Next Generation Network 5G

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Abstract——**Technology has reached the point where it is necessary to project a new network, 5G that can offer efficiency, higher speeds and a converged fiber-wireless topology. It is intended to offer high speed wireless access for data access speeds up to the Internet by using very-wide-bandwidth radio channels to 10Gbps. Factors that customers imply to need as quickly and as much are: ubiquitous coverage, high mobility, low latency, enormous number of devices and low cost/energy consumption is discussed in papers written on the same subject [1]-[5]. This paper aims to offer a solution to achieve speeds, low latency and coverage for massive access in an urban area.**

Keywords— 5G, LTE, wireless

I. INTRODUCTION

5G is manuscript for the fifth generation of mobile data communications, but there isn't a single 5G standard. Next-generation mobile broadband will be delivered to 5G-a catch-all term, for the technologies and those technologies are predicted to be use in on large scale by 2020

That's what of common conjecture, anyway, although it may be prolonged before 5G hits your home town: South Korea, which conduce to be a good few years ahead of the rest of us, isn't supposed to have 5G trials before 2017, and US trials aren't also expected before 2018.

It'll be worthiness the wait, though. 5G is meaningful because it isn't just not only about making mobile data faster; but also it's about creating a network that can deal with not just the demands of today, but the demands of the future - a future where almost all in all is connected to all in all else.

II. EASE OF USE

It's speed that's one of the headline draws of any new wireless connection, so But let's check out the numbers first.

Samsung has achieved data transfer speeds of 7.6Gbps, Nokia 10Gbps and the University of Surrey 1Tbps over wireless connections, although that's in the lab; in real-world conditions last year, NTT Docomo and Huawei achieved 3.6Gbps, which is still more than ten times faster than 4G LTE.

5G is likely to get even faster than that. There's a consensus that 10Gbps should be doable - at that speed, a HD movie would take around four seconds to download.

So speed is crucial, but when you've tried to think to get data in a city centre at rush hour you'll be solemnly aware that capacity matters just as much.
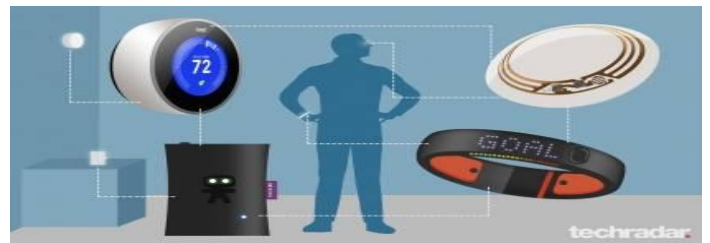

Fig. 1. 5G

Fig. 2. self-driving car

Low latency and high speeds also mean devices will take less time connected - which doesn't sound like a big deal until you memories that there will be 50 billion internets of things devices uploading and downloading data.

III. KEY IOT REQUIREMENTS ON ACCESS

IoT requires the confluence of technologies and standards, such as sensors and actuators, wearable computing, and protocols, network, storage and computing infrastructure, and varying data and analytics. Integration and automation of everything from home appliances to entire factories entail moving predominantly small burst packets of data to and from large number of end devices as well as large data packet transfers. The key requirements resulting from M2M communications on the access network are summarized below.

- Adaptable Quality of Service (QoS) support
- Significant increase in spectral and network efficiencies
- High system capacity, massive device connectivity, along with handling of small to large devices with varying traffic characteristics
- Range of low to high communications bandwidth
- Typically, equal bandwidth in both uplink and downlink directions Significantly reduced latency

IV. NEEDS OF 5G

One of the fundamental benefits of 5G technology over 4G won't be its speed of delivery – which honestly could be between 10Gbps and 100Gbps – but it is the latency. At present, 4G is masterful of between 40ms and 60ms, which is low-latency but not enough to provide real-time response. Multiplayer gaming, for example, needs a lower latency than that to ensure that when you click a button, the remote server responds instantly.

