BROADBAND WORLD FORUM 2020

F5G & OI

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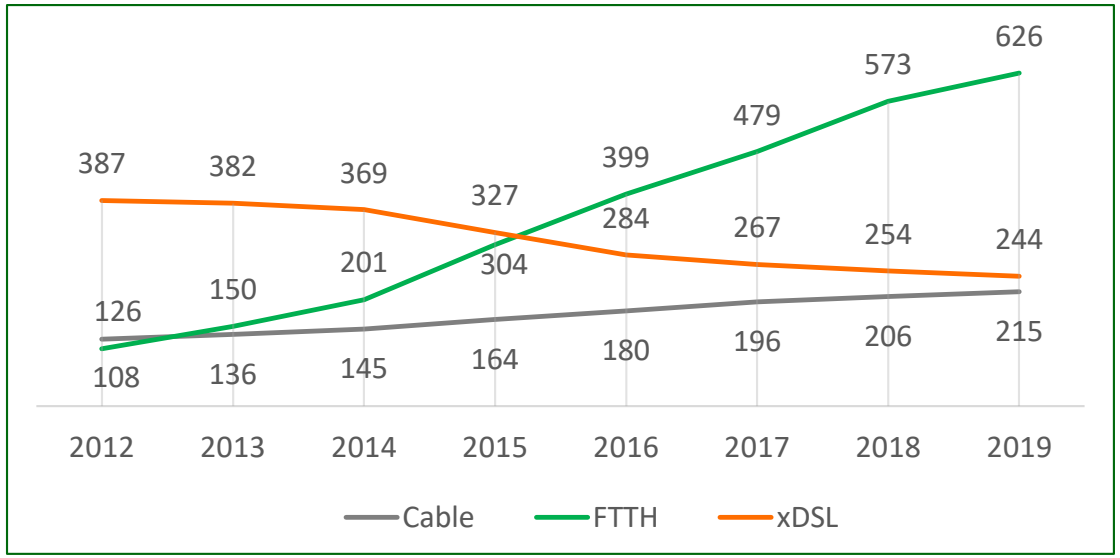
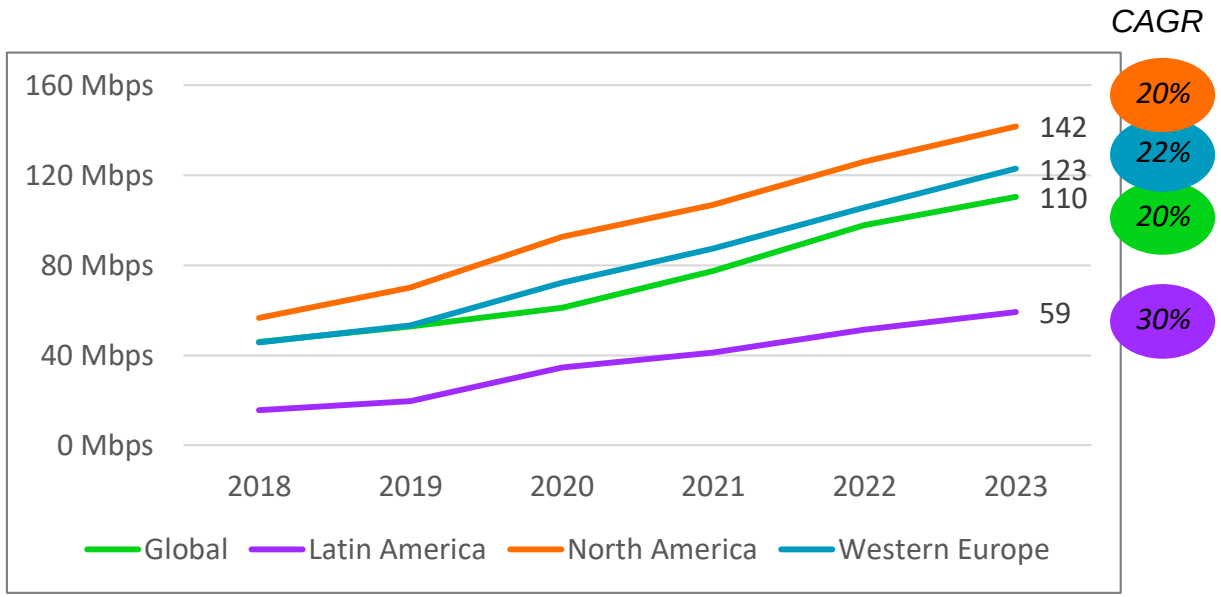
WORLD FIXED BROADBAND TREND

Number of Global Fixed Broadband Users per Technology (in Million)



