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Research Article

COMARASION APPROACH TO THE SEVERAL PROTOCOLS OF RADIO INTERFACES OF LTE TECHNOLOGY

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ABSTRACT

This article describe the LTE radio interfaces, protocols, components, structures, and their applications. And analyses comparation of their differences.

KEYWORDS

LTE, radio interface, protocol, radio communication, mobility (handover) terminal, Node-B, eNB, P-GW - Packet Data Network Gateway, Infrastructure Domain, infrastructure, EMM, EPC, Mobility Management.

INTRODUCTION

Problem setting: Analysis of radio interfaces and deeper theoretical and practical mastering of their foundations in the transition to the fifth generation mobile communication networks. Comparisons and analyses main demanded process whether of all.

Achieving and solving the objectives of the problem: It is known that protocols are a set of rules, methods, and equipment for exchanging information between electrical communication devices. An interface is a device for connecting and communicating with another device. In both cases, although these terms are not far from each other concepts, it is necessary to refer to both terms and their processes in the process of analysis. The purpose of the article is to widely disclose modern 4th generation LTE (Long-Term

Evolution) technologies to the public, their systems and networks, equipment, protocols and their purposes based on scientific and analytical approaches.

The LTE (Long-Term Evolution) radio interface has a transmission speed of more than 300 Mbit/s, a packet retransmission delay of less than 10 ms, and a high spectral efficiency. The subscriber terminal with the appropriate hardware and software is compatible with UMTS, CDMA2000, WiMAX networks and GSM or IS-95 networks.

There are common principles in LTE, which are the logical separation of transport sub-networks for mobility, user data and service data transfer, transport functions used in radio communication networks and basic packet networks, complete freedom from addressing schemes and not depending on the addressing schemes used in the use of transport functions. and consists of others.

The architecture of the LTE network provides mobility, packet delivery with minimal delay and high quality of service traffic.

As the main functions of the network, mobility functions are achieved through discrete mobility (roaming) and continuous mobility (handover). LTE networks use roaming and handover procedures with all networks, LTE-subscribers (terminals) must always be covered by wireless broadband services.

Packet transmission allows to ensure the transmission of all services. Including voice traffic for users. The architecture of LTE networks can be considered flat, since the entire network interaction takes place between 2 BS (base station) and MBB (mobility control unit) nodes. BS is B-node (Node-B, eNB) in technical specifications, while MBB (MME, Mobility Management Entity) includes GW, Gateway gateways in terms of usage, where MME/GW combined units have their place.

The radio network controller is freed from data flow control, and its traditional functions - radio resource management, header compression, encryption, and reliable packet transmission - are loaded directly onto the base stations.

MBB works only with service information called network signaling, IP packets do not pass through it. In this way, the network can be expanded for both user traffic and service data without depending on the bandwidth. The main function of the MBB will be related to the management of the user terminal UT (FT) in standby mode, including call forwarding and handling, authorization and authentication, roaming and handover, service and user channel establishment.

Among the network gateways, a serving gateway (XKSh) (S-GW- Serving Gateway) and a packet network gateway (P-GW - Packet Data Network Gateway) or a packet gateway (PSh) are distinguished.

The principles of building LTE networks, as in 3G networks, are based on 2 aspects - separating the physical use of individual network blocks and the formation of functional connections between them.

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This means that the first division of the network architecture at the physical level is to divide the network architecture into user equipment domain (UED, User Equipment Domain) and network infrastructure domain (ID-Infrastructure Domain). The field of network infrastructure, in turn, is divided into radio communication subsystem (E-UTRAN, Evolved Universal Terrestrial Radio Access Network) and basic (packet) subsystem (EPC- Evolved Packet Core).

The following figures show a generalized scheme of the LTE network, from which 2 layers of functional communication are visible - the radio communication layer (AS - Access Stratum) and the external radio communication layer (NAS, Non-Access Stratum). The indicated oval shapes in the figure indicate the points of connection to the services.

