



Research on the Optimization of Information Technology Security Under the Circumstance of 5G Network

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Abstract. In 2021, 5G has been widely and maturely commercialized, and has become one of the most competitive technologies in communication technology. To a certain extent, it is a hot spot in today's social development and competition. Countries with scientific research capabilities are competing for high-tech in the 5G field. As far as the country is concerned, the right to speak of advanced technology in the world will also increase, and it will take the lead in the development of future network information technology. In the 5G world, the security of information technology is the main aspect of competition. In the network age, 5G has changed the development model of the entire society and subverted people's work, study, and life. With the rapid development of the network environment, the value of information has become more significant. How to ensure information security and improve the stability of 5G networks has been attracted people's attention.

Keywords: Network environment · Information technology · Security

1 Introduction

The understanding of information in the information age is difficult to concretize, because the information that people understand is abstract, or technology, and these technologies collectively referred to information have played a very important role in social development. At this stage, 5G technology has become the most competitive part of the field. In recent years, China's research on 5G technology has gradually improved. The use of 5G networks in most cities in China is becoming more and more widespread, and the security of information technology is highly valued in the use of 5G technology.

2 5G Communication Technology

Under the influence of the "Huawei storm", 5G technology has been brought to the center of public opinion. People originally thought that 5G would be unattainable, but it will be within reach after 2020. But for the general public, it is only aware of the system and basic modes of 5G in the general public's mind, and does not have a systematic understanding of 5G technology. Before 5G technology, the 4G technology used by people has been very mature, including the mastery and use of 4G [1] (Table 1).

Table 1. 5G communication index characteristics.

Performance index	Data range	Efficiency index	Improved multiples compared to 4G
User experience rate	0.1–1 Gbps	Spectral efficiency	5–15 times
Connection number density	1 million/km ²	Energy efficiency	> 100 times
Latency	Number ms	Cost efficiency	> 100 times
Mobility	> 500 km/h	-	-
Peak rate	number+Gbps	-	-
Flow density	number+Tbps/km ²	-	-

5G (5th-Generation), the fifth-generation mobile phone communication standard. Compared with 4G, 5G technology is more prominent in terms of influence. It has network coverage and influence in a broad sense. The basic system of its operation moves from the terminal base of mobile devices to the chip. The development of the model direction can simplify the composition, increase the speed of the system, ensure that the execution of the command can be completed in the shortest time, and complete the information dissemination. The application of 5G technology emphasizes the importance of timeliness in the information ship. As far as 5G technology itself is concerned, it can drive the synchronous operation of related devices, improve the “point-to-point” mobile communication method in traditional 4G, and move toward a “point-to-line” plane. For communication technology, once double-sided interconnection is realized, Theoretically, it is possible for the local area network to be connected to the wide area network through media switching, and it can be realized in theory to enhance the efficiency of information execution. The most important thing is to improve the security of information. In the process of 4G technology transmission of information, all base stations can ensure the smoothness of the signal through information amplification. If coverage is lost or the signal is amplified, distortion effects will occur. In this case, the communication content With the complete disclosure of the information itself, the confidentiality of the information is lost [2]. Under 5G technology, the network connection combination terminal device completes intelligent analysis. If the data does not match, the signal and the program still exist independently in the computer, and they are still independent languages. When there is no matching key, the information content cannot be cracked. This is to a certain extent The security of information transmission is enhanced, and the security of information is greatly improved [3].

3 5G Network Environment Development Trend

With the arrival of 5G technology, economies are accelerating the promotion of 5G commercial use, and the 5G industry has developed under the support of policies, technological progress and the market, and has achieved good results in different fields. The Chinese government attaches great importance to the development of the 5G industry, and has pointed out the direction for the development of the 5G industry in terms of related policies. The four major mobile operators in the United States continue to advance, Japan's BEYOND 5G strategy supports high-speed communications, South Korea's 5G technology is helping the Games, Brazil's 5G technology is already commercially available, etc. It is expected that China's 5G connections will exceed 400 million in 2025. According to the commercialization in 2020, the number of connections exceeds 4 billion. According to the data provided by the Institute of Information and Communication, after 2020, 5G will drive the economy 50 million yuan, and indirect economic output will be 1.2 trillion yuan; it is estimated that by 2025, 5G will drive economic output of 3.3 trillion yuan, and indirect output will reach 6.3 trillion yuan [4].

