

Designing 5G Networks. An Overall Perspective



Più vicini
The future you want

Gabriella Coluccelli

Bologna – 15 DICEMBRE 2017

TLC networks relevance



- ❑ Telecommunication networks have become the “nervous system” of any modern Nation
- ❑ In perspective TLC networks will be more important: not only will connect millions of people, but also tens of millions of computers and billions of objects (IOT)
- ❑ TLC sector and related infrastructures constitute a strategic resource **facilitating social-economic development and political strength**

We have to think to network infrastructures as a way to build our future!

High speed Internet infrastructures and services will be:

- ❑ the raw material of our future, for the entire economic and social environment
- ❑ the essential resource on which to build the **future competitiveness of the country**



Italian government digital priorities



On that basis in 2015 Italian Government presented the “**National Ultrabroadband Strategy**” directed to:

- ❑ define the framework within which to **build future-proof telecommunications infrastructures**
- ❑ obtain the right balance between investments and benefits for users and between technological flexibility and capacity to meet the demand
- ❑ incorporate the **targets of European Digital Agenda**,
- ❑ support the development of high speed broadband networks (considering FTTH fiber the best solution to obtain such results)

About **six billions** will be invested by Government for the realization of ad hoc infrastructures for ultrabroadband networks

In 2015 a new Italian company, **Open Fiber**, participated by state-owned shareholders, was created having the goal to realize installation, supply and exercise of high-speed optical fiber TLC networks on the whole Italian territory.



Italian government digital priorities

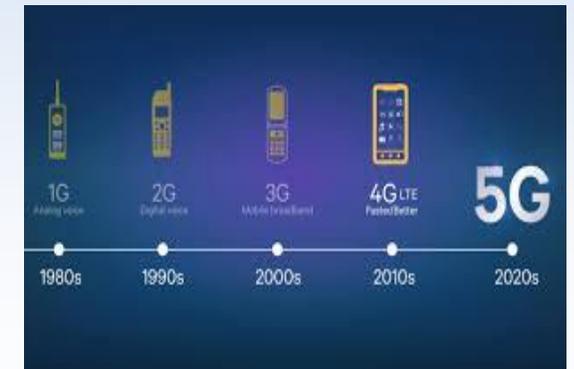


In 2017 Government launch an initiative for the **5G-test** in Prato-L'Aquila, Milano, Bari-Matera:

- ❑ The cities were selected on the basis of criteria related to geographical distribution, to the capillarity of ultra-fast connectivity, to the availability of frequencies in the 3.7-3.8 GHz band, to membership in the European corridors
- ❑ This test constitutes an excellent opportunity for people in Italy to use new technology and to implement synergies that can produce a positive impact for people.

In 2017 through Budget Law, Gov. will regulate the **5G frequency auction (700 MHz, 3.6-3.8 GHz, 26.5-27.5 GHz)**

- ❑ Providing for an "efficient use of the spectrum and transition to 5G technology" that involves the transition of the national television system to second-generation digital terrestrial (DVB-T2), to facilitate the 5G auction in favour of mobile sector future assignee of spectrum.
- ❑ The transition to 5G mobile technology is declined in line with EU principles, with the aim of developing the 700 MHz frequencies, currently occupied by television channels.



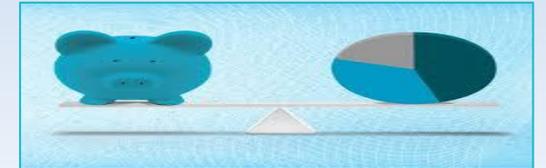
Wind Tre 's way to build the future



- ❑ Wind Tre entered into a **close partnership with Open Fiber** to develop new technology with particular focus on FTTH fiber in order to wire more than 270 Italian cities within 2024, assuring competitive services, easily accessible for our customers, and giving our significant contribution for the digitalization of Italian economy: together with Open Fiber we will be able to accelerate and consolidate the ultrabroadband developing plan launched by Italian Government!
- ❑ The two companies together won the tender promoted by Italian Government to test 5G technology in Prato and L'Aquila: we are the **first in all Europe to test 5G** and enable citizens and companies to hold in their hands all the related potential!

With Wind Tre we have:

- ❑ the opportunity to **invest** 6 billion euros over the next 5 years in new networks, new systems, and in people who can support digital transformation in Italy
- ❑ strong **partners**: Open Fiber with their ambition to roll out access fiber across the country, accessing ten million households within the next 5 years
- ❑ technological **relationships**: ZTE, the company leading 5G innovation, which in January 2018 is going to start an Innovation Lab in L'Aquila working with universities, such as L'Aquila and Bologna Universities



Wind Tre 's way to build the future



With 5G we can set out on a **significant route to innovation and digital transformation** that has the goal not only of testing the limits and potentials of new technology but also of strengthening the synergetic relationships between companies, universities and institutions so as to find a way to be completely in line with the future.



- ❑ “Digital skills” development is extremely important in order to create new services able to stimulate “Digital transformation”
- ❑ Generally, “digital” means different things to different people: there is artificial intelligence, virtual and augmented reality, the IOT and the cloud, data analytics... so **we need to come together because technology moves so quickly!**
- ❑ If we just address issues individually, we will never be able to make the most of the opportunity and to deal with the challenge ... because **with technology, there are also challenges.**

Working as a partnership we will be in a much better position to manage challenges, because new 5G infrastructures are going to be a priority for Italy considering that Industrial Revolution 4.0 is strictly connected with technological development and digital innovation.

