



Implementation of communication scenario of long term evolution (4G) toward security using network simulator3.

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ABSTRACT : Long Term Evolution (LTE) is a significant project of 3rd Generation Partnership Project (3GPP). It defines a new packet-only wideband radio with flat architecture and assumes a full Internet Protocol (IP) network architecture in order to assure voice supported in packet domain in design. Up to a certain years we were dealing with 3G, 3G had certain problems such as cost of cellular infrastructure, upgrading base station and Power consumption is very high, it requires closer base station which are very expensive. Now these problems have been recovered in 4G. In this paper we are this paper we are focusing on Communication scenario of Long Term Evolution using Network Simulator3.

KEYWORDS - Long Term Evolution(LTE), 3rd Generation(3G), 4Genration(4G), Network Simulator3.

1. INTRODUCTION

In last two decades the tremendous growth and change have been experienced over four generation. The wireless communication network generally refers to change with the nature of service and forward compatible transmission technology and new frequency bands. New generation have developed in every 10 years, since first was move from 1981 that is analog (1G) to analog (2G) network. After that there was 3G which is at high speed multimedia supports spread spectrum transmission and in all IP- switch network 4G comes that was a great growth or improvement in the wireless industry both in the mobile technology and its subscribe. There has been a shift from fixed to variable that is mobile cellular communication. 4G provides comprehensive IP solution where voice, data and multimedia supports. After that coming soon generation is 5G which is Re - configurable, Multicore technology such as Nano Technology, Cloud Technology, Cognitive Radio and based on All IP Switching.

2. First Generation (1G)

In late 1970 to early 1980 the cellular communication had started. 1G provides voice services based on the analogue radio transmission technique. 1G is not a digital technology, it is an analogue in nature. The First cellular system becomes operational in the world by Nippon telephone and Telegraph [NTT] in Tokyo Japan in 1979. Two years later it reached to the Europe. In United States, the advanced mobile phone system [AMPS] was launched in 1982. And two most popular Analog system were Nordic Mobile telephones [NMT] and Total Access Communication System [TACS].

In which Semiconductor technology is used and microprocessor made smaller, lighter in weight and more reliable mobile system. Analog transmission for speech services. These are used Frequency Modulation technology [FM] for Radio Transmission. And traffic is multiplexed by FDMA.

3. Second Generation (2G)

Second Generation was introduced in the 1980. As compared with the First Generation (1G), 2G system uses

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Digital Multiplexing Technology. And it having higher spectrum efficiency, better service and more advanced roaming facility. In United States there were three line of development in 2G system.

The first system introduced in 1991, was the IS-54 which is a new version supporting some more services IS-136 was developed in 1996. IS-95 was introduced in 1993. 2G communication system is generally uses global system for mobile (GSM) and 2.5G uses general packet radio service (GPRS) along with GSM.

4. Third Generation (3G)

Third Generation (3G) uses Wide Band Wireless Network in which clarity is increased. 3G telecommunication system support services that provide an information transfer rate higher than 1G and 2G with high-volume movement of data was possible in 3G, but still the packet transfer on the air-interface act like a circuit switches call. Thus efficiency is lost in the circuit switch environment. Moreover, the standards for developing the systems were different for different networks of the world. Hence, it was decided to have a system which provides the technology platform and network design standards are same.

Thus, 3G was born. 3G is not one standard; it is a family of standards in all can work together.

An organization called 3rd Generation Partnership Project (3GPP) had great work by defining a mobile network system that truly fulfil the IMT-2000 standard. In Europe, it was called UMTS (Universal Terrestrial Mobile System). IMT2000 is the ITU-T name for the third generation (3G) system, while CDMA2000 is the name of the American 3G system. WCDMA is the air-interface technology for the UMTS. The main components includes BS (Base Station), RNC (Radio Network Controller), WMSC (Wideband CDMA Mobile Switching Centre) and SGSN/GGSN. 3G networks enable network operators to offer users a wider range of advanced services while achieving higher network capacity.

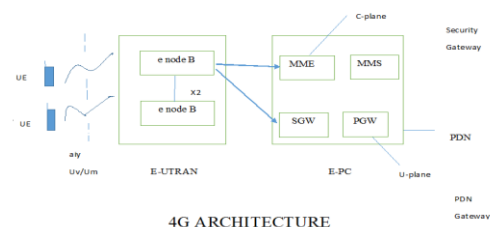
5. Fourth Generation (4G)

The first successful field for 4G was conducted in Tokyo, Japan on June 23rd, 2005. NTT Do Co Mo was successful in introducing 1Gbps real time transmission in the downlink at a moving speed of about 20km/h. To use 4G services, multimode user terminals should be able to select the target wireless systems. In current GSM systems, base stations periodically broadcast signal messages for service station to mobile stations. However, this process becomes complicated in 4G systems because of the differences in wireless technologies and access protocols. To provide services at anytime and anywhere, terminal mobility is a must in 4G infrastructure. Terminal mobility allows mobile users to roam across geographic boundaries of wireless networks. There are two main issues in terminal mobility: location management and handoff management. With location

management, the system tracks and locates a mobile terminal for connection. Location management involves handling of all the information about the roaming terminals, such as original and current location, information etc.

