As Utilities e os Desafios da Infraestrutura 5G

Workshop 5G

UTCLA – São Paulo/2019

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Cisco do Brasil

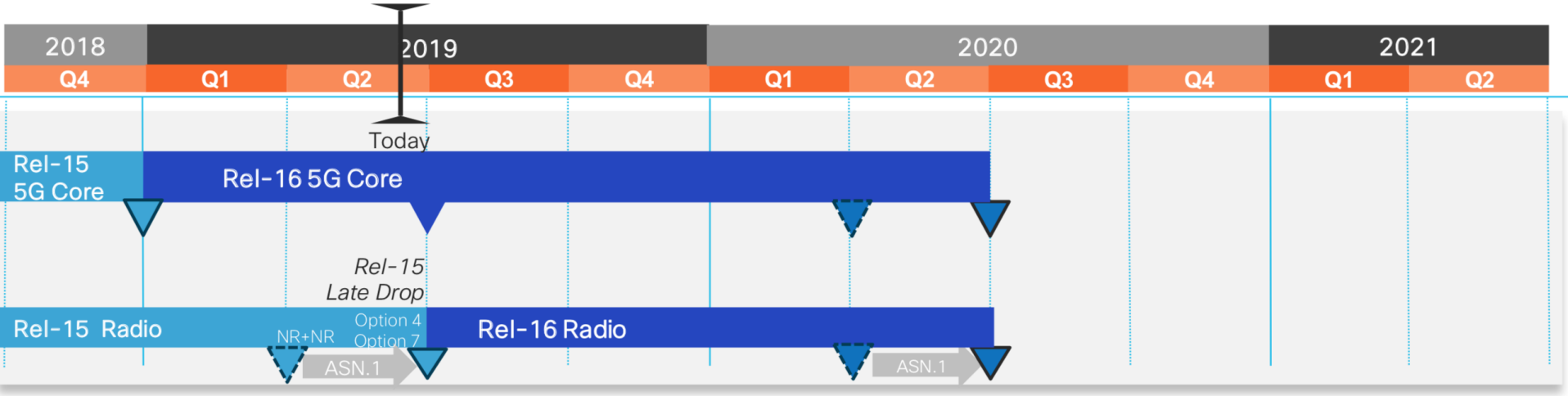
Agenda

1. 5G – Where we are?
2. 5G Use Cases
3. Market Forecast
4. 5G Technology Challenges
5. Network Transformation

5G Where we are?

You make multi-cloud **possible**

3GPP Standards Timelines for Release-16



Rel-15
- New Radio (NR)
  - NR NSA (w EPC)
  - NR SA
  - Wide BW (~400 MHz)
  - Wide Freq Range (upto 28GHz)
- New 5G Core
  - Cloud friendly (SBI)
  - NaaS (Slicing)
  - MEC

Rel-16
- Radio
  - NR in unlicensed band
  - Industrial IOT (TSN)
  - Accurate Positioning
- 5G Core
  - Slice Management
  - Network Analytics
  - Private and neutral hosted-core
  - Wireless/Wireline (Cable/BNG) Integration
  - Time Sensitive Network (TSN)
  - NB-IOT RAT connected to 5GC
  - Enhanced SBA

Converged Access & Core

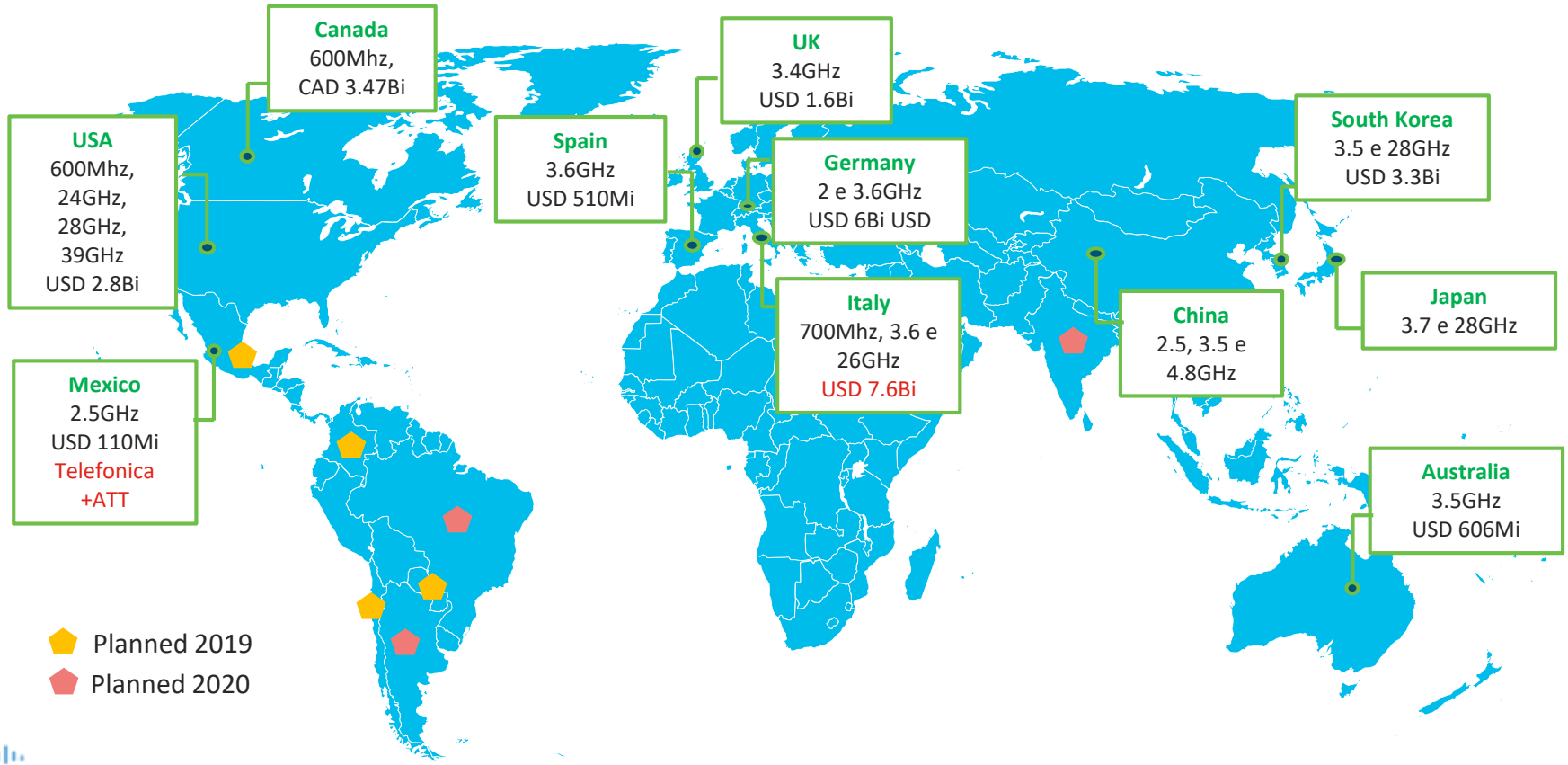
Multi Access Technologies

Private Networks

Architecture freeze Stage 2 | Functional freeze Stage 3 | ASN.1/OpenAPI freeze Stage 3