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Alessandro Anania

Bologna – 15 DICEMBRE 2017

5G Use Cases Overview



The network won't be built to offer services anymore, but three fundamental kind of service scenarios will define specific requirements for new 5G network



5G Use Cases Detail

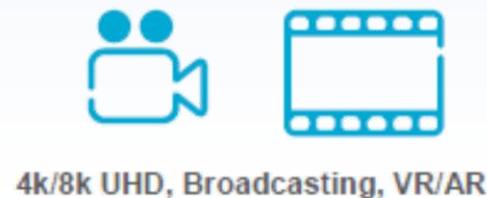
Massive MTC



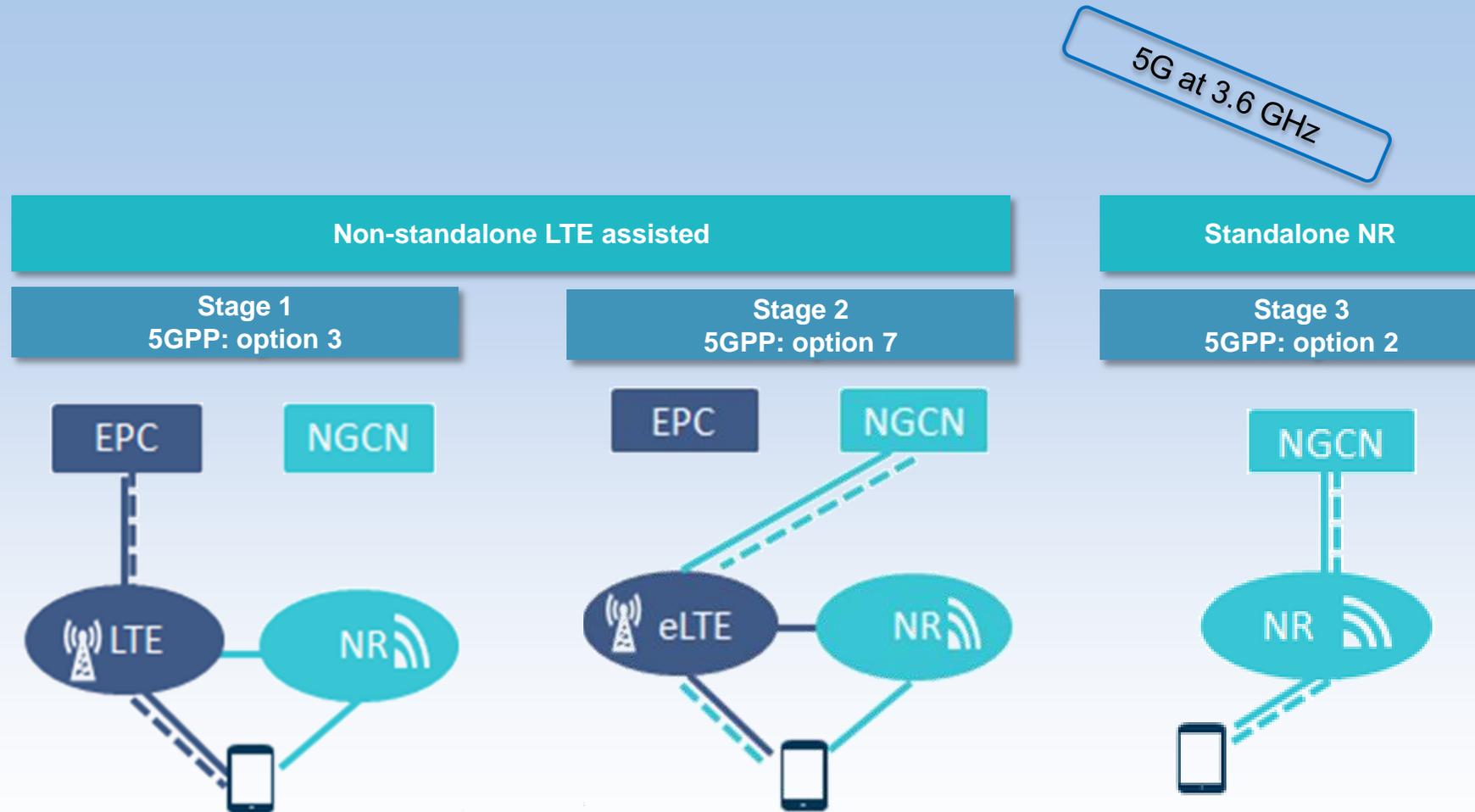
Critical MTC



Enhanced Broadband



5G Architecture Strategy. Migration Path until 2022



5G MISE Trial Results

Italy's Ministry of Economic Development (MISE) has selected companies to carry out pre-commercial trials of 5G technology in five Italian cities, starting later this year.

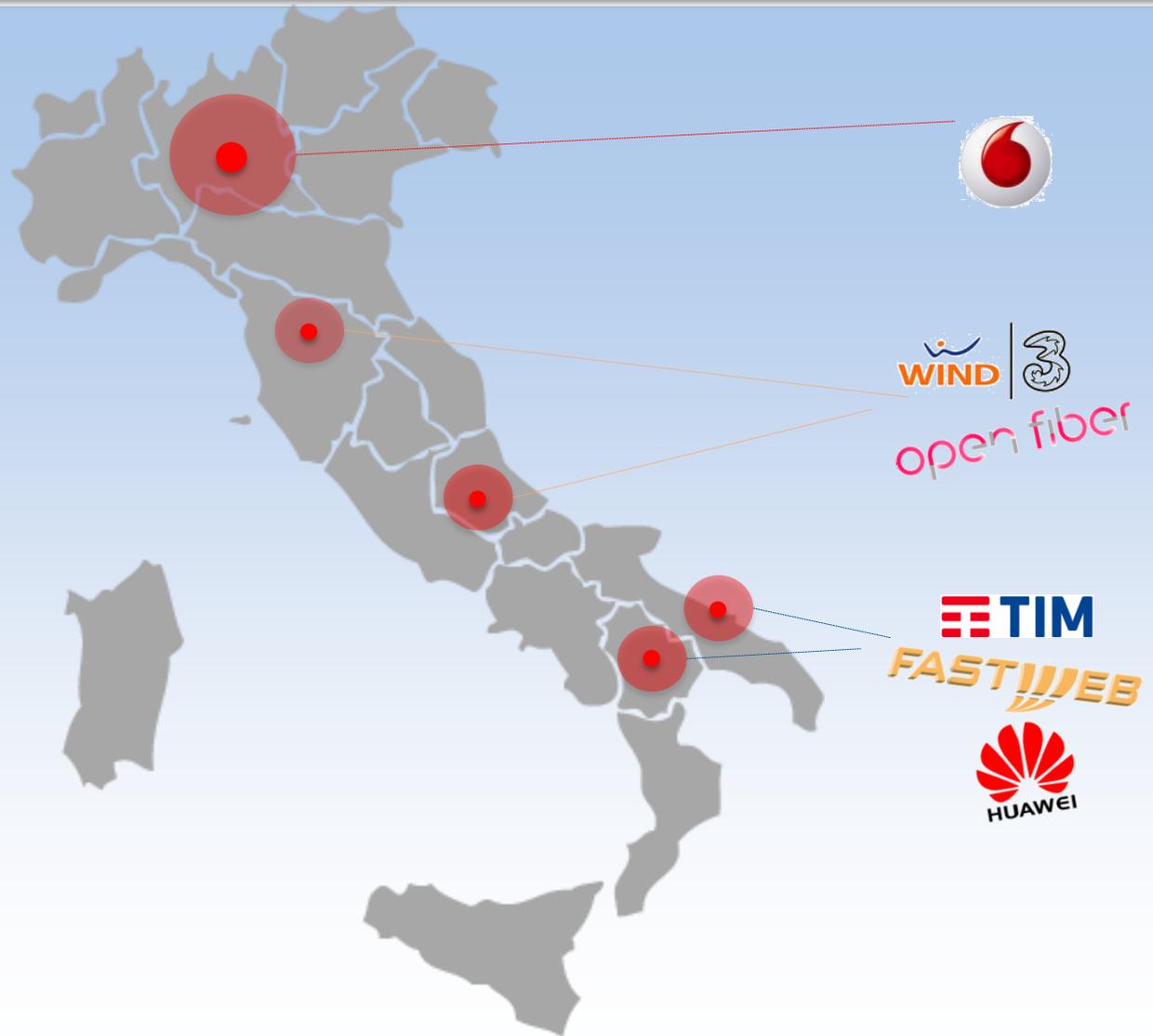
- **Vodafone Italia was chosen to carry out the tests in Milan (Area 1)**
- **Wind Tre and OpEn Fiber were selected for Prato and L'Aquila (Area 2)**
- **Telecom Italia, Fastweb and Huawei will run the trials in Bari and Matera (Area 3)**