Handoff management maintains ongoing communications when the terminal roams. Mobile IPv6 (MIPv6) is a standardized IP-based mobility protocol. In this network design, each terminal has an IPv6 home address. Whenever the terminal moves outside the local network, the home address shows as invalid, and the terminal obtains a new IPv6 address (called a care-of address) in the visited network. The design of upcoming radio access techniques and evolution of the existing system, the Third Generation Partnership Project

(3GPP) had the foundations of the future Long Term Evolution (LTE) advanced standards. The values of peak spectrum efficiency for advanced systems were set to 30bps/Hz and 15 Bps/Hz in downlink and uplink transmission respectively. Apart from the multiple access Technology, uses multiple-input multiple-output (MIMO) channel transmission techniques called coordinated.



LTE is a standard for wireless data communication technology and for GSM standard. The main aim of LTE is to increase capacity and data rate of wireless network, to improve spectrum efficiency improvement in coverage area. Basically, LTE standard only support packet switching with all IP network. The main reason behind LTE is design only for packet switching to provide internet protocol (IP) connectivity between user equipment (UE) and packet data network (PDN), without any disruption to the user application during mobility.

Due to this, voice call and text message which are typically handle by circuit network like GSM and CDMA. In LTE architecture Evolved UTRAN (E-UTRAN) played an important roll which is the air interface of LTE. The term "System Architecture Evolution" (SAE) which include evolved packet core (EPC) network. Together LTE and SAE comprise EPS.

LTE network uses an eNodeB (Evolved node B), MME (Mobile Management entity), HSS (Home Subscriber Server), SWG (Serving Gateway), PGW (Pocket Data Network Gateway). These part consider as part of EPC except eNodeB.

The Core network called EPC is responsible for control of UE. The main logical nodes of EPC are as Follows.

- 1 PDN Gateway (P-GW).
- 2 Serving Gateway (S-GW).
- 3 Mobility Management entity (MME).

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The enodeB are normally interconnected with each other by means of an interface known as "X2". The protocols that run between enodeB and UE are known as AS protocol

AMPS – Advanced Mobile Phone System
FDMA – Frequency Division Multiple Access
PSTN – Public Switched Telephone Network
NMT – Nordic Mobile Telephone
HI cap – Higher Capacity Alternative
TACS – Total Access Communication System
ETACS – Extended Total Access Communication System
GSM – Global System for Mobile
GPRS – General Packet Radio Service
W-CDMA – Wireless Code Division Multiple Access
CDMA – Code Division Multiple Access
BDMA – Beam Division Multiple Access
WIFI – Wireless Fidelity

In First generation (1G) AMPS was used. In that system only analogue transmission technique was used and that was introduced in 1970-1980. The speed for the First Generation 1G was less than 2kbps. In that system FDMA (Frequency Division Multiple Access) was used. It had Circuit switching and it was used PSTN core network. The services offered by 1G that is only voice. In this system no official requirement of analog technology. Standard for 1G was NMT, AMPS, HI cap, TACS, CDDD, ETACS etc. Frequency range was from 800-900MHz.

In Second generation (2G) Digital Technology is used. In that system digital transmission technique is used and that was introduced in 1990-2004. Now a days in rural areas and in undeveloped area this 2G technology is used.

The speed for the second Generation 2G is 63-64kbps. In that system TDMA (Time Division Multiple Access) and CDMA (Code Division Multiple Access) used. It has Circuit and packet switching and it is used PSTN core network. The services offered by 2G that is not only voice but also SMS. In this system no official requirement of analog technology. Standard for 2G is GSM, GPRS, EDGE, ETC .Frequency range was from 850-1900MHz.

In third generation (3G) W-CDMA (Wireless Code Division Multiple Access) Technology is used. In that system digital transmission technique is used and that was introduced in 2004-2010. Now a days 3G becomes popular technology in mobile network.