Another example was given to us by EE's Sutton, who said that 5G's prospective ultra-low-latency could range between 1ms and 10ms. He said, a spectator would be allowed in a football stadium to watch a live stream of an alternative camera angle of the action that matches what is going on the pitch ahead with no conceivable delay.

The capacity is also crucial factor too. With the Internet of Things becoming more and more significant over time, where gadgets and objects becoming smart, connected features that they have never had previously, the strain on bandwidth will continue to grow.
Prior ideas behind 5G are that an infrastructure will be in place to skip that. It will be more adaptive and flexible to user's needs and demands and therefore able to allocate more.

A. Advanced Features

In comparison to previous radio technologies, 5G has following betterment –

- Practically possible to get available the super speed i.e. 1 to 10 Gbps.
- Latency will be 1 millisecond (end-to-end round trip).
- 1,000x bandwidth per unit area.
- Feasibility and usefulness to connect 10 to 100 number of devices.
- Worldwide coverage.
- About 90% minimization in network energy usage.
- Battery life will be prolonged.
- Whole world will be in *Wi-Fi* zone.

B. The Internet of Things

By the year 2020,it is predicted by analysts that 27 internet connected devices is owned and used by each person. In future, here will be 50 billion connected devices across whole world. These can have a huge range from existing technology, such as smart phones, tablets and smart watches, to fridges, cars, augmented reality specs and even smart clothes and many more. Some of these will needed important and meaningful data to be shifted and transferred back and forth, while others might just require small packets of information sent and received. The 5G system itself will understand and identify this and allocate bandwidth respectively, thereby not putting unnecessary stretch on individual connection point.

The work has already started for 4G implementation, but will become even more crucial to a 5G future. As part of a "heterogeneous network", the points, or cells, will be used for LTE-A and the technology will be expanded , refined clarify to adapt to 5G too. Automatically Cells will talk to each device to replenish the best and most efficient service no matter where the user is.

Larger cells will be used in the same way as they are now, with broad coverage, but urban areas, for example, will also be covered by multiple smaller cells, fitted in lampposts, on the roofs of shops and homes, and even inside bricks in new buildings. Each of these will ensure that the connection will be regulated and seemingly standard across the board.[9][10].

Algorithms will even aware how fast a device is travelling, so can adapt to which cell it is connected to. For example, a connected car might need connection to a macro-cell, such as a large network mast, in order to maintain its connection without having to re-establish continuously over distance, while a person's Smartphone can get connected to smaller cells with less area coverage as the next cell can be picked up easily and automatically in enough time to stop the user noticing.[9][10].

C. 4K video streaming

Capacity will also be significant for the future of video streaming. By 2030, EE predicts that 76 per cent of its data traffic, streaming will use. And a large amount of that will be at 4K or even 8K resolutions.

The data rates of 4G can cope with that – it is expected that a 14Mbps connection should cope with streaming 4K video, 18Mbps for 8K – but if everybody was to do that at the same time, like statistics suggest, the network would have difficulty keeping up with demand [5]

V. APPLICATIONS OF 5G

Some of the important applications are –
- It will make collective global standard for all.
- Network availability will be everywhere and will aid people to use their computer and such kind of mobile devices anytime anywhere.
- Because of the IPv6 technology, visiting care of mobile IP address will be assigned as per the connected network and geographical position.
- With this application World will be made real Wi-Fi zone

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- Its cognitive radio technology will facilitate different version of radio technologies to share the same spectrum efficiently.
- Its application will give facility to people to get available radio signal at higher altitude as well.

