

TECHNOLOGY

Prepare for THE 5G REVOLUTION

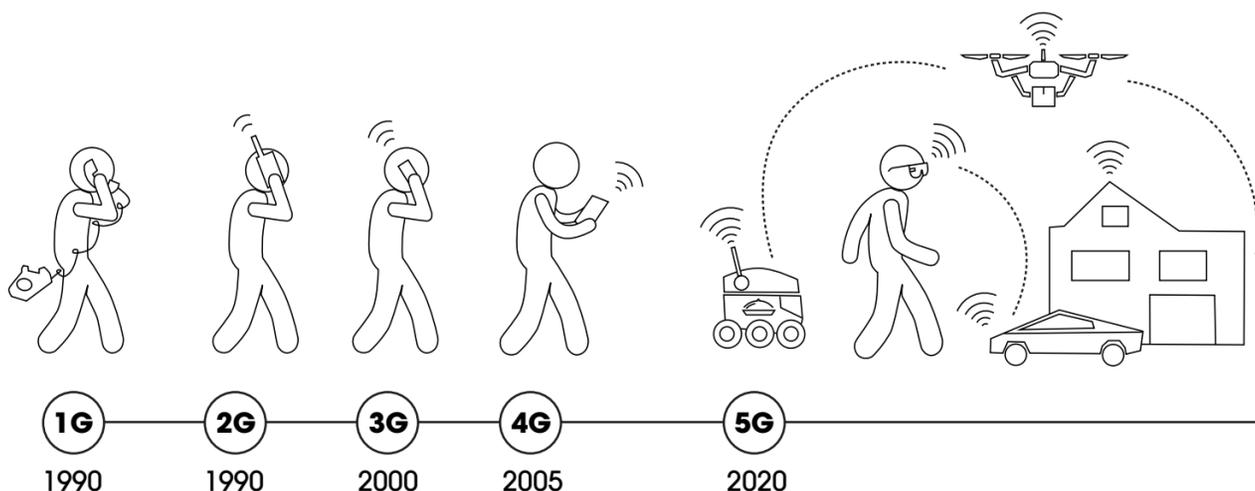
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When the rising demand for non-physical interactions suddenly bring telecommunications to the center of the stage.

Have you ever ran out of mobile data, or had no access to data at all in a super

crowded place? More and more, people today are realizing that we are at the verge of our current technology's limitation. That was simplistic example, however, there are many other situations where you can notice this trend, in business or consumer

environments. At the current state, our needs for data services frequently exceeds the technical capabilities available. Lucky for us, such issues are going to be a thing of the past.

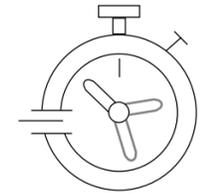


As mobile connectivity progressively develops as an essential part of our everyday lives and connected devices become more and more ubiquitous, we have come to yet another breaking point in society's technological advancements: the arrival of the 5G. Dialing the network performance/efficiency knobs up will cross a threshold that will enable new products, services and experiences to become reality. We are about to start experiencing a much smarter, interconnected and personalized world.

At this point, do we really understand what it means to be connected? The commoditization of digital may have turned people unaware of how being online have become an essential part of our lives. It increases our productivity, represents a crucial mean of social interaction, facilitates a wide number of (daily) tasks, ranging from financial transactions to our healthcare, from home to business. As the demand for such elements grow, we can see an exponential increase in data consumption, as simultaneously, the revenue for such services decline. This saturation summed up to competition, regulation and an ever-growing demand for speed, capacity and quality are the main reasons why telecommunications providers have been struggling with the industry's profitability in recent years. The coming paradigm shift may represent the solution for this problem, by opening the door to a fully connected, full-service experience era, brimming with new business models, opportunities and revenue streams.

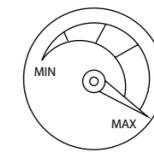
The upgrade has been highly anticipated for years by experts, analysts, industry players and the end consumers as well, as a game changer in the world communications framework. But is all this hype justified? This article will focus on clarifying the mysteries around the topic, approaching business and economic impacts of the new network standards, together with popular technological elements, explaining the most repeated theories, predictions and industry jargons.

First things first, what exactly is 5G? In a nutshell, 5G is the next generation of mobile communication standards. The new technology is meant to deliver not only a faster version of 4G but significant improvements that will enable innumerable use cases to take off, such as the internet of things, robots, autonomous vehicles or VR/AR/MR, for example (more on the use cases later). These services impose heavier and more critical requirements on network capabilities and will be made feasible by the three main functional pillars (defined by the 3GPP, a collective of organizations that develops protocols for mobile telecommunications) that the new network architecture will deliver (here come the first jargons):



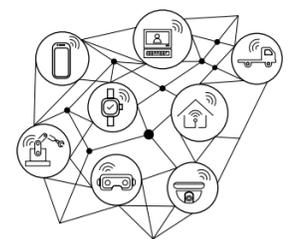
2. ULTRA RELIABLE LOW LATENCY COMMUNICATIONS (URLLC):

Low latency (the delay between information transfer) here means a 50x reduction compared to 4G (50ms to 1ms, respectively). This factor, combined with robust security properties creates an ultra-reliable connection that supports applications where failure can't occur, the so-called mission-critical applications, such as: autonomous vehicles, drones, robotics, industrial automation, medical applications, etc.



