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A Brief Study on Benefits, Growth, Challenges & Future Implications of 4G Technology in India

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ABSTRACT :*4G, a short form used for fourth-generation wireless communication systems, has occupied the attention of wireless operators, equipment makers (OEMs), investors, and industry watchers around the world. This technology is likely to overwhelm the deficiencies of 3G technology in terms of speed, quality and data rate etc. It has been developed rapidly since last few decades.This article discuss current trends and its underlying technologies to implement the 4G techniques. This article also shows some of the possible scenario that will benefits of the 4th generation technology and challenges faced to implement it with its future implications.*
KEYWORDS: 4G, Networks, impact of 4G, benefits and challenges.

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I. INTRODUCTION

What is 4G?

4G is not one defined technology or standard, but rather a collection of technologies at creating fully packet-switched networks optimized for data. 4G Networks are projected to provide speed of 100Mbps while moving and 1Gbps while stationary. It is a Carriers that use orthogonal frequency-division multiplexing (OFDM) instead of time division multiple access (TDMA) or code division multiple access (CDMA) are increasingly marketing their services as being 4G, even when their data speeds are not as fast as the International Telecommunication Union (ITU) specifies.

Comparison 4G of with 2G and 3G?

At the time of 2G networks, they were suitable for calling and texting a messages only. And when 3G came into the market in 2003, it allowed us for calls and texts, along with surfing the internet. With the speedy introduction of smart phones, it simply couldn't handle the increased data consumption. So 4G was introduced. 4G is a network built from the ground up, with the space to handle loads of superfast data.

Reasons for Having 4G -

- It supports interactive services teleconferencing, wirelesses Internet, etc.
- It has wider bandwidths, higher bit rates.
- Global mobility and service portability.
- Low cost.
- Scalability of mobile networks.

4G Technology: Evolution

For the smooth transition of 3G to 4G the mobile communication companies were promoting Super 3G/LTE. They are upgrading 3G Technology by initializing the introduction of High Speed Downlink Packet Access (HSDPA) service, which increases the downlink data rate of packet services, and by

finalizing specifications for High Speed Uplink Packet Access (HSUPA), which enhances uplink speed. HSDPA and HSUPA cover area by 3-4 times relative to W-CDMA and by providing the high transmission rate with low cost per bit transmission. The main purpose of the Super 3G is to construct simple, low cost system by removing the complexity from wireless network and mobile handsets.

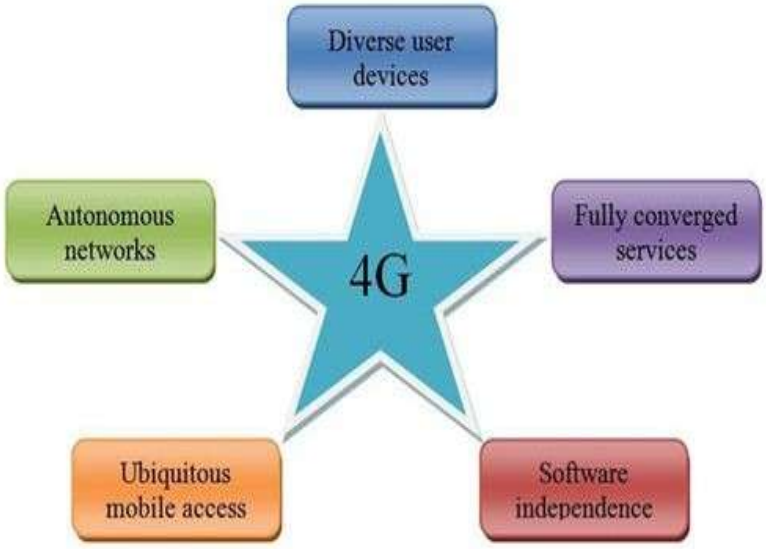

Figure1: Four Factors that are driving 4G growth in India

What's New about 4G?

- Entirely packet switched networks.
- All network elements are digital.
- Higher bandwidths to provide multimedia services at lower cost (up to 100Mbps).
- Tight network security.

Technique used in 4G:

- OFDM
- USB(Ultra Wide Band)
- Millimetre wireless.
- Smart Antennas
- Long term power prediction.
- Scheduling among users.
- Adaptive modulation and power control.