Source: Ovum Omdia

Average Fixed Broadband Throughput



Source: Cisco VNI 2020

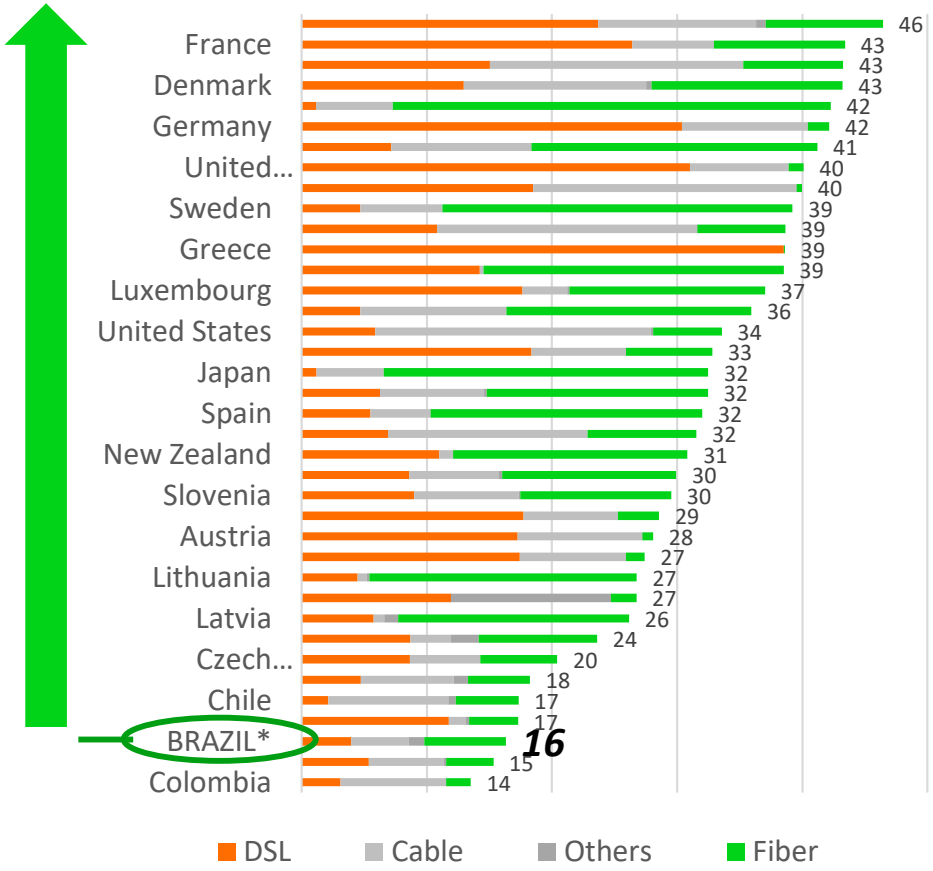
- Analysis conducted by ITU: Globally an increase of 10% in fixed broadband penetration yields an increase of 0.8% in GDP.
- Analysis Group: Communities in which more than 50% of the population have access to FTTH broadband the per capita GDP is between 0.9% and 2.0% higher than areas without fiber broadband.

- The values of Cisco VNI are consolidated for all speed plans and technologies of the fixed network (FTTx and xDSL), whose average values are shown;
- The main message is throughput growth indicating increasing adoption of FFTx technology;