5G Spectrum Auctions Status

+25Bi USD



5G Spectrum Auctions – Highlights

Frequency Range Designation

mmWave - (24-28GHz, 40GHz, 64GHz)

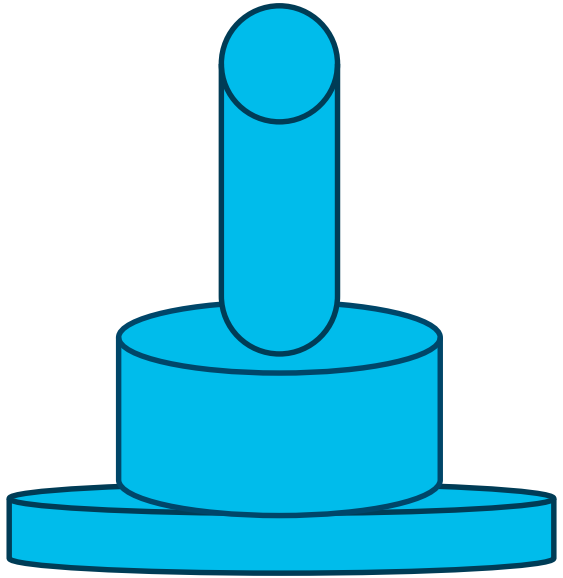
- Hotspot/Fixed Wireless Access
- Capacity Layer
- Main band: 24 – 28 GHz
- Up to 400 Mhz channel bandwidth

Mid Band - 1GHz to 6GHz

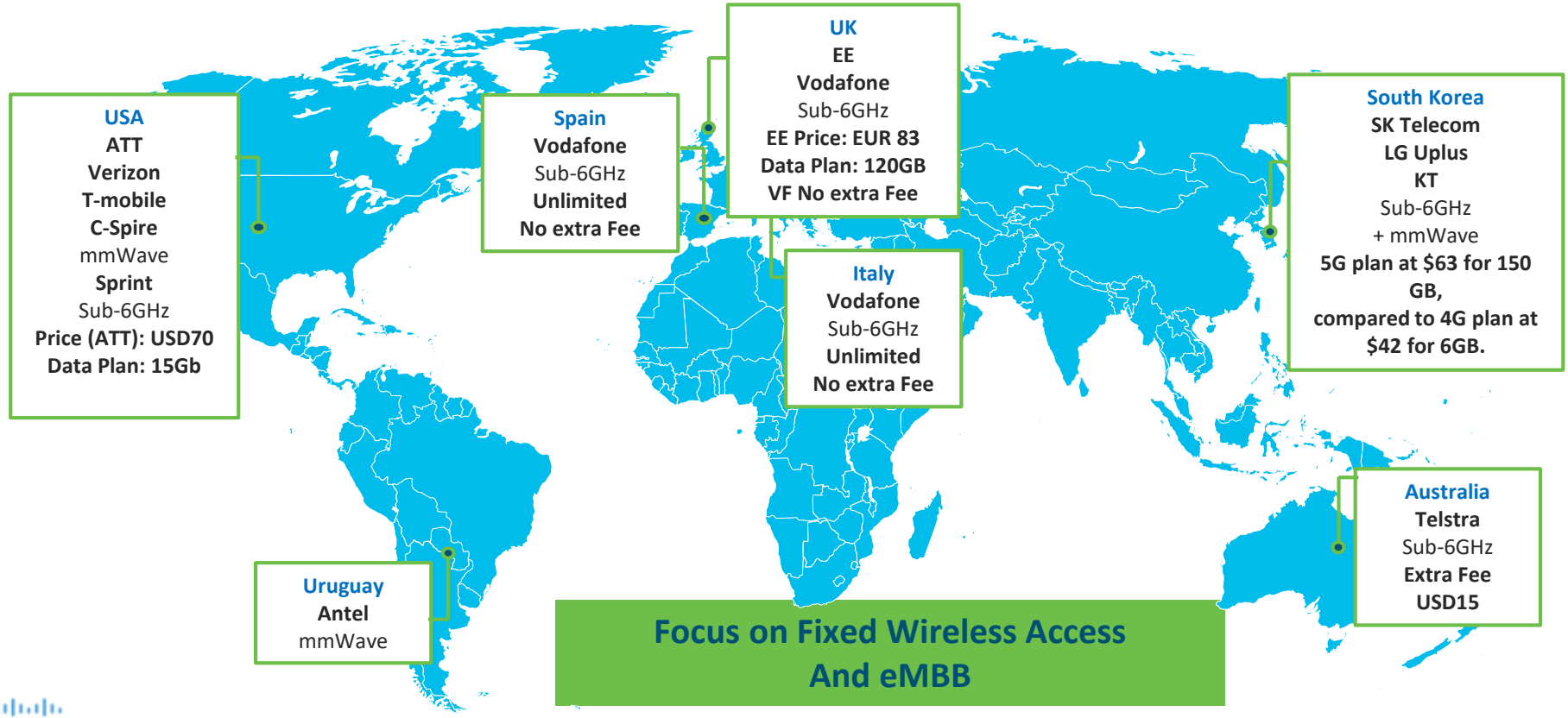
- Dense environment (implies Multi-RAT)
- Main band : 3.5GHz
- Up to 100 Mhz channel bandwidth

