

An Overview of the Fifth Generation (5G) Networking Technology

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Abstract

In this study we review the advantages and disadvantages of 5G networking technology, with a special focus on its impact on individuals and society. We also look at the safety implications of using 5G technology in a wide setting. Qatar has been a pioneer in implementing the 5G technology and some experiences in this area will be discussed.

Introduction

The development of network technologies such as the 5G network closely links to the increase in the public demand for such inventions. Notably, the growing adoption of mobile devices has led to consumer needs for more broadband services. Most media reports consider the past few decades a moment of transformation whereby there has been a proliferation in the number of devices and services. Furthermore, customers are demanding more access and affordability and better user experience, which require the development of innovative technologies. Qatar telecom companies are adopting 5G technology quite fast, and soon, billions of devices will depend on the system for communication and information exchange. The fifth-generation technology (5G) network has several efficiency it affords to people, data and

applications, infrastructures, and networked environments although there are fears that it may cause adverse environmental and health effects.

Characteristic Features

Low Latency

There are several more crucial features aside from better speed in 5G, such as the network's capacity as an ecosystem of massive IoT devices that facilitates the connection needs of millions of devices. Low end to end latency in the network supports real-time interactive experience involving the exchange of data and information such as multimedia and text document contents (Salem et al., 2020).

High Speed to Support Cloud Functionalities

5G technology can support functionalities such as augmented reality, virtual reality, or real-time online gaming. The fast information sharing capacities enable tactile internet feature, which thrives on the low end to end latency, less than 1ms to prevent delay of the mobile communication system (Antonakoglou et al., 2018). 5G technology distinguishes its role as a higher speed mobile internet comparable to the 4G and the 4.5G. However, the 5G internet features improvements in performance, such as low latency that offers better connectivity and cloud services (Lema et al., 2017).

Better Data Rates

The rationale for the function of 5G networks is that for the typical user experienced data rates, the network can provide gigabit levels of data and support several devices' connection. The implication is that the speed enhancement has led to a 1Gbps data speed, which outdoes predecessors. Essentially, the network improved from the previous version through an enhancement of the edge cell capacities.

Advantage of Technology/System to individuals

Self-Organizing Networks

Limited costs

There are several contributions that the new features of the technology will likely avail for global communications and technology interactions. Self-organizing networks are one crucial utility of the 5G network ((Jiang, Strufe & Schotten, 2017). The benefit of the feature has to do with its capacities in limiting the running costs of mobile networks as it depends on dynamic regulation and optimizing instead of configuring the networks manually during their deployment.

Better Network Configurations

Adopting SON is associated with better HetNet, and LTE functionalities evidenced through better network configurations such as lesser dropped calls, accelerated rollout times, throughput, and subscriber satisfaction (Jiang, Strufe & Schotten, 2017). There are several advantages to the implementation of SON, including reducing mobile operator costs, avoiding CapEx expenses that are not worthwhile, and creating favorable Op-Ex within the given revenue levels. As such, the network's advantage goes beyond achieving better consumer experiences or better network performances but is also a factor in encouraging better economic performance.

Radio Access Technologies

Uses Multiple RAT's

Another advantage of the technology is that it deploys multiple Radio Access Technology systems that allow for better performance of 5G driven activities. For instance, the better functioning of RATs offers the advantage that it enables the exploitation of intelligent systems such as Corporate Intelligent Transport Systems and the Internet of Things, which are supportive

technologies for most cloud functions. According to Sanchez-Iborra et al. (2019), the internet of things will be the most benefitted industry with the 5G network's deployment.

Supports IoV Functionalities

The IoV scenarios, for instance, usually include three primary services, that is, alert notifications using Ultra-Reliable Low Latency Communications (URLLC); vehicle or load monitoring that applies massive Machine-Type Communications (mMTC); or onboard infotainment that applies evolved Mobile Broadband (eMBB) (Sanchez-Iborra et al., 2019).

Different Levels of Latency

The rationale for 5G is that the three activities require diverse Quality of Service (QoS) and different levels of latency or bandwidth (Sanchez-Iborra et al., 2019). Essentially, there is usually a need to use more than a single RAT to transmit the traffic of data and information to and from the core network (CN).

High Speed

Lower Latency than Predecessors

Thirdly, the network's speed benefits are quite convenient for the performance of personal activities and private functions. The network's benefit is that its lower latency and high speed offer the advantage of better remote executions, an increase in the number of connected devices, and network slicing or virtual networks that support the expanding need for internet services.

