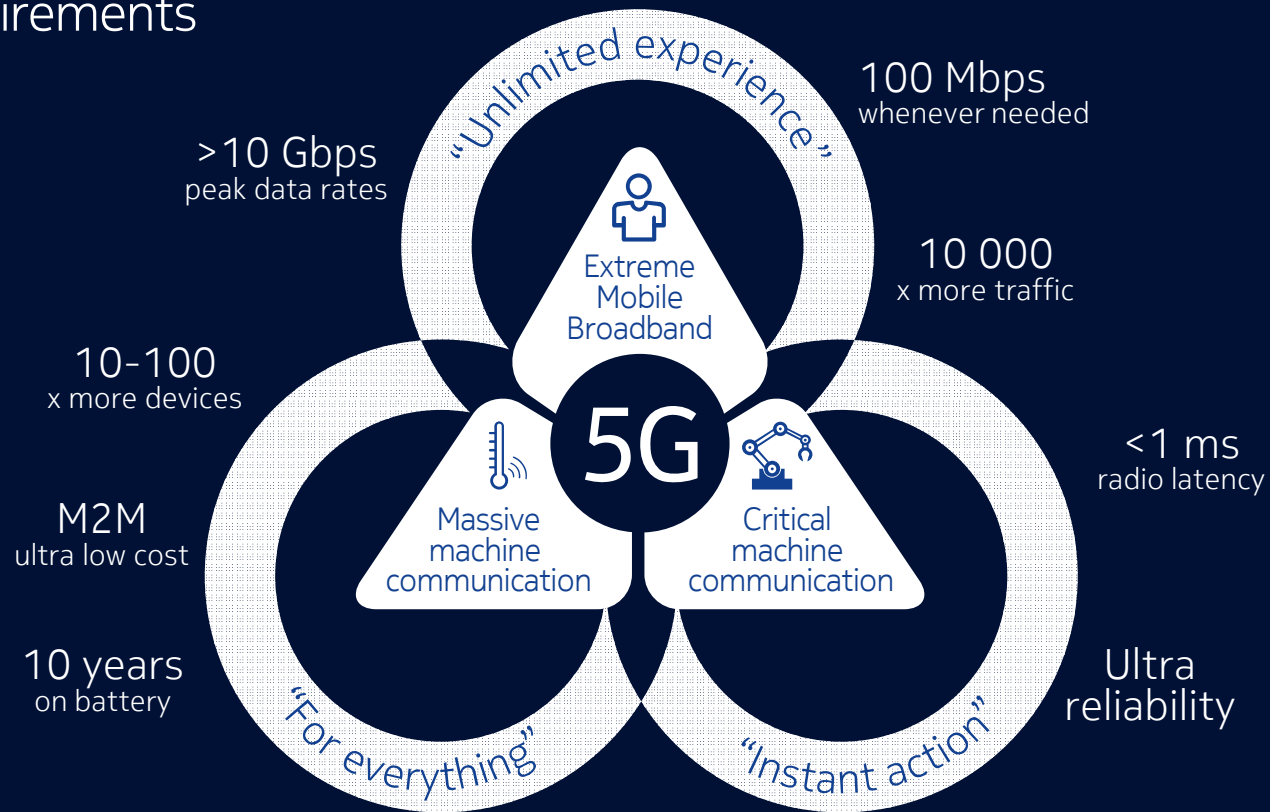


5G for people and things
Key to the programmable world

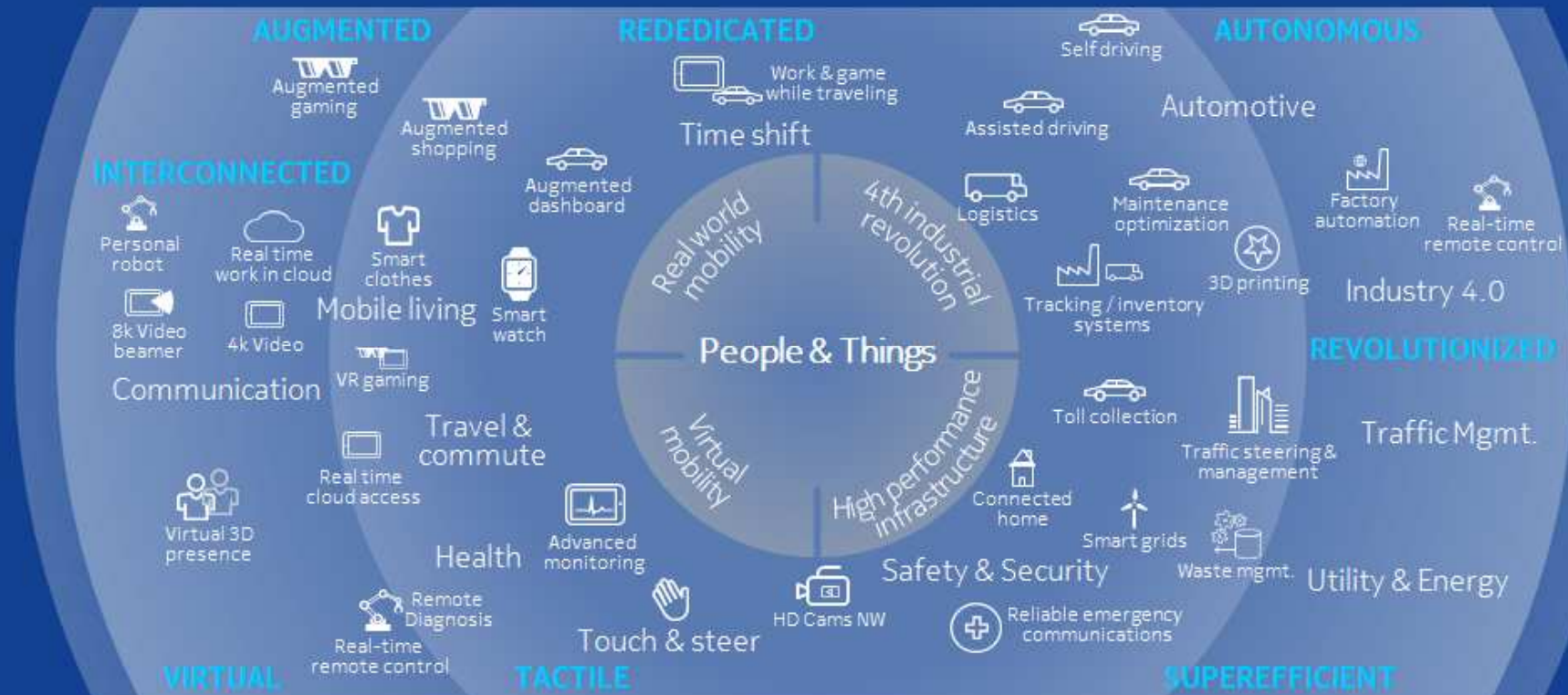
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Heterogeneous use cases – diverse requirements