Low Band - Below 1GHz

- Wide coverage, good Indoor penetration, IOT
- Main bands : 600/700 MHz



5G Commercial Networks



5G Brazil – Government Annoucement

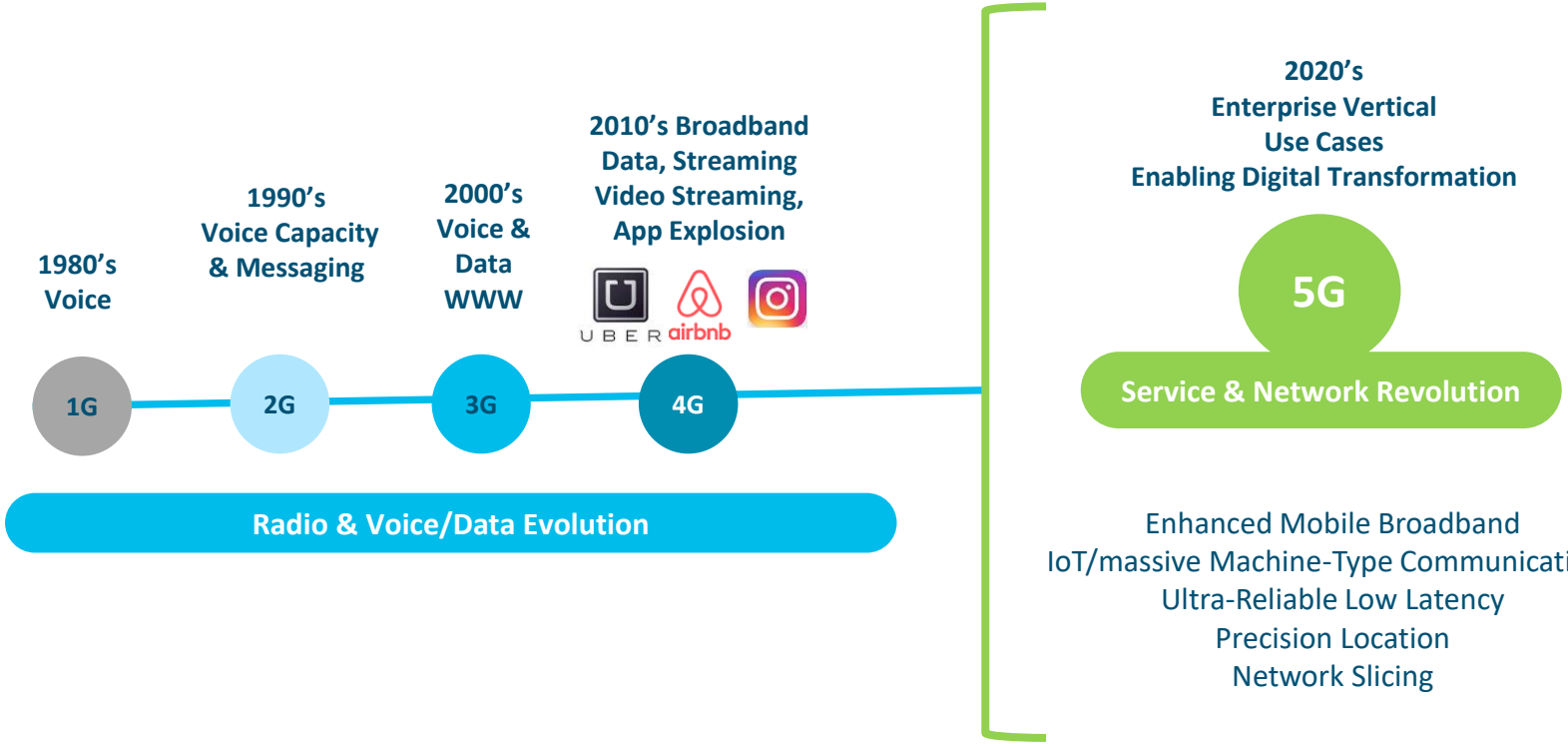
- Spectrum Auction scheduled to **March 2020** (government's goal)
- Frequencies: **700MHz [10MHz], 2.3GHz [100MHz], 3.5GHz [200MHz] and 26GHz. (+ 3.3 e 3.4GHz - **Bandwidth 300MHz)**

- Claro, Vivo, TIM (Florianópolis – 2019) and Oi (Buzios – 2019) in phase of equipment validation and trials

