

Comparative Study on Mobile Switching Center of Mobile Generations

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The mobile wireless generation (G) generally refers to a change in the nature of the system, speed, technology, frequency, data capacities, new techniques and new features which differentiate it from the previous one. The first generation (1G) mobile wireless communication network was analog use for voice calls only. The second generation (2G) is a digital technology and supports text messaging. The third generation (3G) mobile technology provided higher data transmission rate, increased capacity and provide multimedia support. The fourth generation (4G) integrates 3G with fixed internet to support wireless mobile internet, which is an evolution to mobile technology and it overcome the limitations of 3G. It also increases the bandwidth and reduces the cost of resources. 5G stands for 5th Generation Mobile Technology and is going to be a new revolution in mobile market which has changed the means to use cell phone within very high bandwidth. This process was studied improvement from 1G to 5G [1].

A. Evolution of Mobile Communications

Mobile communications systems revolutionized the way people communicate. First Generation (1G) of telecommunication technologies were originally introduced in the early 1980's and fulfilled the basic mobile voice using analogue access transmission (FDMA).

A decade later, Second Generation systems followed introducing digital multiple access technologies (such as TDMA and CDMA) which improved the quality of the existing

ABSTRACT

The world of mobile wireless communication is rapidly developing. The last few years have experience a remarkable growth in wireless industry. Just within a decade, an evolution of wireless service people used every day can be completely dumbfounded from the roots of analog based first generation service(1G) to today's truly broadband-ready fourth generation networks. The ever-growing demands for higher data rates, greater capacity and better quality of services triggered operations to come up with new network technologies. There are many improvements of mobile generations in the world of telecommunication. Mobile Switching Center can perform various types of function in mobile communication. It also connects VLR (Visitor Location Register), HLR (Home Location Register), AuC(Authentication Center) and EIR (Equipment Identity Register) and they are essential needing for mobile communication. This paper represents the introduction about evolution from 1G to 4G system and discusses about the main elements in Mobile Switching Center eventually it includes comparison of Mobile Switching Center in every mobile generations.

KEYWORDS: 1G, 2G, 3G, 4G, evolution, mobile switching center

1. INTRODUCTION

In the last few decades, Mobile Wireless Communication networks have experienced a remarkable charge.

voice services and added new ones as Short and multimedia message service.

This is followed by the third generation (3G), which targets for data at higher speeds to open the gates for truly "mobile broadband". The Fourth Generation (4G) provides access to wide range of telecommunication service, including advanced mobile services, supported by mobile and fixed networks, which are increasingly packet based, along with a support for low to high mobility applications and wide range of data rates, in accordance with service demands in multiuser environment. Fifth Generation should be more intelligent technology that interconnects the entire world [2]. Fig 1 is essential need to know about the network elements of mobile communication.

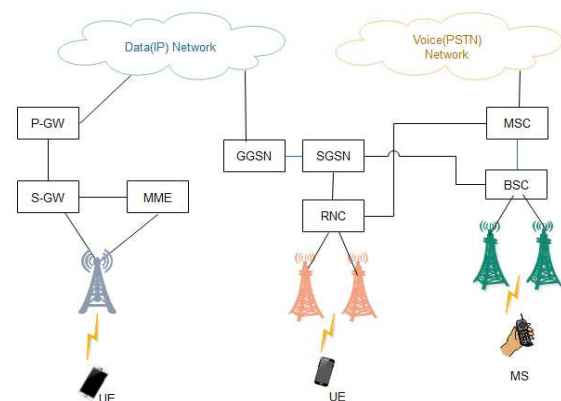


Figure1. Block Diagram of Mobile Network System

B. Introduction to MSC in Mobile Generations

The author aims to study the evolution of MSC developments in mobile generations. So this paper will be described the performance of MSC in each generation. In literature views, MSC is the main part in the telecommunication network. GSM network system also contains MSC as a main part. GSM network system contains the following:

- MS (Mobile Station)
- BSS (Base Station Subsystem)
- NSS (Network Subsystem)
- NMS (Network Management System) or
- OSS (Operation Station Subsystem)

NSS is the main component of the public mobile network that carries out mobility management functions for mobile phones roaming on the network of base stations. The NSS originally consisted of the circuit switched (core network), used for traditional GSM services such as voice calls, SMS and circuit switch calls. It was extended with overlay architecture to provide packet switch data services. This allows mobile phones to have access to service such as WAP, MMS and the Internet [3].

