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Implementation Steps and Significance of Fourth Generation Mobile Technology in Real World (4G)

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***Abstract*–Mobile technology is improving day by day. To increase the speed of internet, different-different technologies are used now a day. The problem with 2G and 3G system is lower bandwidth. The problem in newer generation in 4G of internet services was introduced and becomes very popluer.4G is a wireless system with wide area coverage a very high throughput. It provides high spectral efficiency. 4G uses orthogonal frequency division multiplexing. Frequency band for 4G is 2-8GHz. 4G gives the ability for worldwide roaming to access cell anywhere. The problem with 3G wireless system is band width. The range of 3G systems are 144 kbps to 2 mbps. While 4G system will be fully IP based wireless internet. 4G support for multimedia, voice, internet, video, broadband services. With this paper we are going to compare the 4G service with the existing 3G, 2G and 1G services as well as the implementation of 4G services.**

***Keyword*- OFDM, LTE, MIMO, PSTN, EDGE, NMT, WCDMA.**

I. Introduction

4G stands for the fourth generation mobile wireless technology. A network always operates on Internet technology and combines it with several different-different applications and technologies such as Wi-Fi, and runs at speeds ranging from 100 Mbps (in cell-phone networks) to 1 Gbps (in local WI-FI networks). This paper discuss the current trend in 4G and why 2G and 3G goes down and why the world needs a new brand technology called as 4G.The main motive of this paper is to define the necessity of 4G. Cellular services provides in India are slowly beginning to deploy the 3G cellular services. To achieve the goals of true broadband cellular services, the systems have to make the leap to a fourth generation network. The goal is to have data rates up to 20 mbps, even when use in such scenarios as a vehicle travelling 200 km/h. 4G is faster, cheaper than 3G. Here we are discussing the comparisons in between 1G, 2G, 3G and 4G with respect to their design, implementation, service, standards, data bandwidth, multiplexing core network. Here we are also discussing the features and implementations of 4G. LTE offers several important benefits for consumers and operators [7]. LTE stands for Long Term Evolution. LTE provides 100 mbps speed for download link. Ericson has already demonstrated LTE rates of 150 mbps. 4G is 3 times faster than 3G [1].

II. Literature Survey About 4G

The best utilization of bandwidth efficiently is to provide best services to the users by high data rates and wider coverage. There is only one 4G network which can provide higher data rates and wider coverage can be achieved [2].The bandwidth utilization means their cost and profit on network resources [3]. So, how to get the highest benefits from the available network resources is a key issue in the wireless communication network.

The problem with 3G and other generations is bandwidth, their systems provides slow coverage range.

III. Comparisons Between The 1G, 2G, 3G, 4G

Technology	1G	2G	2.5G	3G	4G
Design began	1970	1980	1985	1990	2000
Implementation	1984	1991	1999	2002	2010
Service	Analog	Digital	More capacity	Broadband Data up to 2 mbps	IP based 100 mbps speed
Standard	AMPS, PACS, NMT	TDMA,CDMA, GSM	GPRS, EDGE	WCDMA, CDMA 2000	SINGLE STANDARD
Data bandwidth	1.9 kbps	14.4 kbps	384 kbps	2 mbps	200 mbps
Multiplexing	FDMA	TDMA,CDMA	CDMA,TDMA	CDMA	CDMA
Core network	PSTN	PSTN	PSTN	PACKET network	INTERNET

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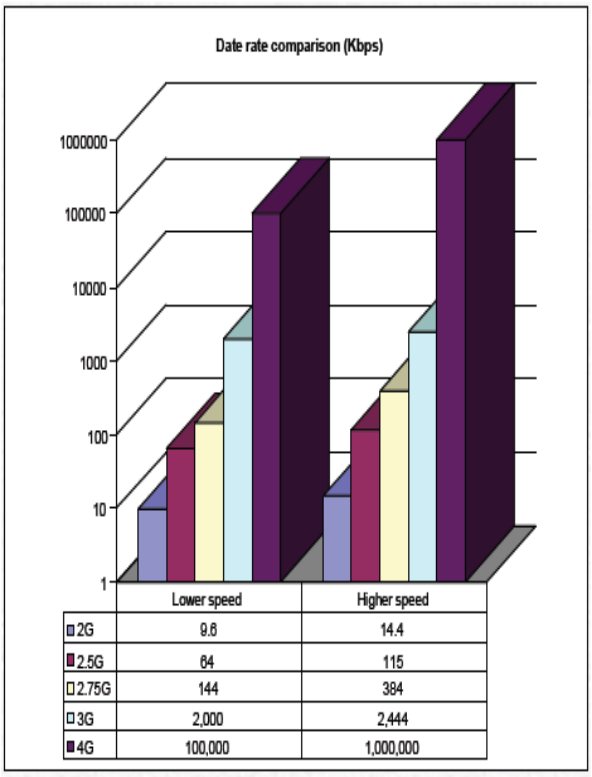
IV. Data Rate Comparisons

The data rate comparisons between the all generations are shown by the bar chart as below:-



	Lower speed	Higher speed
2G	9.6	14.4
2.5G	64	115
2.75G	144	384
3G	2,000	2,444
4G	100,000	1,000,000

[8]

V. Features Of 4G

- 4G is a range of new services and models.
- 4G support for multimedia, audio, video and broadband.
- 4G is based on the IP mobile system.
- The cost for 4G is less than other generations.
- Due to high speed and high capacity, it is more popular than 3G
- It uses the seamless switching and quality of service-driven services.
- 4G also have the better spectral efficiency.
- 4G is better call admission control technique.
- 4G also have the 802.11 WCDMA, Bluetooth, Hyper LAN technology.
- 4G have the data range from 100 mbps to 2 gbps.
- 4G is global access, service, portability and scalable mobile service [3].

