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5G Technology in India

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Abstract : The entire world is moving with mobility at an ultra-fast speed in the utmost minimum time but in India the situation is different, With the creating passion of high data speed in India and addition in the amount of customers from the latest period the present development of 3G and 4G won't have the choice to satisfy the requiring services of the customers ? In this manner the evolution of the best framework called as 5G Technology is significant. As the expectation of the public increases with the advancement of technology comes into picture, the services that can be obtained using the telecom networks have extended. In This paper we will summarize the main initiatives toward 5G technology in India. This paper briefly discusses how this technology will provide changes or a huge impact on India, apart from this we discuss the architecture and working of 5G, its features, Benefits and we have also outlined the broader usage of 5G and its future impacts on our lives. We discuss the Reality of 5G in India and what are the main challenges India is facing in launching 5g. How to tackle them. Furthermore, at the end of each subtopic the necessary recommendations are given.

Keywords - 5G Technology, evolution, framework, telecom networks, ultra-fast speed

I.   INTRODUCTION

The next generation 5G wireless access technology not only promises high data capacity and speeds of more than 10 GB per second, but also has the ability to connect billions of devices. In the All Things section, mobile networks must meet very different requirements. 5G is expected to redefine global industry industries such as transportation, healthcare, and transportation. Unlike 3G and 4G, with significant improvements in data transfer speeds on smartphones, 5G will allow everywhere on connected devices to communicate or interact.

The key feature significantly reduced the delay of less than a 1 millisecond (ms) from the current 50ms, along with throughput up to 10 megabytes' throughput per second speed and a significant increase in connection rate. High output means a higher network speed to consumers. This will allow applications that would not have long response times. For example, in India, there are large numbers of people who have access to professionals under their remote control. The Lower delays in 5G technology can open the doors to robot surgery remotely.

Take education as an example, for students living in areas with limited educational resources, virtual reality technology allows them to teach and interact with teachers in the visual classroom and enables them to perform tasks such as performing tests in the virtual Laboratory. To make this to happen, the resolution of virtual reality image and immersive video needs to approximate to the amount of detail the human retina can perceive. This requires an output of 300 Mbps and above, almost 100 times more than the current performance of supporting HD video services.

The 5G generation of wireless technology is the next big thing in mobile technology. Like its predecessors, 5G promises faster data speeds, lower latency, and higher bandwidth, which will make your mobile networks feel lazy and outdated. 2021 should be a big year for 5G, especially in India, so here's what you need to know about it. [1]

This paper highlights all past generations of mobile communication and fifth-generation technology. and we summarize some points as follows: -The emergence of mobile networks and the adoption of 5G in India, how this 5G differs from 4G, we offer some advantages and features of 5G technology, 5G architecture, Negotiation and 5G India and what the biggest challenges India faces when launching 5G Technology, how to deal with them.

