

The Standard of Wireless Network Technology and Its Application in Router

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Abstract: The development of routers has been a subject that has attracted researchers from a diverse range of fields including wireless networks standard and technology development. Make new products meet technical standards through continuous hardware upgrades such as chip updates and expansion of new frequencies. The direct effect of routers is that the speed of the Internet continues to increase, which promotes the development of many electronic products. By analyzing the development of routers and wireless network standards, this paper understands the general direction of future routers. The development of routers in the future needs to face the challenges of high network speed, low latency, intelligence, and more frequency bands. The application of hardware or new technology is a new opportunity brought by the development of routers.

Keyword: Traditional Network. WIFI development, Router

1. Introduction

It is obvious that wireless technology is widely used in today's daily life. At the same time, routers are fast becoming a key instrument in the connection of electronic devices to the Internet. From the first generation of wireless network standards to the forthcoming seventh generation, the speed and bandwidth corresponding to routers are also constantly improving in order to satisfy the application of home, school, industry, and other fields. However, much of the research is up to the development of 5G networks and artificial intelligence, and people's needs are enhanced, and the speed, application capability, and security capability of routers need to be developed. The significance of this research assumes future router development to accommodate updates to corresponding network standards.

2. The history of wireless network technology and standard

2.1 The development of traditional network

It is noticed that the development of wireless network technology and the development of routers has had a huge impact on human production and life. The development of wireless network technology from telephone networks can be summarized as telephone networks, Wired communication, and high-speed networks. The telephone network is based on a two-party call network. The history of the telephone network can be traced back to as early as 1870. In 1878, the world's first commercial call was established in the United Kingdom and the United States. The technology originates from the earliest harmonics, and the rapid development of wired telephones accompanies the industrial revolution. However, the first wireless telephone was invented by Bell and Charles Sumner Tainter in 1880, and this technology was widely used in the military. Despite there is great progress in technology, the firstly commercial Atlantic fiber optic cable is used until 1956. One of the most significant processes is the occurrence of wireless networks. The advent of optical fiber in 1969 enabled the rapid development of wired networks. Furthermore, the wireless network is now familiar with began in the 1990s, and its emergence ushered in a social revolution [1]. Wireless technology is widely used in scientific research, medical, education, and other fields. Moreover, it drives the development of new electronic devices such as laptops, and routers. On the other hand, the application of radio frequencies and microwaves has promoted the process of the wireless revolution [2].

2.2 The history of WIFI development

There is a problem with the connection of retail tools and cash registers in the 1980s, people have to rewire when changing the layout of the store. As a result, the Federal Communications Commission decided to open some frequency bands so that can be used freely. NCR Corporation assigned the project to an engineering team out of the Netherlands office, who eventually succeeded in developing WaveLAN, considered a pioneer in WIFI. Additionally, NCR Corporation established it as a standard, and the 802.11 wireless standard was formed eventually in 1990, and the original version of Wi-Fi was finally officially standardized in 1997. Although the 802.11 wireless standard was released in 1997, the technology was not widely used. Slower speeds and expensive hardware hampered its mass-market appeal for a long time. At the time, 10Mbit/s was the network standard for Ethernet, so the research team found that if 802.11 could reach that speed, they would have a strong competitive edge. In 1999, The team first developed the first-generation WIFI standard, namely WIFI1(802.11a), Its frequency band is 5GHZ, but the speed is only 54Mbps [3]. In the same year, they also successfully created 802.11b, which is the second generation of the WIFI standard, WIFI2. This technology uses the same 2.4GHz ISM band as the original 802.11 wireless standard, but considerably increases data traffic to 11Mbps/s, wireless Ethernet finally becomes a reality. Shortly after the establishment of the 802.11b standard, the scientific research team released a faster 802.11a standard, which no longer operates in the increasingly crowded 2.4GHz frequency band, but operates in the 5GHz frequency band and supports speeds as high as 54Mbps/s, which is the second generation WIFI standard, WIFI 2. In the 21st century, technology has developed rapidly, but the speed of Ethernet is 10 times higher than that of WIFI2 [4]. In order to solve the speed problem, the scientific research team launched 802.11g in 2003, which is the third-generation WIFI standard, WIFI 3. Although 802.11 g uses the same 2.4GHz frequency band as 802.11b, but is capable of speeds up to 54Mbit/s. 802.11g is not the first 802.11 wireless standard to reach 54Mbit/s, 802.11a has already achieved such speed in 1999, but it has a relative disadvantage, its frequency band is 5.8GHz. While 5.8GHz has the advantage of having less radio interference from consumer electronics, it is not compatible with 802.11b [5]. Considering this situation, 802.11a is not widely used in household/consumer applications. Moreover, the fourth-generation wireless standard was born in 2009. It works in the 2.4GHz or 5.8GHz frequency band. It improves transmission efficiency by using frame aggregation. It also introduces optional MIMO and 40Hz bandwidth, making the fourth-generation standard the third-generation wireless standard. double the generation standard [6]. is obvious that the fifth and sixth generation of wireless technology is used on a large scale, which are signed 802.11ac and 802.11ax. One fact is that the current speed has achieved a gigabit-level rate, but there is a very real problem. In the case of high frequencies, the wireless distance and penetration are greatly reduced.