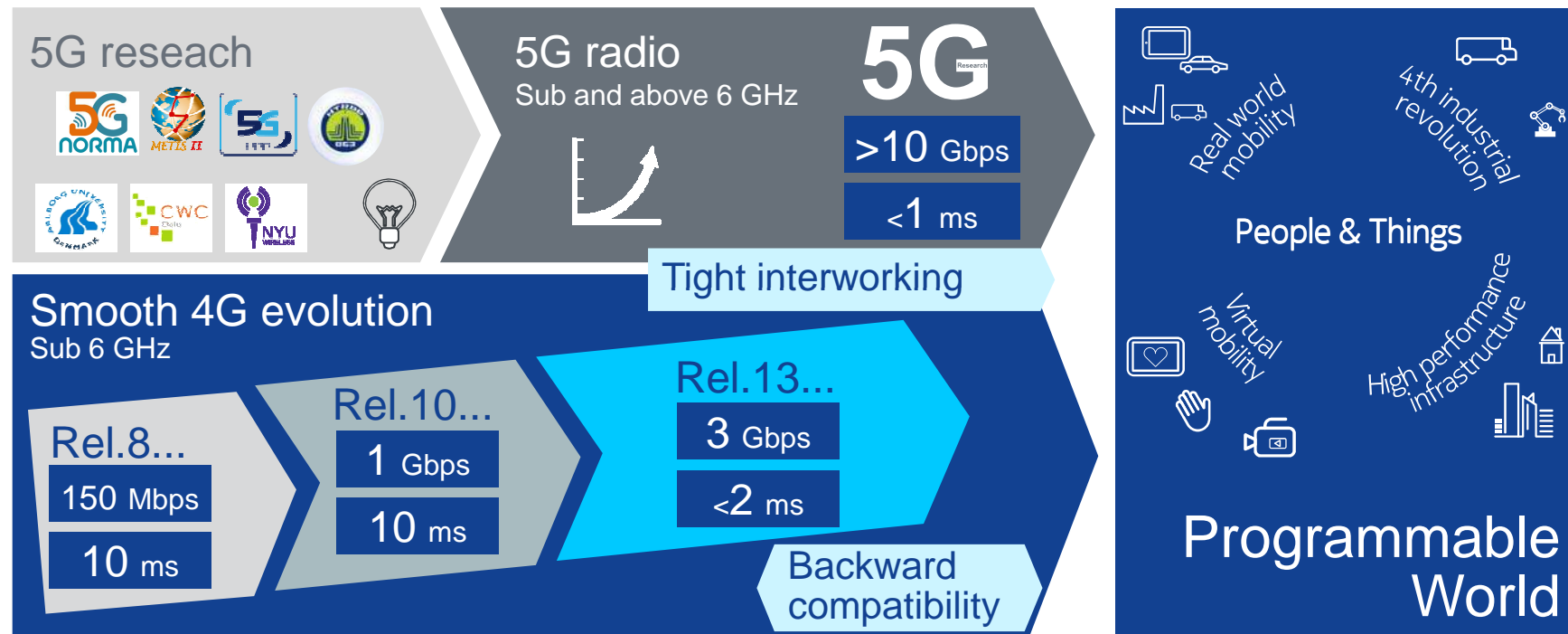


Explosion of possibilities: new performance levels of people and things

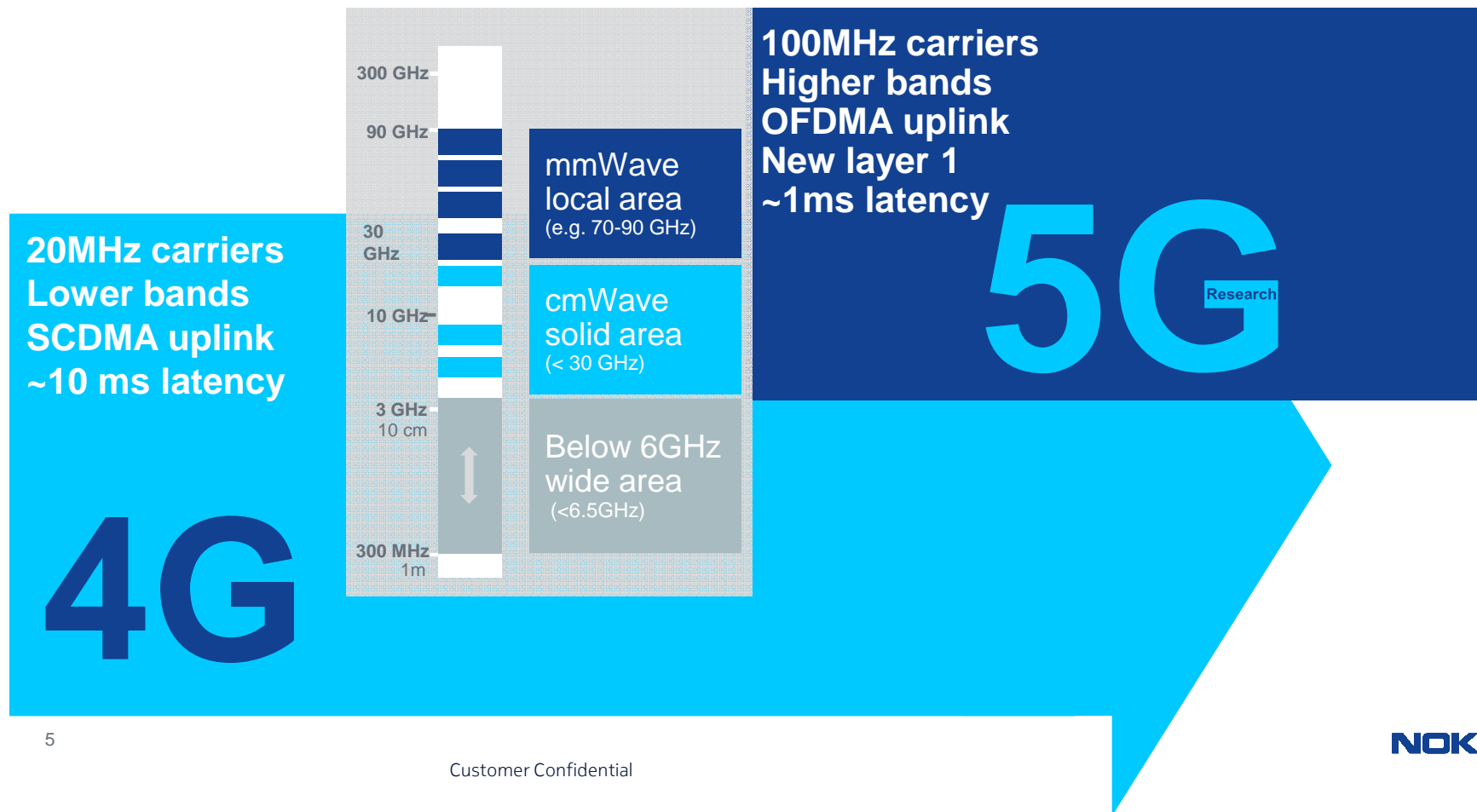


LTE-Advanced Pro builds the bridge from 4G to 5G

Enabler for initial 5G and ensures backward compatibility



4G evolves and will coexist with 5G, both are needed