5G Use cases

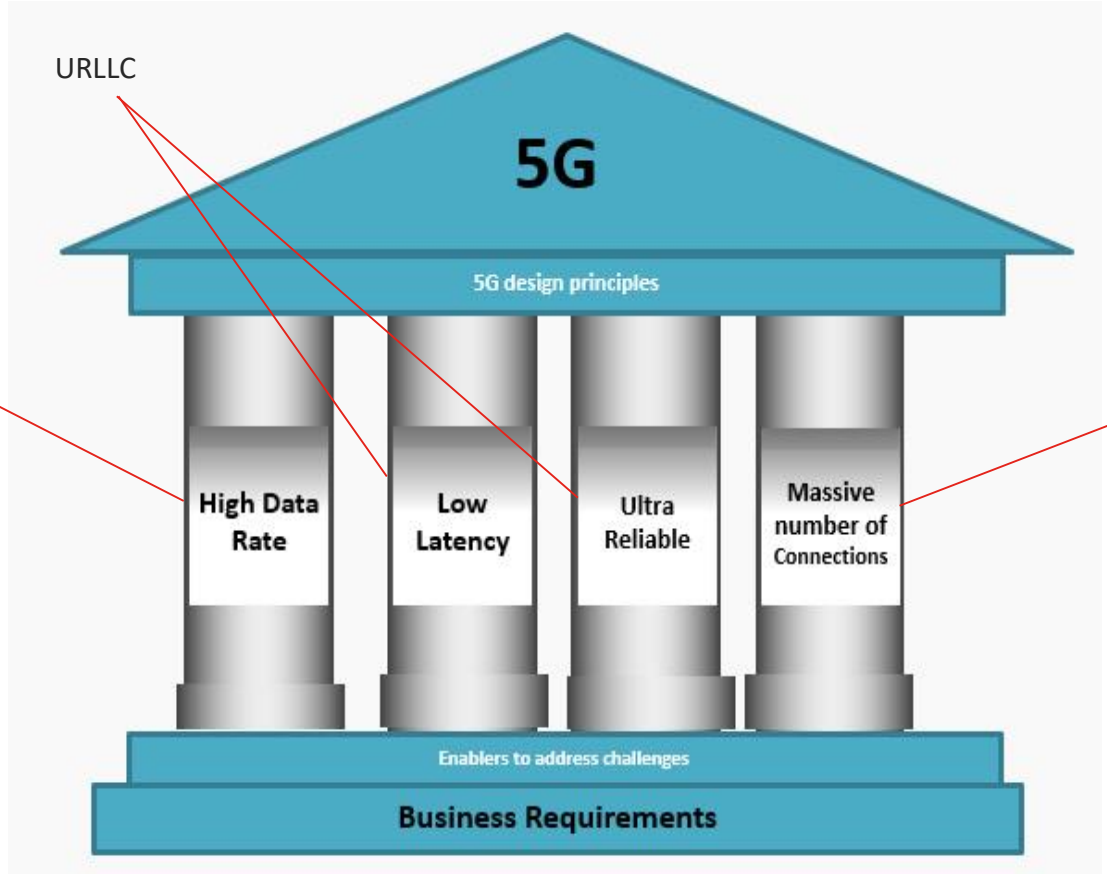
You make multi-cloud **possible**

How 5G aspires to be different

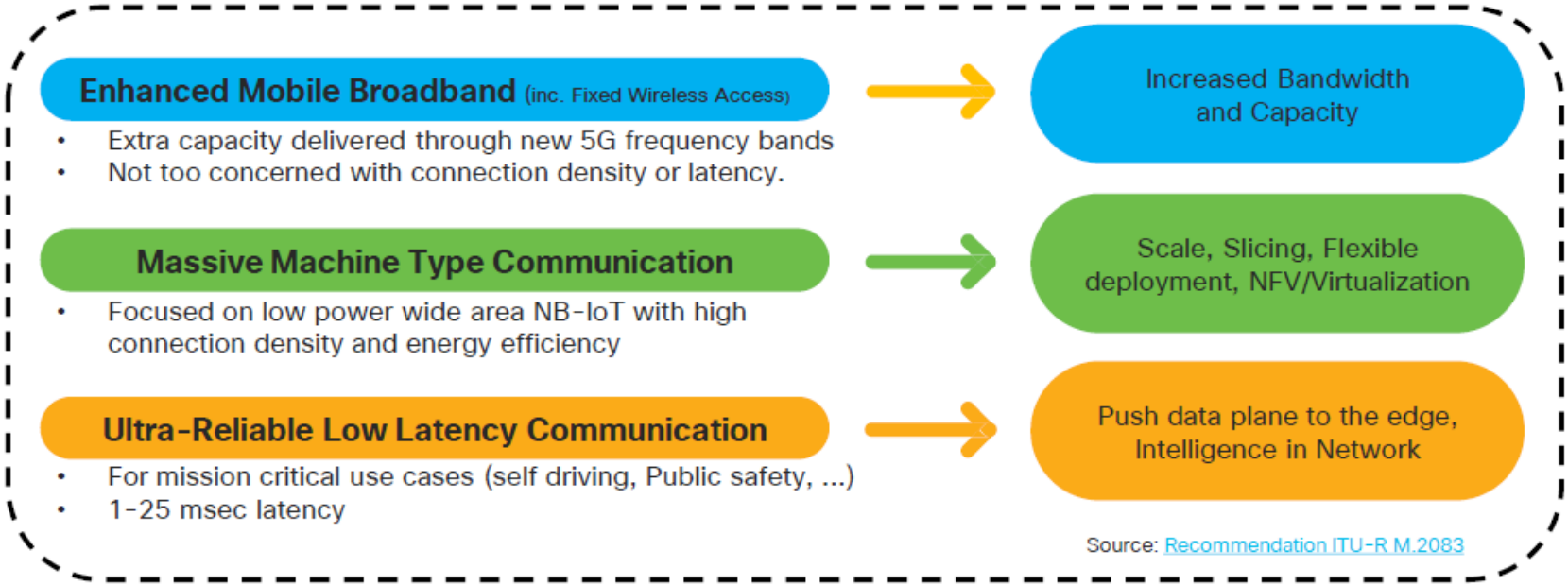


5G Service Design Pillars

eMBB - enhanced Mobile Broadband
URLLC - Ultra Reliable Low Latency Communications
mMTC - massive Machine Type Communications



5G Key Use Case Categories



Market Forecast

You make security **possible**

A Growing World: More & Faster

More people, more things**

- 5.7 bi mobile users in 2022
- IoT/M2M traffic grows 8x by 2022
- 177mi mobile users in 2022**

More traffic**

- CAGR of 46% (2017 – 2022)
- From 12 Exabytes per month in 2017
- To 77 Exabytes per month in 2017
- 6x increase in mobile traffic
- 1.2 Exabytes per month by 2022

Fast speeds**

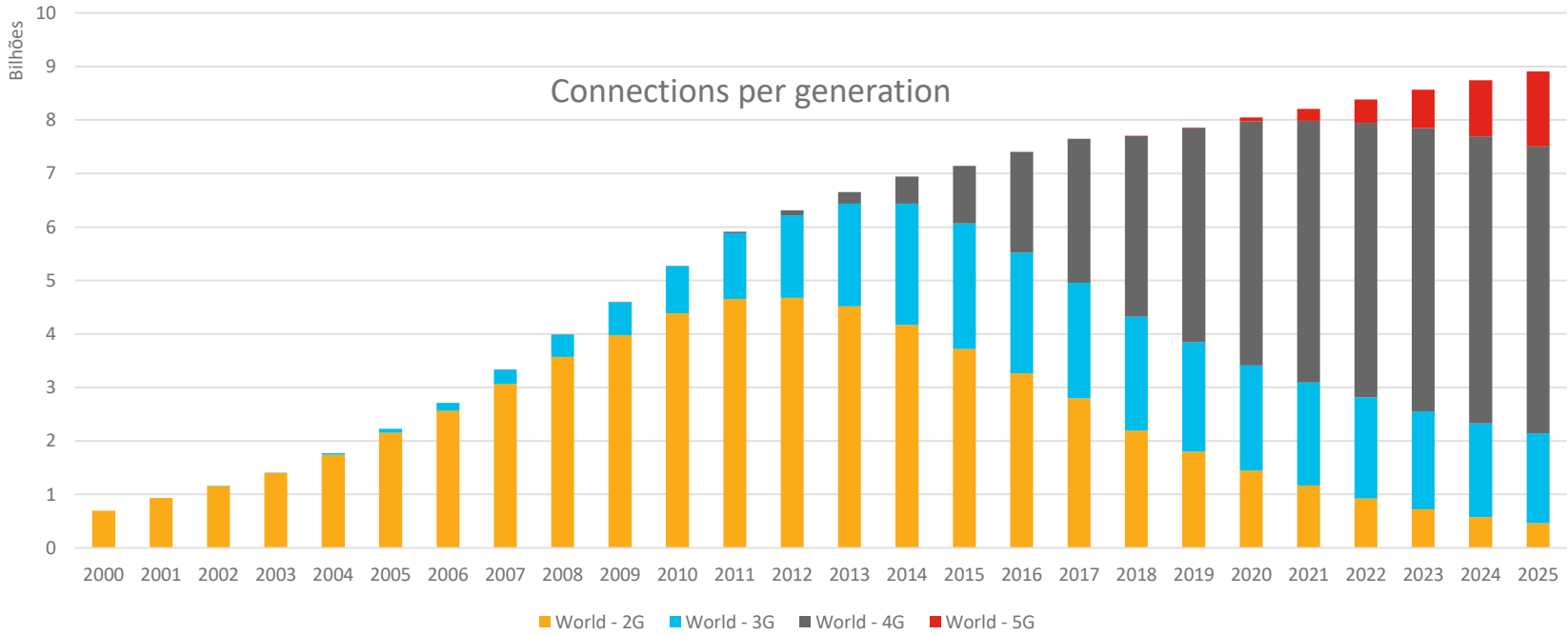
- From 6.8Mbps in 2016
- To 20.4Mbps in 2021
- **From 5.7Mbps in 2017**
- **To 19.7Mbps in 2022**