1. ENHANCED MOBILE BROADBAND (EMBB):

The upgrade of the core connectivity services, providing faster and better-quality connections for mobile and fixed-wireless customers. By the way, Fixed-Wireless access, or FWA is the deployment of fiber-like connectivity speed using mobile technology as a bridge for fixed (fiber) points, especially effective in areas, where the installation for fiber is not viable. eMBB is the most important aspect for the next wave of consumer devices too, as it implies deep awareness (optimization and discovery) higher throughput, extreme speed and capacity, handling a much larger number of devices using much higher amounts of data. Use cases: AR/VR, HD streaming, cloud gaming, etc.



3. MASSIVE MACHINE TYPE COMMUNICATIONS (MMTC):

Efficient, low cost communications with deep coverage, also meaning massive Internet of Things (IoT), and other mass market applications. The increased spectrum and power efficiency allow for a large number of connections to support data-intensive applications at a low cost, empowering smart cities, energy, logistics, wearables, analytics etc.

This diversity of applications and use cases bring us to a scenario where the new networks will require a high degree of flexibility. If we think about the situation for a second: managing such a huge number of different applications with different requirements, in the same network, could turn out to be extremely complex. In the other hand, managing multiple networks could solve for the complexity but it would be extremely costly. That brings us to another very important innovation enabled by 5G, the dynamic allocation of network capabilities based on specific applications, or Network Slicing. The concept means that operators will be able to provide a different range of services on demand by offering virtual “slices” of the same physical network. This powerful feature could be the main driver of a massive industry digitalization, as now businesses can have cost-effective, tailored connectivity services that deliver the requirements necessary for each case.

Sounds good, no? But how is this all of this possible? We will briefly discuss next the underlying technologies on which 5G is being built.

5G New Radio: new generation of a more flexible type of radio standards, shifting the previous focus (4G) from mobile broadband only to include use cases beyond consumer devices.

Spectrum: The essential building block, spectrum plays a crucial role in mobile communications development. Unlike its predecessor, 5G will need a variety of spectrum bands to support this wide range of new products, services and applications. 5G will operate above and below the 6 GHz band, much wider range than previous generations, creating more capacity, higher speed and more simultaneous usage. The overall range of 5G spectrum includes 1 GHz or lower (low), 1-6 GHz (mid) and 24 GHz or higher (high-frequency, millimeter wave). The main difference between different spectrum bands is that lower frequencies travels longer distances with lower data speed, while high frequencies travel shorter distances with faster data speed.

Network Virtualization: In the legacy structure, all network functions are performed using dedicated hardware. Network virtualization means bringing the executions of those functions into software, making it cheaper to operate. That means optimized services and tailored requirements (base of the Network Slicing concept, explained above).

Massive MIMO: Multiple In (MI) Multiple Out (MO) solves the problem of network capacity, that is, an upgrade that allows the installation of multiple antennas in the same towers, making them able transmit and receive data simultaneously from different sources.

Beamforming: A sub product of MIMO, it means the transmission of information to specific targets (devices), rather than spreading the signal in all directions.

Already tired of technical terms? Alright, since the foundations are laid, lets jump into business!

There is a high value creation potential for almost every industry and companies that are digital-ready, by leveraging 5G technologies. Additionally, we will see a significant positive socio-economic impact as well, which brings also public and political attention to 5G deployment.

We are going to dive in an experience era. The way we interact with products and the stories they tell will evolve. We can expect radical changes in design in many of the products are are used to as well as much more creative and useful new products, given the fact that some of the biggest constraints today for product makers are going to be overcome, so innovative thinking can flourish.

In the mass market, 5G will reinforce the attention on consumer devices. The smartphone market is in desperate need of innovation that will drive a new replacement cycle and 5G is the perfect candidate. The first 5G Android devices were presented in 2019 and the so expected Apple devices should be presented in late 2020 (the year this is being written).

Although there are numerous forecasts and projections available out there, formulated by experts from different natures, the great majority of them deliver the same message: The global 5G ecosystem markets are supposed to have reach multi-trillion value in the near future. Connections will build up quickly as networks are rolled out and 5G-ready devices proliferate. We can expect already hundreds of millions of 5G connections in 2021, growing to over 1 billion in 2023 and reaching close to 3 billion by 2025, almost all of them mobile devices (FWA, M2M and IoT will account for a very small share at this point).

Now considering the macro developments, we can expect many technological and in-

dustrial advances and a higher focus on automation, efficiency, customization and increase customer experience. Due to the large number of business models that will be created, there is a competitive pressure reinforcing network and technology leadership as important competitive differentiators. Early adopters can capture the already existing market demand for more advanced hardware as well as digital products and services. Another crucial fact is the optimization and automation of businesses (vehicles, industrial production, health etc.), which will affect the competition dynamics in their respective markets. As 5G business models can be composed of different requirements, for example: connectivity, platform and hardware; we can expect vertical integrations, partnerships and M&A activities, allowing the incorporation of knowledge, cost reductions and stronger market positions.

As for the timeline, judging by the past industry revolutions, the technology overhaul will require high upfront investment and impose a highly regulated framework from telecommunications providers (significant entry barrier, too). In this case, the full transformation will be a gradual, incremental rather than instantaneous process. Starting from now, different industry players will deploy different versions of 5G in different times and locations, very likely starting from big city centers in developed countries and working its way further. We can expect technological maturity in 5 to 10 years.

By now, we already know that a big transformation is taking place right in front of us and we are about to experience a whole new ecosystem of smarter products and services. It is time to grab opportunities, to rethink your business model, to surf in the 5G wave and create meaningful experiences. Time for accelerating innovation and inspire new growth opportunities. We can't be sure of what exactly is going to change, but we can be sure of one thing: change is coming. Adapt or be left behind.