1.1 Key Point that we have to focus on 5G Technology.
1.1.1 Emergence of mobile networks and adoption of 5G in India: -

The advent of mobile phone networks began in 1982 with the introduction of the first generation of mobile phones. They started fully operational in 1990 and had a top speed of 2.4 kbps. Second-generation 2G technology started in the early 1900s and was fully operational at 64kbs followed by 2.5G when the packet transmission network began to be used over high-speed internet. Then came third-generation technology or 3G technology and focused on providing internet speed at 2Mbps. The technology continued to emerge in the early 2000s and uses the technology to change the region. Next came 4G technology in 2010 and an IP-based network system focused on providing voice and data services, multimedia and Internet over IP [2]. The future is currently focused on 5G technology aimed at connecting 4G IP devices to wireless architecture. 5G will be based on supporting and integrating all 4G technologies such as LTE streaming, unauthorized spectrum, device acquisition on device. [3] The Government of India under the leadership of the Honourable Prime Minister Mr. Narendra Modi and his move to make India a digital system enables India to actively develop the 5G ecosystem. The country is already in the process of approving and monitoring the release of I 5G release, which is expected to be released in 2018. The government is planning a commercial spectrum of the 3400-3600 MHz band, which will be used for the implementation of 5G services. Indian authorities in charge of Telecom also maintain the price of 5G airwaves and the Department of Electricity and IT has provided a $ 1 billion investment plan for 5G research and technology between 2017-18. [4]
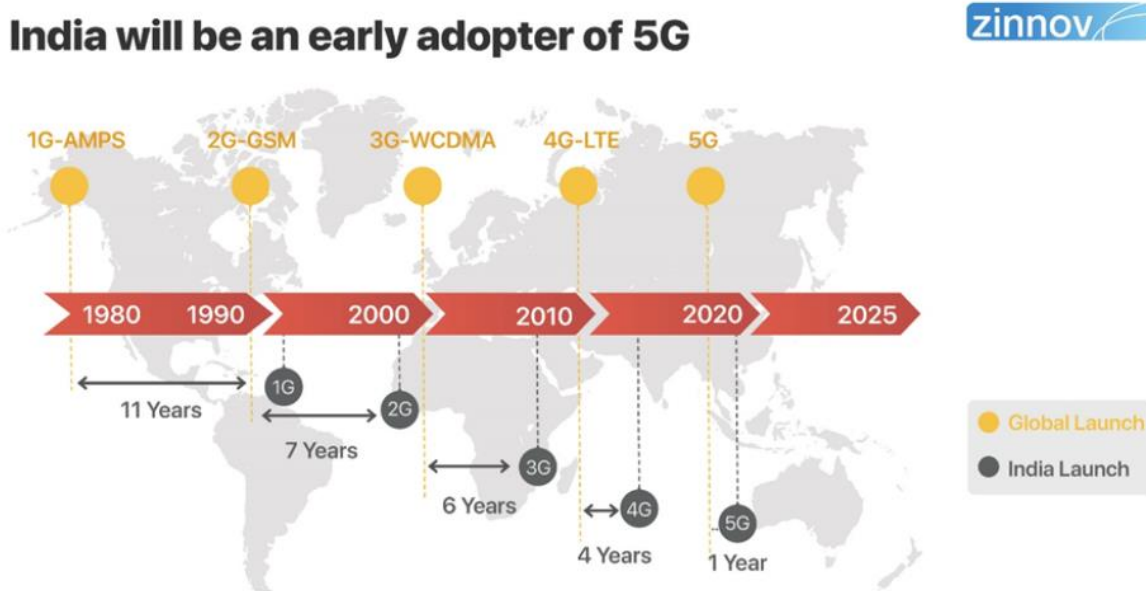

Fig 1. Evolution of 1G to 5G Technology.

1.1.2. **Key features of 5G networks: -**

The most important and divisive features of the 5G network are: The 5G network will support the strong delivery of high-speed and low latency services. It will promote the exploitation of existing frequency bands (up to 6GHz) and will use new wavelengths (between 6GHz and 100GHz). It will increase flexibility and reduce delay. Additionally, the speed will be increased to 10 Gbps and will provide up to 1Gigabit streaming capacity that will support approximately 65,000 connections at a time. [5] - [7]

1.1.3. The need to learn related to 5G Technology: -

Technology is under a paradigm shift from one generation to the next. This transition from one phase to another is not expected to be a smooth process as it requires major changes to be made in existing phase technology. The same is true of the generation of mobile technology. The fourth generation is fully integrated by India and fully operational and the next goal is to take the 5th generation. Moving to 5G from 4G can be a big challenge and will require major technological and infrastructure changes because, unlike 4G, 5G not only focuses on providing improved speed and accuracy but will also include a large IoT ecosystem with billions of devices connected at the same time. in the network at the highest possible speed and with zero delays. It is therefore important to understand the various challenges that will arise along the way from 4G to 5G so that transactions can take place smoothly. Therefore, the current study focuses on delivering and understanding the challenges of the transition from 4G to 5G in India. [2]

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1.2 Problem Definition: -

5G in India is not available because the country is in the testing phase of the 5G network in India. As reported by the Parliamentary Panel on 5G in India, the country is not yet technically ready to support the full rolling of 5G. Given the high prices of India's 5G network spectrum, as opposed by operators with a lack of fiber optical connectivity to control delays, there are many challenges that need to be addressed before achieving India's 5G dream. Once the current 6 months of the testing phase is over, the 5G spectrum auction will take place in early 2022. Only then will the 5G release date in India be confirmed and, after that, the launch of 5G in India will take place. [8]

5G also has major challenges to deal with. As we see in the past, that is, the development of radio technology, we are experiencing rapid growth. From 1G to 4G, the journey is only about 40 years (Considering 1G in 1980 and 4G in 2010). However, in the 5G Technology journey, the most common challenges we have seen are lack of infrastructure, Spectrum requirement, research methodology and cost, etc. [8]