More Video**

- 79% will be video in 2022

**Cisco VNI 2019

Market Forecast – GSMA Intelligence



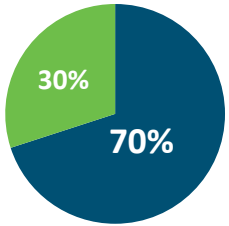
Source: GSMA Intelligence - Data set 23 April 2019

Enterprises are Key to Higher Margin Monetization

69% of SP CEOs agree*

4G

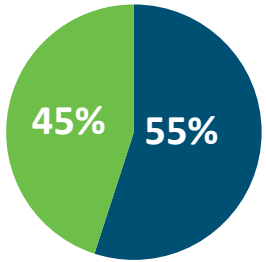
2018



consumer business

5G

2025



consumer business

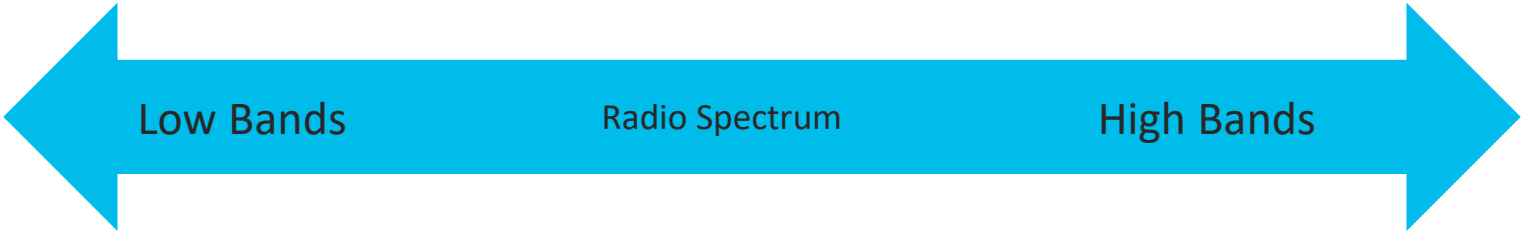
SP mobile revenue mix

Source: GSMA Global Mobile Trends 2018

5G Technology Challenges

You make the power of data **possible**

Frequency x Coverage x Capacity

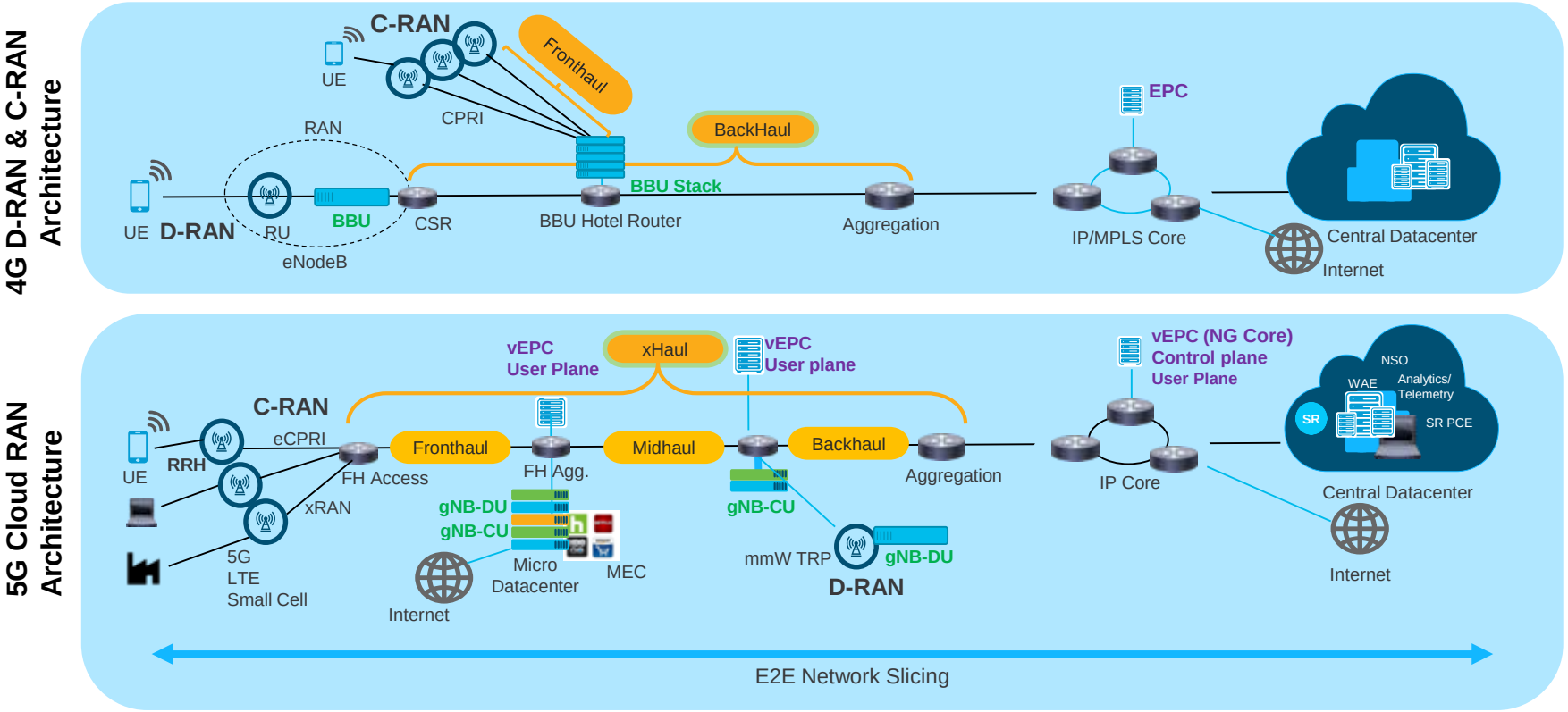


Below 6GHz
Better Indoor Penetration
High Range / coverage
Big Cells

Above 6GHz
Large Channels available
Short Range
Small Cells

Source: GSMA Intelligence - Data set 23 April 2019

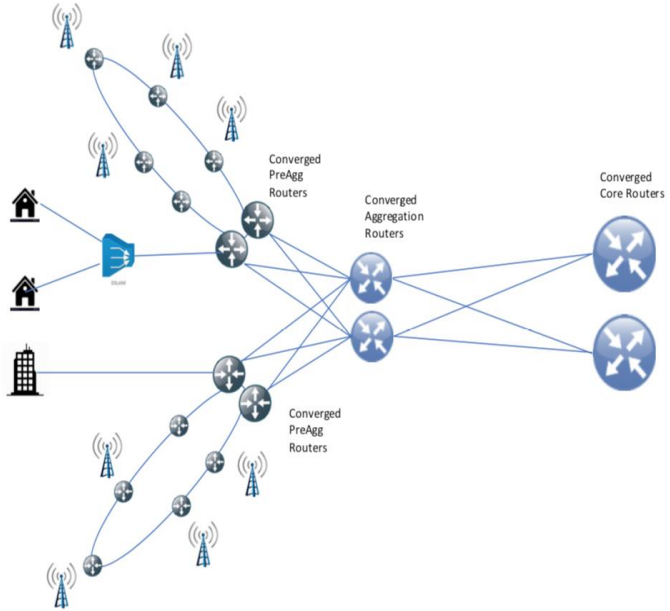
LTE to 5G: Mobile Transport Evolution



