

FEATURES OF TELECOMMUNICATION NETWORKS OF FIFTH GENERATION 5G

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Introduction

The paper considers the next communication standard fifth generation 5G. It will support the Internet of things [1], smart cars and other equipment [2] that will not until 2020, the related specifications are being developed, and it is obvious that the 5G standard will differ considerably from 4G. We are talking about increasing the speed of information exchange to mobile phones and tablets and about many other solutions, each with its own requirements.

Capabilities of the network 5G

In the era of 5G all home electronics will be interconnected [6]. If earlier during the transition from one room to another had to be transferred from a portable device to continue, for example, to listen to your favorite radio station, now the speakers in different rooms will contact each other and the listening will continue from the interrupted place. In addition, it will be possible to monitor the energy consumption of each device or finding out how much electricity produced by solar panels.

The concept of the unification of phones, coffee makers and washing machines, headphones, lamps and everything else into a single network called the Internet of things [9]. The ability of things to "feel" with the help of sensors and remotely run commands can be used in urban planning, technology, smart homes, control systems of heat and electricity, security, health, public transport, riteyling. The Internet of things requires a small connection speed, but for the vast number of devices. Thus, the telecommunications network will have to support not only users of mobile communication and "smart" things.

It is assumed that the technology 5G will use unmanned connect to a network that will exchange information with each other [7]. In the event of an accident the car closest to the scene, will report on it all cars, riding after him. This will allow them to pre-reduce the rate or, in the case of the tube, to calculate a new route.

Vehicle sensors will more accurately measure weather conditions and send the data through the 5G network, so that the car calculated the best route [8]. In the field of public transport the 5G network will allow real-time tracking of the number of waiting passengers at bus stops. The bus driver miss the stop without passengers, and the dispatcher will send an additional transport to their places of accumulation.

The 5G network will change the emergency services, providing reliable communications in an emergency and the priority of police and emergency services. And firefighters in helmets with cameras will transmit images to the command and to help in the difficult rescue operations.

In 2015, managed to organize a big part of 5G developments, but the selection of technology, ensuring their practical application continues [9]. Among them: microwave frequency, the achievement of which previously seemed impossible, will provide much greater speed; developing systems, mailing tiny parts, to extend the operation of the devices of the Internet of things for many years; reducing delays for tasks which require an urgent response. The project of creation of the 5G standard was officially called IMT-2020.

Increase the speed of the 5G standard compared to the previous ambiguous. Ericsson managed to achieve growth in 50 times - to 5 Gbit/s. Samsung reached the figure of 7.5 Gbit/s with strong signal of 1.2 Gbps in a moving at high speed car. Partnership "the EU – China" intends to increase the speed of 5G to 100 times. NTT DoCoMo, a Japanese mobile operator, jointly with the companies Alcatel-Lucent, Ericsson, Samsung and Nokia trying to achieve 10 GB/s. And scientists from the University of Surrey suggest speed 1 Tbps. It is expected that over the next 10 years, the speed of mobile networks will grow to a thousand times.

The increase in speed will require more sophisticated antennas and equipment, as well as an extended range of frequencies.

Technical characteristic of the standard

It is obvious that the next net 5G network will support the technology of unmanned vehicles. In this case, the information should flow in real time. Time of reception-transmission in 4G networks exceeds 10 ms, which is very much. The future standard can completely change the network architecture by moving designated data storage from data centers to end nodes, including smart devices and cloud computing. The moving vehicle, for example, requires data on the location of the nearest transport. Existing network with the flow of such data already for three cars to cope not able to. Large transfer delays require local data placement. It is assumed that the responsiveness of the next generation networks will be maximized. The delay in data transmission will not exceed 1 ms, even if the speed of the terminal 500 km/h. This will be the main driving factor in the creation of new technologies, such as driving in city traffic and surgery at a distance.

The operation of the devices in the millimeter wavelength range has such a feature as very poor signal propagation, the capacity of which drops significantly with distance from the base station. In addition, the signal interference can be caused by even a human body. The solution is to use MIMO (Multiple Input Multiple Output), when you send and receive several signals simultaneously. Now it is used for LTE and WLAN. For high frequencies applies Massive MIMO

technology to optimize receiving, when the mobile devices are placed dozens of small and hundreds of antennas in the transmitter [10]. Antenna manufacturer SkyCross has created a system of 4x4 MIMO, which can be used in terminal size 16x10 cm. Is much larger than antennas for LTE. For example, the dimensions of the LG G4 15x7,6 cm, Samsung Galaxy S6 - 14x7 cm, while the Apple iPhone 6 Plus – 16x7,8 cm the 4x4 MIMO System is also used in satellite TV systems, stringent requirements for size and power consumption will be charged [11]. Thus, the creation of a small mobile device with 4 antennas will be a test for designers. Development of portable terminals will also require a major effort.

Development of technology for 5G

In the development of 5G technologies, you need to decide what technology is needed in the first place, and which will be implemented after. Despite this, manufacturers are trying to lead the development of 5G technologies, to occupy a favorable position in the future. Nokia in April 2015, announced the acquisition of Alcatel-Lucent for 16.6 billion dollars, a us telecommunications company Verizon Wireless said that the first 5G network in the US will appear already in 2016. There are already prototypes of 5G networks. The first 5G network launched in South Korea. The company SK Telecom has introduced a new technology at the opening of the research center, which will be engaged in its development. The company plans to build a 5G network across the country for the XXIII Olympic winter games 2018 in South Korea. NTT DoCoMo also intends to launch a 5G network in Japan for the summer Olympic games 2020 in Tokyo.

In the United States in October 2015 a number of regional groups came to an agreement to convene every six months to develop a common position on the 5G standard. A similar agreement was reached in September 2015 between the European Union and China [3]. Ericsson and TeliaSonera came to an agreement on strategic partnership with the aim to provide customers of cellular operators in Tallinn and Stockholm with access to a 5G network in 2018.

Qualcomm proposed a technology for 4.5 G LTE Advanced Pro, which is scheduled for implementation over the next four years. Thanks to this, the company will be able to support both a wider range of frequencies necessary for the 5G standard, and previously deployed LTE network, which will reduce latency and increase throughput. Features network: high throughput by combining the spectra of frequency; support 32 operators at the same time and increase throughput by combining the frequency and distribution of network traffic between operators; 10-fold reduction in latency compared to LTE Advanced when using existing towers and frequencies from 1 ms to 70 ms; increasing the number of antennas on base stations to increase coverage area and signal strength; more energy-efficient IoT devices by narrowing the range to 1.4 MHz and 180 kHz (up to 10 years on a single battery); 1 Gbit/s for exchange of information between

vehicles, pedestrians and IoT devices; scan the environment without the inclusion of Wi-Fi or GPS on the mobile device. At the Fraunhofer Institute for telecommunications in Berlin conducted experiments with frequencies of 40-100 GHz, Samsung uses in their experiments, a frequency of 28 GHz, and Nokia – over 70 GHz.

Conclusions

Thus, the use of 5G networks by a significant increase in transmission rates, enables access to streaming video, enables computer applications to be updated in a very short period of time (almost instantly), and the small signal delay will make a reality things that are now considered science fiction. So, for example, appears everywhere, cars moving without a driver, in computer games, working in online mode, there will be new heavy-duty capabilities (including virtual reality). 5G network will allow to combine billions of devices on a completely new concept called "Internet of things" and use "cloud technologies".

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