- 3.7-3.8 GHz spectrum range (maximum 100MHz continuous bandwidth)
- Frequencies authorization on 22 September

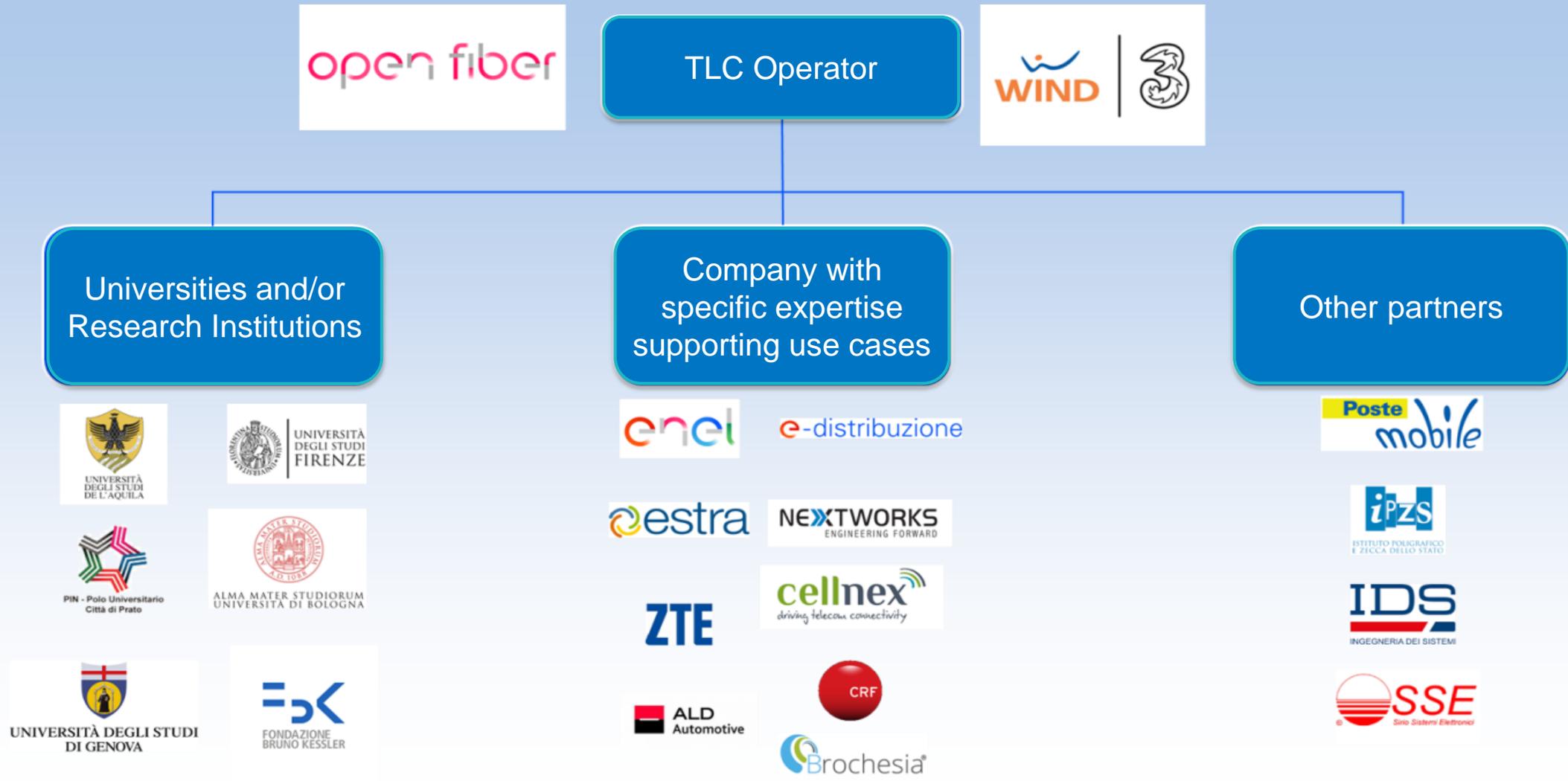


4 years, up to 2020

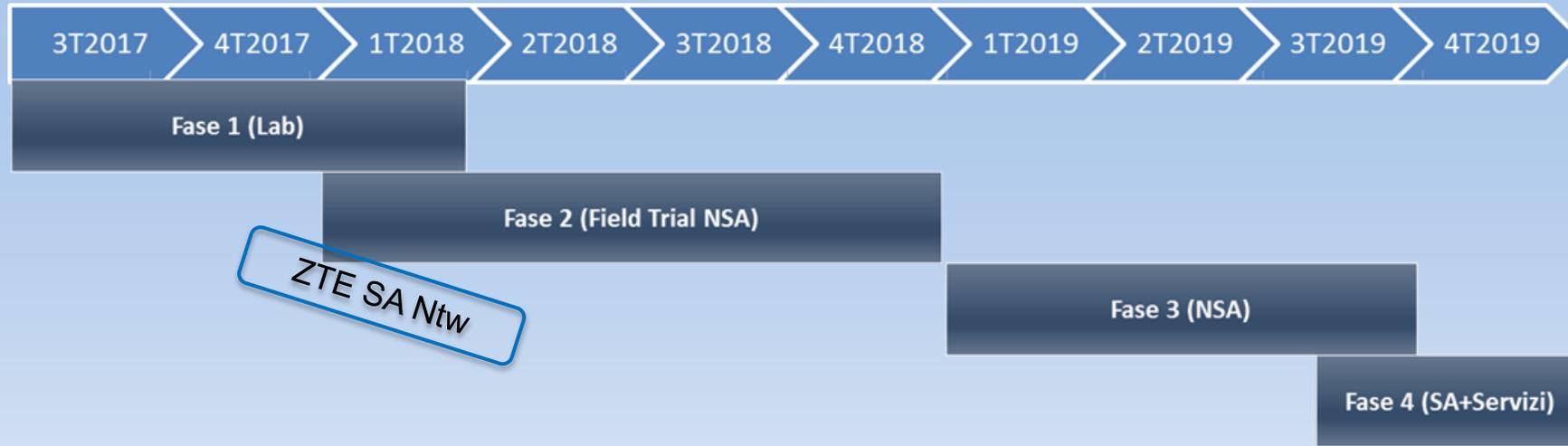


MISE plan for 3.7 – 3.8 GHz in Milano, Prato, L'Aquila, Bari, Matera