UE (User Equipment) **RU** (Radio Unit) RAN (Radio Access Network) **BBU** (Baseband Unit) **EPC** (Evolved Packet Core) **RU** (Radio Unit) **CSR** (Cell Site Router) **C-RAN** (Centralized RAN) **TRxP** (Transmit Receive Point aka Remote Radio Head (RRH)) **vEPC** (Virtual EPC) **CU-CP** (Centralized RAN Control Plane) **CU-UP** (Centralized Unit User Plane) **SR** (Segment Routing) **MEC** (Multi-access Edge Compute) **xHaul** (Backhaul + Midhaul + Sidehaul + Fronthaul) **FH Agg** (Fronthaul Aggregation Router) **FH Access** (Fronthaul Access Router) **D-RAN** (Distributed RAN) **mmW** (28GHz & 39 GHz) **Sub 6Hz** (600 MHz, 3.5GHz, 4.3 GHz)

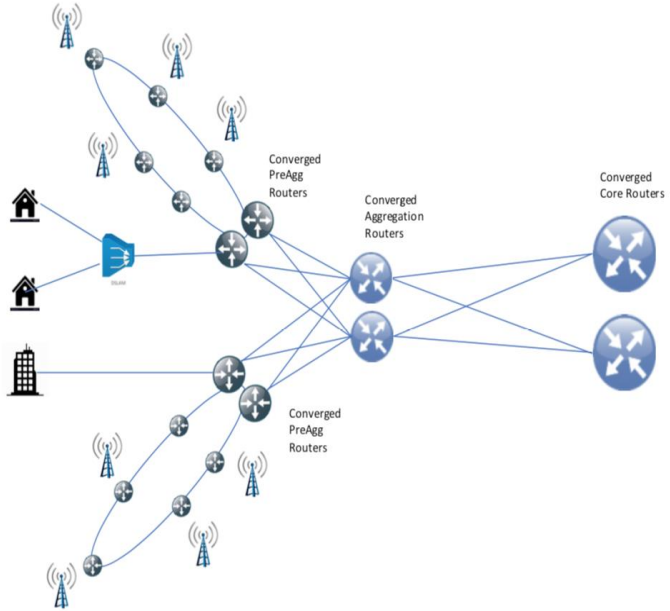
5G Technology Challenges

- Massive increase in bandwidth
- Ultra-low latency for selected traffic
- Multi-access Edge Compute for infrastructure and enterprise workloa
- Network slicing



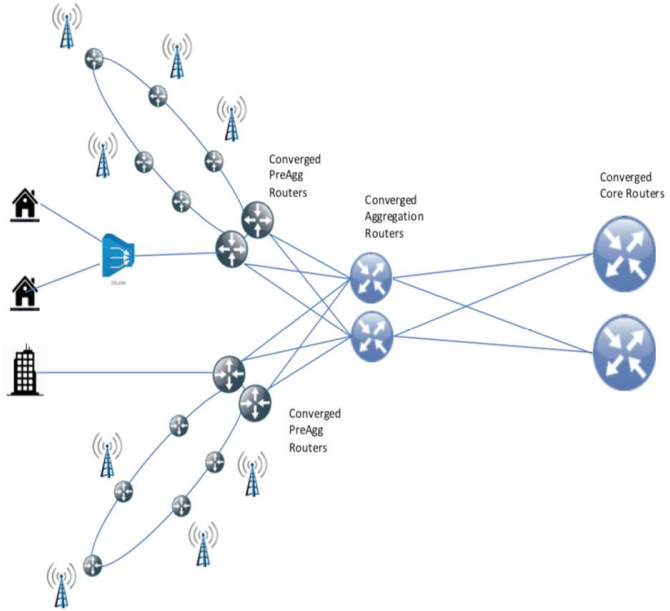
5G Technology Challenges

- Massive increase in bandwidth
  - High frequency bands (mmWave)
  - Larger radio channels
  - More cell sites
  - X-haul scalability.