With the support of policies, 5G technology is becoming more and more mature, China's 5G industry is constantly advancing, and the development of enterprises is developing in a good direction. From planning links, construction links, and operating environments in different industrial chains, great benefits have been obtained [4]. With the continuous development of 5G, 5G will play a very important role in China's economic output and offering employment opportunities in the future. The outstanding features of 5G networks are high performance, low latency, and large capacity. The maturity of 5G technology has opened up a new era of the Internet. In the continuous development, artificial intelligence, big data and other technologies have been integrated. 5G has promoted transportation, medical care, and tradition. The manufacturing industry is changing and participating in the direction of intelligence and wireless. As of 2021, China has built 961,000 base stations; in the first quarter of 2021, China's 5G construction speed is getting faster and faster. In the second quarter of 2021, the number of 5G packages nationwide was 495 million users. According to the data released by the Ministry of Industry and Information Technology, the number of mobile phone users in China reached 1.619 billion in the second quarter; therefore, the penetration rate of 5G users in the second quarter was 30.57% [5].

As a fifth-generation mobile network, the transmission rate of 5G network is more than one hundred times that of 4G, and it is the forefront of world technology research. As an important communications industry, its regional distribution is roughly as follows (Table 2).

Table 2. Distribution of 5G Communication Industry.

Region	Enterprise Resources	Carrier/Platform
North China	There are 25 related listed companies, 2 companies with annual operating income of more than 10 billion yuan, and 11 companies with more than 1 billion yuan	1 National Autonomous Driving Demonstration Zone; 1 open test demonstration area for 5G Internet of Vehicles; 5G Innovation Center 4GE
East China	There are 73 related listed companies in East China, 4 companies with annual operating income exceeding 10 billion yuan, and 42 companies exceeding 1 billion yuan	There are two 5G car networking demonstration zones, one 5G + industry loss networking demonstration zone; 5G Internet demonstration zone and three 5G innovation centers
South China	There are 90 listed companies related to Zhongnan, 9 companies with annual operating income exceeding 10 billion yuan, and 60 companies exceeding 1 billion yuan	One 5G application pilot demonstration area; one 5G human intelligent demonstration area; one 4G\5G dual-mode site demonstration area; four 5G industry innovation platforms; three 5G industry alliances
Northeast China	There are 4 related listed companies and 1 company with annual operating income exceeding 1 billion yuan	One 5G application pilot demonstration zone; one 5G + smart medical consortium innovation base; one 5G industry alliance
Southwest China	There are 15 related listed companies, 1 company with annual operating income of more than 5 billion yuan, 5 companies with more than 1 billion yuan	One 5G application pilot demonstration zone; one 5G smart online dating demonstration zone, one 5G industry innovation demonstration zone; three 5G innovation centers
Northwest	There are 2 related listed companies, 1 company with over 1 billion yuan	One 5G joint innovation demonstration zone; one 5G joint laboratory

4 Information Security Issues Under 5G Network Environment

4.1 Threats Between Entities and Terminals

In the 5G environment, malicious accounts cannot intercept the signal. The 5G signal is always in an independent state. In theory, it can be achieved by simulating the terminal to obtain the signal by brave binding or virtual binding, but 5G has a very complete key system. Therefore, the communication signal in the 5G environment can transmit instructions to different terminal signals through the mobile communication terminal. Therefore, any terminal in the signal transmission will be considered to obtain the communication content through the “regular channel”, but this situation will not

exist, because the link signal existing in an independent environment is the same as the frequency perfection. If there is no active command, this kind of acquisition The information will be seen through the disguise. Therefore, obtaining illegal signals can obtain content, but does not have the function of external transmission [6].

4.2 User Privacy

The user penetration rate in the 5G environment is increasing, and it contains a lot of user information. Basically all user privacy content is stored in 5G terminals. Most 4G terminals are rapidly changing towards 5G, and user privacy leaks have been posted many times. Public opinion center. If there is a problem with the security of information technology, user privacy will be circulated in a large area after the user's privacy is leaked, which will seriously affect the user's personal life. In real life, there are a lot of news about personal privacy being exposed, and the parties are depressed or even on the road of no return, which has a certain impact on the security of the entire mobile communication network environment to a certain extent. Although 5G continues to emphasize the confidentiality of user privacy, there are many uncontrollable factors that cause loopholes in the system program, leading to many problems in the operation of the 5G network environment, mainly reflected in:

- (1) Illegal organizations maliciously steal information, such as the "Prism Gate" incident. In the mobile communication environment, the state has carried out a variety of mobile signal stealing operations. As the form of concealment has distinct political characteristics, and the overall high level of technology leads to passive disclosure of user privacy, this situation is inevitable.
- (2) In the case of malicious competition, information is stolen. In the 4G era, it is common for a large number of malicious factors to cause privacy to be leaked, because 4G networks are frequently damaged [7]. In the 5G era, the frequency of such accidents will only increase, and user privacy is more likely to be stolen in the context of 5G network operation. For any industry, enterprise, or individual user, information is an important resource. In the age of traffic and data, people believe that mastering resources can seize the market. Therefore, incidents of obtaining and stealing user privacy for profit will definitely occur.
- (3) Anti-social organizations maliciously steal in order to achieve illegal purposes. The criminals in the society have impure motives and use various network viruses to maliciously invade computer users, such as the "Panda Burning Incense" virus. Once the virus enters the computer system, the wisdom will be The system was paralyzed and the information was leaked. In the 5G era, a large number of criminals write viruses to invade network systems to verify their abilities. Once the 5G era is fully entered into, such behaviors of criminals will increase unabated.

4.3 Low Latency

In the 5G era, the signals of smart mobile communications have multiple transmission functions. In the 5G era, the huge amount of equipment and users will cause significant low latency in information transmission, which needs to be solved continuously in the

current development. In the 4G era, low-latency measures are taken to ensure signal stability. This measure can be used in a 4G environment, but it is difficult to solve information transmission in a 5G environment. If low-latency is still used, the distance between the terminal and the node will be shortened. This process There will be a state where a single coverage is not comprehensive and the signal does not need to be managed within a certain period of time.

5 Information Technology Security Strategy in 5G Network Environment

5.1 Certification Management

The security of information in the 5G network environment needs to be combined with the diversified characteristics of the 5G environment to strengthen authentication management. The single authentication mode of the 4G network cannot meet the current needs of information transmission. There are more variables in the 5G network environment, so it is necessary to strengthen the optimization of the authentication mode., Making 5G network environment information technology more secure. Up to now, the security optimization of 5G networks is still under continuous research, and this state will determine the final direction with the development of 5G technology [8]. In order to optimize the security of information technology in the 5G network environment, China has introduced a plan. Relevant organizations can establish different trust models to deal with different businesses according to user needs, thereby providing different authentication modes. Although this scheme is conducive to improving network security, it is difficult to complete commercial operation due to the need for a large amount of funds as support. The certification management model in the 5G environment has replaced 4G certification, and can realize the management of 5G in the continuous development. With the continuous development of the 5G network, it will become a truly open network environment.

5.2 Upgrade of Key Structure

In the 5G network environment, the key derivation method of 4G network can be used continuously. For example, only the long-term key of the core network is the user, and the entire derivation system is based on the root key [9]. The entire key is a backward-compatible encryption algorithm for the complete algorithm key service; KSEAF is a key derived on the basis of the key and the complete algorithm, giving play to the access and mobility management services, when the user moves to manage the access and session derivation.

5.3 Strengthen Isolation

A very important part of the 5G network is network slicing. Network slicing provides convenience for the commercial environment and meets the diversified and personalized needs of the market to create networks to provide better services. Any logical combination in the 5G network consists of one slice, and one slice serves a specific scene.

Network slicing is a network virtualization technology, and the slices should be isolated. In order to meet the network security specifications, the slices should be isolated, and the network slicing can be placed in a secure server. The security server (SSS) provides the slice ID for the user, and the slice configuration is placed in the server to ensure the security of the slice. The user authentication vector is obtained through a security algorithm, which is bundled with the slice ID after authentication to realize the safe isolation of the slice. Network slicing is very complicated. Only cooperation and sharing can meet higher-level functions. This problem has not been solved at this stage, but I believe it will definitely be solved in the 5G environment.

6 Conclusion

In summary, the 5G network environment provides innovative possibilities for mobile communication networks. Only when the security of information technology is emphasized in the 5G environment can the sustainable development of the network be promoted. At this stage, the 5G network is developing in the direction of comprehensive coverage. In the context of continuous popularization, the security of the 5G network is the research focus, and the security of the 5G network is the development direction, so that the 5G architecture can be realized as soon as possible.

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