VI. Implementation Of 4G

The fourth generation is based on the IP for control video, packet data, voice. IP is assumed to act as an adhesive for providing global connectivity and mobility among networks.

An IP wireless network replaces old signalling system 7. IP networks are connectionless and use the slots when they send data. The goal is a merged data/voice/multimedia network.

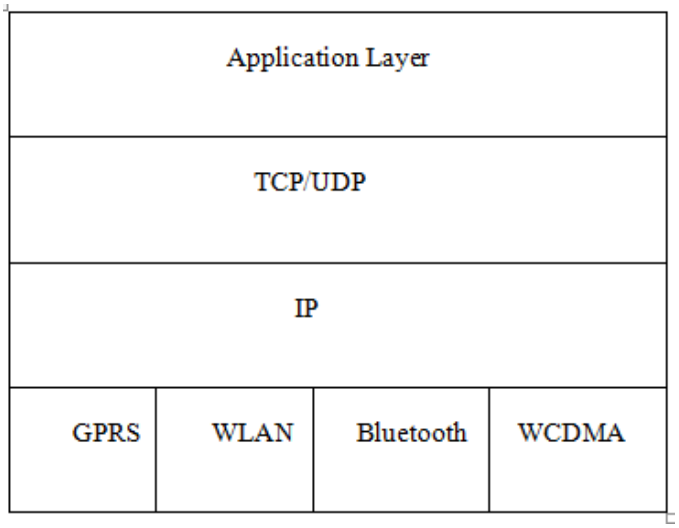


Fig:- Scenarios in 4G [6]

OFDM is a form of multi-carrier modulation, works by dividing the data stream for transmission at a bandwidth B in to N multiple and parallel bit streams, spaced B/N.

An OFDM transmitter accept data from IP networks, convert and encode it and transform the OFDM signal into an IF analog signal and analog signal is received by RF transceiver. OFDM provides better link and communication quality [4].

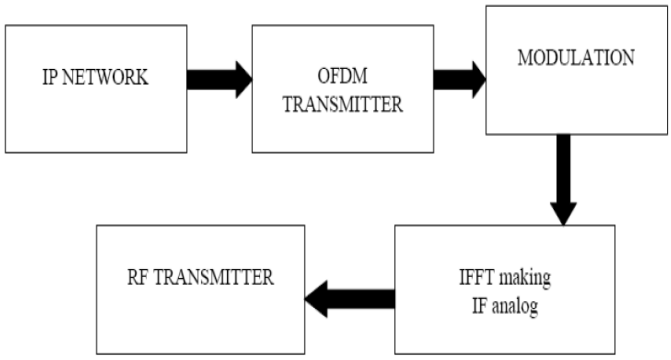


Fig. Transmission in 4G

An IFFT (inverse fast Fourier transform) transforms the OFDM signal into an IF analog signal with the help of RF transceiver. The receiver circuit builds a new data by reversing this process. Due to orthogonal sub-carriers, Sub carrier can be separated and processed by the receiver without interference from other sub-carriers.

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VII. Technique Used In 4G

- OFDM
- UWB (Ultra Wide Band)
- Millimetre Wireless
- Smart Antennas
- Scheduling Among Users
- Adaptive Modulation and Power Control [3].

Need of 4G:-4G will utilize most of existing wireless communication infrastructure than 3G. 4G presents comparability in expansive standard. 4G is 3 times faster than 3G [9].

VIII. Advantage And Disadvantage Of 4G

Advantage:-

- 4G is IP based Mobile system.
- It uses the Ad-hoc and multi hop network.
- It produces better spectral efficiency.
- It has better call admission control technique.
- It provides high speed transmission with high capacity and low cost per bit.

Disadvantage:-

- Battery usage is not so good.
- Due to complicated hardware, it becomes more complex [3].

IX. Conclusion Of 4G

4G is not so popular in India till now. It will dominate the wireless communication and its converged system will replace most of the conventional wireless infrastructure. The next five years, mobile internet services will move beyond a novelty and becomes a cone solution for consumers and business.

X. Future Scope Beyond 4G

5th generation will be the next major phase of mobile telecommunication standard beyond the current 4G standard. The main area for researcher in the field of research is 5G now a day. Researchers uses the Massive Dense Network called as MIMO providing green flexible small cells. Researchers are also using the Dynamic Ad-hoc network.

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