The Network Switching System (NSS), the main part of which is the mobile switching center (MSC), performs the switching of calls between the mobile and other fixed or mobile network users, as well the management of mobile services authentication. It also includes Home Location Register (HLR), Visitor Location Register (VLR) and Equipment Identity Register (HLR).

The MSC is the central element of a mobile telecommunication network, which is also called a Public Land Mobile Network (PLMN) in the standard. In a classic switched network, all connections between subscribers are managed by the MSC and are always routed over the switching matrix even if two subscribers that have established a connection communicate over the same radio cell.

II. MAIN ELEMENTS IN MOBILE SWITCHING CENTER

Fig 2. is the main components of GSM network system. Among them, the author will study mainly the components connected to MSC such as HLR, VLR, EIR and AuC. The most important responsibilities of the NSS are call establishment.

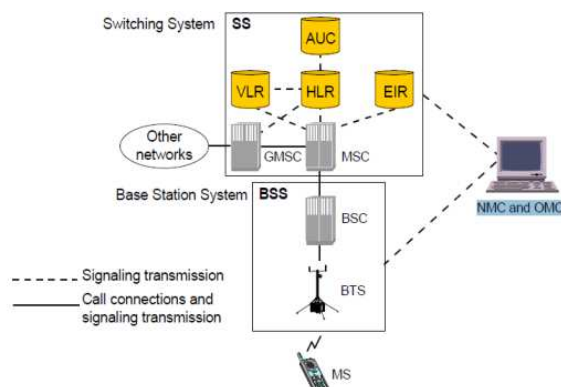


Figure2. Main Components of GSM Network System [4]

A. Mobile Switching Center (MSC)

A mobile switching center (MSC) is the centerpiece of a network switching subsystem (NSS). The MSC is mostly

associated with communications switching functions, such as call set-up, release, and routing. However, it also performs a host of other duties, including routing SMS message, conference calls, fax and service billing as well as interfacing with other networks, such as the public switched telephone network (PSTN).

The MSC is structured so that base stations connect to it, while it connects to the PSTN. As cell phones connect to these base stations, all forms of communication, whether between two cell phones or between a cell phone and a landline telephone, travel through the MSC [5]. The Mobile Switching Center (MSC) database contains critical subscription data about each network user.

- Home Location Register (HLR)
- Visitor Location Register (VLR)
- Authentication Center (AuC) and
- Equipment Identification Register (EIR)

B. Home Location Register (HLR)

The Home Location Register (HLR) is the main database of permanent subscriber information for a mobile network. The HLR is an integral component CDMA (Code Division Multiple Access), TDMA (Time Division Multiple Access) and GSM (Global System for Mobile Communications) networks. The HLR contains pertinent user information including address, account status and preferences. The HLR interacts with the Mobile Switching Center (MSC), which is a switch used for call control and processing. The MSC also serves as a point of access to the Public Switch Telephone Network (PSTN). The third integral element is the Visiting Location Register (VLR) requests from subscribers who are out of the area covered by their home system.

When a user initiates a call, the switching equipment determines whether or not. The call is coming from the device's home area. If the user is out of the home area, the area VLR sends out a request for information required to process the call. An MSC queries the HLR identified by the call for information, which it relays it to the VLR. The VLR sends routing information back to the MSC which allows it to find the station where the call originated, and finally the mobile device to connect Communication between the elements are based on Signaling System (SS7) protocols and signaling [6].