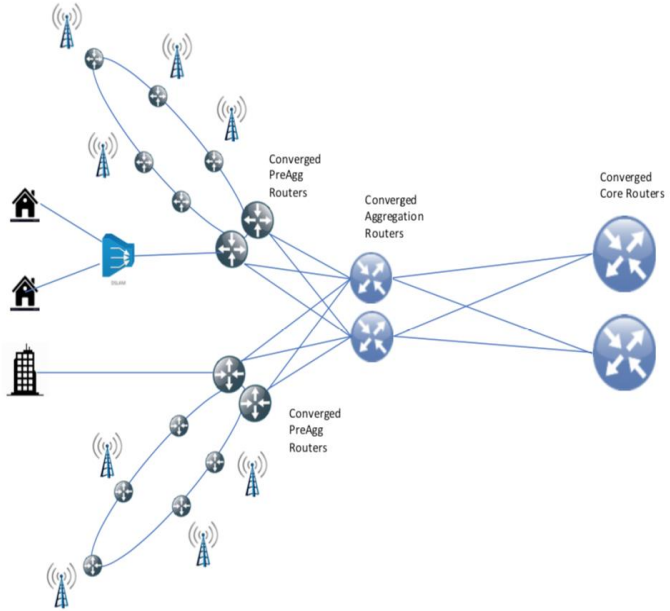
5G Technology Challenges

- Ultra-low latency for selected traffic
  - Better cell sites connectivity (typically Ethernet over fiber)
  - Reliability
  - Syncronization
  - Coverage



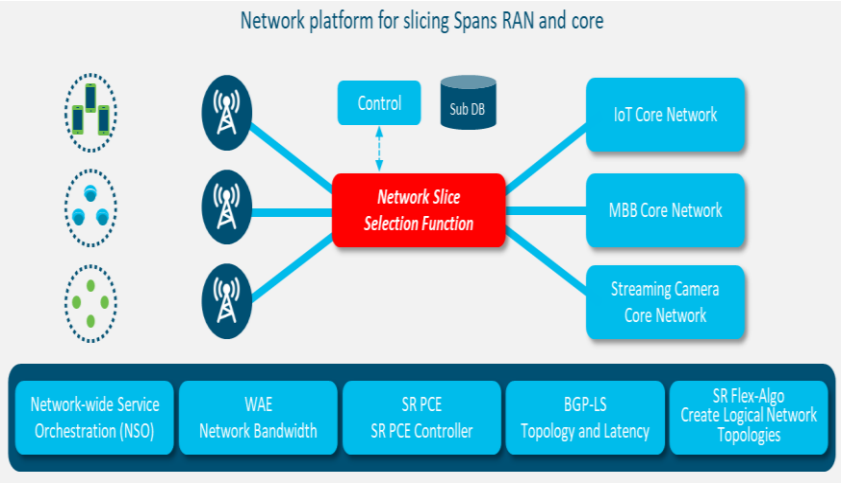
5G Technology Challenges

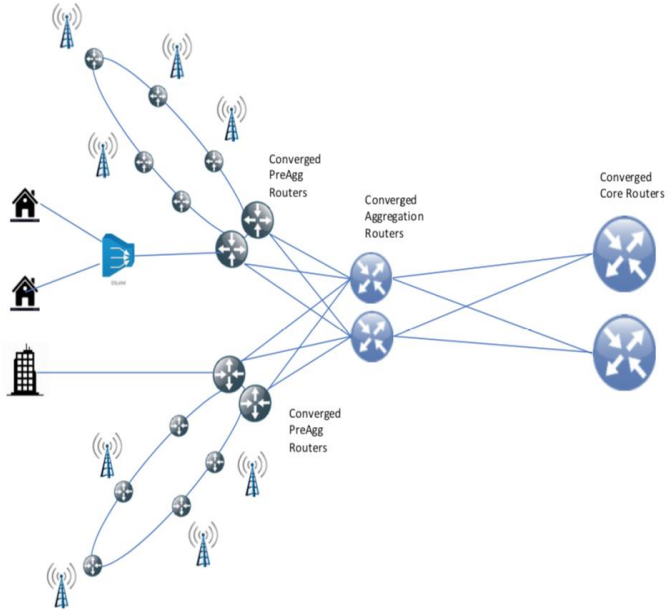
- Multi-access Edge Compute for infrastructure and enterprise workloa
  - Distributed facilities
  - DC infrastructure



5G Technology Challenges

- Network slicing
  - Allocating network resources for different u cases
  - Slicing is end-to-end





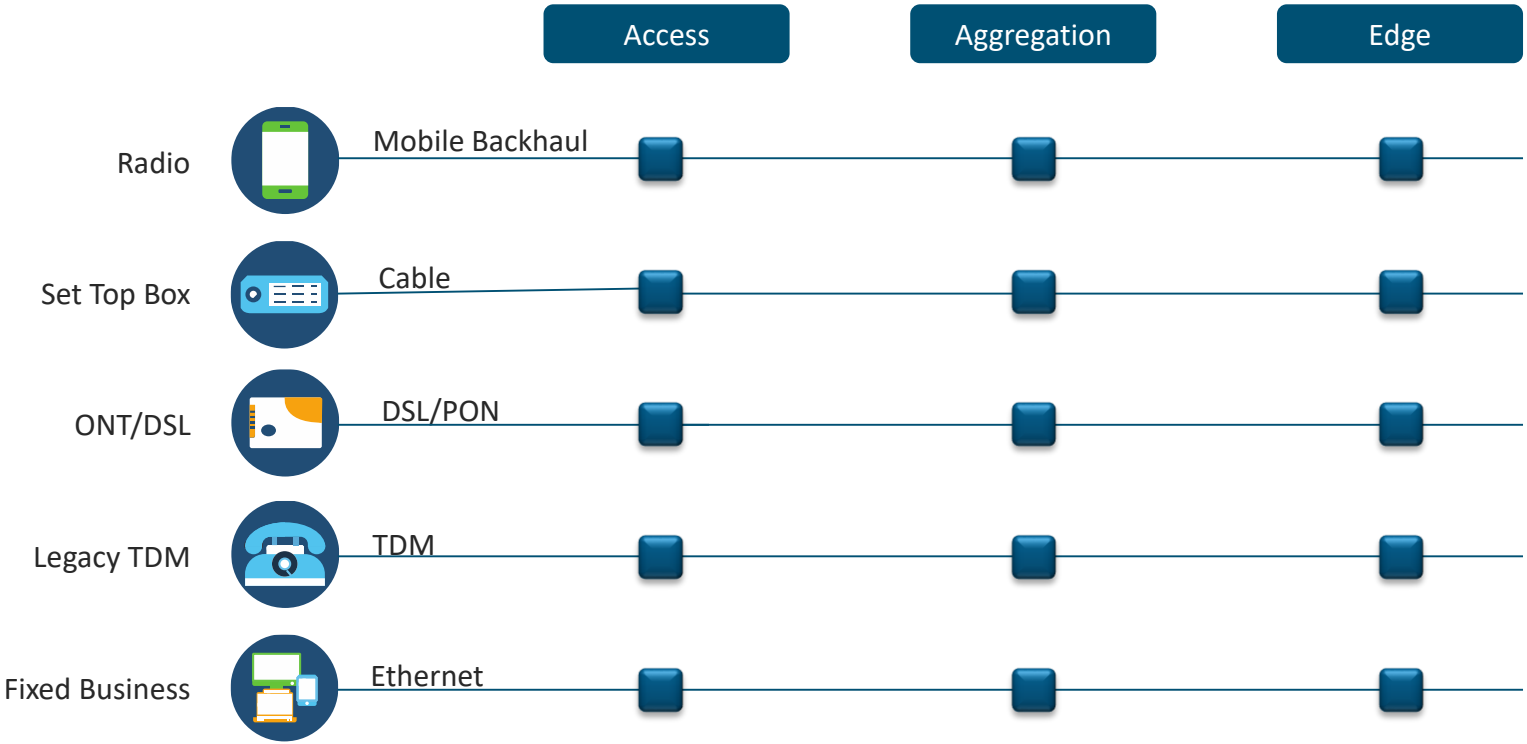
5G Transport Requirements (summary)

