5g Wireless Technology

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ABSTRACT: 5G is the 5th generation mobile network. 5G wireless technology is meant to deliver higher multi-Gbps peak data speeds, ultra low latency, more reliability, massive network capacity, increased availability, and a more uniform user experience to more users. Wireless communications systems use radio frequencies (also known as spectrum) to carry information through the air. 5G operates in the same way, but uses higher radio frequencies that are less cluttered. This allows for it to carry more information at a much faster rate.
Keywords: Evolution from 1G to 5G, Architecture, Hardware and Software of 5G, Features, Advantages, Applications.

I. INTRODUCTION:

5G wireless technology is meant to deliver higher multi-Gbps peak data speeds, ultra low latency, more reliability, massive network capacity, increased availability, and a more uniform user experience to more users. Higher performance and improved efficiency empower new user experiences and connects new industries. The 5GTF work helped accelerate the release of the 3GPP 5G New Radio (NR) standard in December of 2017. On April 3, 2019, of we introduced 5G mobile service in parts of Chicago and Minneapolis. Customers in those cities were the first in the world to have a 5G-enabled smartphone connected to a 5G network. Fifth-generation wireless (5G) is the latest iteration of cellular technology, engineered to greatly increase the speed and responsiveness of wireless networks. These speeds exceed wireline network speeds and offer latency of 1 millisecond (ms) or lower, which is useful for applications that require real-time feedback. 5G will use 'massive' MIMO (multiple input, multiple output) antennas that have very large numbers of antenna elements or connections to send and receive more data simultaneously. The benefit to users is that more people can simultaneously connect to the network and maintain high throughput.

Evolution from 1G to 5G:

1G, 2G, 3G, 4G and 5G represent the five generations of mobile networks where G stands for 'Generation' and the numbers 1, 2, 3, 4 and 5 represent the generation number. Since the early 1980s, almost every ten years, we have seen a new generation of mobile networks. A Brief History of the Evolution of Mobile Standards. ... On December 1, 2018, South Korea became the first country to offer 5G (the fifth generation mobile wireless standard) and it's fair to say that the mobile industry has made breathtaking advances since the first mobile phone call was made back in 1973. It enabled smartphones to provide faster communication, send/receive large emails and texts, provide fast web browsing, video streaming and more security amongst others. It was widely based on CDMA2000 (Code-division multiple access) and EDGE technologies. Verizon surprised most of the world by launching its 5G Home network in late 2018, followed by its 5G mobile network at the start of April 2019, making it the first globally to offer the next-generation network. The first country to adopt 5G on a large scale was South Korea, in April 2019. ... When South Korea launched its 5G network, all carriers used Samsung, Ericsson, and Nokia base stations and equipment, except for LG U Plus, who also used Huawei equipment. The study by two research firms identified the inventions most closely connected to the 5G standards and found that six companies owned more than 80% — Huawei, Samsung Electronics Co., LG Electronics Inc., Nokia Oyj, Ericsson AB and Qualcomm Inc., the only U.S.-based company in the group.

Key Concepts:

5G technology most powerful and in huge demand in near future technology. The key concepts discussing 5G and beyond 4G wireless communications are: 1) Real wireless world with no more limitation with access and zone issues. 2) Wearable devices with AI capabilities. 5G is the 5th generation mobile network. It is a new global wireless standard after 1G, 2G, 3G, and 4G

networks. 5G enables a new kind of network that is designed to connect virtually everyone and everything together including machines, objects, and devices. 5G specified radio frequencies are higher than frequencies used by 4G, which has advantages and challenges. Higher frequencies provide larger network bandwidth, lower latency and much higher connection density.

Architecture:

5G Architecture. ... 5G is effectively a dynamic, coherent and flexible framework of multiple advanced technologies supporting a variety of applications. 5G utilizes a more intelligent architecture, with Radio Access Networks (RANs) no longer constrained by base station proximity or complex infrastructure. The proposed architecture consists of four different layers identified as network layer, controller layer, management and orchestration layer, and service layer. 5G comes in three different spectrum layers — low, mid and high-band 5G — each important for the best 5G experience. The system comprising of a main user terminal and then a number of independent and autonomous radio access technologies. Each of the radio technologies is considered as the IP link for the outside internet world. The IP technology is designed exclusively to ensure sufficient control data for appropriate routing of IP packets related to a certain application connections i.e. sessions between client applications and servers somewhere on the Internet. Moreover, to make accessible routing of packets should be fixed in accordance with the given policies of the user (as shown in the image given below). Surprisingly, any service mode can be opened under 5G New Deployment Mode as World Combination Service Mode (WCSM). WCSM is a wonderful feature of this technology; for example, if a professor writes on the white board in a country – it can be displayed on another white board in any other part of the world besides conversation and video. Further, a new services can be easily added through parallel multimode service.