3.1 The principle of the router

A router connects two network devices to each other and forwards data to different network devices. During the process, the router needs to use different IP addresses to determine the corresponding network and host addresses. When the router as a gateway receives network data, it determines the forwarding path according to the corresponding IP address, finds the next layer address from the cache and forwards the data, and finally outputs it to the data line in the order of passing. As the core equipment of IP network, router technology has become an important technology in the information data industry and plays an important role in data communication. Everyone may only know that it allows us to surf the Internet. In fact, in practical applications, it uses signal transmission technology to convert electrical signals into digital signals to meet user query needs. On the other hand, the role of the router is to move information from the origin to the destination by interconnecting the network. At the same time, the information will pass through at least one or more intermediate nodes before it is transmitted. Many friends will compare the functions of routers and switches and find that their functions are similar. In fact, there is no essential difference between the two. Switch switching occurs at the data link layer, while router activity occurs at the network layer. In this way, routers and

switches will be implemented according to their own functions in their work. The principle of the router is shown in figure 1 [7].

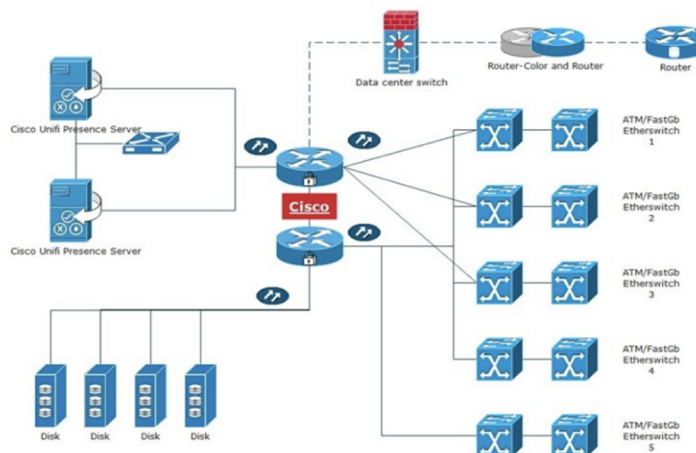


Figure 1. The principle of the router

3.2 The hardware in routers

As a gateway device, a router can be regarded as a hardware combination or called an integrated device. The hardware in the router can be summarized as a central processing unit (CPU), read-only processor (ROM), memory (RAM), flash memory (Flash Memory), non-volatile memory (NVRAM), console port (CONsolePort), Auxiliary port (AUX PORT), interface (INTERface), cable (CABLE). The CPU in the router mainly executes the instructions of its operating system, interprets, executes the corresponding commands, and calculates the topology database. ROM is used in routers to store data during use and to store configuration files during operation. The main function of Flash Memory is to save the image file of the operating system. The router's non-volatile memory is used to store the router's startup configuration file. Just in case its contents are still there when the router runs out of power. For CONsole Port, it is significant for users to configure the router, and usually different routers have different console ports, Similar to the control port, the auxiliary port also provides an EIA/TIA RS-232 asynchronous serial interface. However, it is often used in modems for remote management of routers. For users, the most common interface is the interface. Common interfaces can be divided into two types: LAN interface and WAN interface. Different network ports correspond to different names. The hardware in routers is shown in figure 2.

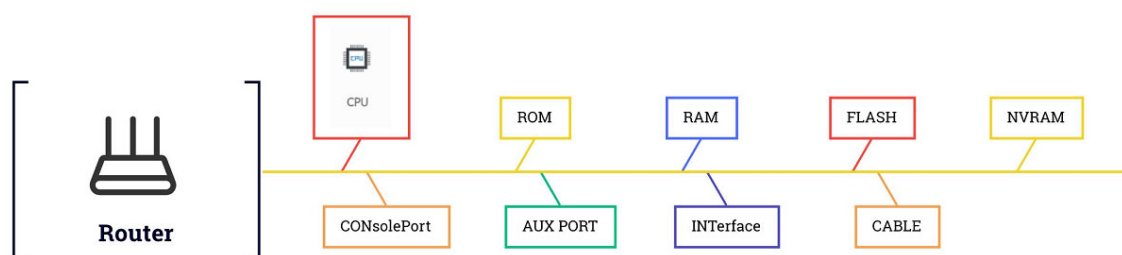


Figure 2. The hardware in routers

3.3 Technical Updates for Routers

The application of each new generation of wireless technology on routers is accompanied by the development of cellular data. In the era of 3G development, there is still no solution that can provide a unified experience on the radio and Wi-Fi ends. But with the development of 802.11n, many technology companies apply WIFI4 technology to corresponding router modules. And this module has also promoted the development of smartphones to a certain extent. When each generation of new wireless technology standards is applied to routers, it is usually accompanied by the synchronous