Growth of 4G

From the independence of India from British, our government has supported and promoted the science and technology by introducing various national policies to motivate people, therefore India has growing slowly and steadily in leaps and bounds when it has been about the expansion of 4G network in the country.

Now days, India is standing at a pedestal and is setting an example as to how rapid and exponential the growth of a network can be with the help of Reliance Jio. To support similar sentiments, statistics tell the same story. A report by Trai revealed that India had 238 million 4G subscribers by the end of December 2017. Another report by CMR India said it's expected that India to have 300 million 4G subscribers by the end of 2018, which will be largely driven by feature phones and Reliance Jio. The report said 58 million will be using a 4G feature phone in 2018. The number of 4G subscribers will be 432 million by 2020 in India. 35 percent of the 4G subscribers will be using feature phones in 2020.

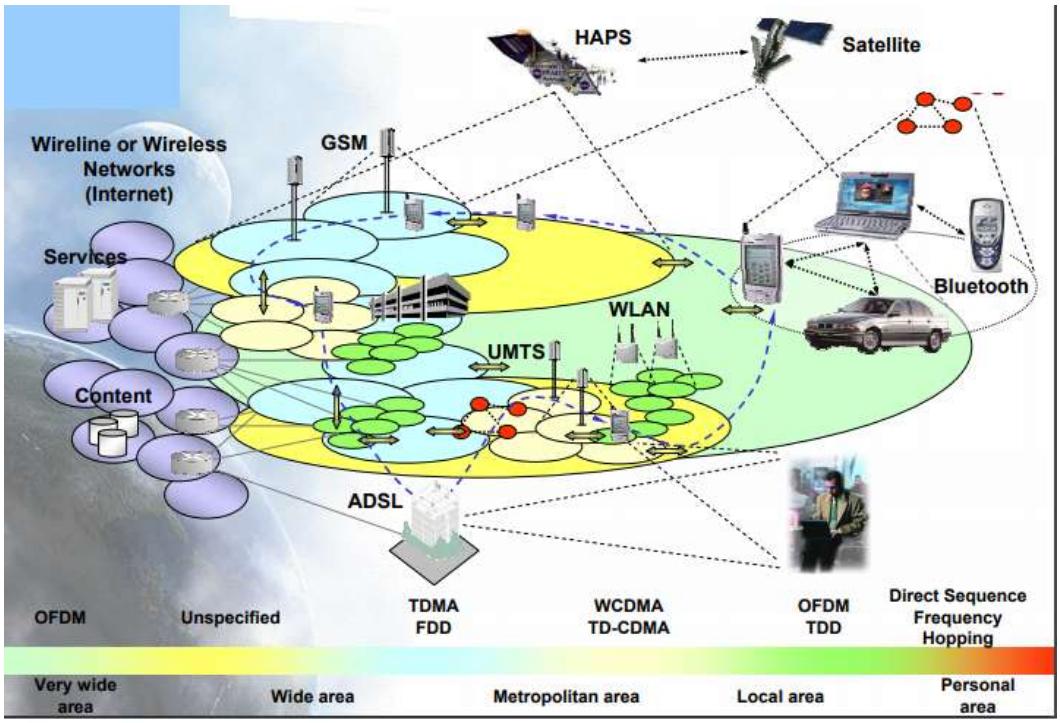

Figure 2:4G Mobile Networks

Challenges faced while Implementing 4G Technology

It may be expected that in 4G networks will continually expand in India. This may include all kinds of channels with various sequences, quality of service and protocols. It will also contain all heterogeneous terminals with a diverse range of capabilities, accessibilities and user preferences. The country today is moving to a content producer. Uploading one's piece of work onto the network and enjoying the work of other is the trend. The gap between the richness of multimedia content and the variation of techniques for content access and delivery will increase dramatically. For which expectation of Universal Multimedia Access (UMA) will be a challenge for the 4G wireless networks. The major concept of UMA is universal or seamless access to multimedia content by automatic selection or adaption of content.

Congestion control is another critical issue in 4G - networks. How to avoid or prevent the congestion is the major problem in the network. The detection and recovery after congestion are two basic approaches taken towards the congestion control. The avoidance of the same requires the network to suitably implement the admission control and scheduling techniques. The detection and recovery would require flow control and feedback traffic management.

