Research on Several Key Technologies for 5G

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Abstract. In order to better meet the development of mobile Internet and the popularization of intelligent terminals, the application of 5G mobile communication is born and becomes the trend of future communication development. Based on the investigation of actual situation, this paper introduces the concept, advantages and characteristics of 5G mobile communication, makes a comprehensive analysis of its development trend, and discusses several key technologies of 5G mobile communication. This can help people understand the development of 5G mobile communication, promote its progress in China, make it put into use earlier, and provide convenience for people's communication.

Keywords: 5G, Mobile communications, Development trend, Key technology.

1. Introduction

The rapid development of information and network technology makes the data traffic of wireless mobile communication network increase exponentially every year. The continuous development of emerging intelligent business needs more high-speed, efficient and intelligent mobile communication technology as the foundation of its development. With the popularization of 4G mobile communication network, 5G mobile communication has entered the development stage. The development of 5G mobile communication technology is to meet the popularization of global intelligent terminals and the rapid development of mobile Internet. This paper analyzes the development trend of 5G mobile communication technology and discusses several key technical points.

2. Concept, Advantages and Characteristics of 5G

2.1 Concept and Advantages of 5G

The biggest difference between 5G and the previous four generations is that it is not a single technology, but the sum of all current communication technologies, with a peak rate of 10Gb/s. As the latest generation of mobile communication technology, security, coverage and flexibility have been greatly improved, solving the problems existing in 4G network. With the most advanced technology and spectrum efficiency, it meets the current demand of mobile service traffic and builds a highly reliable network society.

2.2 Characteristics of 5G

The features of 5G are embodied in the following aspects: firstly, the rapid expansion of networking devices will be 100 times that of 4G network. Second, the network consumes less energy and achieves the goal of energy conservation. Third, the frequency required by 5G is about 10 times higher than that of 4G. By means of compression and other technologies, the utilization rate of frequency is effectively improved. Fourth, 5G mobile communication is more reliable than 4G, and the time delay is reduced by nearly 10 times. Fifth, the user rate of 5G mobile communication has been greatly improved, especially for businesses with special needs. Sixth, the throughput capacity of 5G mobile communication is strong.

3. Development Trend of 5G Mobile Communication

The development of 5G communication system is a new-generation mobile communication system developed after 4G network communication. Its wireless coverage performance is good, which greatly improves the system security and user experience. The emergence of a new generation

network system will be developed in many fields. 5G system has some flexibility, and it can be adjusted automatically, so that it can well cope with the trend of future changes and development.

At present, 5G mobile communication has become a hot spot of research at home and abroad. With the booming development of mobile Internet, the Internet has gradually become a huge driving force for 5G mobile communication. As the basic platform of various communication services, mobile Internet can provide convenience for users through wireless means. According to the current industry's estimation of 5G mobile communication, the operation of 5G will be updated on the basis of 4G network through certain wireless transmission technology. In addition, the introduction of new architecture enables intelligent systems to scale the system's overall throughput capacity to more than 25 times.

4. Several Key Technologies for 5G Mobile Communication

In order to improve the transmission speed of 5G operation, the design of 5G system will further adopt the technology of spectral efficiency, such as some waveform design technology, multi-antenna technology and so on. In terms of these wireless networks, some emerging network architecture technologies will be adopted on this basis to conduct a new round of improvement for 5G mobile communication.

5G mobile communication mainly adopts ultra-high energy wireless transmission technology and high-density wireless network technology.

4.1 Wireless Transmission Technology

4.1.1 Large Scale MIMO Technology

The benefits of MIMO technology are mainly: the spatial resolution of large-scale MIMO has been greatly enhanced compared with existing ones. In this case, it can further explore the space and grasp its dimensions, so that different users can communicate freely at the same time, so as to achieve the improvement of spectral efficiency without increasing the density of base station. In addition, in large-scale MIMO, the beam can be concentrated in a very narrow area, which can greatly reduce the interference and also increase the power.

At present, some deficiencies are still found in the study of MIMO technology. For example, since the transmission scheme basically adopts TDD system, in which single antennas are used, the number of them is much smaller than the number of base station antennas, and the number of pilot frequencies will increase with the increase of users.

4.1.2 Multi-carrier Technology based on Filter Bank

Multi-carrier technology is widely used in wireless communication systems, which can effectively improve the spectral efficiency and counter some multipath fading phenomena. However, we can see that there are some deficiencies in OFDM technology. For example, since each subcarrier has the same bandwidth, it needs to be synchronized during operation, and each subcarrier must be orthogonal, which greatly affects the flexibility of use. In order to solve this problem, a multi-carrier technology based on filter bank is adopted. This technology can be widely used in radar signal processing and signal processing. The multi-carrier technology based on filter bank does not need to be orthogonal between each carrier, nor does it need to insert the cycle prefix. It can not only realize the bandwidth settings between each carrier, but also ensure its flexible control, so as to control some small parts.

4.2 Wireless Network Technology

4.2.1 Hyper-dense Heterogeneous Network Technology

In 5G systems, due to its wireless transmission technology, it is doomed to be a variety of wireless access forms. In the hyper-dense heterogeneous network technology, the network node is closer to the terminal due to its high network density. Therefore, the spectral efficiency and power can be effectively improved, and the capacity and flexibility of the network system can be improved to a

greater extent. Although hyper-dense heterogeneous network technology provides a better prospect for 5G mobile communication, problems are constantly occurring in the system due to the reduced distance between nodes. Therefore, this needs to be improved for this technology. On this basis, the wired return method can be used, which can not only save resources effectively, but also simplify the program effectively, making mobile communication operate better.

