

5G essentials

- Demetrio Rakitin
- 27-Jun-2016

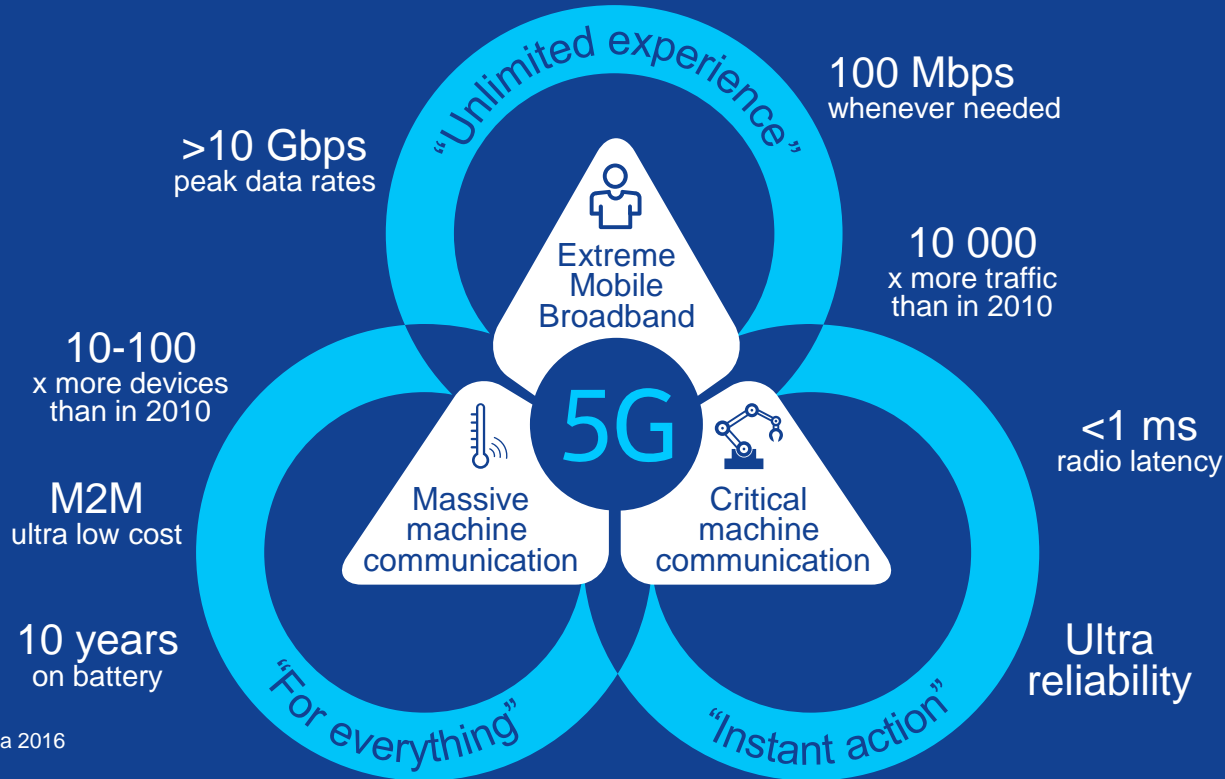


What is 5G ?

*“5G is the new generation of radio systems and network architecture delivering **extreme broadband, ultra robust, low latency connectivity, and massive networking for people and things.**”*

5G or IMT-2020 (ITU-T)

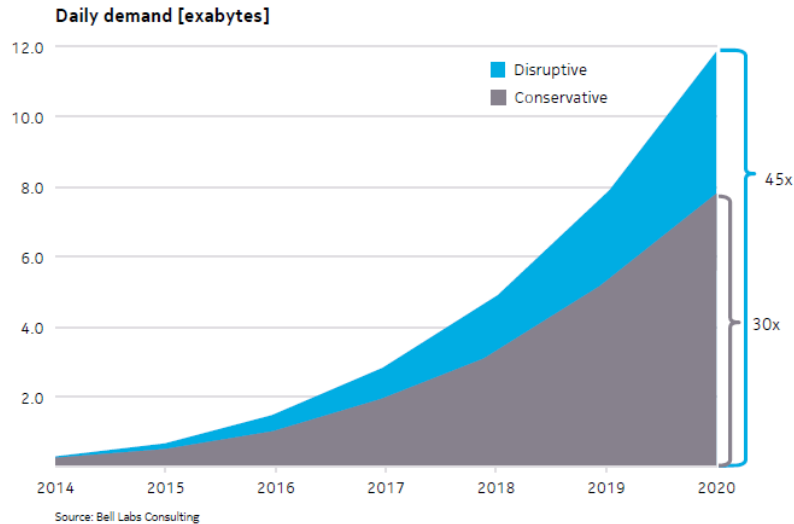
The next generation of wireless networks that will integrate **existing** and **new** technologies making possible the automation of everything in a connected world.