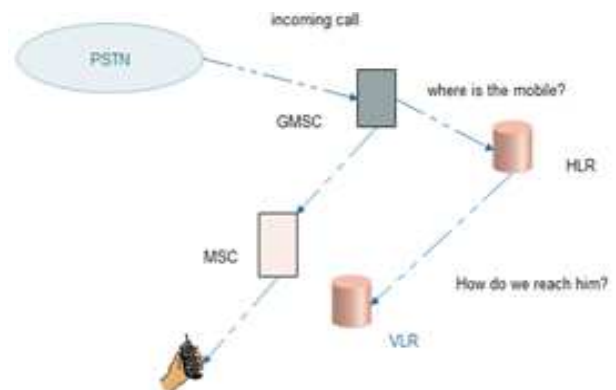


Figure3. Network Diagram of Home Location Register

C. Visitor Location Register

A visitor location register is a database that contains information about the subscribers roaming within a mobile switching center's (MSC) location area. The primary role of

the VLR is to minimize the number of queries that MSCs have to make to the home location register (HLR), which holds permanent data regarding the cellular network's subscribers. Ideally, there should be only one visitor location register per MSC, but it is also possible for a single VLR to serve multiple MSCs. The VLR also holds the international mobile subscriber identity (IMSI) and the mobile subscriber integrated services digital network is designed such that one VLR serves each MSC's location area, there will be fewer records in the VLR than the HLR. As soon as a subscriber moves into an MSC's location area, corresponding record is updated the VLR. Subsequently, the subscriber's HLR is automatically informed of the change. A visitor location register may also perform the following functions:

- Monitor the subscriber's location within the VLR's jurisdiction
- Determine whether a subscriber may access a particular service
- Allocate roaming numbers during incoming calls
- Delete the records of inactive subscribers
- Accept information passed to it by the HLR [7]

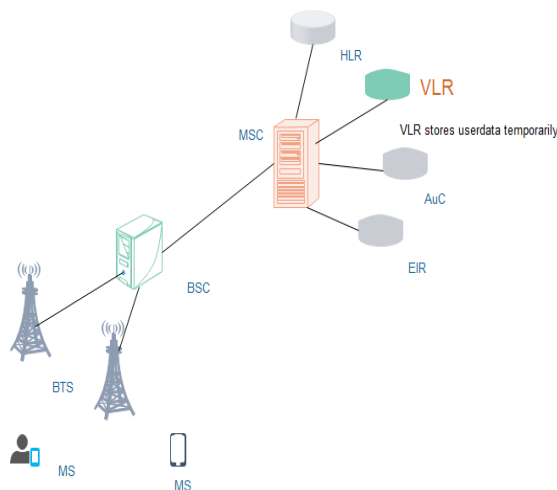


Figure4. Network Diagram of Visitor Location Register

D. Authentication Center (AuC)

The Authentication Center (AuC) is a key component of a global system for mobile communications (GSM) home locator register (HLR). The AuC validates any security information management (SIM) card attempting network connection when a phone has a live network signal. The AuC provides security to ensure that third parties are unable to use network subscriber services.

Each network SIM card is assigned an individual authentication key (Ki). A matching Ki is contained in the AuC. The SIM and the AuC store the Ki in an unreadable format. The Ki even remains hidden from the SIM card owner to protect network operators from fraud, such as SIM cloning, through enabling user identity verification and ensuring call confidentiality.

During the authentication process, the Ki is used with the subscriber identity (IMSI) number. Network and service subscriber validity is determined by successful authentication between the mobile device and the core network. The entire process is completed during a wireless connection. If the numbers do match, the authentication is invalidated as a failed function request [8].

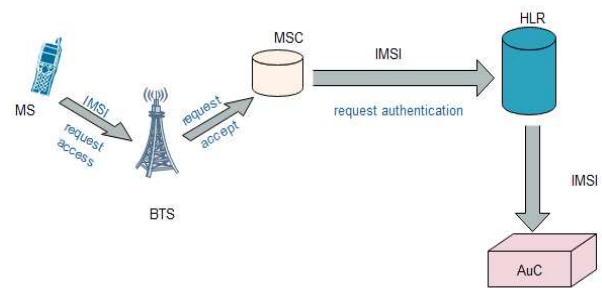


Figure5. Block Diagram of Authentication Center

E. Equipment Identity Register (EIR)

A handset theft problem exists in GSM networks in many countries. A person obtains a legitimate subscription to a network to a network, and then obtains a legitimate IMSI, MSISDN, and SIM card. The person initially buys an inexpensive handset and then steals a better handset from another subscriber.

