

5G networks: business, security and geopolitics

Before full implementation 5G technology requires a thorough investigation of its various security and geopolitical aspects as those related to business and health.

At a European level research and innovation towards the development of 5G communication networks has been a subject of significant support under the Horizon 2020 programme. In cooperation with industry the European Commission has propelled the 5G Public Private Partnership (PPP), a research and innovation vehicle, that aims to structure and steer European research in this area. The objective of this huge project is to foster Europe's technological know-how and industrial leadership in 5G networks. The research results are intended to shape 5G standards, validate relevant spectrum identification and support a global 5G vision. All these efforts will prepare the ground for the 5G rollout in line with the 5G Action Plan for Europe.

The last wave, planned to start in 2020, will address the long term evolution of communication systems, examining technologies not fully developed under the 5G PPP, thus preparing the beyond 5G era of smart connectivity systems.

A recent European PPP report “Empowering Vertical Industries through 5G Networks - Current Status and Future Trends (20.08.2020) discusses in detail several cases from 11 different vertical sectors and identifies key 5G features that have been used to meet the specified requirements in these fields. The report plays the role of a white paper which explains how current activities to empower vertical industries through the use of 5G networks are being implemented in practice and what the real problems are.

A very convincing example how 5G networks will revolutionize a given economic sector is the media. The media sector is one of the most promising consumer sectors that can benefit from 5G networks, since it is expected that 5G technology will drastically increase bandwidth, reduce latency and thus increase media usage. The average monthly traffic per 5G subscriber will grow from 11.7 Gigabyte (GB) in 2019 to 84.4 GB per month in 2028, at which point video will account for 90% of all 5G traffic. The European Technology Platforms, New Electronic Media and NetWorld2020 have issued a joint position paper, which considers nine use cases, covering a broad range of existing and future media services. The latter include ultrahigh fidelity imaging for medical applications, immersive and interactive media, machine generated content, collaborative design to include immersive communication and many more. With respect to the necessary operational conditions the paper identifies 12 key performance indicators (KPIs), such as latency, reliability, data rate, mobility, user density, positioning and user equipment speed that should be taken into account to adapt the network to the application requirements. Two network slices with complementary capabilities should be applied in the media sector. The reason for this is that the media production and delivery chain encompass functionalities and operations, which demand very diverse network capabilities. Content production, for instance, mostly needs high uplink capacity, while media distribution typically relies on high downlink capacity.

In the context of the 5G PPP several projects are currently designing or have provided solutions and innovative services for the media sector. A solution for immersive on-site live experience includes HD video targets largescale event sites to provide better experience for the audience. End-users are able to request Ultra High Definition (UHD) in their media consumption through their user devices. UHD media experience is available for linear (e.g. live programming, streaming) and non-linear (e.g. on-demand) content. The solution demonstrated the use of 5G to deliver a high data rate streaming service to the fans, and the capability to deploy the service at the network edge for the audience, which is critical to provide an immersive experience. This innovative solution was demonstrated on-site live at the golf event Mutuactivos Open España in October 2019 in Madrid. The pilot showed the viability of the new models of events' coverage. The virtualized service improved the current processes of television production, making them simpler and faster. This is achieved by replacing the usual technical and human deployment in television production by mobile units with the simple connection of cameras and sound equipment directly to the edge. The solution maintains the optimum quality, a very important factor, for example, in the retransmission of sporting events. The optimistic conclusion is that through the new vanguard 5G technology it is possible to perform production from a remote centralized point, thus avoiding the use of large technical and human resources and cutting costs by 30%.

Despite its business impact, 5G has also quickly become a geopolitical topic. The United States, for example, has advocated that global network operators should exclude Chinese suppliers from their networks, based on perceived security concerns. The long-lasting nature of network investments means that supplier selection decisions will have implications for decades ahead. 5G service will support a more diverse set of applications than traditional mobile service. This will add new value - value at stake - to 5G service as compared to prior generations and will take into consideration the consequences of service outages.

Geopolitical tensions have also impacted the progress of standards development. In March 2020, President Trump signed the **Secure 5G and Beyond Act of 2020**. This makes multiple references to the role of standards-setting bodies. Standards body participants are typically companies that are stakeholders in the wireless ecosystem. Prominent examples include Qualcomm, Nokia, and Huawei. The standards development process requires harmonization of proposals and eventual integration into one shared standard. The process is also a forum where companies that compete in the marketplace sit together to codify the technologies they will use in that competition.

All these issues are discussed in another report titled "Security Implications of 5G Networks" prepared by the University of California, Berkeley Center for Long Term Cybersecurity (CLTC). One of the basic lines of reasoning in the document is that network upgrades do not happen overnight. Rather, a new generation will co-exist with prior generations for years, even decades. The Global Mobile Industry Association (GMSA) for instance, projects that 20% of worldwide mobile handsets in use will be 5G-capable by 2025. From a security perspective, this means that

capabilities or fixes added to new generations of network technology must co-exist with the limitations of prior generations. Consequently, the major equipment suppliers for 4G network equipment, such as Ericsson, Huawei, and Nokia, are also the dominant 5G equipment suppliers. The benefits of incumbency are high, and switching costs go well beyond equipment costs. Thus, when issues of security are raised, or when more secure capabilities are introduced, network operators are obliged to look at a live network of customers using multiple generations of technology and consider benefits. The report defines some of the most important security implications of 5G networks:

- More diverse applications may mean more heterogeneous suppliers, including device and service partners outside of the traditional set of operator suppliers. Working with unfamiliar suppliers may open new risk vectors. This will require operators or their partners to be able to test and verify new device partners quickly to validate their security practices.
- Mid-band and high-band service will necessitate significant densification of operator networks. This densification may open greater operational and physical access risks than traditional cellular networks. The increase of cell sites entailed will require robust network monitoring capability and the ability to update and patch software on small cells and customer premise equipment.
- 5G networks allow improved authentication, distributed core, and network slicing. However, these benefits also are compelling reasons for customers to investigate 5G-only service.

Berkeley Center report stresses that interviews with network operators and their suppliers highlight the need to improve awareness around security risks related to 5G. One equipment provider commented that few network operators proactively monitor their networks for attacks. In practice, many rely on third-party tower operators (e.g. Crown Castle or American Tower in US) for cell site hosting, and network equipment providers (e.g. Ericsson) for network operation. Network operators and network equipment providers have also indicated that the virtualization and software-defined networking described in 5G requires a new set of skills, and that this shift potentially adds more to the strengths of traditional enterprise IT players (e.g. Cisco, Dell/VMware, Oracle). Another risk is that 5G with an increased number of small cells and/or customer CPE could increase the potential for misconfiguration. If 5G networks do support more heterogeneous devices, the ability to rapidly push out security updates to all connected devices, not just commonly used devices, will be essential. If the service provider is different from the network operator, then a clear division of responsibilities between parties should be established.

The report also emphasises that policymakers should facilitate the rapid deployment of 5G networks and recognise the role of global standards bodies, rapid standards development and the economic value of globally harmonized standards.

Compiled by Media 21 Foundation from:

<https://ec.europa.eu/digital-single-market/en/research-standards>

<https://5g-ppp.eu/white-papers/>

<https://5g-ppp.eu/wp-content/uploads/2020/09/5GPPP-VerticalsWhitePaper-2020-Final.pdf>

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