Nokia

Leading 5G Industry

NOKIA

Active in shaping and aligning the global 5G end-to-end ecosystem



Confidential

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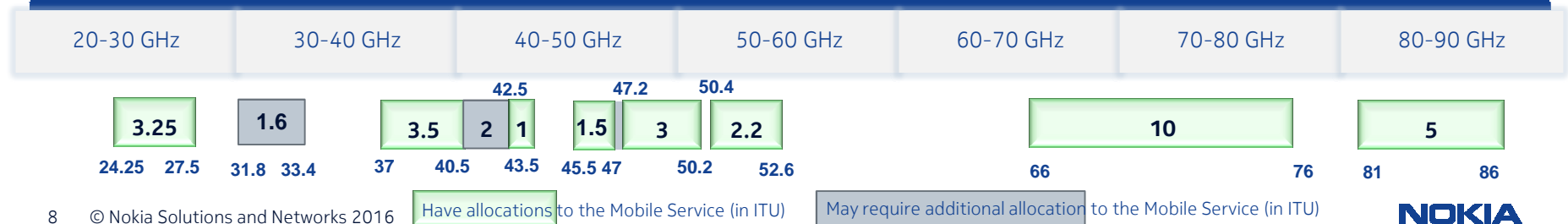
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WRC-19 process for 5G spectrum