Once the handset is stolen, the thief replaces the SIM card with users own legitimate, the phone will operate and the network operator has no way to determine that the subscriber is using a stolen handset. In addition to individual handset theft, organized groups have begun stealing entire shipments of mobile handsets from warehouses and selling these handsets on the black market.

The Equipment Identity Register (EIR) is a network entity used in GSM networks that stores lists of IMEI numbers, which correspond to physical handsets (not subscriber). The IMEI is used to identify the actual handsets and is not dependent upon the International Mobile Subscriber Identity (IMSI), Mobile Station International ISDN number (MSISDN) and SIM are all subscribers specific and move with the subscriber when he or she buys a new handset. The IMEI is handset specific. The Equipment Identity Register is often integrated to the HLR.

- Black-Mobile Station (MS) on the Black List are denied access to the network
- Gray-MSs on the Gray List are allowed on the network, but may be tracked
- White-MSs on the White List are allowed access to the network. The EPAP Real Time Database (RTDB) stores the White, Gray, and Black Lists of IMEI numbers.

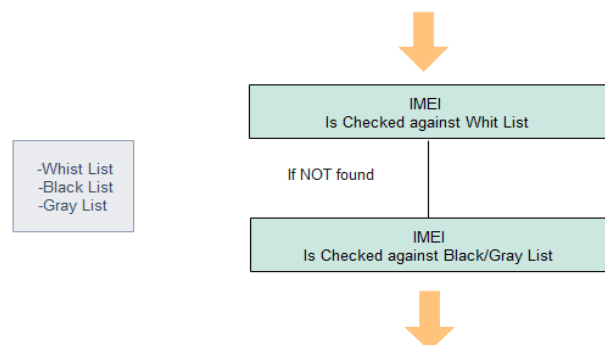


Figure6. Block Diagram of Equipment Identity Register (EIR)

The RTDB (Real Time Data Base) is downloaded to Service Module cards in the EAGLE5 ISS. When a subscriber roams to a new MSC or VLR location, the handset attempts registration with the MSC or VLR. Before the MSC registers the subscriber with the VLR, it may send a handset a query

to the EAGLE 5 ISS returns a response indicating whether the IMEI is allowed, disallowed, or not valid. If the IMEI is allowed, the MSC completes registration; otherwise, registration is rejected. The RTDB may contain associations between individual IMEIs and IMSIs. This can provide a further level of screening by directly associating a particular IMEI with a particular IMSI. This association is used in follow.

If an IMEI is found on a Black List, an additional check of the IMSI could then be made. If the IMSI from the handset matches the IMSI provisioned with the IMEI, this would override the Black List condition, and allow registration to continue. This could be used to protect against mistaken Black List entries in the database, or to prevent unauthorized "handset sharing". This association could also be used in other way [9].

III. PERFORMANCCE OF MOBILE SWITCHING CENTER IN MOBILE GENERATIONS

Mobile communication has become more popular in last few years due to fast reform from 1G to 5G technology. This reform is due to requirement of service compatible transmission technology and high increase in telecoms customers. Generation refers change in nature of service compatible transmission technology and new frequency bands.

A. First Generation Analog System

1G refers to the first generation of wireless system of mobile telecommunications. The first commercially automated cellular network (the first generation) was launched in Japan by Nippon Telegraph and Telephone (NTT) in 1979, initially in the metropolitan area of Tokyo. Within five years, the NTT network had been expanded to cover the whole population of Japan and became the first nationwide 1G network.

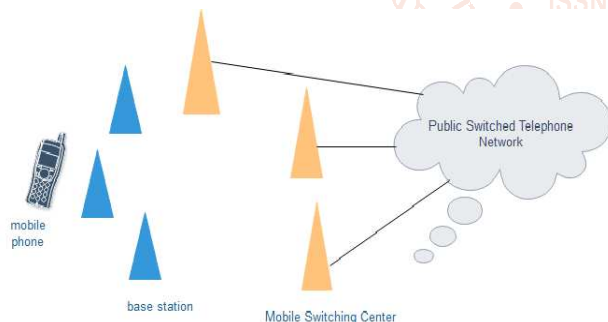


Figure7. Architecture of First Generation System

1. Mobile Switching Center in First Generation

Wireless System The Mobile Switching Center (MSC) is the switching service delivery node for analog system for voice calls. The MSC sets up and releases the end-to-end connection, handles mobility and handover requirements during the call and takes care of charging and real time prepaid account monitoring.