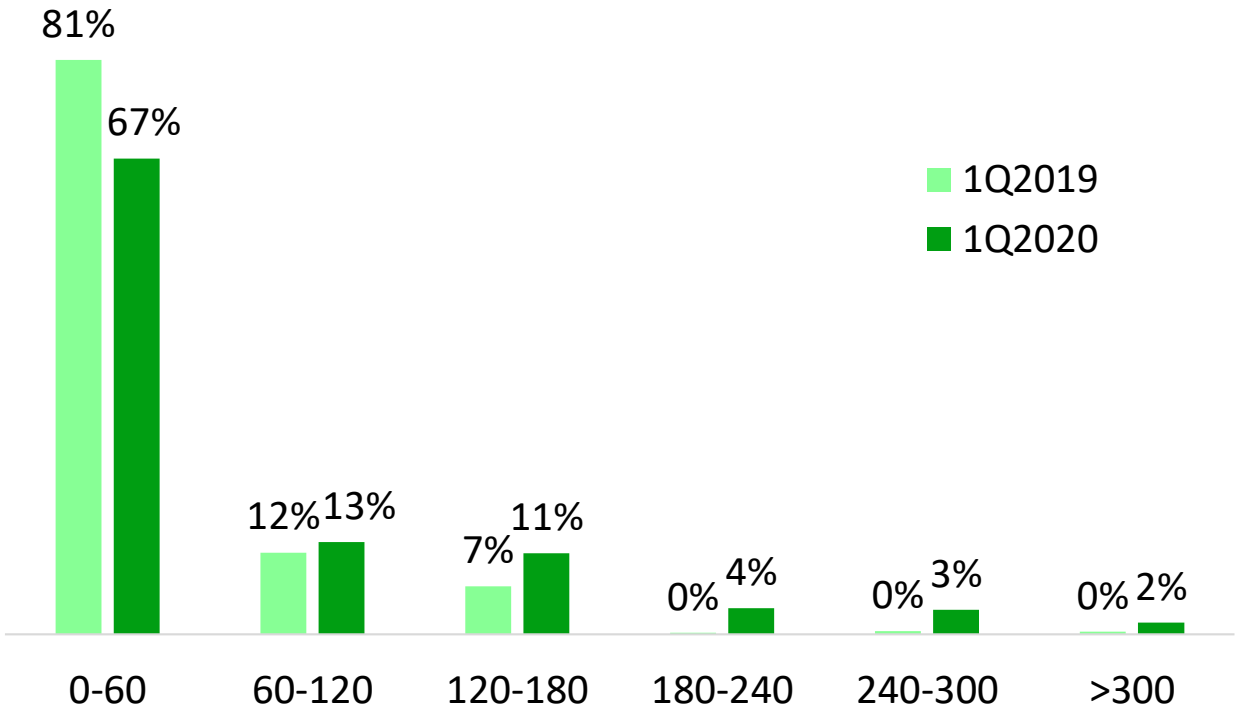
Rapid Growth of Global Fiber Users

FIXED BROADBAND OPPORTUNITY IN BRAZIL

Global Number of Fixed Broadband Subscription per 100 inhabitants



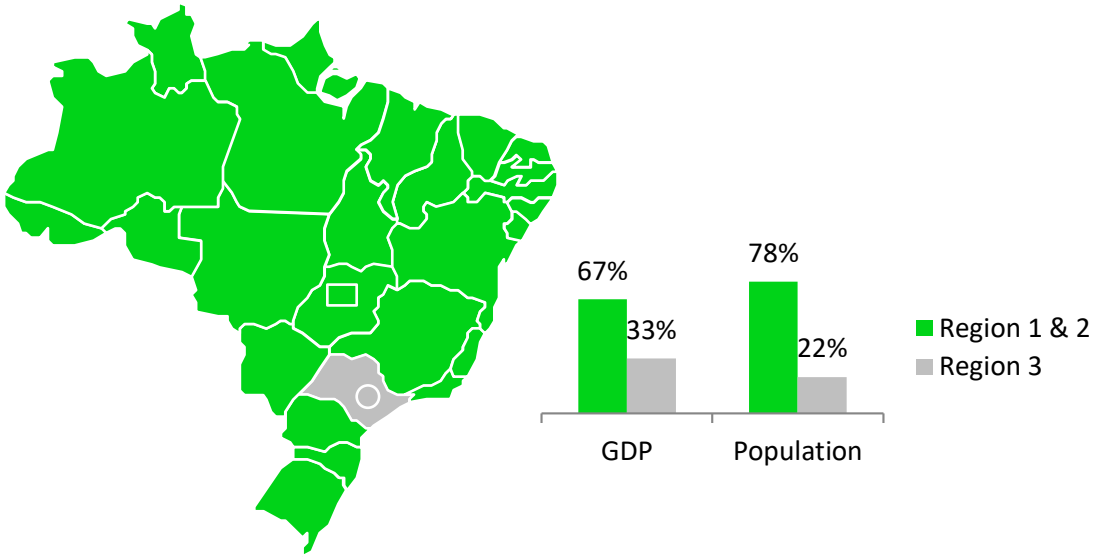
Fixed Broadband Distribution (Mbps) in Brazil



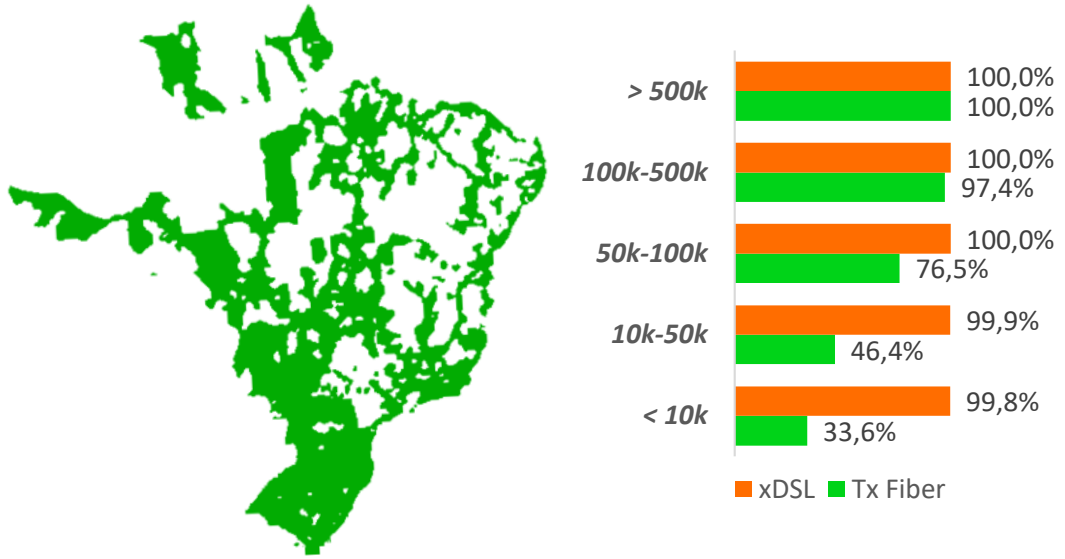
Although low penetration, Brazil has a big space to grow. Currently, there is a pressure for more throughput allowed by powerful FTTx deployments

