The Key Technologies and Development Trends of 5G Mobile Communication Networks

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Abstract: In recent years, mobile communication networks have developed rapidly. It provides convenient communication services for people from various fields, and it is constantly changing the way people live. 5G mobile communication is a further extension of 4G mobile communication widely used at present. At this stage, 5G application scenarios are divided into the field of Internet of Things and the Internet. The research on key technologies of 5G mobile communication can satisfy the development needs of China's future mobile communication systems. It will promote the further development of various fields such as industrial Internet and Internet of Things. In view of this, this paper mainly analyzes some key technologies and development trends of 5G mobile communication.

1. Introduction

At present, China's wireless communication network is in the 4G stage. The wireless communication network technology has undergone a leapfrog transition from 2G to 3G to 4G. The 2G mobile wireless communication technology was developed in 1991, and China's wireless communication technology has begun a new one. Chapter 3, 3G mobile wireless communication technology was developed in 2001. The discovery and use of 3G communication technology enabled the wireless communication network to realize the transition from a pure wireless communication technology system to a network system capable of transmitting a large amount of information. 4G wireless communication technology compared with 2G and 3G, there have been leap-forward improvements in terms of propagation speed, propagation quality, and range of transmission, and they are also widely used [1]. Human demand for information is getting higher and higher, so 5G wireless communication network is about to bring, 5 wireless communication network is in the stage of exploration and research. The key technologies of 5G wireless communication network will be mainly explained below.

2. Mobile communication network and features

2.1 5G mobile communication network overview

At present, 5G mobile communication network is a hot research topic in the global mobile communication field. It does not have a unified definition. The 5G mobile communication network is the continuous improvement and expansion of the fourth generation mobile communication technology, compared with 4G mobile communication. Technology, there will be a faster and more stable network, in terms of transmission efficiency and resource utilization, it will also break through the limitations of 4G communication technology, and get a qualitative leap [1]. At the same time, 5G mobile communication network technology will continue to add higher technology patents. Technology to serve humanity with better communication quality. It is expected that 5G mobile communication network technology will be put into use in 2020, and it will become another great change in the history of mobile communications.

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2.2 Analysis of the characteristics of 5G communication technology

In 5G mobile communication, not only the innovation of technology, but also the user experience and network throughput, thereby increasing the speed of communication development, increasing people's recognition and use of communication technology. In the 5G communication technology, compared with the development of 4G and 3G mobile communication, 5G communication technology is more concerned with point-to-point information data transmission technology, which causes it to change into multi-point communication, multi-user joint communication and multi-cell networking. Joint communication. In the construction of 5G communication, penetrating power will be greatly valued. At the same time, in the 5G mobile communication, the cost of the relevant communication unit will be reduced to a certain extent, so that the technology is more rationalized, and the communication unit can allocate network resources according to the usage of the network, thereby improving the user experience [2]. Technical characteristics of 5G mobile communication:

2.2.1 Scalability.

The 5G mobile communication network technology effectively integrates the advantages of 2G, 3G and 4G technologies, thereby effectively improving the user experience and usage during use. According to relevant survey data, the coverage of 5G mobile communication network technology is about ten times that of traditional 4G technology. Therefore, 5G mobile communication network technology has very good signals, and it can also bring convenience and speed to communication for different groups [2]. In addition, 5G mobile communication network technology effectively increases the spectrum efficiency of 5G mobile communication network technology due to the rapid expansion of its equipment. It can be seen that the future 5G mobile communication network technology will bring us very efficient network environment that reflects the civilization and progress of society.

2.2.2 Energy saving.

Compared with the previous mobile communication technologies, 5G mobile communication network technology has undergone earth-shaking changes in terms of flexibility and compatibility. Since 5G mobile communication network technology consumes very little energy, it is very consistent with China's sustainable development [2]. The realization of the development of economic strategy is supported and favored by the government. It can be concluded that 5G mobile communication network technology has very good market prospects and development space.