5G Trial. Main Partners



5G Trial Deployment plan. L'Aquila

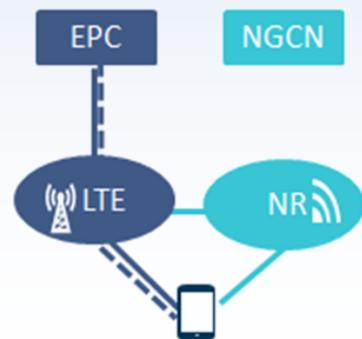


5G at 3.6 GHz

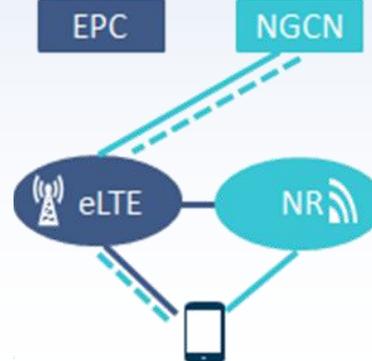
Non-standalone LTE assisted

Standalone NR

Stage 1 5GPP: option 3



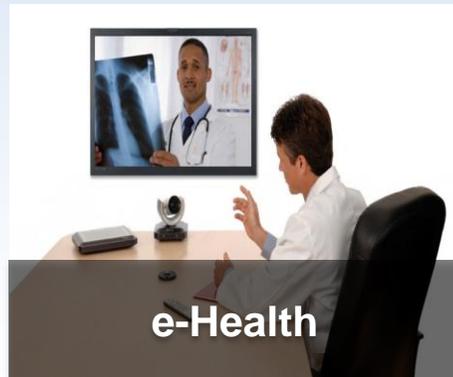
Stage 2 5GPP: option 7



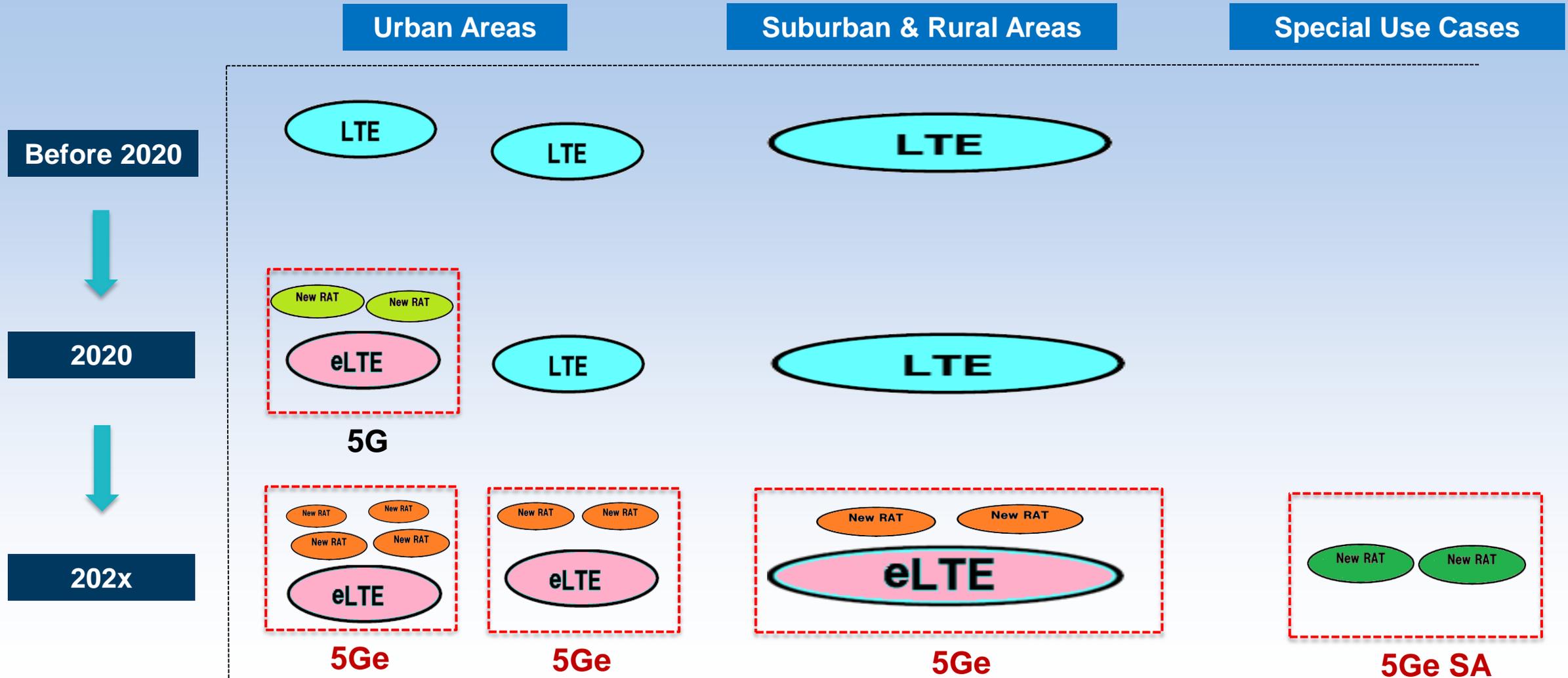
Stage 3 5GPP: option 2



5G MISE Trial. Main Use Cases



5G Deployment Plan

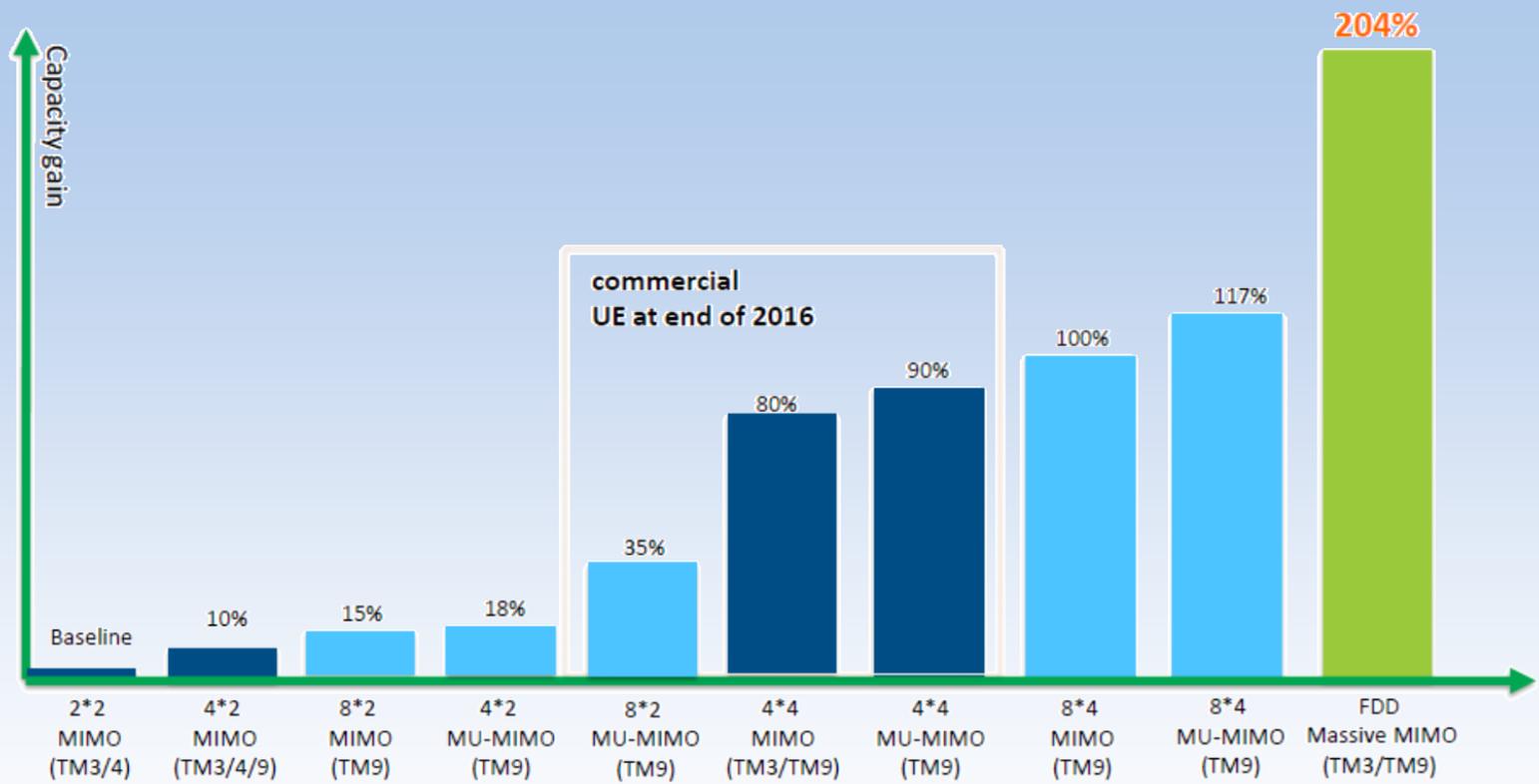
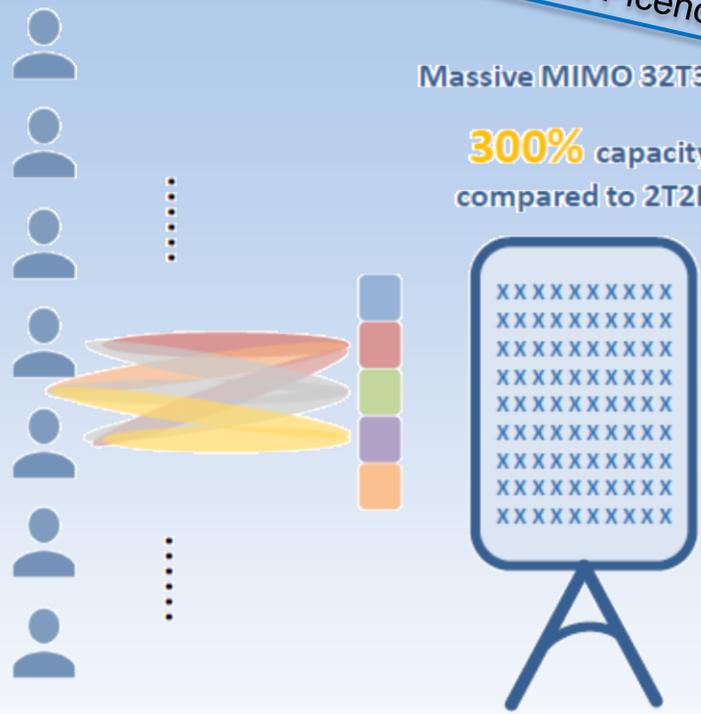