WHERE OI IS

Brazilian Regions



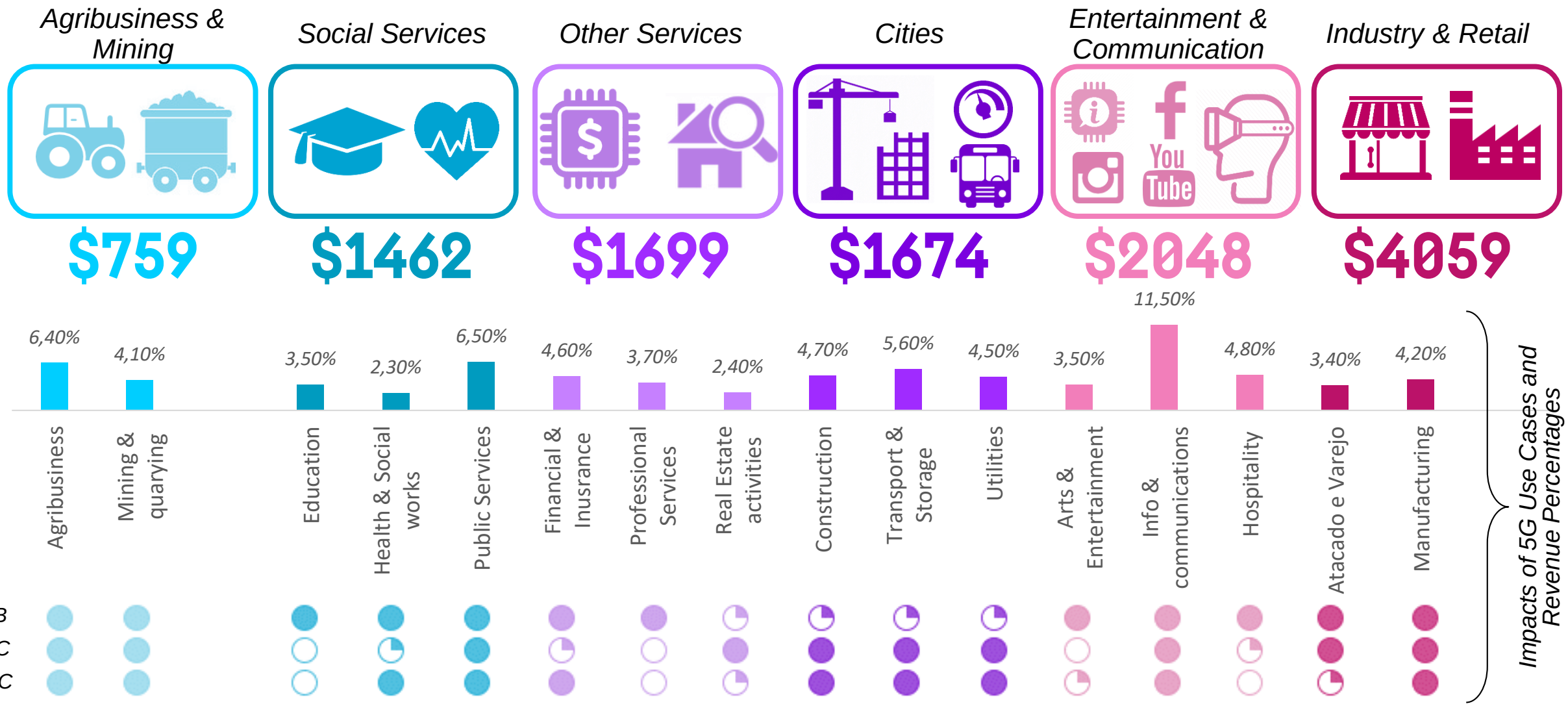
Oi Fixed Broadband Offering



- Oi mainly operates in the most expressive regions with economic potential of almost 70% of the Brazilian GDP and addressing population of almost 80%;

- More than 388 thousand km of fiber (2x more than the second competitor)
- More than 43 thousand km of pipelines - The country's largest infrastructure
- More than 2300 municipalities served with fiber, covering more than 35 million households (1000 households more than the 2 competitor)
- FTTH in 125 cities (end of @ Q20) with more than 7 million HP and more than 1.3 million HC.
- Approx. 400 thousand HPs and 100 thousand HCs activated per month