2. Various Types of MSC

There are various different names for MSCs in different contexts which reflect their complex role in the network; all of these terms though could refer to the same MSC, but doing different things at different times. The gateway MSC (G-MSC) is the MSC that determines which "visited MSC" (V-MSC) the subscriber who is being called is currently located at. It also

interfaces with the PSTN. All mobile to mobile calls are routed through a G-MSC. The term is only valid in the context of one call, since any MSC may provide both the gateway function and the visited MSC function. However, some manufacturers design dedicated high capacity MSCs which do not have any base station subsystem (BSS) connected to them. These MSCs will then be the gateway MSC for many of the calls they handle.

The Visited MSC (V-MSC) is the MSC where a customer is currently located. The visitor location register (VLR) associated with this MSC will have the subscriber's data in it. The Anchor MSC is the MSC from which a handover has been initiated. The target MSC is the MSC toward which a handover should take place.

The Mobile Switching Center Server is a soft switch variant (therefore it may be referred as mobile soft switch, MSS) of the mobile switching center, which provides circuit switched calling mobility management, and GSM services to the mobile phones roaming within the area that it serves. MSS functionally enables split between controls this guarantees better placement of network elements within the network [11].

3. Home Location Register (HLR) in First Generation Network

The Home Location Register (HLR) is a central database that contains details of each mobile phone subscriber that is authorized to use the network. There can be several, logical and physical, HLRs per public land mobile network (PLMN) though one international mobile subscriber identity (IMSI)/MSISDN pair can be associated with only one logical HLR (which can span several physical node) at a time.

The HLRs store details of every SIM (Subscriber Identity Module) card issued by the mobile phone operator. Each SIM has a unique identifier called an IMSI which is the primary key to each HLR record. Another important item of data associated with the SIM are the MSISDNs (Mobile Subscriber Integrated Service Digital Network), which are the telephone number used by mobile phone to make and receive calls. The primary MSISDN is the number used for making and receiving voice calls, but it is possible for a SIM to have other secondary MSISDNs associated with it for fax and data calls. Each MSISDN is also a primary key to the HLR record. The HLR data is stored for as long as a subscriber remains with the mobile phone operator.

4. Visitor Location Register (VLR) in First Generation Network

The Visitor Location Register (VLR) is a database of the mobile station that had roamed into the jurisdiction of the MSC (Mobile Switching Center) which it serves. Each main base station in the network is served by exactly one VLR; hence a subscriber cannot be present in more than one VLR at a time [14].

B. GSM/GPRS Wireless Network System

GSM (Global System for Mobile Communications) is a standard developed by the European Telecommunications Standards Institute (ETSI) to describe the protocols for second-generation network used by mobile device.

2G networks developed as a replacement for first generation (1G) analog networks, and the GSM standard originally

described a digital, circuit switched network optimized for full duplex voice telephony. This expanded over time to include data communications, first by circuit-switched transport, then by packet data transport via GPRS (General Packet Radio Services) and EDGE (Enhanced Data rates for GSM) [16].

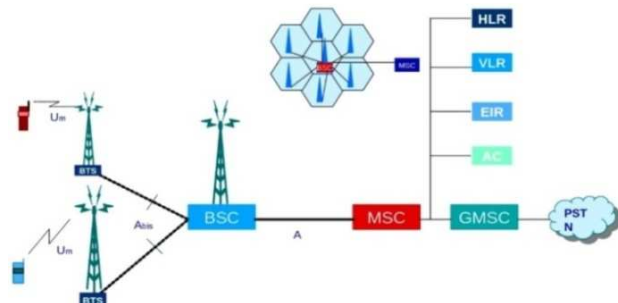


Figure8. GSM Network Architecture

1. Performance of MSC in 2G Network

Mobile Switching Center (MSC) is the primary service delivery node for GSM, responsible for routing voice calls and SMS as well as other services. The Mobile Switching Center sets up and releases the end-to-end connection, handles mobility and handover requirements during the call and takes care of charging and real time pre-paid account monitoring.