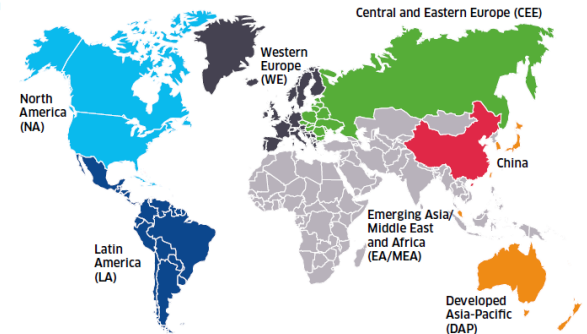
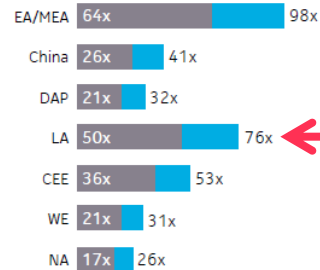
Nokia Bell Labs Consulting mobility traffic report – March 2016

- **Streaming** and **cloud-based applications** are the biggest demand drivers.
- Most streaming (66–74 %) will be homebased, driven by more content and larger and higher resolution devices, with video streaming representing 43–57 % of the total streaming demand.

Global wireless data demand growth – conservative versus disruptive trajectories



6-year demand growth by region



LA is almost doubling YoY.

World growing 76% YoY.

Mobile traffic expected to grow exponentially until 2020

Traffic has **nearly doubled every year** in past three years => $2^{10} = 2048$

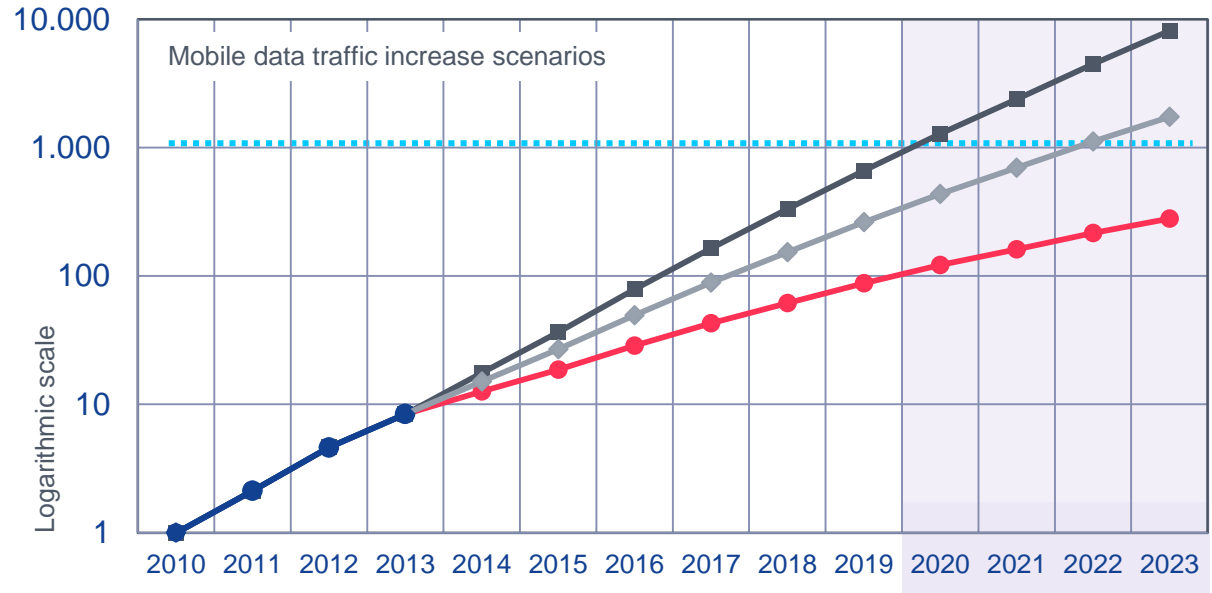
Drivers

- > Bandwidth made available
- > Smartphones
- > Mobile video
- > Bandwidth-hungry apps
- > More subscribers