- 1-10/25Gbps connection to end devices
- 100 us ~ 10 ms end-to-end latency
- 10-100x number of connected devices
- Nanosecond accuracy through packetized timing
- 99.999% availability
- 100% coverage
- Services aware
- End to end secured

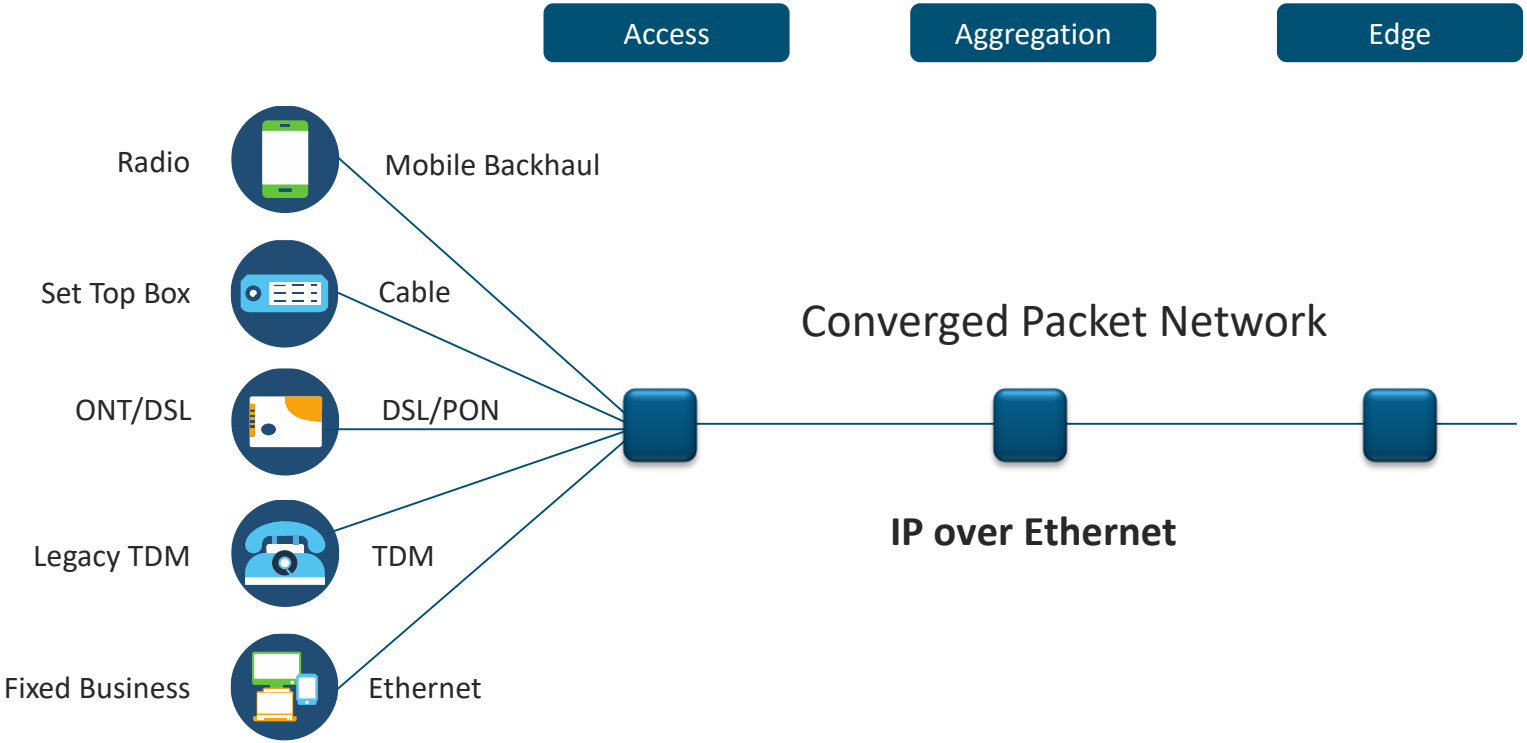
Network Transformation

You make the power of data **possible**

Converging all services in one network



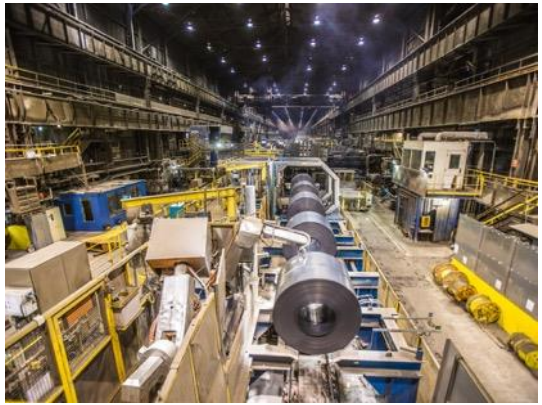
Converging all services in one network



How to get there?

Software Attributes

SDN | Orchestration | Virtualization



Simplicity | Convergence | Automation

Network Architecture Attributes

Questions?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