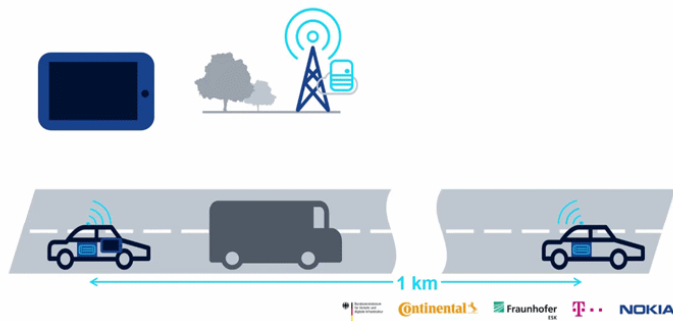
- Spectrum between **24-86 GHz** for 5G to be studied in ITU-R
- Determine the suitability of those bands for 5G mobile
 - Which band(s) have best potential to avoid undue limitations/restrictions if identified for IMT and used for 5G
 - Which band(s) have best potential for global availability
- Prioritize the target band(s) that should be studied in more detail
- Execute following ITU-R activities:
 - Define and calculate spectrum requirement of 5G in those target band(s)
 - Conduct sharing studies to demonstrate how bands can be used for mobile (for input into ITU-R TG 5/1)

Suitable and wide enough spectrum bands between 24 -86 GHz to be identified in WRC-19 to allow for wide operational bandwidths (several GHz)

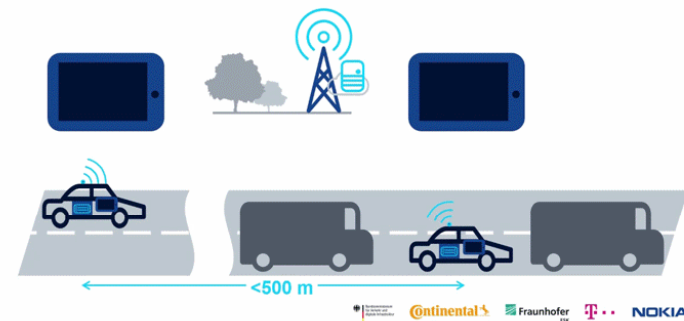


Traffic Control & Driving “state-of-the-art”(pre-5G): Research on automation

Nokia, Continental, Deutsche Telekom, Fraunhofer demonstrate real-time V2V-communications in Germany Digital A9 Motorway



Collision prevention use-case:
“Sudden-Brake / Traffic Jam” alerts



Collision prevention use-case:
“Approaching car / Car changing lane” alerts

Low-Latency (approx. 20ms or below)
key for applicability of “sudden brake” and “collision prevention” use-cases

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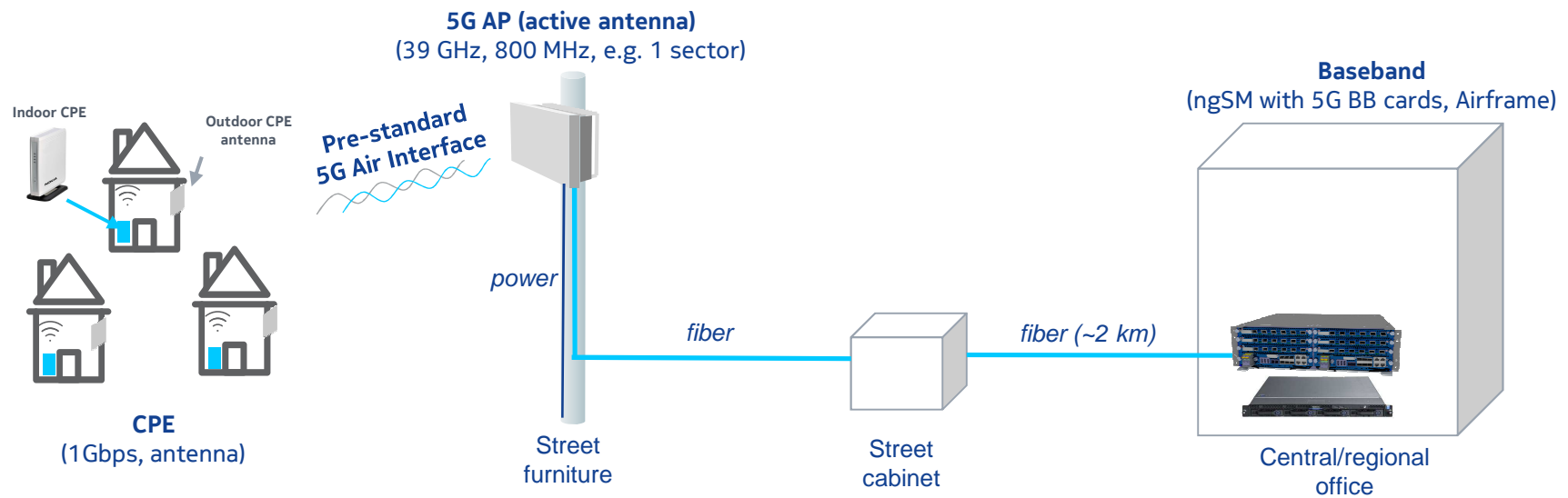
Path to 5G