In the GSM mobile phone system, in contrast with earlier analogue services, fax and data information is sent directly digitally encoded to the Mobile Switching Center. Only at the Mobile Switching Center is the coded into an “analogue” signal (although actually this will almost certainly mean sound encoded digitally as PCM (Pulse Code Modulation) signal in a 64-kbit/s timeslot.

The Mobile Switching Center connects to the following elements:

- Home Location Register (HLR) for obtaining data about the SIM and mobile services ISDN number (MSISDN; i.e., the telephone number)
- Base Station Subsystem (BSS) which handles the radio communication with 2G and 2.5G mobile phones
- Visitor Location Register (VLR) provides subscriber information when the subscriber is outside its home network [15].

2. Performance of Home Location Register (HLR) in 2G Network

The HLR interacts with the mobile switching center (MSC), which is a switch used for call control and processing. The MSC also serves as a point-of-access to the Public Switch Telephone Network (PSTN). The third integral element is the Visitor Location Register (VLR), which maintains temporary user information to manage requests from subscriber who are out of the area covered by their home system.

3. Performance of VLR (Visitor Location Register) for 2G Network

The main difference between data stored in the VLR and that found in the HLR is that the some of the data in the latter is more permanent, while the data in the former changes more frequently. As soon as a subscriber moves into an MSC's location area, the corresponding record is updated in the VLR. Subsequently, the subscriber's HLR is automatically informed of the change [15].

C. UMTS/WCDMA Network Technology

The 3G UMTS/ WCDMA network technology including the User Equipment (UE), the radio network subsystem, and the core network. The UMTS 3G is required to provide a greater level of performance to that of the original GSM network. However as many networks had migrated through the use of GPRS and EDGE.

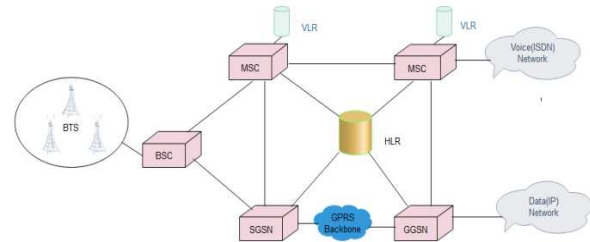


Figure9. Block Diagram of UMTS Network

The UMTS core network may be split into two different areas:

- Circuit switched elements: These elements are primarily based on the GSM network entities and carry data in a circuit switch manner
- Packet switched elements: These network entities are designed to carry packet data.

1. Operation of Mobile Switching Center in UMTS Technology

The circuit switched elements of the UMTS core network architecture include the following network entities. Mobile Switching Center (MSC) is essentially the same as that within GSM, and it manages the circuit switched calls under way. Gateway Mobile Switching Center (GMSC) is effectively the interface to the external networks. The packet switched elements of the 3G UMTS core network architecture include the following network entities: Serving GPRS Support Node (SGSN) as the name implies, this entity was first developed when GPRS was introduced and its use has been carried over into the UMTS network architecture.

- Mobility Management
- Session Management
- Interaction with other areas of the network
- Billing [18].

2. Gateway GPRS Support Node (GGSN) in UMTS Network Technology

Like the SGSN, this entity was also first introduced into the GPRS network. The Gateway GPRS Support Node (GGSN) is the central element within the UMTS packet switched network. It handles inter-working between the UMTS packet switched network and external packet switched networks, and can be considered as a very sophisticated router. In operation, when the GGSN serving the particular UE. The SGSN has been logically separated from the radio network and its cell-based architecture. The SGSN contain HLR, EIR and AuC in UMTS network. The UMTS SGSN is no longer aware of the cell in which a subscriber is currently located.

