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Application of Optical Network Transmission Technology in Telecommunication Network

Guande Luo*

Guangzhou Shentu Technology Co. Ltd. E-mail: luogd@163.com

Abstract: In the telecommunication network, the optical network transmission system is one of the most important components. The system mainly includes two elements, namely transmission media and node equipment. In the specific operation process, the effective use of the system can fundamentally provide practical and effective support for the telecommunication network, and it is safer and more effective applied in the telecommunication support network and various business networks. Moreover, it can carry out long-distance and large-capacity business transmission. Optical network transmission system and technology has a vital direct impact on the safe operation and innovative development of telecommunications networks, so it is very important and necessary to analyze and discuss the application of this technology in telecommunications networks. This article focuses on the analysis and discussion of the application of optical network transmission technology in telecommunication network and the specific implementation strategy, aiming to provide some reference for relevant practitioners.

Keywords: Optical Network Transmission Technology; Telecommunication Network; Application; Strategy

At present, with the further development and application of information technology in China, there are more and more kinds of services provided by telecommunication networks, which are more diversified and efficient. Traditional telecommunication services have been unable to completely adapt to the development trend of the times. Corresponding network services and resources, such as telecommunication value-added services, mobile communication and data communication, have further entered the business level. Under such circumstances, the service pressure faced by telecommunication networks is increasing. With the further development of IP technology, people pay more and more attention to the capacity and broadband of telecommunication networks. In order to fully ensure the business development needs of telecommunication network, make it have stronger business carrying capacity, and realize large-capacity intelligent development, the optical network transmission technology is introduced in a targeted way, so that the telecommunication network is developing in a more diversified and high-speed direction.

1. The main content of optical network transmission technology

1.1 SDH technology

Synchronous Digital Hierarchy (SDH) has obvious international and unified transmission rate standard, whose optical interface can be unified. At the same time, it has favorable horizontal compatibility, and can more effectively carry out standardized and unified management in electronic interface, so as to ensure that different

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equipment and manufacturers can effectively realize interconnection and mutual integration. Its advantages mainly lie in its higher transmission rate, which can effectively meet the requirements of communication network development.

1.2 WDM technology

Compared with SDH technology, WDM technology uses multiple wavelengths as carriers, and its advantages are that it does not transmit synchronously in the same fiber, which can effectively save the cost and further reduce the cost of network construction. Various types of signals can be transmitted more effectively through the bandwidth resources of optical fiber. At the same time, it also has remarkable smooth expansion, more flexible networking, safer and more reliable, which is in line with the advantages of economic rationality. It can directly intervene in various types of services, which is faster, more convenient and more efficient.

1.3 OTN technology

OTN came into being based on WDM technology. This network system can reflect the intelligent optical switching function to a greater extent, and ensure the development of WDM technology towards intelligence and dynamics. OTN effectively integrates the relative advantages of SDH and WDM systems, and carries out practical and effective transmission in the optical layer organization network, showing more obvious application advantages.

OTN is the mainstream direction of the stable development of backbone transmission network, which can deal with wavelength-level services more effectively, and further enable the transmission network to fully enter the era of multi-wavelength optical network.

1.4 MSTP technology

Multi-service Transfer Platform (MSTP) is to further integrate related equipment based on SDH platform. It can more efficiently manage digital cross connect, network two-layer switch, WDM terminal IP router and other related contents, and better complete service access, transmit and process ATM, TDM and Ethernet. Like SDH, it has better compatibility and higher bandwidth utilization, which can provide better technical support for multiple service access, fundamentally ensure end-to-end delay, and present a more perfect network protection mechanism.

1.5 ASON

Automatic Switch Optical Network (ASON) is built on various transmission technologies and adds independent control planes to SDH and OTN, so it supports services with various rates and different signal characteristics provided by current transmission networks. ASON can provide a transmission channel with fixed bandwidth between two customer network elements, and the channel is defined between the input and output access points of the optical network.

2. Application strategy of optical network transmission technology in telecommunication network

2.1 Application of SDH technology

At present, SDH has been continuously improved and optimized in the application process with more efficient running, and has been widely used in the core convergence layer of long-distance transmission backbone network, access network and local network, showing more and more obvious application advantages. The disadvantage is that the application range is limited due to the lack of specifications.