Problems or challenges in implementing of 5G in India: -

1.2.1 India lacks Fiber Infrastructure: -

1. Making 5G in India Fiber work criticized. It takes important work to pass on the expanded knowledge limit once the voice quality has been improved.
2. Due to the lack of a Fiber framework, India suffers from poor quality management and cost reduction problems to reflect low national interest in Fiber and support base.
3. Only 20% of India's towers have been restored compared to 80% in countries such as the US, China, and Korea which are heavily focused on developing a system that provides fiber-based organizations.
4. As a further report, India has just surpassed the average 15 million miles of Fiber compared to the current rate at any average 50 km continuously. [9]

1.2.2 Spectrum requirement: -
1. Globally it is possible from now
on to open the 5G network to its customers it has always been possible that, in India, the 5G range will still be shared. This means that there is no denying that the old ones are still waiting for the call operators to check their new ones. [9]

1.2.3 the most expensive Spectrum: -
1. One reason why the 5G range is sold postponed in India its response costly to social media organizations. India bond ridden rulers like however it moves under pressure to maintain the cost of 4G down. [9]

1.3 Objective and Scope of 5G Technology: -

1.3.1 The objectives of the study are as follows: -
1. The Infrastructure and working process of 5G
2.To understand the process or methodology of switching from 4G to 5G technology and determining slip requirements, the introduction of 5G technology in India
3. Finding the biggest challenges that 5G has to face technology in India.
4. When will 5G launch in India and how it will give benefits in different applications.

1.3.2 The scope of the study are as follows: -
1.5G is a new organization that guarantees speed information, reduces inefficiency and faster web speed.
2. It will also provide unlimited access to data, great fun and correspondence a level that will change the way of life of Indians various clients.
3. In the meantime, new features (4G and 3G) are available still under precedence in most parts of nation.
4. Network conversion from 3G to 4G once and in laying down the network framework for 5g.
5. 5G can be used by government as an opportunity for good governance and creativity a good environment that will improve investment in 5G technology
6. System conversion from 3G to 4G too moreover about setting the system 5G format.

II.   METHODOLOGY

This paper presents the results of a detailed study of the design of the fifth-generation (5G) cellular network and other important emerging technologies that are useful in improving facilities and meeting the needs of users. In this detailed study, the main focus is on building a 5G mobile network, multi-input multitasking

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technology, and device-to-device (D2D) communication. In line with this, one of the emerging technologies is mentioned in this paper. The proposed construction of a 5G mobile network is proposed, indicating that D2D, mobile access points, network cloud, and Internet of Things can be part of the 5G mobile network infrastructure.

2.1 5G cellular network architecture: -

Considering the 5G network on the market right now, it is clear that many of the ways to reach the network are almost stagnant and require sudden improvement. Current technologies such as OFDMA will work for at least the next 50 years. In addition, there is no need to make changes to wireless settings from 1G to 4G. Otherwise, there may only be an application addition or modification made to the critical network to suit the needs of the user. This will prompt package providers to access the 5G network as soon as 4G is commercially available [10]. In order to meet the needs of the user and overcome the challenges posed by the 5G system, a major change is needed in the strategy for designing 5G wireless mobile infrastructure.

A recent study by researchers showed in the fig [11] tree that most wireless users live within about 80 percent of the time and outside about 20 percent of the time. In the current design of wireless cell phones, the mobile user can communicate internally or externally, the external channel located within the cell facilitates communication, So in order for internal users to connect to an external channel, signals will have to travel through internal walls, and this will result in a much higher loss of entry, coupled with costs with reduced view efficiency, data rate, and energy efficiency of wireless connection.

To overcome this challenge, a new idea or an existing design approach to designing 5G mobile devices separates external and internal settings [10]. With this design approach, the loss of penetration through the walls of the building will be slightly reduced. This idea will be supported with the help of MIMO's advanced technology [10], where dispersed antennas with tens or hundreds of stick units are sent. As current MIMO systems use two or four horns, the concept of MIMO large systems came up with the idea of using the advantages of large antenna components in terms of maximum power gain.

