

THE LTE MOBILE RADIO ACCESS NETWORK

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Cellular mobile communication system is a kind of mobile communication for transmission to subscribers of mobile telephone communications and digital data. Cellular network got its name in accordance with the principle of territorial distribution of work areas (cells). In the center of each work area is a base station communicates by radio with the mobile stations, which may be stationary or movable. Due to the property of attenuation of radio waves propagation, it has been able to use the same set of radio channels in different cells. LTE standard was confirmed as the next after UMTS Third Generation Partnership Project (3GPP) standard mobile broadband network international union in January 2008. Standard provides a throughput and a data rate that are necessary for the growing number of subscribers increasingly demanding. In Belarus, the LTE network was put into commercial operation in the city of Minsk in December 2015 by the infrastructure operator beCloud. Minsk became the first Belarusian town, where there was this network. Currently it runs construction of networks for the fourth generation mobile communication in other cities of Belarus, including regional centers and other cities.

The main task in the LTE mobile penetration is the development of a radio access network for a given number of users and selected area coverage in given frequency band. LTE network employs large number of the base stations and uses the frequency band 20 MHz to 1800 MHz (LTE band 3). If necessary it is possible to activate of the second band - 30 MHz in the range of 2600 MHz. However, development of LTE at 1800 MHz are given the cost is less on average 60% than the development of networks in the high-frequency bands. LTE network consists of two major components: a radio access network E-UTRAN and a core network SAE (System Architecture Evolution). The radio access network E-UTRAN examined in a number of technical specifications according to which it consists only of the eNB (evolved Node B) base stations. A simplified diagram of LTE network when it interacts with the packet switched domain (PS-Domain) networks according to other 3GPP technical specification 3GPP TS 23,401 is illustrated in Figure 1 [1].

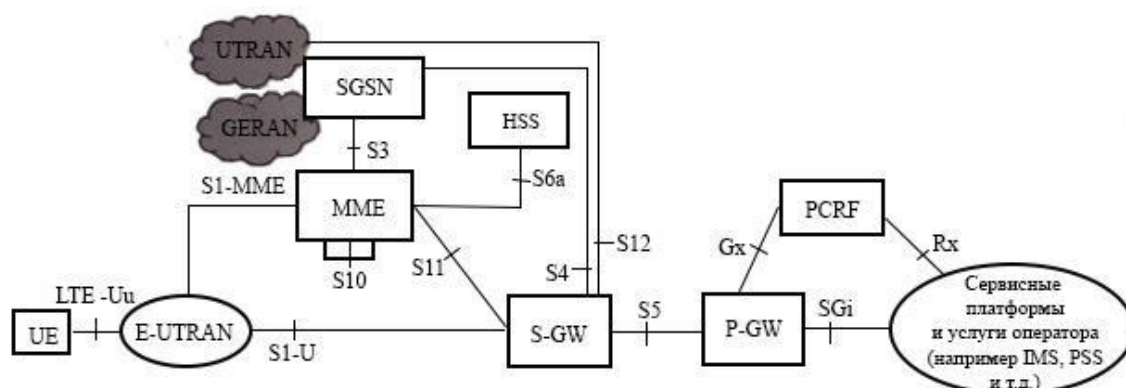


Figure 1. A simplified diagram of LTE network

Radio access networks are used GERAN network, UTRAN and E-UTRAN. Note that in practice the network elements - SGSN service node serving gateway S-GW and P-GW gateway packet can be constructively combined. According to the scheme of Figure 1 the main LTE network interfaces interact with 3GPP networks (GERAN / UMTS) are interfaces S3, S4 and S12. Interfaces S3 and S4 provide interaction logic control MME mobility gateway and S-GW LTE network service node SGSN 3G network using the tunneling protocol GTP (GPRS Tunnelling Protocol). S12 interface for its intended purpose similar to Gn interface between the service and the SGSN GGSN GPRS network gateway.

In simulation number of base stations has been determined to coating service area for town Polotsk with the given number of users and area. We estimated the maximum allowable losses in the propagation of the signal for the uplink (from the cellular phone to base station) and downlink radio link (base station to mobile phones). We used a well-known model COST-231-Hata to determine the propagation loss of radio signals in selected frequency ranges [2]. Software program complex Atoll was used for the calculation of coverage of the base stations for given region of the Polotsk. The software package Atoll is one of the best solutions for radio planning and optimization of different radio technologies for mobile communication systems, including LTE / LTE-Advanced.

List of sources used:

1. Tikhvinsky, V.O., Terentyev, S.V. B. Yurchuk A.B. LTE mobile networks: technologies and architecture / V. O. Tikhvinsky, S. V. Terentyev, A. B. Yurchuk. - M.: Eco-Trends, 2010. - 284 p.
2. Mishchenko V.N. Radio access networks of cellular radio systems with code division channels / V.N. Mishchenko. - Minsk: BSUIR, 2016. - 65 p.