3. Visitor Location Register in UMTS Network Technology

Whenever a Mobile Switching Center (MSC) detects a new mobile in its network, in addition to creating a new record in the VLR, it also updates the HLR of the mobile subscriber. The MSC address received during a HLR look up for a particular mobile number is useful for identifying number roaming in another country [21].

D. Long Term Evolution (LTE) Network System

LTE is an abbreviation for Long Term Evolution. LTE is a 4G wireless communication standard developed by the 3rd Generation that's designed to provide up to 10x the speeds of 3G networks for mobile devices such as smart phones, tablets, notebooks and wireless hotspots. 4G technologies are designed to provide IP-based voice, data and multimedia streaming at speeds of at least 100Mbit per second and up to as fast as 1Gbit per second.

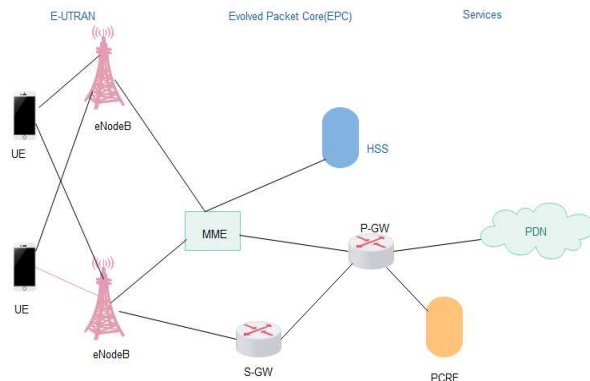


Fig10. LTE Network System Architecture

1. The Mobility Management Entity (MME)

While the eNode-Bs autonomously handles users and their radio bearers once they are established, overall user control is centralized in the core network. This is necessary as need to be a single point over which data flow the internet. Further, a centralized user database is required, which can be accessed from anywhere in the home network and also from networks abroad in case the user is roaming.

The network node responsible for all signaling exchanges between the base stations and core networks and between the users and core networks is the Mobility Management Entity (MME). In large network, there are usually many MMEs to cope with the amount of signaling and for redundancy reasons. As the MMEs are not involved in air interface matters, the signaling it exchanges with the radio network is responsible for the following tasks:

- Authentication
- Establishment of bearers
- NAS mobility management
- Handover support [23].

2. The Serving Gateway (S-GW)

The S-GW is responsible for managing user data tunnels between the eNode-Bs in the radio network and the Packet Data Network Gateway PDN-GW, which is the gateway router to the Internet. On the radio network side, it terminates the S1-UP GTP tunnels, and on the core network side, it terminates the S5-UP GTP tunnels to the gateway to the Internet [23].

3. The PDN- Gateway (PGW)

The third LTE core network node is the PDN-GW. In practice, this node is the gateway to the Internet and some network operators also use it to interconnect to intranets of large companies over networks. The PDN-GW terminates the S5 interface. On the user plane, this means that data packets for a user are encapsulated into an S5 GTP tunnel and forwarded to the S-GW, which is currently responsible for this user. The S-GW then forwards the data packets over the S1 interface to the eNode-B that currently serves the user, from which it is then sent over the air interface to the user's mobile device.

The PDN-GW is also responsible for assigning IP addresses to mobile devices. When a mobile device connects to the network after being switched on, the eNode-B contacts the MME. The MME then authenticates the subscriber and requests an IP address from the PDN-GW for the device. For this purpose, the S5 control plane protocol is used.

In practice, a mobile device can be assigned several IP address simultaneously. Several IP addresses might be necessary in cases where the device uses services that are part of the network operator's internal network. A mobile device can also request the assignment of simultaneous IPv4 and IPv6 addresses.

4. The Home Subscriber Server (HSS)

LTE shares its subscriber database with GSM and UMTS. In these systems, the database is referred to as the Home Location Register (HLR) and the mobile Application Part (MAP) is used as the protocol between the MSC and SGSN on the one side and the HLR on the other side [24].

IV. COMPARATIVE STUDY ON MOBILE SWITCHING CENTER

Mobile Switching Center (MSC) connects and manages when a user calls another user. The First generation of wireless telecommunication technology used analog transmission techniques which were basically used for transmitting voice signals. 1G use frequency modulation techniques for voice signals and all the handover decisions were taken at the Base Station (BS). The spectrum within cell was divided into number of channels and every call is allotted a dedicated pair of channels. Data transmission between the wire part of connection and PSTN (Packet Switched Telephone) was done using packet-switched network [22].