Assumptions

Traffic volume per subscriber

- +75% per year
- ◆ +50% per year
- +25% per year

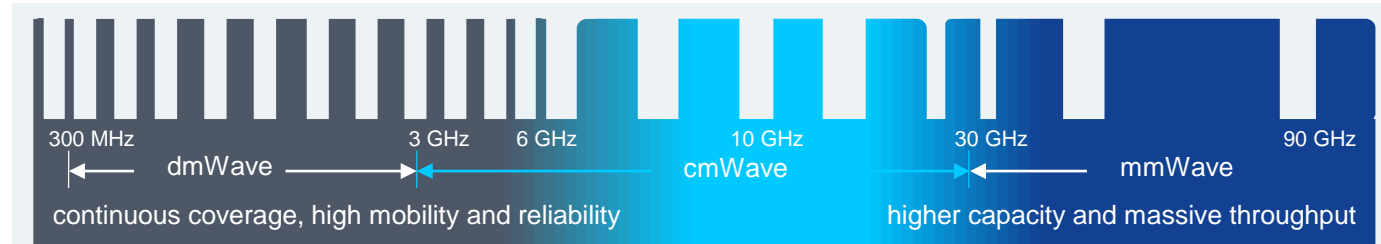


Networks should be ready even if traffic grows aggressively @ 75%/yr

5G spectrum bands and status (~400MHz .. ~90GHz)

3GPP TSG-RAN#72 (June 2016):

- 5G channel modelling above 6 GHz technical report was approved.
- Calibration simulations to be done until August.
- 3GPP aims to have L1/L2 completed by Dec-2017 for the non-standalone 5G operation.



Different characteristics, licensing, sharing and usage schemes



WRC2015 outcome

Agenda Item for WRC 2019 to identify spectrum for IMT2020

Ongoing studies focus on bands:

- 24.25-27.5 GHz
- 37-40.5 GHz
- 42.5-43.5 GHz
- 45.5-47 GHz
- 47.2-50.2 GHz
- 50.4-52.6 GHz
- 66-76 GHz
- 81-86 GHz