The speed for the third Generation 3G is 1.5-2Mbps. In that system CDMA (Code Division Multiple Access) is used. It has packet switching and it is used packet network. The services offered by 3G that is voice, SMS and packet data. In this system official requirement of technology are ITD's IMT-2000 required 144kbps mobile, 384kbps pedestrian, 2 Mbps in door. Standard for 3G is WCDMA, CDMA-2000. Frequency range was from 1.6-2.5GHz.

In Fourth generation (4G) WI-MAX LTG, WI-FI Technology is used. In that system digital transmission technique is used and that was introduced in 2010-2012. Now a days 4G becomes most popular technology in mobile network.

The speed for the fourth Generation 4G is 1-2Gbps. In that system CDMA (Code Division Multiple Access) is used. It has all packet switching and it is used internet core network. The services offered by 4G that is voice, SMS packet data at high speed and multimedia application. In this system official requirement of technology are TTU's IMT advanced required ability to operate in 40MHz radio channel and very high spectral efficiency.

Standard for 4G is OFMDA, MC-CDMA Network-LMDS. Frequency range was from 2-8GHz.

6. Security Parameters of 4G

Now a days Security is most important issue. Anyone can hack your e-mail ID and misused it.

Denial of service that is (DOS) is probably most potent attack that can bring down the entire network structure. This can be caused by sending excessive data to the network which is more than the network can handle. And another is channel jamming, this technique is used to jam the wireless channel. If a proper method of authentication is not used then an attacker can take free access to the network and then can used services.

There are some Security Parameters shown below

6.1 Data Confidential -

The Confidential algorithm is known as f8 and it operates on the signalling data as well as user data. The user's device uses Cipher Key CK and some another information and then it calculates output bit stream. Then this bit stream is xored bit by bit with the input data stream to generate new cipher stream. This is then transmitted to the RNC, where RNC uses same CK. And input as the user's device. This is then xored with the cipher stream to get original data.

6.2 Authentication-

Authentication is the process of determining whether something is, in fact, who or what it is declared to be or logically, Authentication is the process in which system provided are compared with those on file in a database of authorised user's information on a local operating system or within authentication server, when process is completed and the user is granted an authorization for access. There can be a two types of Authentication First is the user authentication and other is Machine authentication.

User authentication occurs within human-to-computer interactions other than guest, Machine need to authorize their own automated actions within the network also. We can used machine authentication by using some of the login ID and specific password for every user. Authentication is nothing but the user identity verification.

6.3 Non-Repudiation-

Non-Repudiation is the method of guaranteeing message transmission between user and digital encryption. It is one of the most important security parameter which gives information assurance (IA). It often used for digital contracts, emails and signature. By using authenticated ID and password the data organisation can be obtained. Non-Repudiation is nothing but the electronic security measure.

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Thus Non-Repudiation protects the recipients and the sender when recipient receiving an email. Without that an essential IA, information security would be flawed.

6.4 Data Alteration–

Generally data alteration defined as, change that does not affect the basic structure or character of information of the thing it is applied to.

And logically it defines as change made to legal document that may affect its validity. If change alters the sense or effect of the legal document, those are generally illegal. An alteration is the variation made in the information or in the legal document that can be affected on the rights and obligations of the users. When essential part of a writing has been cut or erased, alteration is also known as a mutilation.

6.5 Access Control-

Access Control is a security parameter or technique that can be used to regulate what can view or use in a networking environment. There are two main types of access control: physical and logical. Physical access control limits access to the campus, buildings, room. Logical access control limits the connection of computer network, data.

CONCLUSION

Mobile Wireless Communication Network Technology is going to be a new revolution in Wireless Industry. With the upcoming feature like personal data assistant (PDA) now our whole office is in our finger tips. We implement 4G Mobile Wireless Communication Network Technology by using MATLAB, NS2 AND NS3 (NETWORK SIMULATOR). 4G Technology has a bright future because it can handle best technologies and offer priceless hand set to their customers. 5G will promote concept of Super Core, where all the network operators will be connected through one single core

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REFERENCES

[1]Abdullah Gani, Xichun EL Lian Yang, Omar Zakaria,(2008) "TCP/IP

Suite Significant Enhancement for 4G Mobile Multimedia Internet Networks", Proceedings of the 8th WSEAS International Conference on Multimedia System and Signal Processing (MUSP'08).vol.586,pp.229-235. April 6-8,2008, Hangzhou, China.

[2] Chen, HH; Guizani, M; Mohr, W (2007), "Evolution toward 4G wireless

networking", IEEE Network, Volume: 21 Issue:1 pp. 4-5.

[3] Chen, YP; Yang, YH (2007), "A new 4G architecture providing multimode terminals always best connected services", IEEE Wireless Communications, Volume: 14 Issue: 2 pp. 36-41.

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