Over 100,000 First Adopters in Qatar

The advantage of leveraging the higher speeds is that remote operation of computer functions will encourage better cloud services implementation. For instance, Ooredoo Qatar already signed up 100,000 customers to adopt the new 5G connections through the Shahry 5G

and Qatarana 5G plans (O'Grady, 2020). There are not many 5G devices on the rollout that do not prevent 4G customers from enjoying the highly accessible and efficient network.

Remote Task Execution

The network will afford the internet new capacities for individuals to activate and run software remotely as though they are doing it from their own devices. Furthermore, the network offers the advantage of large capacity and handling large amounts of data due to its massive IoT.

Advantages of the Network/Technology to Society

Better Connectivity and Reliability

5G is an advantage, not only to the individual but also to the larger society for several factors that surround its various efficiencies. Predominantly, there is a growing interest in the lower latency that technology offers the users. For instance, the technology has speeds over 1 Gbps that makes it the best option for creating a medium level to high-level capacity computer offices or company networks (Li et al., 2017). The impact on society will be substantial since it will allow for unprecedented connectivity levels and reliability of the internet for various functions.

To Support Business and Industry in Qatar

The move by Ooredoo Qatar, for instance, will encourage the growth of the industry sector as the company was the first to launch a live 5G network running on a 3.5GHz spectrum band (O'Grady, 2020). Part of the technology's advantage in the industrial and business sectors may have to do with aspects such as better peer to peer communications. For instance, executing functions like file and information transfer makes it possible for users to transfer vast amounts of data in the least time.

Transform Human Experience of Technology

Another advantage of 5G technology is that, similar to other past android and computer technologies, transform human experiences significantly. Primarily, technology will lead to the proliferation of new devices and services bound to affect how people conduct business and social interactions through their day (Sankaran, Ramprabu & Prakash, 2020). For instance, autonomous cars function through remote commands that depend only on the 5G network and can prevent accidents that cause numerous deaths on roads today. 5G Technology has the potential to enhance financial technologies through blockchain (Unal et al., 2020)

Qatar is already identified as a leader in the telecom industry (O'Grady, 2020). The economic outcomes may be limited in the short term, although Qatar pioneered 5G networks for mobile technologies. However, the system is highly likely to result in substantial infrastructure supports for economic growth in the long term.

Security

5-G network security can be augmented with Blockchain technologies (Unal et al, 2020). In addition, the security policies for mobile networks has to be checked for consistencies for ensuring secure operation (Unal et al, 2006). This can be achieved by using model checking and theorem proving approaches (Unal et al, 2013).

Disadvantage to Individuals

Health Effects of Radioactive mm-Waves

However, new inventions have profoundly market-friendly plans but always have some adverse effects on human survival. Scientists could currently discuss possible debilitating effects that 5G may render its users if implemented (Russell, 2018). Notably, government agencies and organizations are suspicious of the impact that the electromagnetic waves have on humans. According to Kostoff et al. (2020). the increased demand for an increase in cell data may require

the usage of 5th generation transmission power in the millimeter waves (mmW) bands. An observation often wave motions at the mmW band shows that they are absorbed in the human skin. The implication is that using the 5G networks may expose the human body to the adverse effects of radioactive waves.

The Disadvantage to Society

Environmental Pollution and Gas Emissions

Furthermore, new network technologies and support services for better internet and android lead to more industrial pollution. The effects of industrial pollution through greenhouse gas emissions are widely discussed as a significant global crisis. In the past, the electronics and computer industry was only responsible for 2% of gas emissions. Still, the surge in cell phones and computer production may exert a more stressful environment (Claire, 2020). With the introduction of the new technology, there is a high likelihood that electronic devices and other applications will increase. Claire (2020) reports that 25% of global emissions are attributable to heat and electricity production. The use of new technologies may expand fossil fuels and other resources for combustion during production and manufacture, which will contribute to more gas emissions.

Conclusion

In conclusion, the advantages of 5G technologies relate to the connectivity and convenience of accessible online services involving people, data and applications, infrastructures, and networked environments. The network's advantages are numerous and may entail faster internet services due to the lower end-to-end latency that links to delay before

receiving a response for an online command. With the higher capacity to support online devices, better speed outcomes, and cost-effectiveness of the networks, the technology is bound to influence considerable growth in online technologies. On the other hand, the capabilities for speed are associated with the emission of harmful radiation. Although there are resources and supports in place, the implications of the 5G technologies are uncertain for economies such as Qatar and the Middle East. Furthermore, wireless technologies and cloud services encourage the proliferation of electronic devices, leading to higher rates of pollution and gas emissions with adverse environmental effects.

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