There is difference between the securities provided in different networks. If we use More interconnectivity and interworking then we get even greater vulnerability. It is more challenging to monitor, analyze and prevent viruses, worms and other interruptions in wireless network rather than in wired one.

Furthermore to handle the Network conditions such as bandwidth, delay, jitter and so for may vary across wireless networks, which result in different service quality provided to them. How do the mobile users deal with the variation in network conditions, and maintain service quality when crossing heterogeneous wireless networks is needs to be observed.

4G is an integration of heterogeneous wireless networks. Moreover these networks rely on different network architectures and protocols for transport, routing, mobility management and so forth. The interconnection of these networks in an integral manner to facilitate the cooperation between them is another research challenge.

4G- is a heterogeneous wireless environment and consists of number of radio technologies and may have overlapped radio coverage. A mobile user needs to switch between access networks to maintain service continuity and optimise service quality. Now a day to deal with the heterogeneous access technologies is a challenge to the design of 4G – Network.

Impact of 4G on Various Sectors in India

With the use of 4G technology the performance of the organization will improve by-

A. Government Organization
- Deduction in the cost of travel
- Fast access to keep an eye on performance of any employee
- on the spot update on all government projects implemented and ongoing projects

B. Educational Institutions
- Use of Wider spectrum ,Observing and analyzing the student and teacher performance
- Evaluation of various practices followed in education system
- Video conferencing, infrastructure tracking etc.

C. Electronics Industry
- An increase in demand for new products
- New enterprises will come forward
- Competition ratio will increase

E. Private Organizations
- Various business tour and trips can be avoided
- Can track each and every move of an employee

F. Banking services industries
- Mobile banking will work more efficiently and securely than before
- Virtual draft and cheque may exists in future

G. Healthcare
- Online diagnosis of disease becomes possible
- Online Consultation of Specialist Doctors at hospitals.
- Emergency situations can be handled very efficiently

Possible Applications of 4G
Virtual existence: 4G system gives mobile users a "virtual existence" -- for example, always-on connections to keep people on event.
Effective navigation: Navigating to remote places will be easier with 4G which contains the graphical representation of streets, buildings, and physical characteristics of a large metropolis.
Medicine Online: 4G will support remote health monitoring of patients.
Geoprocessing: Queries dependent on location information of several users, in addition to temporal aspects have many applications.
Education: Video Lectures, Online Tutorials etc.

4G Benefits
I. 4G-network is a "All-IP" based data network. It is a completely data based network and allow for more bandwidth this means more data can be passed through the network.
II. 4G network devices can take advantage of the higher bandwidth and speeds to deliver more robust and data applications.
III. One can easily access Internet, IM, Social Networks, streaming media, video calling and the other broadband services, it is very stable network which work without any disruption.
IV. 4G networks present much more coverage than the other systems such as Wi-Fi ,that forces the users to depend upon hotspots in each area they visit , Since it offers a coverage of 30 miles and more , as also overlapping network ranges , the users would be assured of complete connectivity at all times .
V. Another most important benefit of 4G is its faster response time or lower latency. 4G technology reduces latency to 1/100th of a second (about 10ms).

How we can build Future 4G Networks?
- With Lower Price slightly higher than alternatives.
- By coordinating all the spectrum regulators around the World.
- Focusing on more academic research on technology.
- By increasing the standardization of wireless networks in terms of modulation networks ,techniques, switching schemes and roaming is an absolute necessity for 4G
- By integrating various network topologies.

- Non -troublesome Implementation: 4G must allow us to move from 3G to 4G

4G features

- Highly developed media access technology which connects the core network to different access technologies.
- Improved network responsiveness- Low latency, lower idle-to-active times
- World wide access, service portability and scalable mobile networks
- Range of services based on Quality of Service (**QOS**) conditions
- High spectral efficiency
- Mobile technology based on IP
- It is used for horizontal communications between different access technologies including cellular, cordless, wlan, short-range connectivity, and wired.
- A familiar platform to complement other services Connection through a common, flexible, seamless, IP-based core network.
- Improved scheduling and call admission control methods
- Multi-hop and Ad hoc networks

II. CONCLUSION

This article presents 4G can viewed as an integrated wireless system that enables flawless roaming between technologies. It is a promising 4G that support interactive multimedia services with wider bandwidths, and higher bit rates. We thought that the future research work will triumph over these challenges and will present newly developed services to 4G networks making them available to all .

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