FDD Massive MIMO

Ongoing Trial in
Ascoli Piceno

Massive MIMO 32T32R

300% capacity
compared to 2T2R



FDD Massive MIMO achieves best performance
keeping compatibility with existing UEs

Massive MIMO Scenarios



Tall building coverage

Resolve Macro BS
blind coverage



Hot area

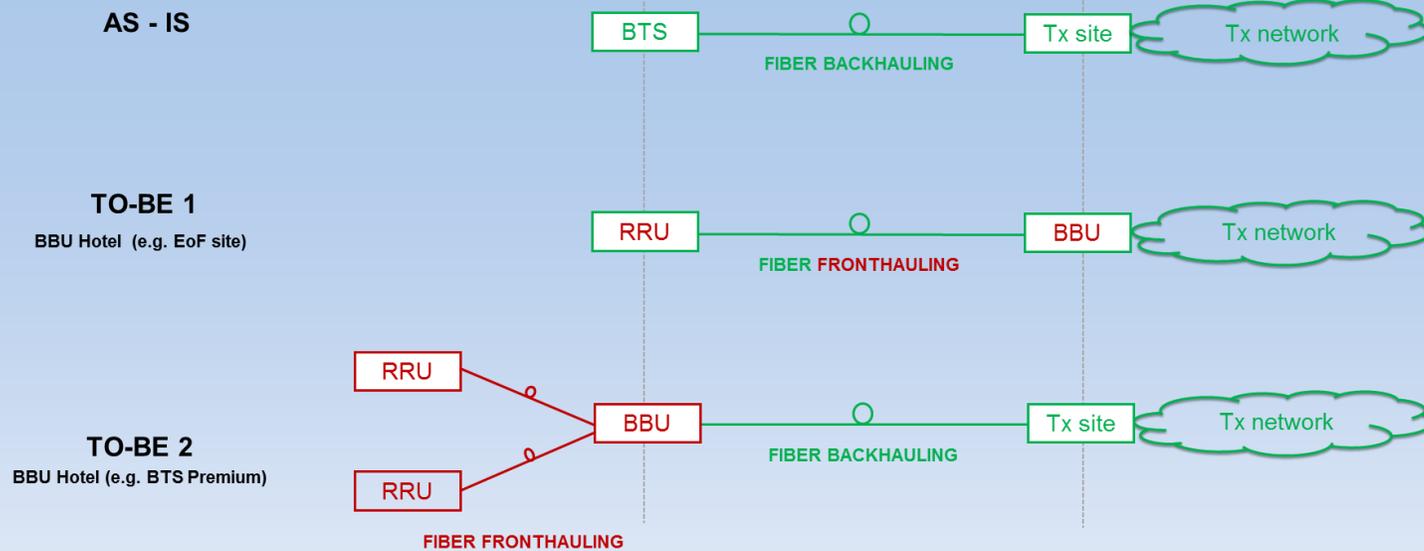
Multiplied improve capacity



Major venues

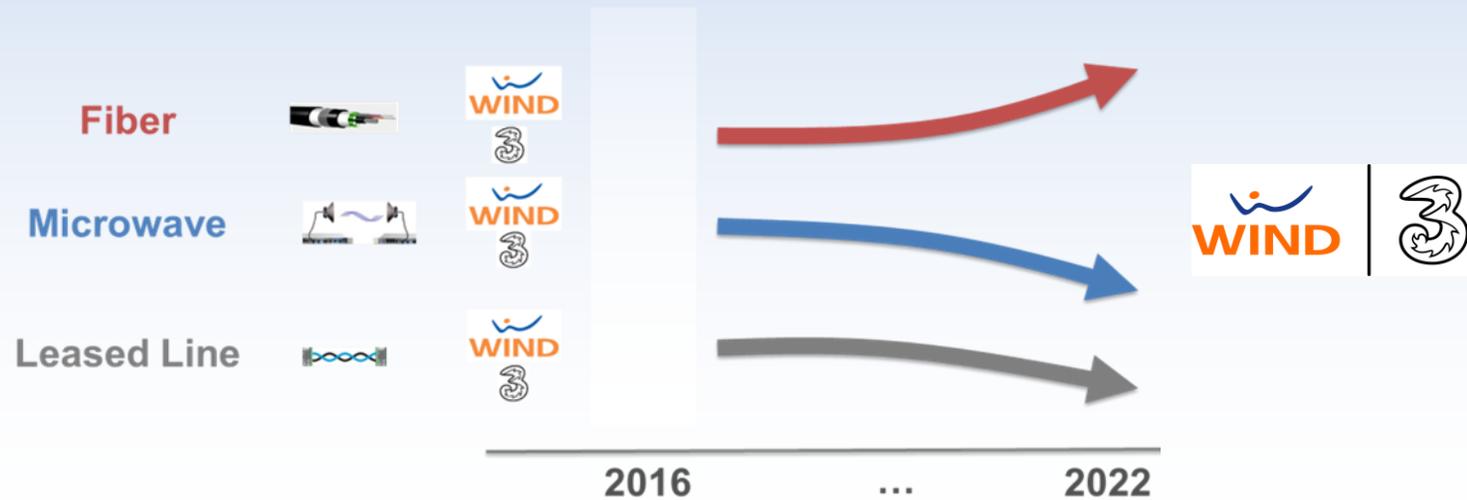
Precise coverage
VIP experience

5G Ready Transport Network

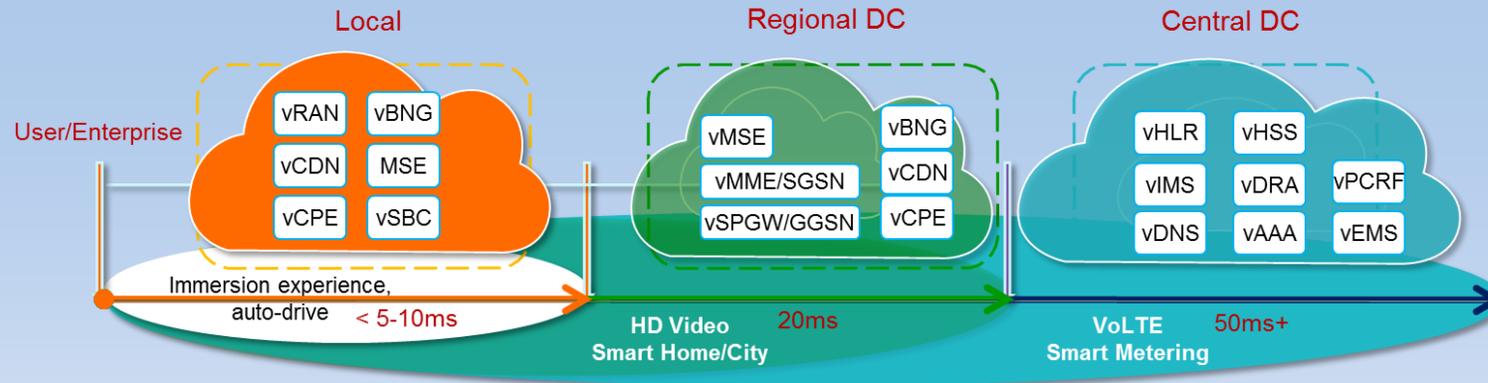


Smooth Evolution from Backhaul to Fronthaul

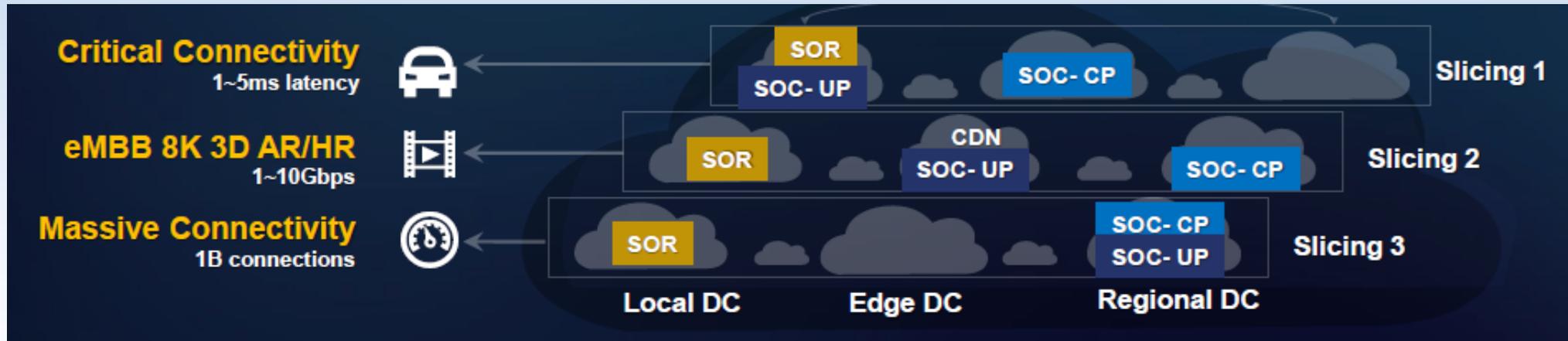
Fiber To The Node Plan to deliver Higher Capacity



Telco Cloud & Network Slicing



SOR: Service-Oriented Radio
SOC: Service-Oriented Core



**Network Function Virtualization in Cloud Datacenter
based on Dynamic Service Demands**

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Francesco Barletta

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Wind Tre offering towards Telco 2.0 paradigm



Enabling information solutions

How to design innovative solutions

Analyzing the evolution of the «Design Management» field

1980

1990

2000

2010

Design as
Form of things

Design as
Creative problem solving

Design as
Innovation of meanings

Innovation



People



Meaning **(why?)**

Utilitarian-Symbolic-Emotional



Solution **(how? what?)**

Product-Service-Process

Smart connectivity & IoT Market

Market Trends: by blending physical and digital realms, the IoT vastly expands the reach of IT technology. The myriad possibilities that arise from the ability to monitor and control things have inspired a surge of innovation and enthusiasm. A total of nine settings can be identified for mapping the global IoT value beyond smart connectivity



Human

Wearables and devices attached to, or inside the human body



Devices (wearables and ingestibles) to monitor and maintain human health and wellness; disease management, increased fitness, higher productivity, sport & fitness performance tracking. Can include some e-health and disease monitoring solutions



Home

Buildings where people live



Home controllers, safety and security systems, energy control systems, elderly care solutions interacting mainly to single customers/communities via dedicated apps and close subsystems. Alerts could be routed to local or national police stations or security guard companies.