2.2.3 High utilization.

Compared with the traditional mobile communication network technology, the 5G mobile communication network technology pays more attention to the user experience, especially the effective application of the high frequency spectrum technology, so that it has a very large penetration. 5G mobile communication network technology is an interactive game promotion, which is a high-utilization technology [3]. The support capability of this new service has become the core competitiveness of 5G mobile communication network technology, and it is very strong for improving the economic strength.

2.2.4 High reliability.

In addition, 5G mobile communication network technology also has high reliability, and effectively improves the user's perfect experience by effectively shortening the user's delay. At the same time, full coverage real-time transmission is realized, which can fully meet the contractor's special service requirements.

3. The status quo of 5G mobile communication technology

3.1 Mobile communication started late and developed faster

In the development process of China's mobile communications, the development of the 1G and 2G networks in the early stage was mainly applied, and did not participate in too much R&D. It was in the

state of introducing technology and imitating technology. Starting from 3G technology, it gradually integrates into the international development trend. In 3G, TD-SCMDA has become one of the three major standards in the world. In terms of 4G, China's independent research and development of TD-LTE has become the mainstream of global 4G networks. The 5G technology, the Chinese government, the R&D team and other aspects have given high priority and strive to have the right to speak in the world's 5G technology. However, China's 5G research program was approved by the World Telecommunication Standardization Assembly as early as 2016, which means that China's 5G technology research and development has been ahead of other developed countries [3].

3.2 China's 5G technology started earlier

China's enterprises that pay more attention to 5G technology and develop at the same time are Huawei, ZTE and Datang Group. For example, in 2014, ZTE Corporation cooperated with China Mobile to conduct pre-commercial testing of the world's first TD-LTE base station in Shenzhen, and established 10 commercial networks worldwide in 2016. As early as 2011, Datang Group has launched the pre-research program for 5G technology. Two years later, it proposed 5G key capability indicators and value schemes. It was fully included in the technical indicators of the 5G framework proposal by the International Telecommunication Union, which fully proved China 5G. The situation of technological development has been affirmed internationally. The Huawei Group has made major breakthroughs in various technologies, such as 5G new air interface technology, networking architecture, virtualized access technology, and new RF technology. At the same time, the polar code scheme proposed by Huawei Group has also been recognized internationally and has become a 5G international standard code solution. Although it is only the initial stage of the 5G standard, it has greatly encouraged the confidence of Chinese R&D personnel, while China Mobile Communications [4].

4. Analysis of key technologies of 5G mobile communication network

4.1 High frequency transmission technology

In the traditional mobile communication working frequency band, the low frequency band wave below 3 GHz is generally used, and the spectrum resource utilization rate of the high frequency band such as millimeter wave and centimeter wave is small, which makes the traditional spectrum resource very crowded. The application of high frequency band in mobile communication networks is a future development trend. 5G mobile communication network technology can achieve extremely high-speed short-distance communication, which can effectively alleviate the current situation of spectrum resources [4]. However, the application of high-band resources still requires scientific planning and overall planning to optimize the allocation of valuable spectrum resources.

4.2 New multi-antenna transmission technology

Multi-antenna transmission technology is one of the key technologies of the current 5G mobile communication network. It is mainly an upgraded version of the multi-input multi-output technology, namely MTMO technology. Its working principle is to use the multiple antennas of the transmitting base station to independently transmit signals and simultaneously receive signals. And a technology that can completely recover information [5]. With the introduction of multi-antenna transmission technology, the transmitting base station is expected to support 128 cooperative antennas to work at the same time, and can effectively reduce mutual interference between signals, and largely improve wireless signals.

4.3 Simultaneous full-duplex technology

The traditional mobile communication network utilizes the time-sharing frequency division mode, which has a great limitation on the work efficiency. At the same time, the same-frequency full-duplex technology can simultaneously perform the reception and transmission of communication on the same frequency spectrum. This greatly improves the signal transmission efficiency of mobile

communication, but at the same time, the same-frequency full-duplex technology requires extremely high interference cancellation capability [5]. At present, there are still many shortcomings in the interference cancellation technology for mobile communication, especially the phase the problem of co-channel interference in neighboring cells is therefore more difficult for multi-antenna and cooperative networks.