The structure of 5G cell phones varies, so it should include macrocell, microcell, small cells, and relays. The concept of a small cell phone is an integral part of the 5G wireless network and in part integrates mobile transmission with the concept of small cell [13]. Introduced to accommodate leading users, internally in cars and high-speed trains. Small moving cells are housed inside the moving vehicles to communicate with users inside the vehicle, while a large MIMO unit consisting of large antennas is installed outside the vehicle to connect to the outdoor station. From a user's point of view, a small moving cell is perceived as a common channel and its interactive users are considered as a single unit in the basic channel that proves the above concept of differentiating internal and external configurations. Users of small cell phones [13] have a high data rate service data with a significantly reduced signalling overhead., as show in [10]

The structure of the 5G wireless mobile network consists of only two logical layers: radio network and cloud network. Different types of components that perform different functions form a radio network. The cloud of virtualization (NFV) operational network consists of an aircraft operator (UPE) and a control airline (CPE) performing high-level functions related to User and Control aircraft, respectively. Specialized network functionality (XaaS) will provide the service per need, integration of resources is one example. XaaS is a connection between a radio network and a network cloud [12]. The structure of the 5G mobile network is described in [10] and [14]. It has the same value as the front part and the backhaul network respectively. In this paper, the standard construction of a 5G mobile network is proposed.

It Describes the connections between various emerging technologies such as the Massive MIMO network, the Cognitive Radio network, and mobile and small cellular networks. The proposed structure also explains the role of network function virtualization (NFV) cloud in the construction of a 5G mobile network. The concept of Device to Device (D2D) connectivity, small cell access points and Internet of Things (IoT) is also included in the design of the proposed 5G mobile network. In general, this proposed 5G mobile network infrastructure could provide a good platform for future 5G network suspension.

In this paper, we will introduce a wide range of technology with many technical challenges arising due to the various applications and user requirements. In order to provide a common connected platform for various 5G applications and requirements, we will explore the technical aspects below [15]:

2.1.1. Radio links, which include the development of new broadcast frequencies and new ways to control additional access and manage radio resources.

2.1.2 Multi-node deployments and multi-node deployments, which include the design of multi-node transmission / reception technologies based on advanced configuration and development of advanced inter-node integration systems and multi-hop technologies.

2.1.3. Network size, including need considerations, traffic and traffic control, as well as new ways to manage disruptive performance across a variety of complex applications.

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2.1.4. Utilization of the spectrum, which includes extended spectrum band processing, and working in new spectrum areas to provide a complete system concept of new spectrum types that carefully address the needs of each application environment. Now the topics that will cover a subset of technical components and provide a solution to some of the previously identified goals are [15]:

2.1.5. Device-to-device communication (D2D) refers to direct communication between devices that allows the local exchange of user aircraft traffic without passing through network infrastructure.

2.1.6. Massive Machine Communications (MMC) will design the Internet of Things with a variety of program fields including the automotive industry, public safety, emergency services, and medical field.

2.1.7. Moving Networks (MN) will develop and expand to connect more people who may have more portable communication equipment.

2.1.8. Ultra-dense Networks (UDN) will be the main driver whose goals are to increase capacity, increase the efficiency of radio connections, and make better use of less usable spectrum.

2.1.9. The most reliable networks (URN) will allow for the highest level of availability. In this section, we identify the amount of technology, calculated at the estimated value, which will be consistent with future wireless standards.
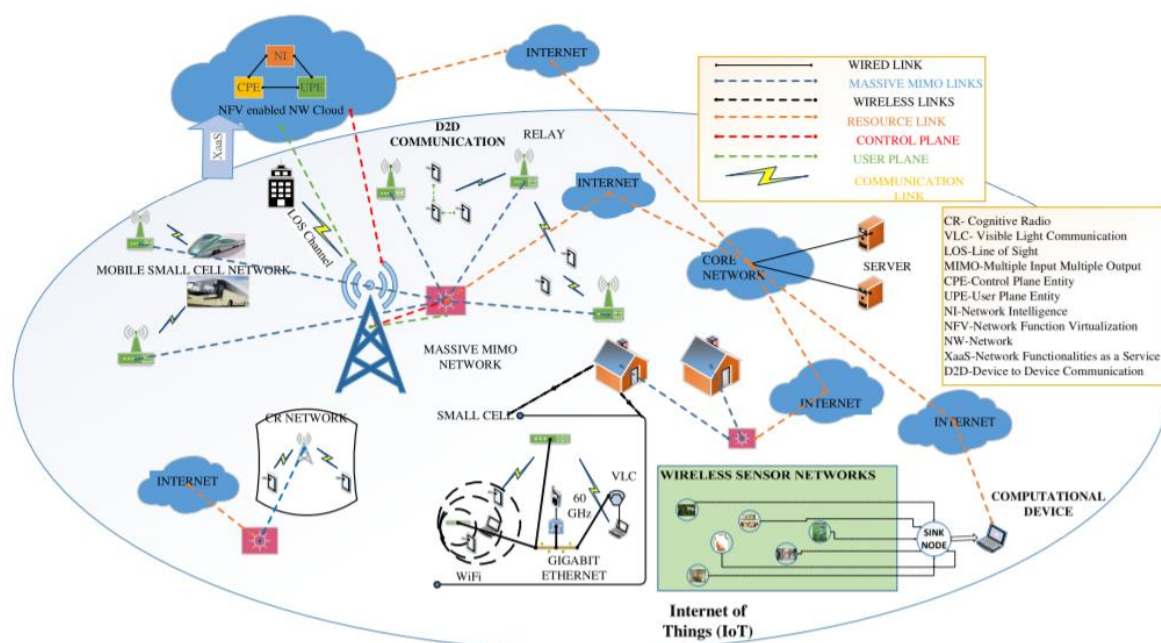

