USING MOBILE TELECOMMUNICATIONS -2000 INTERNATIONAL FOR ANALYZING TECHNOLOGY NETWORK ERA 4G-LTE

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ABSTRACT: Technology long-term evolution(LTE) is the latest standard of mobile network technology, development of GSM (Global System for Mobile Communication) / EDGE (Enhanced Data Rate for gsm evolution) and UMTS (Universal Mobile Telephone Standard) / HSDPA (High-Speed Downlink Packet Access). 4G is a technology development from 3G. 4G system will provide comprehensive IP solution where voice, data and multimedia flows can be up anywhere and anytime, and 4G has a higher average data from the previous generation.Customers may also use their cellular terminals for video conferencing and in time to exchange information via e-mail or multimedia mail.

Keywords: TechnologyLong TermEvolution, 4G-LTE, IMT-2000

1. INTRODUCTION

Today the development of internet and wireless communication technology is one of the necessities to communicate with everyone. Internet and also the mobility of communication anywhere through wireless communication technology is called mobile broadband. The need for telecommunication services will increase due to increasing user demands as well; however, the need for voice facilities is still a major requirement for telecommunication service users.

LTE which is a 3GPP standard can be the answer to the challenge. LTE is designed as a 4G technology that provides multi-megabit bandwidth because the advantages of LTE technology can be implemented simultaneously on existing 2G and 3G networks, so the implementation of LTE technology is low cost.

IMT-2000 is a third-generation mobile communications system (3G) designed to provide global services, diverse service capabilities, and significant performance improvements.This technology will integrate pager, mobile phone, and mobile satellite system; in addition, with IMT-2000 later users are expected to be able to access globally with the same number wherever it is. Therefore, IMT-2000 can be said as the basis for integrated global communication access.

2. OBJECTIVES OF WRITING

The objective to be achieved is to produce and know the specifications and standardization of mobile communication systems in the third generation IMT-2000. Gaining optimizations that can improve system performance and gain the advantages and disadvantages of this system from the technical point of view.

3. 4G LTE Network Architecture

The emergence of 4G LTE (Long Term Evolution) network with all its advantages can promise super-fast mobile data communications. To be able to enjoy 4G services at some 4G points, people can exchange their 3G sim card with a special 4G sim card named USim, the form of a 3G sim card with USim 4G is the same, the difference is only on the technology embedded in it. The architecture of LTE 4G networks can be seen from the picture below.

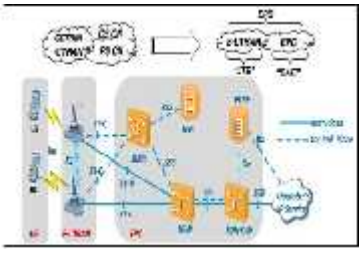

Figure 1. 4G LTE network architecture

4. MOBILE COMMUNICATION SYSTEM

Communication technology continues to grow with years.Wireless communication is quite popular in various countries as one of the solutions to meet the needs of telecommunication facilities.

The role of mobile telecommunications, especially mobile communications systems is felt increasingly needed. Due to the existence of mobile telecommunication facilities is expected to make it easier for users to communicate.

A. CELL CONCEPT

The basic concept of a cellular system is the division of services into small areas called cells. Each cell has its own coverage area and operates specifically. Cell sizes in mobile communication systems can be affected by:

1. Density of traffic.
2. Power transmitters, namely Base Station (BS) and Mobile Station (MS).
3. And natural factors, such as air, sea, mountains, buildings, and others.

B. FREQUENCY REUSE

The use of the same frequency on different cells at the same time by multiple users is at the core of cellular communication.

In the concept of frequency reuse, a certain frequency channel can serve multiple calls at the same time. Then it can be said that efficient frequency spectrum usage can be achieved. All available frequencies can be used by each cell, so that it can reach the capacity of a large number of users using an effective frequency band.

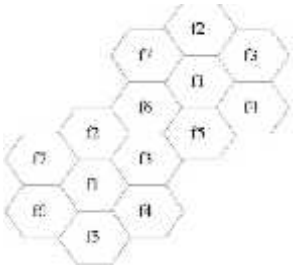

Figure 2. *Frequency Reuse*

On frequency reuse, use of the Canal does not depend on the same carrier frequency for some areas of coverage.

In Figure 2.3. repeated use can be seen the channel frequency, in a cell that uses the radio channel, f1 has radius R can be used in different cells of the same range at a distance D from the previous cell.

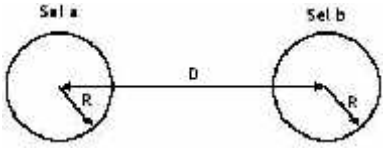

Figure 2. Reuse Frequency

While the relative separation distance to the cell radius is expressed by D / R.

Equation of formula below:

$$D/R = \sqrt{3K}$$

Where : D = distance between BS and other BS

R = cell radius

K = number of frequency patterns

The concept of frequency reuse can improve efficiency in the use of frequency spectrum but must be followed with a certain pattern and orderly to avoid channel interference.

C. MOBILITY

Mobility is one of the important things of a mobile communications system. On matters relating to mobility, it is expected that cellular calls which are made wherever and whenever within the service area, able to keep the call (conversation) without service interruption or breaking the call while in a state of motion.

D. ROAMING

There are many mobile operators in the same city, which use radio switches equipment, and different cell sites. However, subscribers are registered on one operator only.

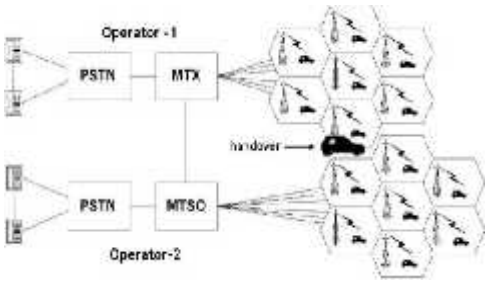

Figure 4. Roaming

The description of the roaming itself is shown in Figure 2.5. Roaming can occur when there is a link between mobile switches.