4.4 D2D technology

The networking method of implementing cell coverage centering on the base station is a common application mode of the traditional cellular communication system. Since the base station and the relay station cannot move, the flexibility of the network connection structure has a great disadvantage. In today's society, due to wireless Multimedia services are developing rapidly, and this kind of network structure can no longer meet the application needs of massive users in different environments [6]. Therefore, there is an urgent need to develop a new network connection technology to solve the communication problems faced today, so D2D technology has emerged. The biggest advantage of D2D technology is that it can be directly connected to the communication terminal without the need for the transfer of the base station to achieve short-distance direct transmission of the communication signal. At the same time, it can improve coverage between networks through widely distributed terminals, support more flexible network architecture and connection methods, and utilize spectrum resources more efficiently. At present, D2D adopts the technical solutions of multicast, unicast and broadcast, and there are still many shortcomings. In the future, D2D enhancement technology will be the direction of the industry.

4.5 Ultra-dense network technology

In recent years, various electronic devices and intelligent terminals have been widely used in the field of mobile communications, and the usage of data traffic will rise linearly. Especially in some network hotspots, the pressure on local networks will become larger and larger, which is urgently needed. The use and support of ultra-dense network technology. Ultra-dense network will become the main force of local network pressure [7]. It can not only improve network coverage, reduce network signal interference, greatly improve system capacity, but also divert communication services for centralized and efficient frequency reuse and flexible network deployment.

4.6 New network architecture technology

At this stage, the mobile communication equipment access network architecture mostly adopts the network flat architecture. In the future, the 5G mobile communication network may adopt the green radio access network architecture, that is, the C-RAN access network architecture. This new network architecture adopts synergy. Technology, which greatly reduces signal interference and device power consumption, and significantly improves spectrum efficiency [8]. At present, the research focus of C-RAN technology includes several aspects such as the architecture and function of C-RAN.

5. The development trend of 5G mobile communication technology

The 5G mobile communication system is a new generation communication system after the 4G network communication system. Compared with the previous generation mobile communication technology, it has significant improvements in system security, user experience and wireless coverage performance, and it also has automatic adjustment [7]. The ability to better adapt to the development of the times. At present, 5G mobile communication system has become the focus of research in various countries. According to the analysis of 5G mobile communication system in the industry, it is believed that it will realize the update of wireless transmission technology based on the current 4G mobile network, and introduce a new system. Structure and intelligent technology greatly enhance the throughput of its system [8]. Through analysis, 5G mobile communication technology has the following development trends:

1) To provide users with a better experience, improve their ability in the network average spit rate, transmission delay, etc., for virtual reality, 3D, interactive Emerging mobile services such as games

provide more effective support.

2) Through further research on the architecture of the system to improve the performance of the system, explore multi-point, multi-user, multi-antenna, multi-cell collaborative networking.

3) Research and improve the indoor wireless coverage performance of 5G.

4) Improve the utilization rate of spectrum resources in high frequency bands.

5) Real-time adjustment of network resources, promote the improvement of resource utilization, and effectively reduce operating costs.

6. Summary

5G mobile communication technology is a cutting-edge technology in the field of mobile communication technology in China. This technology can improve the utilization efficiency of spectrum resources on the basis of scientific application of network technology, and then play a role in improving people's quality of life while satisfying people's requirements for Internet speed and Internet traffic. Under the influence of cloud computing technology and intelligent technology, the information transmission system based on 5G mobile communication technology has a broad application prospect. Based on the integration of this technology and other wireless communication technologies, the construction of a scientific and efficient mobile communication network system will also contribute to the utilization efficiency of 5G mobile communication technology.

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