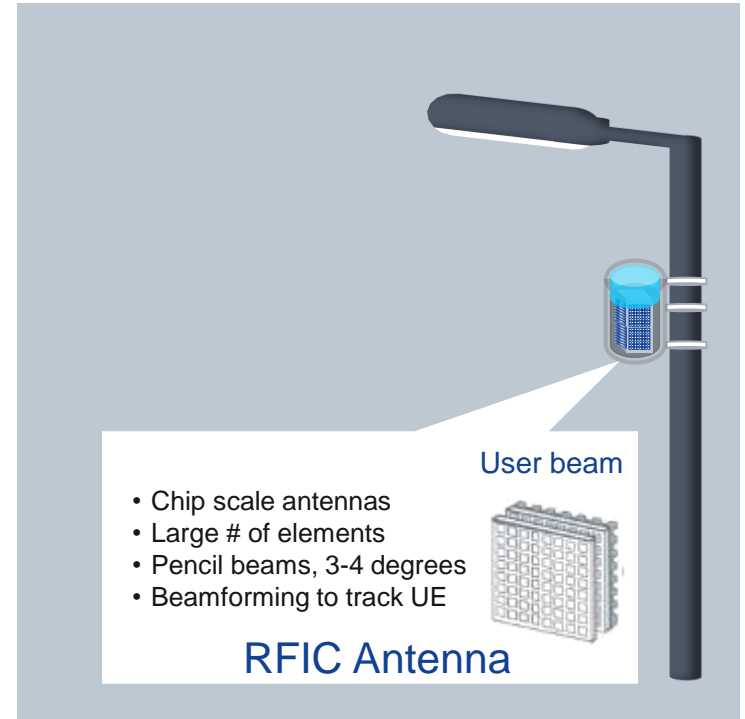
UHF* band will be revisited in WRC 2023

5G for Fixed Wireless Access

As alternative to FTTH

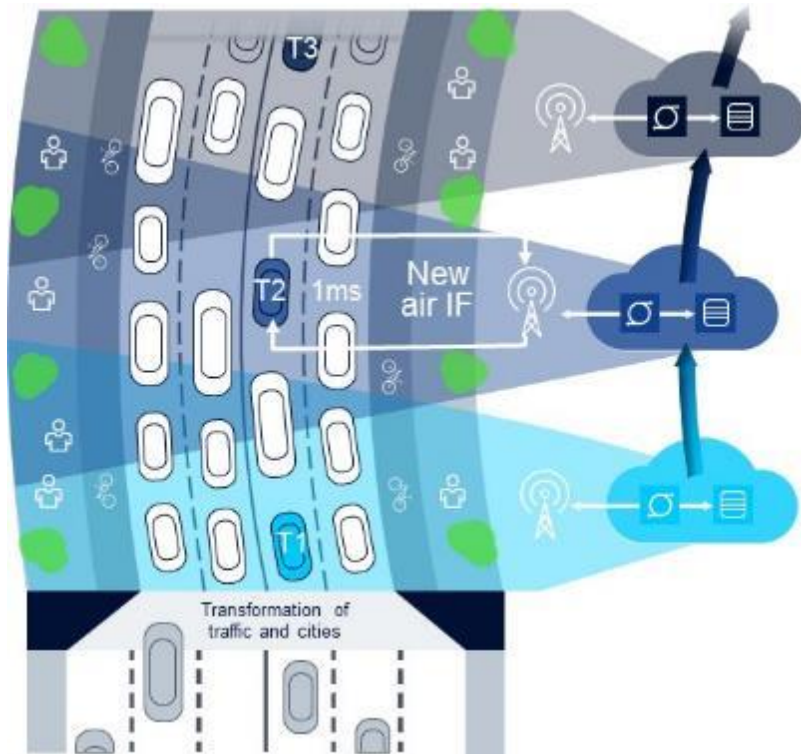


- 5G Antenna (mmWave or cmWave)
- 5 Gbps / cell throughput
- 1 Gbps to indoor CPE @ 100 m
- Indoor CPE -> no professional install
- 5G AP to be located at light or utility poles



5G autonomous driving - world's first

Connected mobility will become a reality



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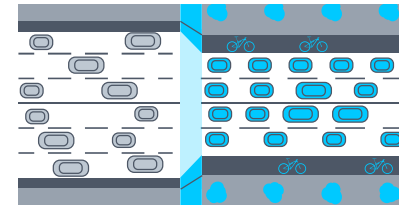
Close to zero fatalities;
1 million lives saved in the US only

300^{bn}
USD

Saving in economic costs due
to car crashes (Bloomberg)



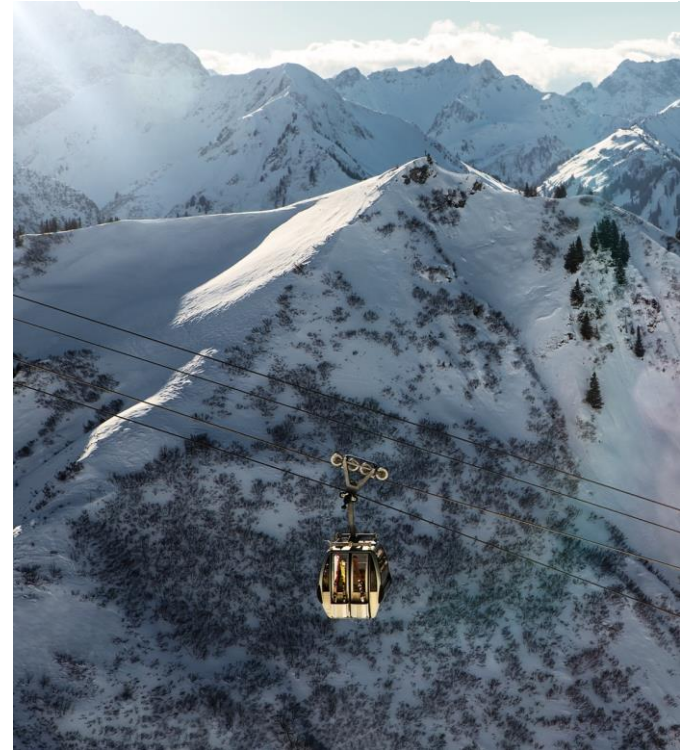
Up to 4 times more cars on
existing roads possible (first
studies in the US)



Planned 5G services for 2018 winter Olympics



- Immersive 5G Broadcasting Service:
 - Sync View - Multiple streams/views/camera feeds/camera angles – decided by end user preferences
 - 360° Virtual Reality – viewed on VR HMD
 - Time slicing – forward/backward time line review (user controlled “instant replay”)
 - Holographic live streams – i.e. athletes interviews
- 5G safety:
 - Flying drones: facial recognition, unauthorized personnel access control