NEW 5G SERVICES (LIKE) IMPACT IN WORLDWIDE ECONOMY

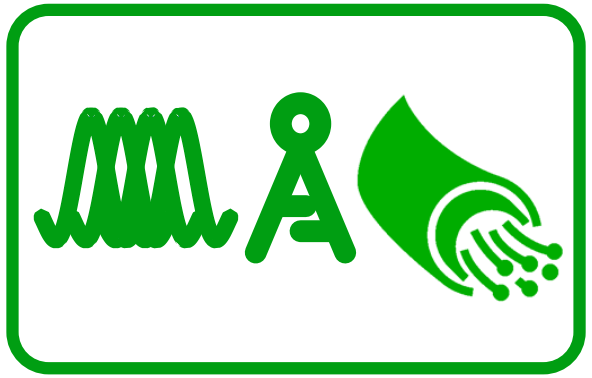


According to IHS Markit 2017, 5G will have a direct impact on all sectors of the economy with the generation of $ 13.2 trillion in 2035. This represents about 4.6% of all revenue generation in 2035; It will also bring 22 million new jobs worldwide in the coming decades;

Source: IHS Markit 2017

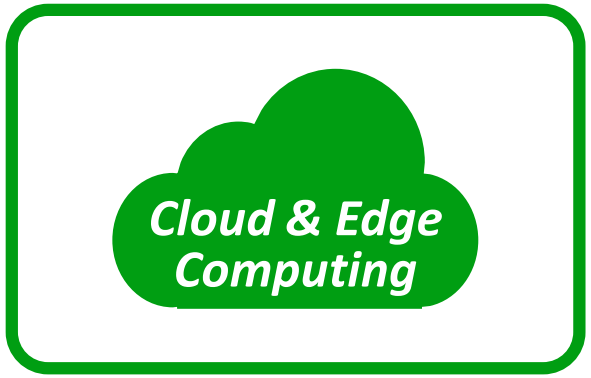
KEY CRICTICAL SUCCESS FACTORS FOR UPCOMING 5G SERVICES

Infrastructure



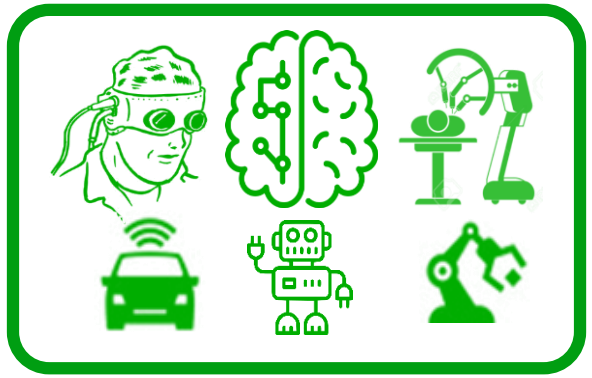
- **Spectrum**: Costs associated with new radio frequency spectrum. Ranges for each use case: eMBB, URLLC, mMTC. 100 MHz and 400 MHz carriers for FR1 and FR2 respectively;
- **Network Densification**: It is estimated 60x more sites than previous networks. Still, Brazil has between 10% to 30% of sites per inhabitant in relation to countries like China, Germany, Japan etc.
- **Fronthaul**: Massive MIMO and mmWave will require above 25 Gbps per base station.
- **Glassification**: Densification and Capacity, there will be an explosion of demand for fiber. For example, for a density of 100 Sites per km2, there is a need for 20-50 km of fiber per km2.

Virtualization & Digital Transformation



- **Cloud Native**. Transformation of the Network of PNFs (Physical Network Functions) to VNFs (Virtual Network Functions) and Containers (Kubertnetes and Micro-services);
- **Edge Computing**: Edge computing for latency-sensitive applications: games, autonomous vehicles, virtual / augmented reality;
- **People and Governance**. Transverse changes in network management with the need for new skills in engineering, IT and operations;
- **Operation**: Customer Centric and not Network Centric, focusing on business impact, CSAT (Customer Satisf. Score) and fast life cycle with Betatesting of Solutions against Five-Nines Specification with management based on network and MTTR metrics,

Ecosystem & Innovation



- **Ecosystem Consolidation**. User experience in all environments with “5G like” and complementary access and broadband technologies, such as Wi-Fi 6, FFTx etc.
- **Product Development**: Non-linear and Agile processes, different from the rigid concept of Watterfalls;
- **SDK**. Need to create flexible architecture for exploiting 5G network network enablers through open APIs;
- **Devops**. Creation of Market Place and programs to develop partnerships and crowdsourcing;
- **Vertical**. Need for knowledge of the verticals value chain to explore 5G's potentials and opportunities. Partnerships and private networks can accelerate the monetization of investments;

KEY TECHNOLOGIES FOR UPCOMING FIXED ARCHITECTURE FRAMEWORK

New Higher Throughput Broadband Technologies → ***Network Flexibility & Scalability*** → ***Network Centralized Control & Automation***

10GPON

- 10 Gbps throughput
- Symmetric down and up streaming
- Higher fiber density
- Low latency

Wi-Fi6

- Indoor Coverage
- Low battery consumption (comparing to 5G)
- Higher modulation scheme: 1024QAM
- Massive MIMO and UM-MIMO
- Higher throughput 1-10 Gbps
- Higher number of users

