5G Technology Evolution

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Abstract— In this paper, an attempt has been made to review various existing generations of mobile wireless technology in terms of their portals, performance, advantages and disadvantages. The paper throws light on the evolution and development of various generations of mobile wireless technology along with their significance and advantages of one over the other. In the past few decades, mobile wireless technologies have experience 4 or 5 generations of technology revolution and evolution, namely from 1G to 4G. Current research in mobile wireless technology concentrates on advance implementation of 4G technology and 5G technology. Currently 5G term is not officially used. In 5G research is being made on development of World-Wide Wireless Web (WWWW), Dynamic Wireless Networks (DAWN) and Real Wireless World. In this paper we propose novel network architecture for next generation 5G mobile networks. In the proposed architecture the mobile terminal has the possibility to change the Radio Access Technology - RAT based on certain user criteria.

Keywords: 5G Technology, World-Wide Wireless Web (WWWW), Dynamic Wireless Networks (DAWN)

I. INTRODUCTION

During last two decades, the world has witnessed rapid evolution of cellular communication technologies from the 2G Global System for Mobile (GSM) to the 4G Long Term Evolution-Advanced (LTE-A) system. The main motivation has been the need of more bandwidth and lower latency. While throughput is the actual data transfer rate, latency depends largely on the processing speed of each node data streams traverse through. Together with throughput-related performance enhancements, some allied parameters, such as jitter, inter channel interference, connectivity, scalability, energy-efficiency, and compatibility with legacy networks, are also taken into consideration when developing new mobile technology.

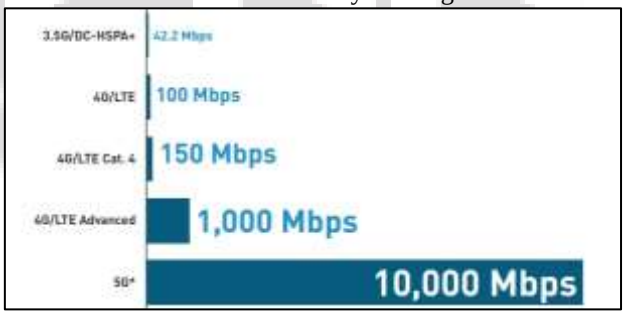
When technology advanced from the 2G GSM to the 3G Universal Mobile Telecommunication System (UMTS), higher network speed and faster download speed allowed real-time video calls. LTE and the subsequent LTE-A offered enhanced network capacity and reduced delay in application–server access, making triple-play traffic (data, voice, and video) access possible wirelessly, anytime anywhere. 4G truly constitutes mobile broadband. Although 3G was the first mobile broadband standard, it was originally designed for voice with some multimedia and data consideration, whereas 2G was intended as the first digital mobile voice communication standard for improved coverage. The data rate has improved from 64 kbps in 2G to 2 Mbps in 3G and 50–100 Mbps in 4G. 5G is expected to enhance not only the data transfer speed of mobile networks but also the scalability, connectivity, and energy efficiency of the network. It is assumed that by 2020, 50 billion devices will be connected to the global IP network, which would appear to present a challenge. In a true "networked society" remote controlled operation of appliances and critical commercial machines over a reliable 5G network will be possible with zero delay. Real-time control of machines by using mobile devices will be possible, making the Internet of things (IoT) more available to all. Finally, but not least important, less energy-hungry network nodes will be required toward a greener world. Therefore, the following are the most important elements in the description of 5G: high throughput, low-latency, high reliability, increased scalability, and energy efficient mobile communication technology.

II. WHAT IS 5G?

The next-generation of telecom networks (fifth generation or 5G) has started hitting the market end of 2018 and will continue to expand worldwide. Beyond speed improvement, the technology is expected to unleash a massive 5G IoT (Internet of Things) ecosystem where networks can serve communication needs for billions of connected devices, with the right trade-offs between speed, latency, and cost.

III. HOW IS FAST 5G?

5G speed tops out at 10 gigabits per second (Gbps).
5G is 10 to x100 faster than what you can get with 4G.



What makes 5G faster? Good question!

According to communication principles, the shorter the frequency, the larger the bandwidth.

The use of shorter frequencies (mm waves between 30GHz and 300GHz) for 5G networks is why 5G can be faster. This high-band 5G spectrum provides the expected boost not only in speed but also in capacity, low latency, and quality.

IV. WHAT IS 5G LOW LATENCY?

5G technology offers an extremely low latency rate, the delay between the sending and receiving of information. From 200 milliseconds for 4G, we go down to 1 millisecond(1ms) with 5G. Just think about it. A millisecond is 1/1000 of a second. The average reaction time for humans to a visuastimulus is 250 m/s or 1/4 of a second. People are capped at around 190-200 m/s with proper training. now that your car could react 250 times faster than you. Imagine it could also respond to hundreds of incoming information and can also communicate its reactions back to other vehicles and road signals all within milliseconds. At 60 mph (100km/h), the

reaction distance is about 33 yards (30 meters) before you pull on the brakes. With a 1ms reaction time, the car would only have rolled a bit more than one inch (less than 3 cm)

V. 5G VS 4G- WHAT IS DIFFERENCE?

The 5th generation of wireless networks addresses the evolution beyond mobile internet to massive IoT (Internet of Things) from 2019/2020. The main evolution compared with today's 4G and 4.5G (LTE advanced) is that, beyond data speed improvements, new IoT and critical communication use cases will require a new level of improved performance. For example, low latency provides real-time interactivity for services using the cloud: this is key to the success of self-driving cars, for example. 5G vs. 4G also means at least x100 devices connected. 5G must be able to support 1 million devices for 0.386 square miles or 1 km2.Also, low power consumption is what will allow connected objects to operate for months or years without the need for human assistance. Unlike current IoT services that make performance trade-offs to get the best from current wireless technologies (3G, 4G, WiFi, Bluetooth, Zigbee, etc.), 5G networks will be designed to bring the level of performance needed for massive IoT. It will enable a perceived entirely ubiquitous connected world. In short, that's what makes transformational.

VI. HOW FAST WILL 5G TAKE-UP BE?

The projected adoption rate for 5G differs drastically from all previous generation networks (3G, 4G). While previous technology was driven by mobile internet usage and the availability of "killer apps," 5G is expected to be mainly driven by new IoT usages, such as connected and self-driving cars, for example. Globally, the number of 5G users worldwide is foreseen to explode from less than 200 million in 2019 to 1,02 Billion in 2023 (Fortune Feb. 2020). According to a November 2020 report from Ericsson, 5G will reach 3.5 billion subscriptions by 2026, making it the fastest generation ever to be rolled out on a global scale.

VII. CONCLUSION

While the future is becoming more difficult to predict with each passing year, we should expect an accelerating pace of technological change. 5G is not a term officially used for any particular specification or in any official document yet made public by telecommunication companies or standardization bodies such as 3GPP, WiMAX Forum, or ITU-R. We conclude that nanotechnology, Cloud computing, All IP are the next great technology wave. We hope that this Paper helps to promote stronger links between people working in different fields creating future concepts of mobile communication, Internet services, Cloud computing, All IP network, and Nanotechnologies. We conclude that it is a great time to invest in startups. Nowadays mobile users have much awareness of the cell phone (mobile) technology. The 5G technologies include all type of advanced features which makes 5G mobile technology most powerful and in huge demand in near future.

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