Robot Taxi to offer rides in Olympic Games in Japan by 2020

Street tests ongoing

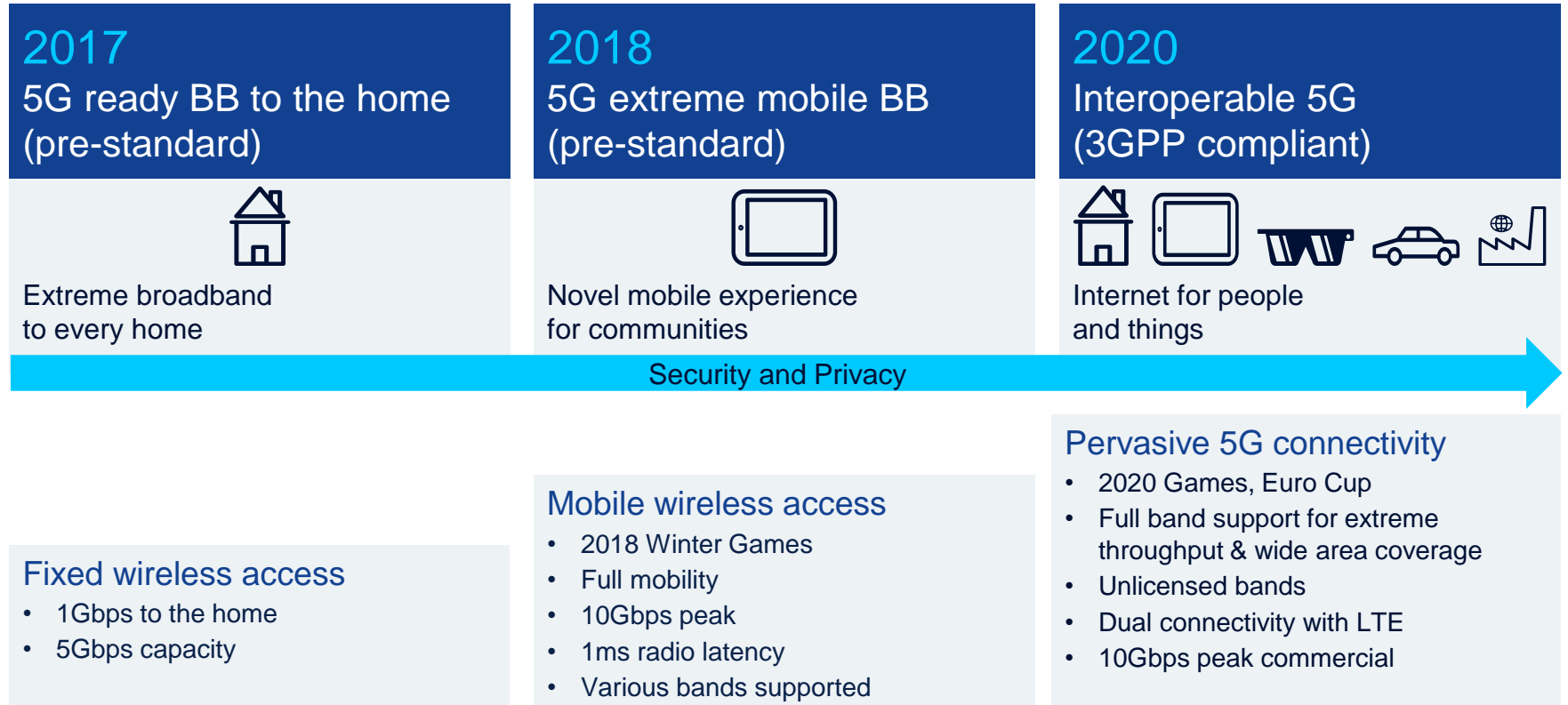
“I can tell you that in 2020 Tokyo, self-driving cars will be running around, and you will be able to use them to move around,” Japan's Prime Minister Shinzo Abe in a science and technology conference in Kyoto in October 2015.

SW will be the key differentiator in future cars, and that by 2030, 15% of the new cars will have an automatic navigation system included. McKinsey

The automatic navigation system is already considered as “the driver”, from a legal standpoint in the US.



From pre-standard products to fully standardized 5G solution



A large crowd of people is seen from behind, looking towards a stage. The scene is bathed in a bright blue light, likely from stage lighting. The Nokia logo is overlaid in a semi-transparent white color across the middle of the image. The crowd is dense, and many people have their arms raised, suggesting a concert or a large gathering.

NOKIA

¡Muchas gracias!

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