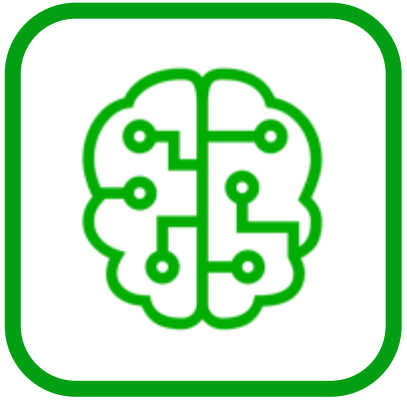
Flexible Optical

- Higher throughput granularity ONT Network
- High Availability
- Ultra low latency
- Massive Connectivity

SDN+NFV

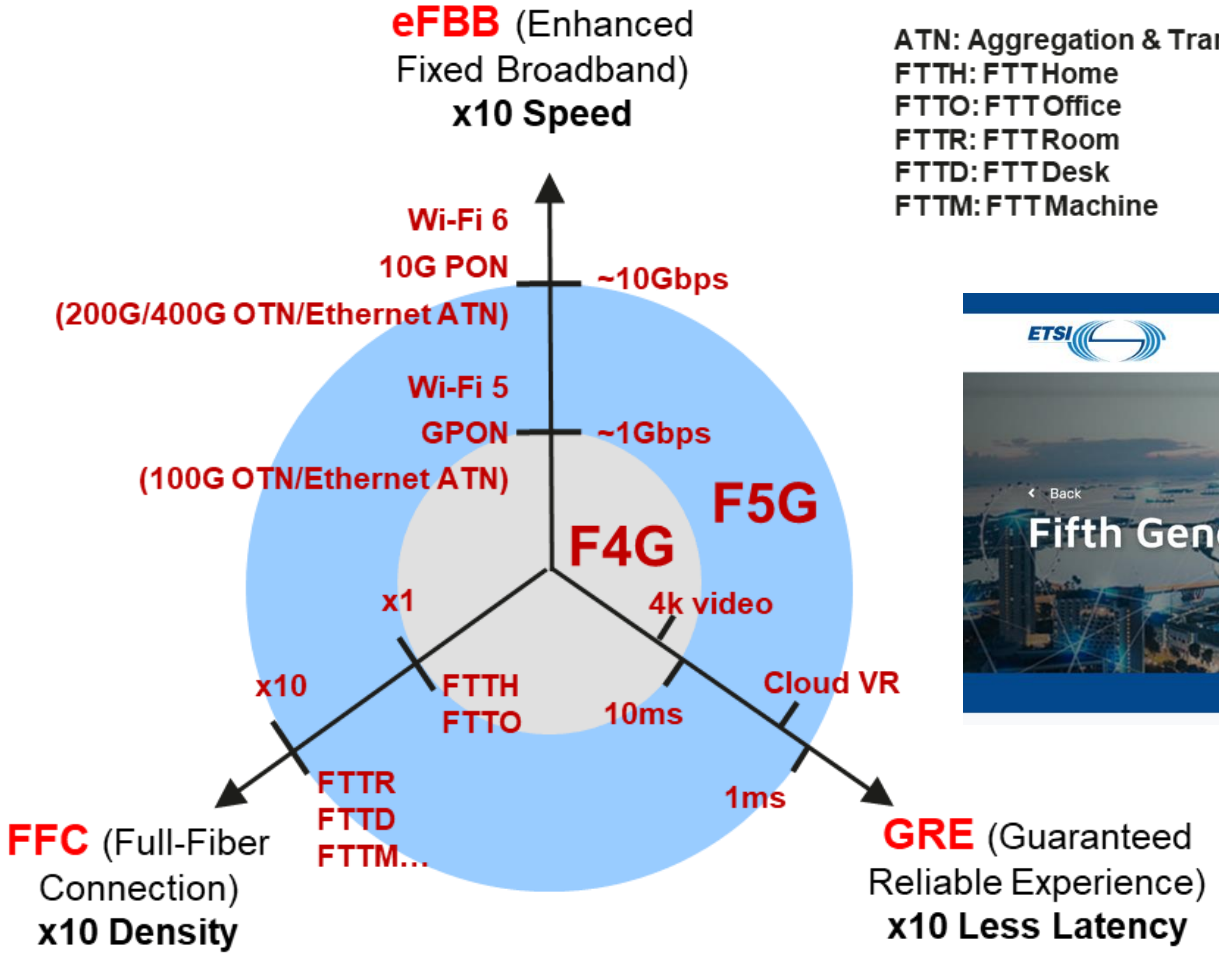
- Network connection/context aware
- End-to-end service orchestration and assurance
- Network Slicing

AI



- AIOps
- Real-time adaptive networks
- Intelligent network slicing management
- Service prioritization and resource sharing.
- Automatic End-to-end service orchestration and assurance
- AI Application Identification and Acceleration
- Wi-Fi slicing and WMM scheduling

WHAT IS F5G?

