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