In the author view, MSC in 1G system is very simple. It works mainly in only switching. There is a problem of call drop when the user talks each other because the switching system is not very good. The connecting devices are more than 1G system in MSC. So, other features can be used in 2G network. Compare 1G and 2G, the features of MSC in 2G are better than 1G system.

Table1. Evolution of MSC, VLR and HLR

| | MSC | VLR | HLR | Voice Tone |
|----|---|---|---|------------|
| 1G | Switching when connects each user | Connect with MSC | Connect with MSC | Bad |
| 2G | Call set up route Mobility management Roaming | Temporary stores subscriber's data eg. IMSI | Permanently stores subscriber's data eg. IMSI | Fair |
| 3G | Media Gate Way and connect to MSC | Same with 2G System | Same with 2G system | Good |
| 4G | Combine with VLR, AuC and call MME | Combine with MSC and call MME | Combine with EIR and call HSS | Very Good |

UMTS is a third generation (3G) broadband, packet-based transmission of text, digitized voice, video, and multimedia. UMTS offers a consistent set of services to mobile computer and phone users, no matter where they are located in the world. UMTS is based on the GSM communication standard. It is also endorsed by major standards bodies and manufacturers as the planned standard for mobile users around the world.

Once UMTS is fully available, computer and phones users can be constantly attached to the Internet wherever they travel and, as they roam, will have the same set of capabilities. User will have access through a combination of terrestrial wireless and satellite transmissions. Until UMTS is fully implemented, users can use multimode devices that switch to the currently available technology. In 3G system, Mobile Switching Center (MSC) contains Media Gateway (MGW). Media Gateway (MGW) performs different network to same network and sends to MSC. Data come from SGSN (Serving GPRS Support Node) switch to GGSN (Gateway GPRS Support Node). Handovers are contains and connect with MSC.

In the author view, internet can be used initially in 2G system by connecting with MSC. There is no change in the part of MSC absolutely.

The general LTE network architecture is similar to that of GSM and UMTS. In this principle, the network is separated into a radio network part and a core network part. The number of logical network nodes, however, has been reduced to streamline the overall architecture and reduce cost and latency in the network. In 4G network, MSC combine with visitor location register (VLR) and call Mobility Manage Entity (MME). Home Location Register (HLR) combines with AuC and connects to Mobile Switching Center (MSC).

In this evolution from 3G to 4G, according to the researcher's view, the features that are used by connecting with MSC in 4G are more advanced. The author thinks that 4G system is completely same with 3G system.

A. Evolution of HLR, VLR, AuC and EIR

Home Location Register (HLR) is joins with Authentication Center and then this is called Home Subscriber System (HSS). Visitor Location Register (VLR), Mobile Switching Center (MSC) and Equipment Identity Register (EIR) are combined in 4G system. This combination called Mobility Management Entity (MME). Although their names change, their performances are not different.

V. CONCLUSION

The author had course of examining the performance of Mobile Switching Center in this study, discovered that MSC perform switching process in first generation analog system. It connected Home Location Register (HLR), Visitor Location Register (VLR), Authentication Center (AuC) and Equipment Identity Register (EIR) in 2G network and also performed roaming, handover, postpaid and prepaid service, call set up route.

MSC connected SGSN (Serving GPRS Support Node) and GGSN (Gateway GPRS Support Node) for Public Data Network (PDN) in Third Generation System. In LTE network, MSC combine with VLR and AuC and this is known as called

Mobility Management. And then, MME connected to Serving Gateway (SGW) and PDN Gateway (PGW) for Data Service.

Finally nowadays, wireless technology is getting popular and important in the network and the internet field. Trend of mobile generations were introduced briefly in this thesis. MSC was described detail from 1G to 4G and compare the performance of MSC in mobile generations. Therefore, everyone can know about MSC easily and get the much knowledge about the network elements concerned with Mobile Switching Center.

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