5th generation technology offers a vast range of features, which are beneficial for all group of people including, students, professionals like doctors, engineers, teachers, governing bodies, administrative bodies, etc. and even for a common people.
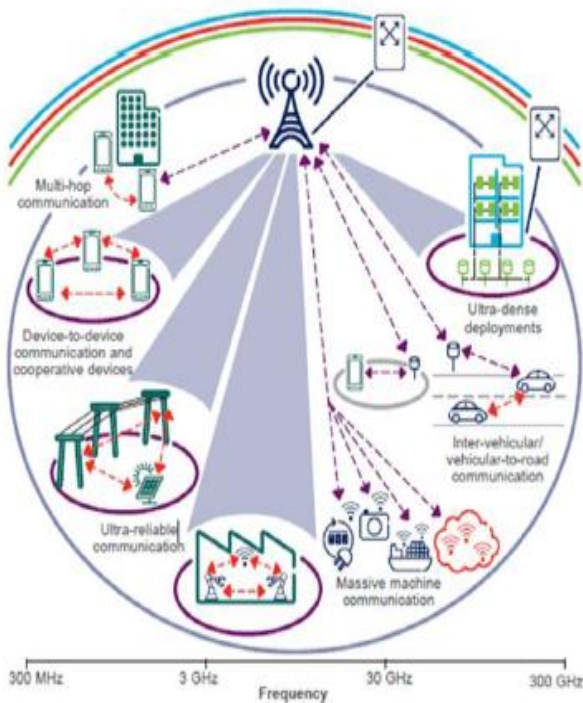

Fig 3. Frequency Spectrum of 5G

There are several other advantages of 5G technology, some of the advantages have been shown in the above *Ericsson* image, and many others are described below −

- Bi-directional large bandwidth shaping and High resolution.
- Technology which will be gather all networks on one platform.
- More effective as well as efficient.
- Technology to facilitate subscriber supervision tools for the quick action.
- Most likely, It will provide a vast broadcasting data (in Gigabit), which will support more than 60,000 connections.
- Easily manageable with all previous generations.
- Technological sound and sharp to support heterogeneous services including private network.
- Possible to provide uninterrupted, uniform, and consistent connectivity across the world.

A. Common Challenges

- Multiple Services − Unlike other radio signal services, 5G would have a huge task to offer services to heterogeneous networks, technologies, and devices operating in regions which are geographically different. So, the challenge is of standardization to provide universal, dynamic, data-rich wireless services and user-centric to fulfil the high expectation of people.

Fig 4. Challenges of 5G

- Infrastructure − Researchers are going through technological challenges of standardization as well as application of 5G services.
- Communication, Navigation, & Sensing − These services largely reckon on the availability of radio spectrum, through which signals are transmitted. 5G needs larger infrastructure support technology though it has strong computational power to process the huge volume of data coming from different and distinct sources.

- Security and Privacy − This is one of the most crucial challenges that 5G needs to assure the protection of personal data. 5G will have to identify and define the uncertainties related to security threats including privacy, cyber security, trust which are growing across the globe.

- Legislation of Cyber law − Cybercrime and other fraud may also expand with the high speed and ubiquitous 5G technology. Therefore, legislation of the Cyber law is also an mandatory issue, which largely is governmental and political (national as well as international issue) in nature.

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VI. 5G - FUTURE SCOPE

Several researches and discussions are going on across the world among all researchers, technologists, academicians, operators, vendors, and governments about the innovations, implementation, viability, as well as security concerns of 5G.

As proposed, loaded with multiple advance features beginning from the super high speed internet service to smooth pervasive service, 5G will decipher many of the problems. However, the question is — in a situation, where the previous technologies (4G and 3G) are still under process and in many parts yet to be started; what will be the future of 5G?

5th generation technology is invented and designed to provide incredible and remarkable data capabilities, unhindered call volumes, and immeasurable data broadcast within the latest mobile operating system. Hence, it is more intelligent technology, which will interconnect the entire world without limits. Likewise, our world would have universal and uninterrupted access to information, communication, and entertainment that will open a new dimension to our lives and will change our life style meaningfully.

Moreover, governments and regulators can adopt this technology as an opportunity for the good governance and can provide healthier environments, which will definitely encourage continuing investment in 5G, the next generation technology.

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