4.2.2 Self-organized Network Technology

In order to be different from the traditional mobile communication technology and reduce the input of human and material resources, this paper proposes the concept of using self-organized network technology in mobile communication while satisfying the needs of customers. In this concept, self-organized capability is introduced into the network, which includes self-configuration, self-optimization and so on, so as to reduce artificial intervention to a greater extent. At present, self-organized network has obvious advantages.

5G is a heterogeneous network that integrates and cooperates with multiple systems. As space changes over time and business, it is necessary to adapt network deployments to these dynamics. In order to guarantee the smoothness of moving process, we must use the form of double connection to optimize the selection of the target.

4.2.3 Content Distribution Network

Content distribution network is a new concept proposed to effectively solve the quality of Internet. Traditionally, the distribution of general content is done by the provider. With the rapid increase of Internet access, the server is prone to high load, which makes the network more congested and the website response speed slow. In this case, the cache servers are taken to distribute them as far as possible to more concentrated areas. According to the connection relationship between network traffic and nodes, user information will be directed to the nearest service point, so that the user can select content nearby, and thus the slow response of the website can be well solved.

As an important wireless mobile platform, the 5G soft base station is integrated into the same hardware platform to adapt to various software requirements. In this way, it breaks the traditional way and restructures the network so that it can communicate more flexibly, so as to achieve the real streamlining management and save the cost of network construction, thus better serving the construction of 5G mobile communication and realizing the management improvement in a larger sense.

5. The Development Process of 5G Mobile Communication in China

From 2000 to now, China has started the research of 3G and 4G mobile communication successively, and will continue to promote the development of 5G mobile communication technology in the future. This will be conducive to improving the technical level of China's mobile communication, so as to achieve the leapfrog development of China's mobile communication. 5G mobile communication is the start of a new round of global mobile communications technology, striving for informatization development at an early date, becoming the support of future enterprises and becoming an important aspiration of relevant departments. 5G mobile communication realizes the application of key technologies such as wireless networking and wireless transmission on the premise of meeting the application requirements of the majority of users. It will constantly expand the influence of China in world communication and speed up China to face the informatization era.

6. Conclusion

With the development of the Times, 5G technology will probably be promoted on a large scale in 2020. Its appearance will meet the needs of the general public and allow users to have a better business experience. At present, 5G mobile communication is still in the early stage of research, which requires related departments to understand and master some key technologies, and combine with the actual needs of people's lives to conduct better research and development.

References

[1]. Wang Zhiqin, Luo Zhendong, Wei Kejun. Analysis of 5G business demand and process of technical standards [J]. Zte communication technology,2014,20(02):2-4+25.

[2]. You Xiaohu, Pan Zhiwen, Gao Xiqi, Cao Shumin, Wu Hequan. Development trend and several key technologies of 5G mobile communication [J]. Chinese science: information science, 2014, 44(05):551-563.

[3]. Yu Li, Zhang Zhizhong, Cheng Fang, Hu Haonan. The fifth-generation mobile communication network architecture and its key technologies [J]. Journal of Chongqing university of posts and telecommunications (natural science edition),2014,26(04):427-433+560.

[4]. Liu Ming, Zhang Zhizhong, Cheng Fang. Analysis of demand for 5G and Wi-Fi fusion networking and research on key technologies [J]. Telecommunication science,2014,30(08):99-105.

[5]. Peng Jingle. Development trend of 5G mobile communication and discussion of relevant key technologies [J]. China new communication,2014,16(20):52.

[6]. Lei Qiuyan, Zhang Zhizhong, Cheng Fang, Hu Haonan. 5G wireless access network architecture based on C-RUN [J]. Telecom science,2015,31(01):112-121.

[7]. Chen Xiaobai, Wei Kejun. Global 5G research trend and standard progress [J]. Telecommunication science,2015,31(05):16-19.

[8]. Yang Lvxi, He Shiwen, Wang Yi, Dai Haibo. Overview of key technologies for 5G wireless communication system [J]. Data acquisition and processing, 2015,30(03):469-485.

[9]. Zhao Guofeng, Chen Jing, Han Yuanbing, Xu Chuan. Overview of key technologies of 5G mobile communication network [J]. Journal of Chongqing university of posts and telecommunications (natural science edition), 2015,27 (04):441-452.

[10]. Kong Linbing. Development trend of 5G mobile communication and several key technologies [J]. Communication power technology, 2015,32 (04):124-125.

[11]. Zhou Yiqing, Pan Zhengang, Zhai Guowei, Tian Lin. Prospect of 5G standardization and research on key technologies of the fifth-generation mobile communication system [J]. Data collection and processing, 2015,30(04):714-724.

[12]. Chai Rong, Hu Xun, Li Haipeng, Jiang Guixiang. 5G mobile communication network architecture based on SDN [J]. Journal of Chongqing university of posts and telecommunications (natural science edition),2015,27(05):569-576.

[13]. Li Ge. Key technology and development trend of 5G mobile communication in China [J]. Science and technology communication,2016,8(01):157-158.

[14]. Ni Shanjin, Zhao Junhui. Key technology of physical layer of 5G wireless communication network [J]. Telecommunication science, 2015,31(12):48-53.

[15]. Zhu Hao, Xiang Fei. Development of 5G network architecture design and standardization [J]. Telecommunication science,2016,32(04):126-132.

[16]. Liu Yiming, Li Xi, Ji Hong. Key technology of network self-organization for 5G hyper-dense scenario [J]. Telecommunication science,2016,32(06):44-51.

[17]. Shi Jianju. Development trend of 5G mobile communication and analysis of several key technologies [J]. New technology and new products in China,2016(14):30-31.

[18]. Chen Shanzhi. Analysis and suggestions for the development of 5G [J]. Telecommunication science,2016,32(07):1-10.