Challenges and Benefits of Fourth Generation Wireless Technology-

An Overview

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Abstract: With the increasing demands in the field of mobile & data communication, the only aim is to connect users as fast as possible.4G provides high-mobility with high speed data rates and also supports high capacity IP-based solutions and programs while it also maintains complete backward compatibility. It is slated on sophisticated MIMO technology and is also according to wireless communication which is IP based. WiMAX, LTE, Advanced LTE systems, etc-are component of 4G. In this paper, we portray what the 4G technology actually is how easy it's to execute 4G revealing its cost-effectiveness and including its specialized aspects, Essential Characteristics, problems, and so on. Some proposals continues to be made to be able to comprehend the appropriate edges and difficulties of 4G program for successful implementation, for e.g.: 4G Network access requires large number of Transmitters & Receivers in the Device which result in heavy consumption of battery.

Keywords:- 4G; LTE; LTE Advanced; MIMO; WiMAX; Multimode Software ; Cost effectiveness.

I. INTRODUCTION

For the past twenty years, communication systems are developing step by step with varied facilities and options. The developments of wireless networks / mobile communication systems were denoted by the term "generation". Every generation is categorized supported its characteristic options like transmission signals, information transmission rate, information measure frequency and nature of the services provided. a brand new generation had been booming at the tip of every decade since 1980. In early Nineteen Eighties, first Generation (1G) technology came into existence. It used analog signals and supported solely voice transmission. the info wasn't reliable; there have been interrupted communication and few different issues. In 1991, second Generation (2G) technology, that used digital signals for transmission, was established. This generation used the prevailing radio-frequency spectrum to produce the services. it absolutely was developed to beat the previous generation's loop holes and to possess information and voice transmission. Few drawbacks like restricted coverage, lack of dependability and

speed were existing [1]. throughout the evolution from 2G to third generation (3G), a spread of wireless systems, together with international Positioning System (GPS), General Packet Radio Service (GPRS), International Mobile Telecommunication - 2000 (IMT- 2000), Bluetooth, Wireless native space Network (WLAN), High Performance Radio native space Network (HiperLAN), increased information rates for GSM Evolution (EDGE)/ increased GPRS (EGPRS) and Universal Mobile telecom equipment (UMTS) are developed. of these systems were designed severally, targeting totally different service sorts, data rates, and users. however it means support the usage of graphical / transmission applications and also the drawbacks of 2G were prolonging. In 2000, came the 3G technology that used digital signals. to beat the disadvantages of previous generations and to support transmission applications like downloading and uploading videos, video conferencing, taking part in games, international roaming and to use net on the move / net within the pocket with enhanced speed and reduced value, this generation was introduced. It absolutely was a safer and cheaper means that of

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communication; higher-data-rate service was provided for quick access [18]. The most focus of 3G was simply to develop new standards, hardware and applications. Communication networks like UMTS Terrestrial Radio Access Network (UTRAN) for complete network access, Mobile Application half (MAP) for core network access, were developed. Initial investment on infrastructure was high, usage rates and roaming charges weren't cheap for everybody, continuous signal whereas movement, were a number of the issues baby-faced. folks most over the globe area unit victimization 3G with very little discontentedness. They're looking forward to the fourth generation (4G) technology to boom in and build Brobdingnagian changes in wireless communication technology, like victimization the transportable as mini portable computer, any time from any desired place or on the move. Since 4G is visualized to be a mixture of various architectures and wireless technologies, it brings many style and readying challenges, like quality management, Quality Of Service (QoS) provision and networks interworking. thus this paper focuses on the technologies, hardware and computer code that area unit employed in developing 4G and challenges baby-faced.

II. The benefits of 4G

WIMAX, LTE & MIMO AS NEXT GENERATION TECHNOLOGIES

The emergent 4G technologies such as WiMAX and LTE are stronger as compared to Wi-Fi. These technologies are having strong QOS and wider coverage. In some key aspect WiMAX and LTE resemble each other including operating in licensed spectrum bands, strong QOS support, wider coverage range. Based on point-to-multipoint connections, both WiMAX and LTE telecommunications technologies provide broadband wireless service. Through Base Station (BS), mobile subscribers (MS) such as smart phones/laptops get connected to internet, while BS controls the channel access of mobile subscribers. Frequency-division duplex (FDD) as well as time-division duplex (TDD) systems are being supported by both WiMAX and LTE. MU-MIMO (Multiple User MIMO) is a technology that deals in transmitting parallel & unique data streams in the same frequency-time to multiple users. (Spatial multiplexing) and also thereby improves sector/site capacity throughput.

2.1 Quicker connections speeds

In fact the foremost obvious profit to come back from 4G is speed will increase on networks, with potential speeds of 30Mbit/s touted by some within the trade. This should commence a full new era of applications and services, with information transfers, downloading and video conferencing all rather more accessible, whereas accessing sites and loading videos, typically the reason for abundant frustration on 3G, ought to currently be easy.