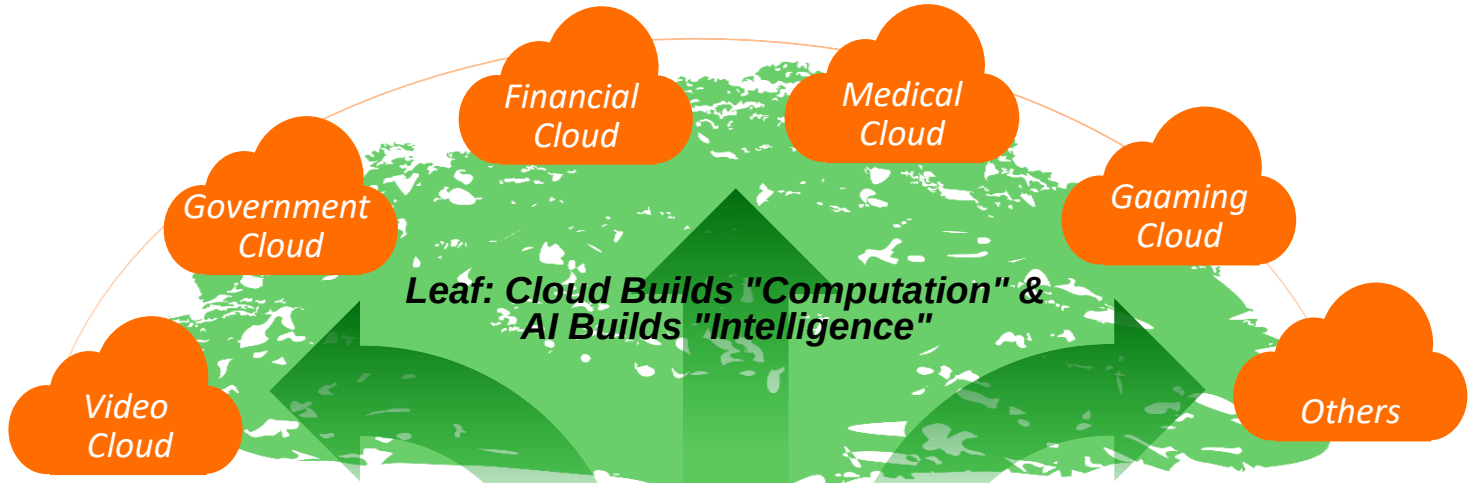


ATN: Aggregation & Transport Network
FTTH: FTT Home
FTTO: FTT Office
FTTR: FTT Room
FTTD: FTT Desk
FTTM: FTT Machine

Source: ETSI

https://www.etsi.org/events/1713-2020-2-fibre-to-everything-launching-the-next-generation-of-fixed-networks-with-etsi-f5g

F5G+5G – BUILDING A FULLY CONNECTED, INTELLIGENT WORLD



Trunk: F5G builds 'transportation'

Root: both 5G & F5G build "connection"