Hardware and Software of 5G:

The overall objective of Flex5Gware is to deliver highly reconfigurable hardware (HW) platforms together with HW-agnostic software (SW) platforms targeting both network elements and devices and taking into account increased capacity, reduced energy footprint, as well as scalability and modularity, to enable a smooth. Software.org: the BSA Foundation's new report, "5G Is Software," details the vital role that software technologies will play in 5G networks and the future of wireless communications.

Traditionally, the networking and tele communications sectors have been thought of as primarily the domains of hardware developers. The 5G next-generation base transceiver station or gNodeB (gNB) connects subscriber user equipment (UE) devices to the mobile network. Many of the gNB throughput improvements come from multiple input and multiple output (MIMO) antenna systems that improve cellular connection reliability and quality. 5G is the 5th generation mobile network. It is a new global wireless standard after 1G, 2G, 3G, and 4G networks. 5G enables a new kind of network that is designed to connect virtually everyone and everything together including machines, objects, and devices.

Features:

Improvements offered by 5G will give businesses access to lightning-fast data transfer speeds and improved network reliability. Faster Connection Speeds – The most widely known benefit of 5G is its connection speed, which is significantly faster than what the 4G network currently offers. The main advantages of the 5G are a greater speed in the transmissions, a lower latency and therefore greater capacity of remote execution, a greater number of connected devices and the possibility of implementing virtual networks (network slicing), providing more adjusted connectivity to concrete needs. In the future, 5G will provide higher qualities of service, lower latency, and higher bandwidth, which will help improve user experiences both in the consumer and business space, from cloud gaming, to telehealth use cases. With a huge array of innovative features, now your smartphone would be more parallel to the laptop. You can use broadband internet connection; other significant features that fascinate people are more gaming options, wider multimedia options, connectivity everywhere, zero latency, faster response time, and high-quality sound, and HD video can be transferred on another cell phone without compromising with the quality of audio and video.

Advantages:

Emerging 5G networks feature lower latency, higher capacity, and increased bandwidth compared to 4G. These network improvements will have far-reaching impacts on how people live, work, and play all over the world. Emerging 5G networks feature lower latency, higher capacity, and increased bandwidth compared to 4G. The main advantages of the 5G are a greater speed in the transmissions, a lower latency and therefore greater capacity of remote execution, a greater

number of connected devices and the possibility of implementing virtual networks (network slicing), providing more adjusted connectivity to concrete needs. The main advantages of the 5G are a greater speed in the transmissions, a lower latency and therefore greater capacity of remote execution, a greater number of connected devices and the possibility of implementing virtual networks (network slicing), providing more adjusted connectivity to concrete needs. Speed in transmissions can approach 15 or 20 Gbps. By being able to enjoy a higher speed we can access files, programs and remote applications in a totally direct and without waiting. By intensifying the use of the cloud, all devices (mobile phones, computers, etc.) will depend less on the internal memory and on the accumulation of data and it won't be necessary to install a large number of processors on some objects because computing can be done on the Cloud.

Applications:

The rollout of 5G will provide benefits in three major areas, also known as the "5G triangle": uRLLC: Ultra Reliable Low Latency Communication use cases. mMTC: Massive Machine Type Communication (IoT) use cases. eMBB: Enhanced Mobile Broadband – high speed use cases. A number of distinct application areas can be identified where current wireless networks will struggle to deliver: these include vehicle-to-vehicle and vehicle-to-infrastructure transportation systems; industrial automation and utility applications; wireless health services; consumer and business virtual and augmented. The fifth generation mobile communication network (5G) will not only be faster than current 4G, but also has the ability to revolutionize other sectors such as production, automotive, health care, and energy. It will allow moving from wired to wireless connections in many industrial environments. This will reduce installation costs and increase flexibility of, for example, the production processes. In case the machines of the factory need to be moved (either manually or automatically) it is an advantage when the communication of the machines is wireless compared to wired: it reduces the work necessary to move machines and thereby again reduces downtime of the factory. As an additional increase in speed, the machines can even be reconfigured, while they are being moved (as long as the controller is battery powered). Another advantage of using wireless networks is the ability to exchange information with devices which cannot be connected by wires: For example, sensors on rotating axes or inside sealed containers. Having such additional sensor data allows to closer monitor and control the production process. In summary, using a wireless communication network in a factory (1) improves the flexibility in use cases which are already possible, and (2) makes new use cases possible.

II. CONCLUSION:

5G will be able to sustainably satisfy the requirement of the 1000-time traffic growth. 5G will provide users with fiber-like access data rate and "zero" latency user experience. 5G will be capable of connecting 100 billion devices. 5G is the 5th generation mobile network. It is a new global wireless standard after 1G, 2G, 3G, and 4G networks. 5G enables a new kind of network that is designed to connect virtually everyone and everything together including machines, objects, and devices. 5G will do many things to transform our lives, including giving us faster download speeds, next to no latency, and more capacity and connectivity for billions of devices especially in the areas of virtual reality, the IoT, and artificial intelligence.

REFERENCE:
[1]. 5G Mobile and Wireless Communications Technology(Cambridge University Press).
[2]. 5G NR: The Next Generation Wireless Access Technology(Erik Dahlman and Stefan Parkvall)