Fig 2. 5G cellular Network architecture

2.2 How does 5G Wireless Technology Work: -

There are 2 main components in 5G Wireless Technology systems namely Radio Access Network and Core Network. Let's see this in more detail.

2.2.1. Radio Access Network: Radio Access Network mainly includes 5G T cells and Macro Cells that form the backbone of 5G Wireless Technology and systems that connect mobile devices to the Core Network. 5G Small Cells are available in large quantities because the millimetre wave spectrum (5G used for crazy speeds!) Can only travel short distances. These tiny cells are attached to Macro Cells that are used to provide space.

Larger cells use MIMO sticks (Multiple Input, Multiple Output) with multiple connections to send and receive large data simultaneously. This means that multiple users can connect to the network at the same time. [16]

2.2.2. Basic Network: Core Network manages all data and internet connection of 5G Wireless Technology. And the great advantage of 5G Core Network is that it can connect to the internet very well and provide additional services such as cloud-based services, streaming servers that improve response times, etc. [16]

2.3 Application of 5G Technology: -

The arrival of 5G will also bring significant applications in various fields.

1. 5G will set a uniform global standard for all users.

2. It will boost the availability of networks and allow people to use their computers and smartphones 24*7.

3. It will transform the world into a Wi-Fi zone

4. With its strong signals and network, people will be able to use their devices at higher altitudes also. [17]

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III. CONCLUSION

This paper provides an overview of 5G technology. We have some advantages and disadvantages based on our ability to improve 5G technology. Advantages of 5G include that it will provide Killer speed, if you are close to one of the 5G towers with your 5G phone, you will transfer all episodes of HD programs in a matter of seconds. Bathing while watching a video will never be the same as in the old days. And there will be a slight blockage of the tower, with the current 4G LTE technology, when more people descend on a smaller area, the towers tend to be congested and have an impact on capacity. For 5G, this will no longer be a problem. This means that the public will not feel like arguing with each other over the tower by using their cell phone in online activities such as online communication activities. This technology will provide options for new technologies, as network speeds have improved, more jobs are being shifted to the world of smart devices from the computer world. With the increase in network speed, this could open new doors for smart devices.

These are some of the benefits that we have, but on the other hand, it is important to know the disadvantages or limitations of 5G technology in detail that will help you make the right decision or choose the right technology. Limited global installation this is a major disadvantage of 5G that it has limited global installation and is only available in certain areas. Only cities can benefit greatly from the 5G network and remote locations may not receive it for some years. In addition, the cost of setting up tower channels is high compared to other networks.

Cyber security is one of the issues for 5G because it will lead to hacking. Extension of bandwidth makes it easier for criminals to steal a site. In addition, it uses software that leads to malicious attacks. As 5G connects with many devices, the chances of attack are very high. Therefore, companies and businesses must protect their infrastructure with a security operating system that will lead to additional costs. Although 5G works faster and faster, it will not go far compared to 4G. In addition, tall buildings and trees can block the frequency of the 5G network which will lead to various problems. Therefore, it requires additional towers to assemble time-consuming and expensive. Rain can also cause problems for 5G coverage that requires extra protection.

Based on this paper we have learned all about the different generations of the network. From 1G followed 2G and then 3G to 4G and finally we learned some 5G related facts and we focused on the various challenges we identified. So basically this paper gives the conclusion that the next 5G will be important and will bring about a beneficial change in mobile technology and with all its uses and other benefits it will definitely make people's lives easier and happier. With this paper, we have tried to study the problems of 5G deployment in India, its solutions, applications and its scope of the future. 5G will transform India's current network into a new standard that will help boost India's economy and help India improve its Internet speed. India will only get 5G benefits if the current problems in 5G use are removed by the government.

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