2.2 Improved in-building coverage

There's nothing worse than not having the ability to select up an honest information association reception or within the workplace, particularly after you are in a town wherever signal ought to be present. However, with 4G signals, specifically the 800MHz band, this should not be a difficulty to any extent further because the frequency is superb for penetrating walls, and different objects, to ensure coverage. After all, it absolutely was the recent TV signal frequency, which worked virtually absolutely.

III. An Overview of the Challenges In Integrating 4g Wireless Systems

To migrate current (3G and 2G) systems to 4G with feature as mention above we have to face number of challenges.4G challenges are broadly classified in categories as Mobile station system, service.

A. Mobile Station

3.1 Multimode User Terminals

For reducing operational costs, devices that operate on 4G networks should have the capability to operate in several networks. This will not solely reduce the operating cost but also will simplify style problems and will reduce power consumption. To accessing completely different mobile and wireless networks simultaneously is one among the major issues 4G networks have been addressing.

One of the mechanisms that has been proposed to handle this problem is termed as "multi-mode devices". This mechanism can be achieved through a software system radio that allows the end-user device to adapt itself to various wireless interfaces of the networks.

3.2 Discovery of wireless system

Due to the nonuniformities of 4G networks, wireless devices ought to method signals sent from whole completely different systems, discover accessible services, and connect with applicable service suppliers. Varied service suppliers have their own

protocols which may be incompatible with one another nevertheless like the user's device. This issue may complicate the method of choosing the foremost applicable technology supported the time, places and services provided, and thus, might have an effect on the standard of service provided to the top user.

One answer to resolve this issue is termed "System-initiated discoveries". This mechanism permits automatic transfer of software package modules supported the wireless system the user is connected to [1]. Another approach to handle this drawback depends overlay networks. during this case, the end-user device is connected to completely different networks through associate degree overlay network.

3.3 Selection of wireless System

With the support of 4G user terminals, we've an inclination to pick any accessible wireless network for every specific communication session. As each network distinctive selection pattern applicable network for a specific service might optimize system performance and resource usage. Moreover, the correct network different will confirm the QoS required by every session. However, it's difficult to decide on an appropriate network for each communication session since network accessibility changes from time to time. Moreover, adequate info of every network is required before a range is created. This includes precise understanding of the supported service sorts, system data rates, QoS wants, communication costs, and user preferences. Eguclii et al. [2] Projected planned a diffusion of range theme during those Session Initiation Protocol (SIP) messages, location data of the supply mobile node, on the market networks of every mobile nodes, and user preferences unit all taken into thought within the choice once a mobile node makes a decision to a distinct mobile node. Totally different researchers jointly counsel that network resources and minimum QoS desires have to be compelled to be thought of in network selection [2], Despite these analysis efforts, we've a bent to believe that there are many problems to be resolved in selecting the acceptable wireless system.

3.4 Incompatible roaming frequencies

Once you get your smart phone, or notwithstanding it's by the time we tend to finally get correct 4G networks up and running, there is not any guarantee it'll be ready to use 4G overseas, this may be as a results of several nations are using completely different spectrums for his or her 4G services, so if you travel abroad you'll have to be compelled to revert to exploitation 3G networks, that are additional

universal in their rollouts. Hopefully, most future devices will embrace cross frequency chipsets that negate this issue, on the opposite hand again maybe not having the flexibility to use 4G abroad isn't any unhealthy issue - are you ready to imagine the roaming costs?

4G: THREATS and CHALLENGES

4G systems currently exist only in few laboratories and hence the future security threats are difficult to be guessed. But the major threats and challenges are presented here:

• IPv6 protects the data that is on transmission. But if the application used by the users is not secured, it creates loop holes. Hence, the wireless devices have to frequently update all the software's used, find the loop holes and fix them.

• VoIP requires real time communication, however IP networks, which are at the core of all VoIP infrastructure, are not designed for such real time applications. Delay, latency, compromised data throughput and unacceptable round trip times that are commonly experienced on IP networks may all lead to voice quality degradation. The actual operating system platform on which VoIP application is in operation, network topology and the choice of communication protocols are all critical in ensuring that the VoIP is of acceptable quality. VoIP network performance differs based on network traffic, the IP versions used, Code /Decode (Codec) algorithm and the operating system used.