Frequency & regulation

ITU

Wireless

3GPP — Standard & specification

GSMA — Ecosystem & Industry development

Frequency & Site

5G – in the Air

F5G – on the Ground

Physical Specification

ITU

Wireline

ETSI F5G — Generation definition & technical specification

EcoSys — Industry development

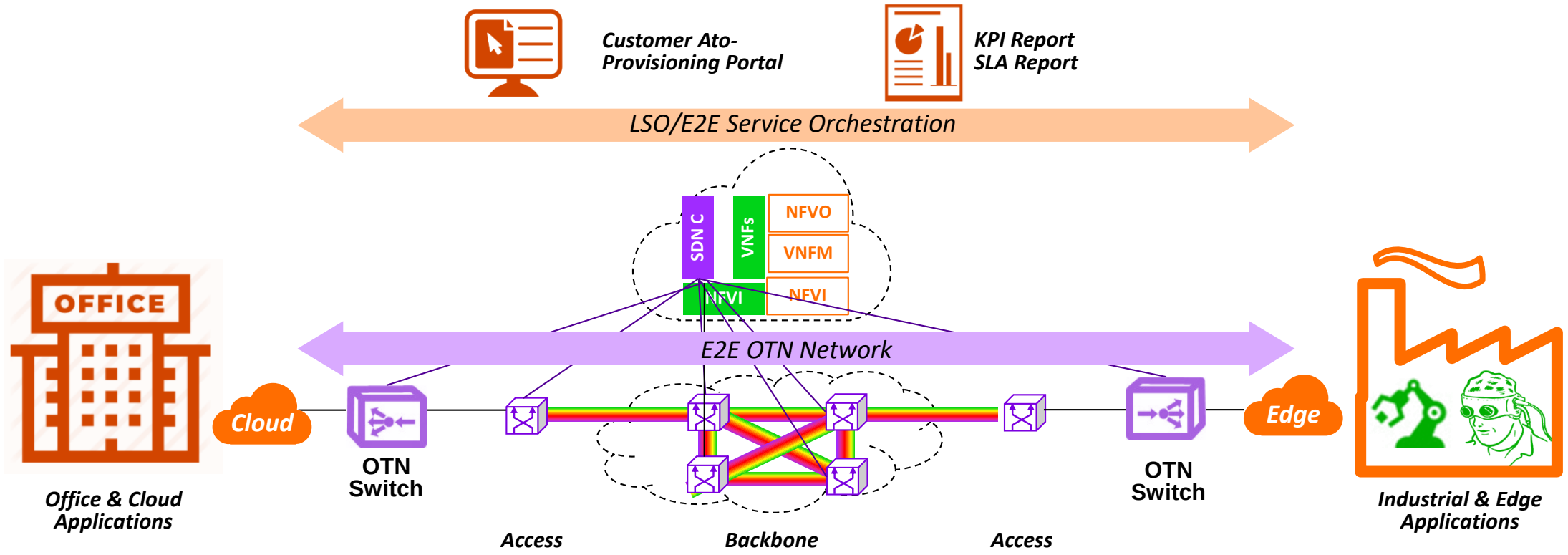
Fiber & Premise

Source: Huawei

F5G+5G build "connection + transportation "to foster the Intelligence and Computing capability

USE CASE: PREMIUM PRIVATE LINE

5 Star service basead on SDN Optical Network, providing: Low latency; Auto-provisioning; Service Aware with SLA/KPI Reports; E2E Orchestation;



Critical Mission

- High Availability (>99.99%)
- Physical Insulation
- Guaranted Throughput

Automation

- End-to-end service orchestration and assurance
- Zero-touch

Auto-Provisioning

- Customer Portal
- SLA Customized by hour and day of week;
- Throughput by demand

Service Aware

- KPI & SLA Reports
- Network Resource Information
- E2E Resource & QoS Control

Quick Rollout

- CPE Plug& Play

PRIVATE LINE PILOT

The overall pilot will take 4 phases in order for checking: technology, integration, service journey, customer satisfaction;

PHASE 1

- Single Domain
- Field Test
- Main functionality tests and verification

PHASE 2

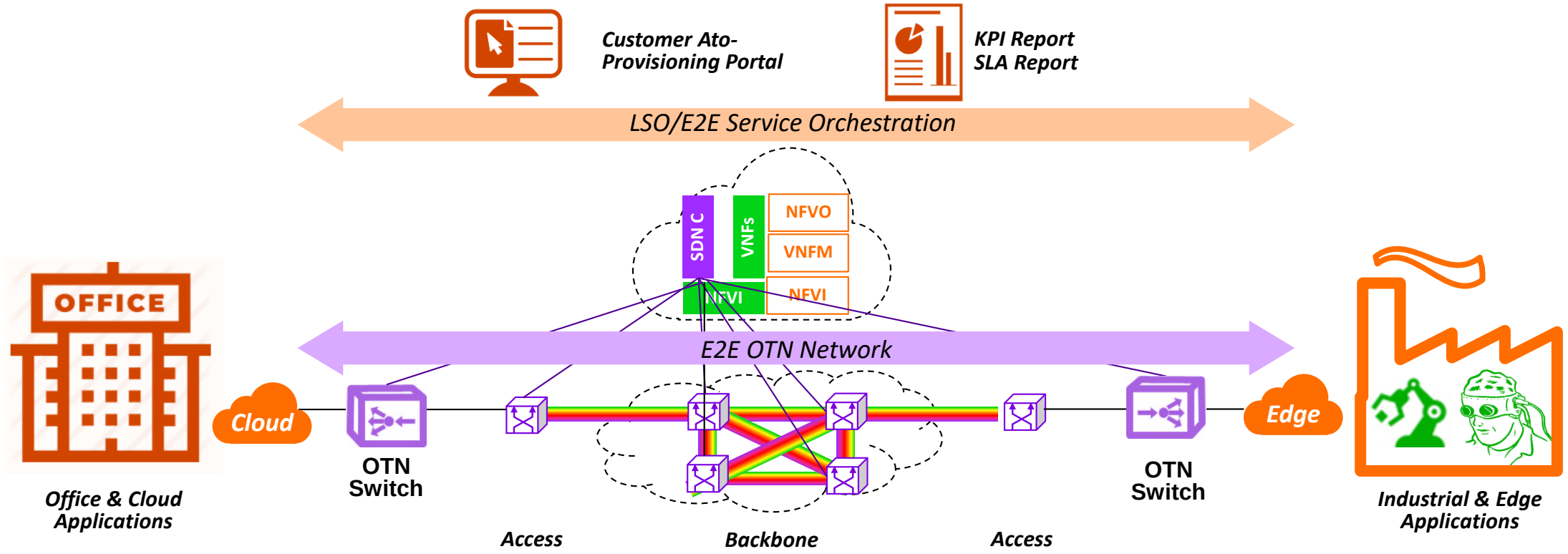
- Multiple Vendor Domain
- SDN & Line Card from different vendors
- Multi-vendor Integration tests

PHASE 3

- Local Customer Pilot
- MVP Journey Test
- Customer Satisfaction Evaluation

PHASE 4

- Long Distance Pilot (two sites distance over 3000 km)
- Access & Backbone e2e Provisioning
- Customer Satisfaction Evaluation



THANKS!
OBRIGADO!

Q&A

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