Extreme Broadband to the home



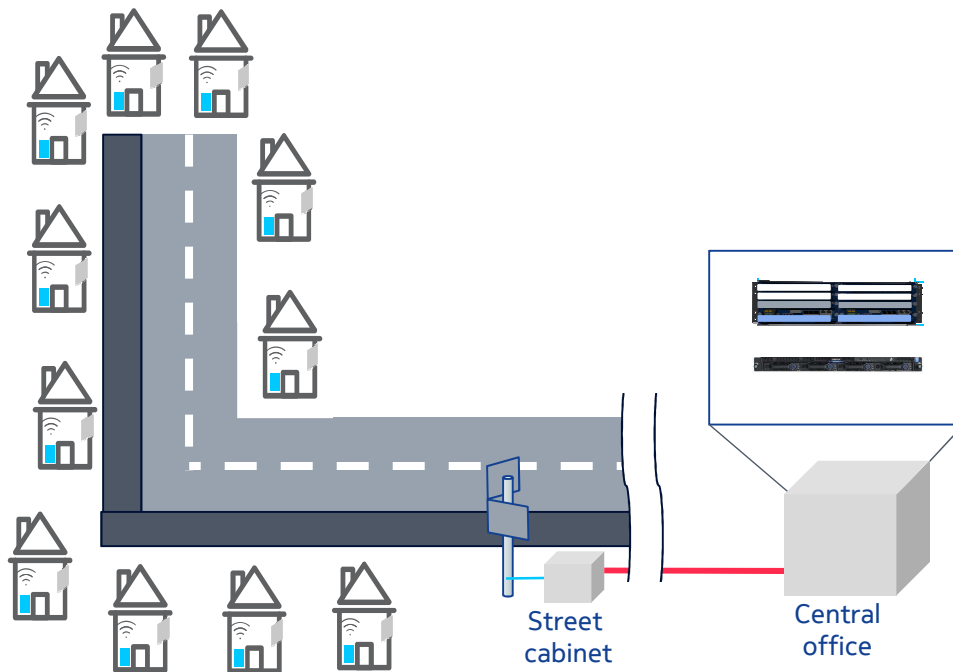
Solution with fiber to the AP

Availability mid 2018



Deployment Example - Street with single homes

High Performance service level design



Capacity:

- ~2 Gbps aggregated throughput (15-20 houses)

HW Configuration:

- 2 5G APs
- 1 ngSM rack (fully utilized)
 - 2 L1 5G BB cards
 - 4 L2 5G BB cards
 - 2 core modules
- 1 AirFrame server (20 % utilized)

Final Messages

- 5G is a new way of connectivity that will be present in our Personal Devices, Homes, IoT and Industries
- We need to start now the use cases needed for Brazil
- We need to adapt the regulatory frame work to allow the full usage of 5G
- Spectrum auctions for 5G can not follow previous model
- 5G starts now, not in 2020

Muito obrigado

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