



5G

Bulletin

October 2018

In this first issue of Telelink 5G bulletin we will briefly introduce 5G, what new it will bring to the table, list a couple of interesting 5G services and define some of the key technologies.

We have also selected interesting news from the industry – a couple of “world first” 5G announcements, US focus on domination, Italy’s already legendary frequency tender.

5G Introduction

What is 5G?

Simply put – the next big thing in the telecommunications!

5G is a buzz word used to make you look on the cutting edge.

5G aims to address a major portion of the enormous IoT market.

5G has more speed, more customers at the same place, more reliability, more flexibility.

5G rides all softwarization and virtualization trends in the telco networks.

Compared to 4G in terms of capacity?

- Has a higher number – 5 is higher than 4
- Has a higher peak data rate – 10Gbps vs 1Gbps
- Has a higher tolerance to latency sensitive services (like industrial IoT, autonomous vehicles, real time augmented reality, etc.) – sub 1 millisecond. Just for example – the human blink is between 100 and 400 ms, which means 5G latency will be 100 times faster compared to the quickest human blink.
- Has a higher limit for the velocity of the subscriber – 500 km/h vs 350 km/h. Now you can jump in your Bugatti Veyron Super Sport, “pedal to the metal” it and still enjoy uninterrupted connectivity.
- Has a higher density – 1 million end points per sq. km. i.e. if ALL PEOPLE in Bulgaria decide to gather together in the Borisova Gradina, or the population of New York in Central Park, there will be a running 5G service for everyone!

Is it a revolution or evolution?

Both!

It continues to evolve the capacity and speed of the networks.

And it aims to significantly expand the addressable market of the operators with IoT, autonomous vehicles, real time AVR, etc. which is a revolutionary opportunity for them.

But what actually makes 5G a revolution is the amount of investment it will require – as history teaches us, revolutions cost a lot – and 5G will be a major one (see the news for Italy in the Industry Bits section below).

What services will be offered?

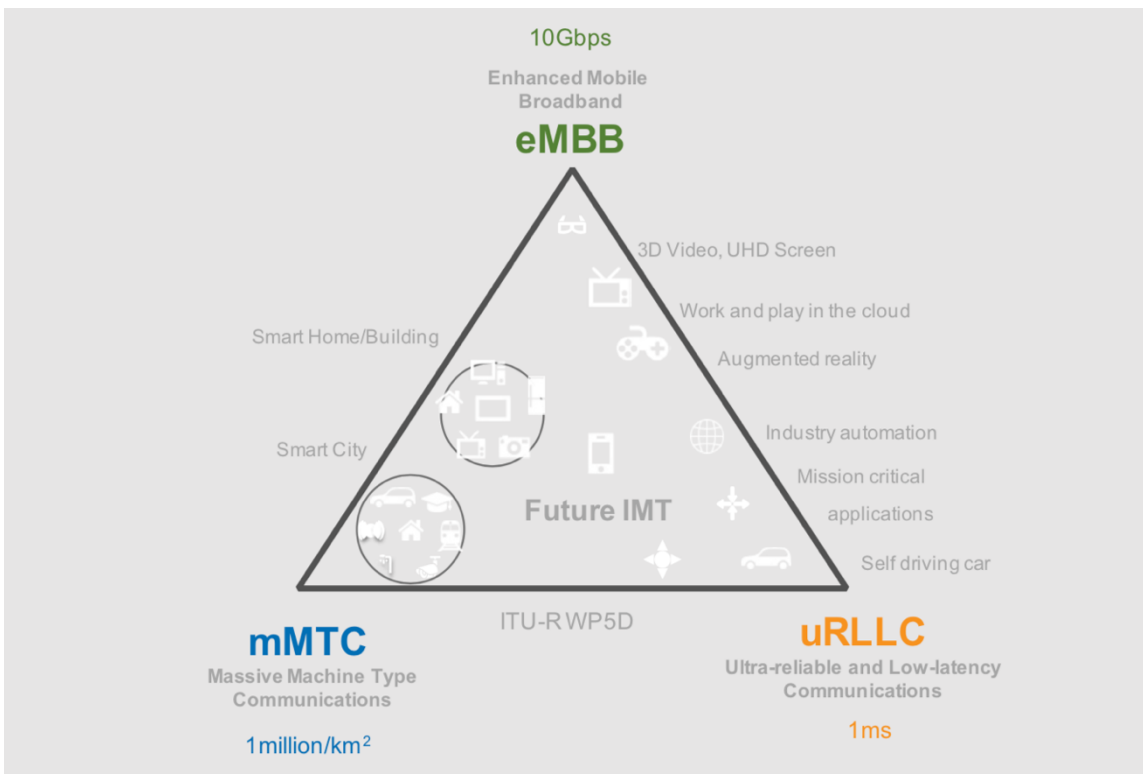
Three quite broad families of services are currently defined:

Enhanced Mobile Broadband (eMBB)

Massive Machine Type Communications (mMTC)

Ultra-reliable Low-latency Communications (uRLLC)

The actual offerings will be specific for each market, but as it can be seen on the picture below, 5G has the ambition to rule the world.



Some examples of important “new” services?

- Mobile AR and VR services

Due to the low latency of the network it will be possible to achieve mobile real time VR and most importantly AR. In the current implementations of such mobile apps there is a lag, that quickly leads to discomfort, motion sickness, etc. With 5G the latency problem will be solved as well as the ability to transfer bandwidth-thirsty immersive HD content. Needless to say, in order for such services to be successful, the right devices, as well as the right content, have to be developed, but since the AVR market is expected to grow to hundreds of billions by 2025 the progress is already rapid.

- Autonomous vehicles and mission critical applications

As with the AVR services autonomous vehicles need huge data pipe and very low latency, a single self-driving car will process 4000 GB per day, equal to 2700 Internet users. This data will need the low latency and high reliability in order to guarantee the safety of the car operation. The same principle is valid in other mission critical applications, where 5G is expected to be dominant in the long term.

- Smart city and automation

These are the key IoT areas that 5G will try to conquer with standardized narrowband services in licensed bands. In this way the reliability and quality of the services will be guaranteed, which is impossible in the overutilized free bands used by the current IoT networks.

Which are the key technologies/areas within 5G?

- 5G-NR

5G New Radio is the brand-new air interface designed for fifth generation wireless technologies. Besides expanding to new bands (mmWaves), there are also a number of infrastructural changes that should enhance performance.

The New Radio is designed to improve wireless performance, quicken response times, improve the network flexibility, offer efficient scalability and reduce device power consumption. Each of these improvements requires new technologies that represent a fundamental difference to the existing 4G air interface.

- mmWaves

Millimeter waves have much higher frequency than the currently used bands in the mobile last leg of the service. These frequencies are tempting from capacity point of view but are hard to utilize due to the millimeters small wavelength, which is absorbed by buildings, even trees and rain.

- Massive MIMO

Multiple Input Multiple Output refers to a wireless network that allows the transmitting and receiving of more than one data signal simultaneously over the same radio channel, typically using separate antennas for the transmitting and receiving of each data signal.

Standard MIMO networks tend to use two or four antennas to transmit data and the same number to receive it. Massive MIMO, on the other hand are systems with tens or even hundreds of antennas. Massive MIMO goes hand in hand with beamforming and its main benefit is to increase spectrum utilization, increase capacity and reliability of the radio interface.

- NS (Network Slicing), SDN (Software Defined Networks), SD-WAN (Software Defined Wide Area Network), NFV (Network Function Virtualization), VNF (Virtualized Network Function)
Network Slicing is yet another term for virtualized networks, where virtual slices of the network are created, so that the network parameters of the slice correspond with the service that it is going to carry. For instance, a network slice for smart city services needs one set of parameters (support for high density, narrowband, low power consumption, etc.) and a slice for fixed wireless home Internet service needs different parameters (high data throughput, no mobility, low latency not needed, etc.).
Security within slices and between slices will be crucial and much effort is directed in its development.

- MEC
Multiaccess (formerly Mobile) Edge Computing pushes back computing and processing functionality from the center of the network or the cloud to the edge of the network, so that reliability, low latency and network utilization are improved. MEC is seen as a key component for the rollout of third-party services.

Industry bits

Verizon launches world's first 5G Home Internet Service. Except it's not exactly 5G. And it's not the first one.

Verizon launched 5G Home Internet Service in 4 selected cities in the United States! BUT it is not using 5G New Radio (NR) standard, rather proprietary 5G TF standard. This means that the network will not be upgradable and compatible with 5G devices other than the ones developed by Verizon.

The infrastructure uses 28GHz frequencies in the mmWave spectrum and Verizon is saying that the network will be capable to deliver maximum speed of 940 Mbps. This maximum is highly theoretical, but Verizon is expecting the customers to get reliable service with 300 Mbps.