Retail

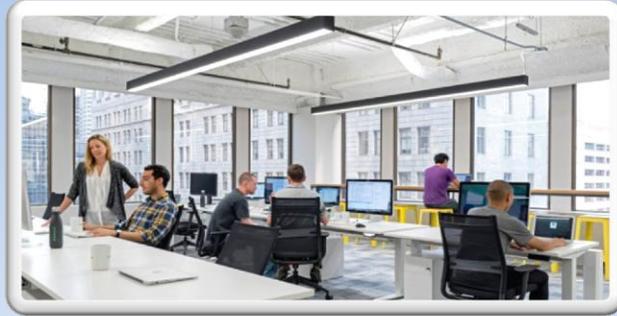
Spaces where consumers engage in commerce



Private stores, malls, banks, restaurants, arenas—anywhere consumers consider and buy; self-checkout, in-store offers, digital signage, inventory optimization, drive2store, in-store traffic monitoring, online queue ticketing, hospitality, mobile payment, digital couponing

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Offices



Spaces where knowledge workers work

Energy management and security in office buildings, improved productivity, smart working platforms, communication & collaboration for mobile employees. Keyless access, co-working, house working, advances learning & sales force optimization tools



Factories



Standardized production environments

Places with repetitive work routines, including hospitals and farms; operating efficiencies, optimizing equipment use and inventory, additive manufacturing. Include **Industrial IoT** solutions -with private coverage over single plants or dedicated campus- and Industry 4.0 services empowered by robotics technology like drones, rovers, collaborative assembly lines



Worksites



Custom production environments

Mining, oil and gas, construction; operating efficiencies, predictive maintenance, health and safety, mandown & proactive protection. Virtual reality & augmented reality, for diagnose and support, AI and chatbot for advanced learning. Could include **Industrial IoT** dedicated coverage solutions

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Vehicles **Systems inside moving vehicles interacting with connected roads**



Vehicles including cars, trucks, ships, aircraft, and trains; predictive & condition based maintenance, usage-based design, pre-sales analytics. On the road security & safety, driving style bound with insurance implications. Self driving vehicles, connected roads.



Cities **Urban environments**



Public spaces and infrastructure in urban settings; adaptive traffic control, Energy smart meters, environmental monitoring, resource management. Smart parking, Energy, lights & waste management, Structural Security and safety, predictive alerts –storms, flooding, quakes, terroristic attacks-



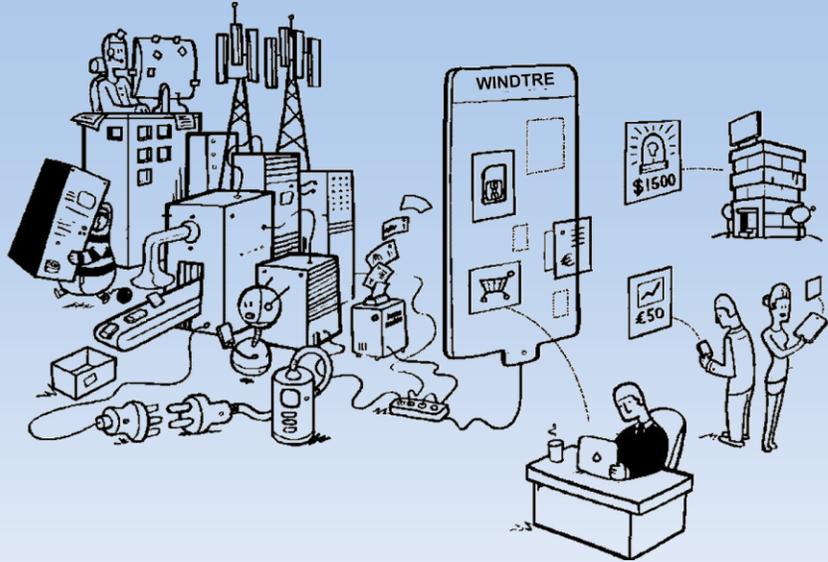
Outside **Post oppidum, between urban environments and outside other settings**



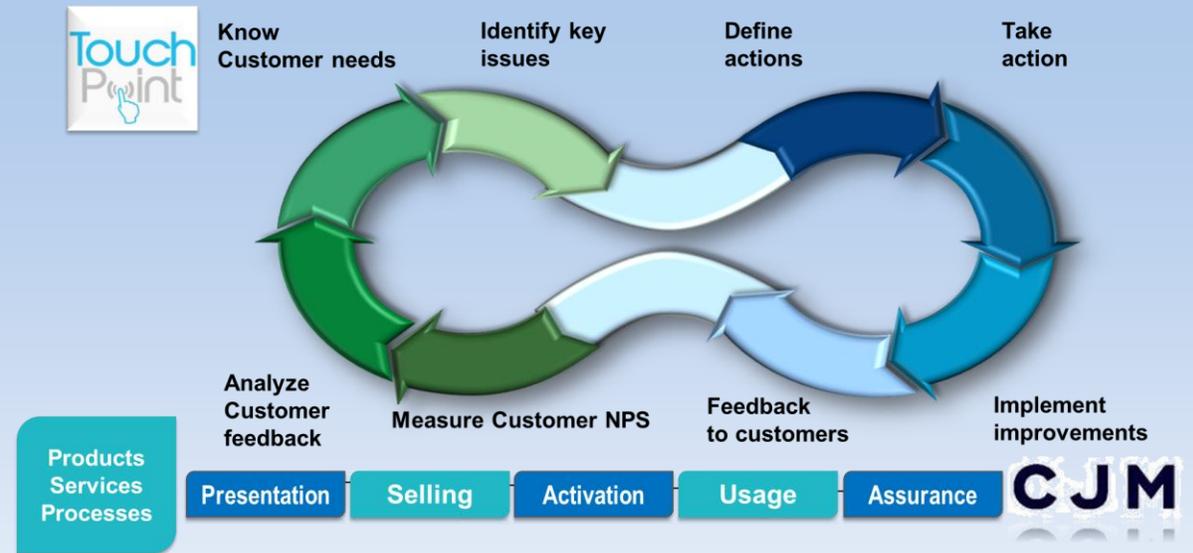
Outside uses include railroad tracks, autonomous vehicles (outside urban locations), and flight navigation; real-time routing, connected navigation, shipment tracking. Ship security and safety, maritime security and safety, sailing style, connected motorways, connected gas-station & truck-stop; oil, gas and electricity smart grids

CX Strategy Karma

Internal complexity will never affect Customer experience



Drive journey map surrounding Brand smart choice



Support Brand values pursuing smart experience

RELATIONSHIP

TRUSTWORTHY

VALUE



Endeavour Clarity, Transparency and predictability



Engage & Evangelize

BUILD A GREAT DIGITAL EXPERIENCE



App e-CARE



Website



Self-CARE Website



Touch points improvement

Open innovation & co-Innovation



Roadshow & Events



Dedicated support & coaching



PR & Promotions