Table 1 Technology and Features of 4G

TECHNOLOGY	FEATURES
Data transfer rate - 20 to 100 Mbps, Frequency band - 2 to 8 GHz Bandwidth -	To support continuous data transfer at a high speed without any loss[18]
IPv6 addressing format	Unique address for each device
MC-CDMA / OFDMA access technology	To support multiple user at the same time[3], [10]
SDR	Allows devices to be upgraded automatically, to new protocols and services[8]
VoIP	To transmit encrypted voice over packet-based networks [7].
IP-based heterogeneous network	Supports different traffic (voice / data / multimedia), that differ in QoS levels, security policies, device settings, charging methods and applications[11]
UWB	Converts signals to noise and transmits. This makes transmission faster and avoids intrusion [9].
Smart antennas	To keep track of user's current location. It receives signals sent by the user and ignores the signals from intruders [4].
Packet Switching Technique	Safe and reliable data transmission. Any device can understand the packet switching technique; hence there will not be any need for new infrastructure.
MIMO	Uses multiple antennas at both receiver and transmitter end, to optimize data transfer and minimize packet loss [10].
HPIN	Used to support fast handover, hence uninterrupted signals and data transfer even while travelling [6].

• Since the wireless device is used for vast number of applications, just like personal computers, they have to be scanned completely, quiet frequently to remove the hidden threats and upgrade the antivirus software periodically.

• Mobile phones and other portable wireless devices were designed to be small and mobile, but this always has a physical security issue, it can easily be stolen and the thief could access all the details present in it; though the police guards can easily trace his location when he makes calls or sends messages with the same SIM card, as the SIM serves as the unique identity and its current location can be traced easily.

• The phone produces more heat while using it for a long time. This heat is caused because of radiation which is not healthy for the user. Say, when a user, with his ear phones on, falls asleep when listening to some songs, being downloaded online, the radio waves, through which the internet works on the mobile phone, passes through / near him for a long time, harming him without his knowledge.

• Though 4G has so many expected features, it might not be as good as a wired internet. Since people have so much expectation for 4G, they might not be able to accept this.

• Existing wireless technologies have not served well in some metropolitan areas. This limitation will be carried into the future generation also.

• It has been proved that when mobile phone is used continuously for a number of years together, the user might develop memory loss, increased blood pressure, weak immune system and brain tumor on the side of the head where the user holds the phone.

• There have been number of studies related to mobile- phone use accidents. Using mobile phone while driving (with or without hands-free) or in the gas stations must be avoided, as the emission could cause petroleum fumes.

• The mobile phones are very useful provided it is being used carefully- mobile phones must be kept out of reach of children because they are more endangered as their skulls are more permeable to electro-magnetic fields. When signal is low (especially in metallically enclosed places like elevators), the phone might radiate more power to compensate the signal, increasing the danger

[5].Keeping the phone away from the body when not in use, using cell phones for emergency and not for long conversations are some of the ideas to be followed for better and healthy life.

IV. Conclusion

The realization of 4G tears down the wall between wireless and wireline solutions, a difficult attempt. Practically, broad-scale availability is years away, but operators and standards bodies are making improvement. 4G wireless networks not only enable better, scalable, and reliable wireless solutions but also provide wider assortment of services. These chances have a dependence on rethinking about the safety, charging, architect and privacy technologies which have been used for previous generations. We believe, nevertheless, that these challenges will be beat by future study and incorporate newly developed services to 4G networks creating them available to anytime and everyone. Farther moving on to further communications generations, it's anticipated also data and voice communications might occur completely with regard to satellite interaction and that shortly global wireless internet will be widespread across the world. We hope that this Paper helps to promote stronger connections between people working in fields that are different creating future concepts of cellular communication, Internet services, etc.

V. REFERENCES

[1] A. Lyle, Clear, first 4G network launched, 2009

[2] H. Eguchi, M. Nakajima, and G. Wu, "Signaling Schemes over a Dedicated Wireless Signaling System in the Heterogeneous Network," Proc. IEEE VTC, Spring 2002, pp.464-67.

[3] http://network4g.verizonwireless.com/#/devices

[4] 3GPP TS 23.107 v.5.9.0. "Quality of Service (QoS) Concept and Architecture," June 2003.

[5] N. Montavont and T. Noel, "Handover Management for Mobile Nodes in IPv6 Networks," IEEE Commun. Mag.yoX. 40, no. 8, Aug. 2002. pp. 38-43.

[6] Wikipedia - 4G [Objectives]

[7]　J. Al-Muhtadi, D. Mickunas, and R. Campbell, "A Lightweight Reconfigurable Security Mechanism for 3G/4G Mobile Devices," IEEE Wireless Commun., vol. 9,no. 2, Apr. 2002, pp. 60-65.

[8]　F. Ghys and A. Vaaraniemi, "Component-based Charging in a Next- generation Multimedia Network," IEEE Commun. Mag., vol. 41, no. 1. Jan. 2003. pp. 99-102.

[9]　S. Higgenbotham, Countdown to 4G: who's doing what, when, 2008

[10]　S. Y. Hui and K. H. Yeung, "Challenges in the Migration to 4G Mobile Systems," IEEE Communication Magazine, vol. 41, no. 12, Dec. 2003. pp.54-59.

[11]　Gaurang Naik,l et al "Challenges in the implementation of Fourth Generation Wireless Systems" IJERA Vol. 2. Issue 2,Mar-Apr 2012. pp.1353-1355