update of wireless technology of a series of smart products. The subsequent 802.11ac, as a version with a longer evolution time, has gone through two deployment phases of Wave1 and Wave2. During this period, many technology companies such as Qualcomm gradually expanded the coverage of their wireless solutions from smartphones or tablets to other network nodes with the help of their own layout in both cellular networks and Wi-Fi. The router is a key part of it. The subsequent WIFI6 brought people into the era of gigabit networks, and the application of dual spectrum accelerated the development of the network [8]. Now many technology companies are beginning to deploy the development of the next generation of WIFI7, and the application of the 6GHz frequency band will further improve the wireless network speed. It can use the 2.4GHz, 5GHz, and 6GHz bandwidth at the same time, greatly improving the network transmission. speed, coverage, and reduced latency, so that ordinary families can enjoy the extremely fast performance of up to 240MHz bandwidth [9].

3. Router, wireless network carrier

4.1 Industry Challenges for router

The challenges faced by the router industry are comprehensive, and routers need to face the rapidly developing smart homes, games, and enterprises. It is necessary to update router technology in time and apply new wireless technology standards. For example, when the market is gradually using WIFI6 routers, research on the next generation of WIFI7 will begin. On the other hand, the challenges faced by routers in different scenarios are also different. It is necessary to overcome the ability to penetrate walls and the impact of coverage on signals, such as signal coverage and speed-up in shopping malls, hospitals, and schools. One of the great advantages of routers in the wireless transmission is that many electronic devices do not need additional wired network ports, and people do not need to carry network cables at all times. A wide variety of electronic devices can be connected to WIFI. Moreover, it avoids arranging network cables in various complicated situations, and the continuous improvement of coverage allows many public places and families to choose corresponding solutions, which have a wide range of application prospects. On the other hand, since the transmission power of network equipment usually does not exceed 100 watts, it does not have direct contact with the human body under the condition of a fast transmission rate, and it will be relatively safe under the condition that the speed of personal and social informatization is satisfied.

4.2 Future prospects for router

The prospects of future routers are broad. First, to develop high-speed routing, such as 10G routers, the network speed will be faster and faster to meet the needs of intelligent life and work; second, network services will become more and more complex in the future, and future routers will have support. The ability to integrate business needs for rapid growth; third, IP networks are penetrating various industries, and edge access routers have broad prospects. Personalized router settings will be a development direction. In the future, there will be more functions of personalized routers, and at the same time, they will develop in the direction of modularization, so that users can choose and choose modules according to their needs [10]. One fact is that a large-scale deployment of range-restricted cloudlets is still an open challenge. From the application market point of view, the industry market needs multi-functional products. This paper can find that routing product with a single function can no longer meet the needs of industrial applications. Enterprise router providers need to customize them according to the enterprise application environment. Functional, security, customized, and service-oriented products have become the application trend. In complex commerce, education, factory environments, etc [11]. with the popularization of network applications, application requirements will gradually increase, people will no longer be limited to the purchase of a single product, and the integration with new technologies and new applications will become the trend of product development, products with rich functions and simple applications will be very popular [12]. The development of wireless networks has put forward certain requirements on the interference capability of routers. The complex network and power equipment in modern life will have a certain

impact on the transmission of the wireless network, usually manifested in the reduction of the network speed or the abnormal connection. How to avoid the interference of different scenarios when using is the basic requirement of future routers.

4. Conclusion

In conclusion, the research outlines the development of wireless networks and the application of new technologies to routers. The analysis leads to the following conclusions: The development of routers is closely related to the development of wireless networks. With the development of science and technology, new requirements are put forward for the technology, functions, and security of routers. Under this condition, the router can meet the needs of future scenarios. Future research should consider the potential effects of Network frequency and anti-interference more carefully, for example, some technology companies use the 6G frequency band on the WIFI7 routers to be interviewed, which further improves the network speed and the anti-interference ability of wireless transmission. This assumption might be addressed in future studies. At the same time, in different technological scenarios, the development function and data security of routers also need to be guaranteed.

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