5G, almost-5G or just a pretender? At the end it does not matter for the customer, but it matters for the industry development and it is clear that the announcement will make the next generation of mobile networks more talked about and will accelerate the introduction of 5G by the other operators – both positives for the business and for consumers.

UK exits EU. Sort of. And enters the live 5G club. Sort of.

Another “first” 5G accomplishment, this time from UK's EE – this is the first 5G NR based live trial there. The place chosen is Canary Wharf in London and the band is 3.4 GHz.

Now next to high rising glass buildings and squares packed with bankers, Canary Wharf will have also a busy 3.4GHz spectrum. City of London – it's your turn!

As in the Verizon news, don't pay attention to the use of “first”, but do pay attention to the UK market, where hundreds of millions of euro have been pumped into 5G research and development. Will it pay off?

[More information](#)

5G is becoming a global power game.

White House issued a [“Presidential Memorandum on Developing a Sustainable Spectrum Strategy for America's Future”](#) and an accompanying memo titled [“America Will Win the Global Race to 5G”](#).

Judging by the titles and having in mind who is the current US President, it will be easy to say - that's just the desire to be the first, the best, and the greatest. Actually, as stated in the memo it is more pragmatic - leading and winning the 5G race comes down to economic growth, new jobs and national security. We agree! 5G has the potential to become an enabling environment for truly innovative products and services and in order for it to happen good policy making and national (or even international as in the case with EU) focus is crucial.

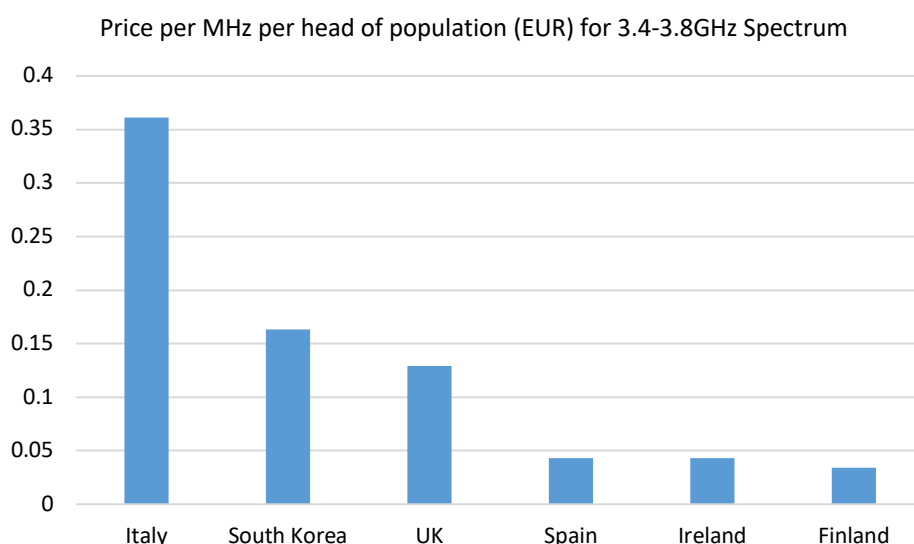
Take a look at the next news to see the opposite approach.

Italian government makes billions out of thin air.

The government in Rome can count the day of October 2nd, 2018 as a good one - it will pocket 6.55 Billion Euro out of thin air. This is the total of the 5G spectrum bidding in the 700MHz, 3.5GHz and 26GHz bands.

The government is happy, but the operators are furious and are blaming the authorities for the unbelievable cost, that according to them will slow down the investment in 5G. As 5G will play a leading role in the introduction of smart services in all sectors of the economy, it means that the price will erode Italy's technological competitiveness and innovation potential.

Only time will tell if this is valid point or just the usual complaining from the mobile operators, but judging from the comparison below, this time they might be right.



[More information](#)

Samsung is stepping on the toes of Nokia and Ericsson

After AT&T confirmed Huawei will not be delivering equipment for their 5G network – no surprise here – they announced that the 5G network will be built with Nokia, Ericsson and Samsung.

It's not good news for the incumbent vendors Nokia and Ericsson, but at least they are protected from the tough Chinese challenge of Huawei and ZTE.

Samsung is continuing its breakthrough in 5G equipment after Verizon also announced that the Korean company will be in their network together with Nokia and Ericsson. Samsung was looking to enter the telco equipment business with 4G/LTE but wasn't able to make it.

[More Information](#)