So, users who move out of their area and make a call (call) from a foreign region called roamer. However, the process of the call is called roaming.

5. BASIC CONFIGURATION OF MOBILE SYSTEM

The mobile phone or mobile radio is also a practical and reliable method of voice and data communications between mobile users and regular telephone systems.

In mobile cellular communication system there are three main component parts, namely:

a. Mobile Telephone Switching Office (MTSO)
MTSO serves as a central connection of the conversation and recording pulse. MTSO is also known as MSC (Mobile Switching Central) and better known as "central".

Calls to and from mobile customers are connected by and through MTSO. In addition MTSO also set up signaling required to make calls.

b. Base Transceiver Station (BTS)
Base Transceiver Station is often called Radio Base Station (RBS). BTS is a liaison between customer and central terminals through radio frequency channels. The BTS series consists of:

a.Control Unit

The control unit is used for data communication with MTSO as well as data signaling with Mobile Station (MS) in the radio network.

b. Channel Unit

The transmitting and receiving devices will be equipped or supplied in each channel unit.Most of the channel units are the speech-channel units.

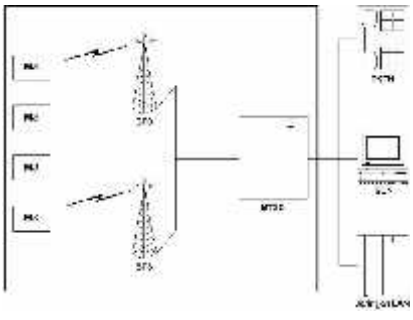

Figure 5. Basic Configuration of Cellular System

c. Mobile Station (MS)
Mobile Station is small and light equipment used by customers. In other words, Mobile Station (MS) is known as a handset or handphone.

6. THE DEVELOPMENT OF MOBILE TELECOMMUNICATION SYSTEM

Communication systems evolve along with the development of human needs. In the past, people were quite satisfied with the one-way communication system, but because it was felt less efficient, then a two-way communication system is created.But the demand to communicate anytime and anywhere becomes a major demand in the telecommunications system.

7. IMT-2000 NETWORK ARCHITECTURE

IMT-2000 network architecture is defined in such a way that various technologies that process various information can be used to realize IMT-2000.

International Mobile Telecommunication-2000 (IMT-2000) is a specification of a functional architecture, which will give freedom to some mobile telecom equipment manufacturers to create their own network architecture design and their own better equipment to meet their implementation objectives.

The IMT-2000 network is composed of three parts of the architecture, namely:

1. Access network
The IMT-2000 access network provides basic radio transmission functions such as handover and local switching functions required to enable access from mobile phones to fixed network centers or sources via the radio interface.

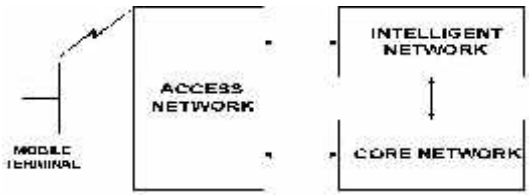

Figure 11. IMT-2000 Network Architecture

2. Backbone network
The backbone network provides a basic fixed network infrastructure and network centers that have the necessary call control and link control for IMT-2000. The backbone network concept consists of Core Network and the core part of Service and Mobility Control Network.

3. Service and Mobility Control Network/Intelligent Network
Service And Mobility Control Network provides service control or provides mobility associated with the highest level of functionality such as handover decisions and storing customer-related data to support access to mobility networks.

8. Research Findings

In the simulation, the propagation model is required to determine the radius of the cell, such as Okumura Hatta model for 900 MHz frequency and Cost Hatta for 1800 MHz frequency. The equation for propagation used is:

$$L = A + B \log\left(\frac{f}{M}\right) - 1{,}8 \log\left(\frac{h_b}{m}\right) - \left(\frac{a(h_M)}{m}\right) + s \log\left(\frac{d}{k}\right) + L_c$$

with,

Table1. Path loss parameters

Propagation	Frequency	A	B
Okumurra Hatta	150 – 1500 MHz	69.55	26.16
Cost Hatta	1500 – 2000 MHz	46.3	33.9

L : Maximum of pth loss

f : Carrier Frequency (MHz)

h_{bs} : Height of eNodeB (m)

h_{MS} : Height of EU (m)

$a(h_{ms})$: The correction factor of the height between MS can be calculated by

$$a(h_m) = \begin{cases} 3.2[\log(1.7\,h_m)]^2 - 4.9 \\ [1.1\log(f) - 0.7]h_M - [1.5\log(f) - 0.8] \end{cases};$$

9. ADVANTAGES AND DISADVANTAGES OF IMT-2000 SYSTEMS

IMT-2000 as a third generation mobile communications system (3G) certainly has many advantages over second-generation mobile communications systems that are still used in some countries.

There are several advantages that can be found on the IMT-2000 mobile communication system. The advantages include: greater capacity, expanded coverage, personality and the addition of other services.

10. CONCLUSION

From the discussion on this final project, the conclusion that can be taken is:

1. IMT-2000 has a difference compared to the second generation telecommunication system, namely in the second generation system, the existing service is in the form of voice and data services with low bit rate.
2. IMT-2000 is a third generation mobile telecommunication system that has a bit rate of 2 Mbps and operates at 2 GHz frequency.
3. In IMT-2000, Transmission data used is packet data instead of data circuit as in second generation system. Therefore data transmission on IMT-2000 can be faster.

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