The connection between the UE user equipment area and the UTRAN radio network area is called the Uu-interface, and the connection between the radio network area and the EPC base area is called the S1-interface. The content and performance of various protocols included in the Uu and S1 interfaces are divided into the use (UP, User Plane) and control (CP, Control Plane) planes [1].

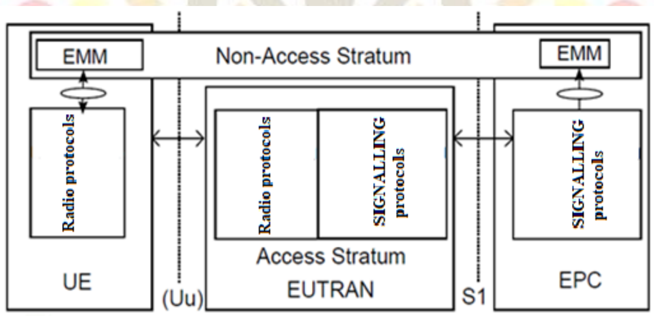

Figure 1. Generalized structure diagram of LTE network

Beyond the connection layer, a mobility management mechanism (EMM, EPC

Mobility Management) is used in the basic network.

In the usage protocols, protocols are used that ensure the transmission of user information over the radio channel.

Protocols that provide FT and network connections in various aspects work in the control layer. Protocols designed for transparent (open) transmission of messages related to the provision of various services work on this plane.

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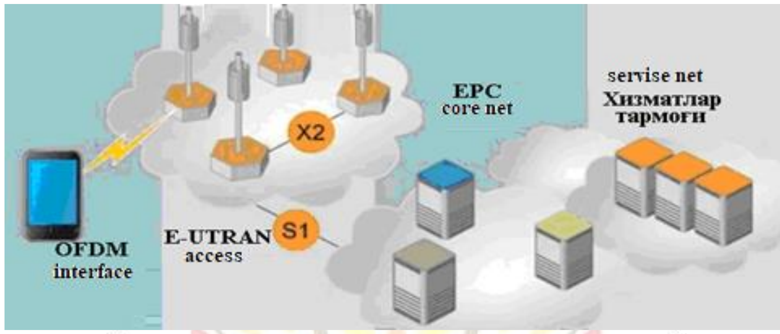

Figure 2. Generalized structure diagram of LTE network

The field of radio communication or communication network is logically divided into 2 areas - radio network layer (RNL) and transport network layer (TNL). The X2-interface shown in Figure 3 implements the interaction of BSs entering the radio network area. In addition, transit connection between base stations and with the base network through the mobility control unit (S1-MM-interface) or the service node (S1-U-interface) has its place. Thus, the S1-interface provides multiple relationships between sets of BSs and MBB/OTs [9-14].

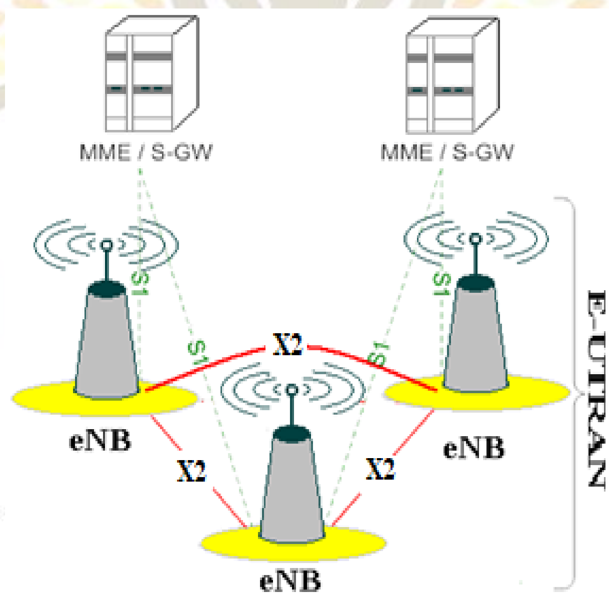

Figure 3. Connection of radio communication network functional nodes

Functions assigned to base stations in LTE networks:

- management of radio channels and dynamic distribution of resources;

- compression of the header of IP packets, encryption of data streams;
- the function of selecting the mobility management block (MMB) when connecting the user terminal (UT) to the network when there is no information about the previous connection;
- routing of data packets in the direction of the service gateway (server) at the level of use;
- transmission of call and distribution of received informations from MBB;
- Dispatching and transmission of PWS (Public Warning System) messages received from MBB;
- measurement and preparation of appropriate calculations for mobility and dispatch management.

The mobility control unit provides the following functions:

- transmission of protected data about connection nodes to services and secure management of connection points;
- data transfer to the base network for managing mobility between different radio networks;
- management of base stations (BS) in standby, including call forwarding mode;
- selection of service gateway (MGS) and packet network gateway for radio communication networks of different standards;
- selection of a new mobility control unit during automatic operation system (handover) operation;
- roaming;
- perform authentication;
- control of the installation of a radio channel, including a dedicated channel;
- Ensuring the transmission of PWS messages.
- The functions that the service node is responsible for:
- selection of the local mobility anchor point in the handover (automatic operation system);
- initialization of the buffering and service request procedure of data packets of the outgoing direction intended for FTs (UTs) in standby mode;
- obtaining user data in accordance with the permitted procedure and law;
- providing routing and redirection of data packets;
- defining transport level (satxi) packages;
- formation of user records and identifiers of service quality classes for pricing;
- tariffing and clarification of subscribers;
- A packet network gateway provides the following functions:
- filtering IP-packets of users;
- authorized acquisition of user data;
- allocation of IP addresses for user terminals (FT);
- setting traffic level (TL) packets in the outgoing direction;
- pricing and sorting of services.

MIMO (multi-input multi output) multiple antennas are expected to be used in LTE systems. This enables LTE systems to operate with multiple receive and transmit antennas. The operation of these systems is organized according to 2 principles - the principle of spatial

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compression and the principle of spatial-time coding [2-9].

For example, when forming a signal from two transmission antennas, the stream of complex modulation symbols modulating one of the subcarriers of the OFDMA signal is divided into odd (x1) and even (x2) symbols, that is, these modulation symbols correspond to one subcarrier, but symbols of different OFDMA signals.

Many different services are provided in LTE technology networks. The development of new network technologies forces the world telecommunication community to look at the issues of service quality and their management system as one of the most important ways to effectively develop the competitive market of communication services.

The concept of quality of communication services (QoS, Quality of Service) is officially approved by the International Telecommunication Union in the E.800 recommendations, and it is considered as a set of effective qualities of service parameters that determine the level of satisfaction of users with communication services.

A quality management system is a set of parameters and mechanisms that ensure that the quality of services meets the established requirements. The purpose of introducing such a system is to increase the demand for services, to maximize user satisfaction with the provided service [1,4,11,13].

A suitable recommendation (Rel'97/98) was issued for modified GSM/GPRS networks with the possibility of packet transmission of initial data for the development of quality management systems in mobile communication networks. The concept of PDP (Packet Data Protocol), which consists of a set of parameters describing the current state of the user or terminal in relation to possible services and methods of providing them, is the basis for ensuring the quality of services. When connecting an FT with a basic packet network, activation of the PDP feature is performed in forward and reverse directions in order to establish a logical connection for the transmission of IP packets between FTs and different network nodes [1,2,3].

CONCLUSIONS

The development of the usage comparations is partly due to the increase of the deference of services provided in the package mode is provided. Service transmission in 3rd and 4th generation mobile networks, the use of speech packet transmission is based on VoIP (Voice over IP) or PoC (Push-to-talk over Cellular) technologies.

The creators of 4G transceiver technologies used the tried-and-tested method of digital transmission - the OFDM method of orthogonal frequency division multiplexing.

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