2.2 Application of WDM technology

At present, WDM technology has been widely used in metropolitan wavelength division networks, domestic inter-provincial backbone transmission networks and other related scenarios. It can fully realize long-distance and large-capacity system transmission, and transmit information and data more accurately and efficiently. It can transmit information with larger capacity and higher definition. In its practical application, the ability of transparent transmission and networking of various services is the key to effectively realize all-optical network.

2.3 Application of OTN technology

At present, OTN technology is further matured and perfected, providing multi-type and multi-directional OTN equipment in telecommunication network and communication equipment suppliers. OTN management platform is basically consistent with SDH, which can be effectively applied in access layer and metropolitan convergence field. Equipment maintenance is more conven-

ient and efficient. OTN is of obvious characteristics of large particles crossing between optical layer and electrical layer, and has been applied more effectively in metropolitan backbone layer. Other characteristics include super-bandwidth capacity transmission and stronger ring network protection capability, showing great application advantages in trunk network. The characteristics of OTN make it applicable to different network levels and will be widely used in the future.

2.4 Application of MSTP technology

At present, MSTP is widely used in the core layer, convergence layer and access layer of transmission network, which mainly carries more effective access services for large customers and also transmits mobile data services. Due to the typical broadband and IP requirements of services, more stringent requirements are put forward for network bandwidth and bandwidth dynamic allocation. MSTP network is developing in the direction of intelligence, and the control plane is fully introduced to realize automatic operation.

2.5 Application of ASON

ASON service consists of the following aspects: SDH service, which supports SDH connection particles VC-n and VC-n-Xv defined by G.707; OTN service, supporting OTN connection particles ODUk and ODUk-n-Xv defined by G.709; Transparent or opaque optical wavelength services; 10 Mb/s, 100 Mb/s, 1 Gb/s and 10 Gb/s Ethernet services; Storage Area Network (SAN) services based on Fiber Connection (FICON), Enterprise System Connection (ESCON) and Fibre Channel (FC). ASON is extensible to new service types. It can support many types of business models, each of which has its own business attributes, target market and business management requirements.

3. The specific application strategy of optical network transmission technology in telecommunication network

3.1 Fundamentally ensure the continuous broadening and extending of the application scope of optical network transmission technology

At present, China's telecommunications network is undergoing continuous transformation and optimization. In order to fully ensure that the optical network transmission technology is applied more effectively within its scope, it is necessary to focus on enhancing the competitiveness of the telecommunications network, fundamentally and effectively adapt to the objective requirements of the strategic development of "internet plus", further broaden and extend the application scope of this technology, and fully tap its application advantages. For example, telecom enterprises should actively analyze, design and formulate corresponding implementation plans, fully meet the continuous and long-term strategic requirements of their own development, and show great application benefits in different fields.

3.2 Continuously improve and optimize the maintenance system of optical network transmission technology

In the specific operation process of optical network transmission technology in telecommunication network, it is necessary to constantly improve and optimize its maintenance system, so as to ensure that related technologies have greater enforceability and efficiency. It is necessary to arrange the whole transmission system in a more systematic and scientific way, and set up a more scientific and efficient operation system in the maintenance process, so as to make the contents of the maintenance system more perfect and operable, and take this as a guide to ensure the sound development of all work. At the same time, attention should be paid to the daily maintenance work, strict detection and verification of the operation of optical network transmission system, to find and solve problems in a timely and effective manner. It is also necessary to make full use of scientific and technological information technology, establish and improve the network monitoring system, and use cloud computing and big data technology to conduct more effective monitoring and management.

3.3 Create a higher quality team of optical network transmission technicians

It is necessary to provide timely and effective skills training for technical personnel, so as to enhance their professional skills and business level in an all-round way, and help them firmly grasp the basic principles of optical transmission and skillfully use corresponding transmission equipment. By conducting practical exercises for

equipment failures and maintenance methods, it can ensure the maximum application advantages of optical network transmission technology.

4. Application of optical network transmission technology in telecommunication network

In the specific operation process, the operators make the 100 Gb/s service signals independent of the existing network services and network topology in the development process, and ensure that 100 Gb/s can communicate with 10 Gb/s and 40 Gb/s service signals. In this development mode, it is necessary to ensure that it can support 50 GHz signal interval in the long-distance transmission process. At the same time, the system dispersion and PMD tolerance should be equal to 10 Gb/s, but it must be better than 40 Gb/s system. In addition, in the design process, it is necessary to fully ensure the compatibility with the existing wavelength division system and minimize the reduction of 100 GB/s. In the process of mixed transmission, it may impact the existing system and cause unnecessary risks. Another development mode is 100 Gb/s transmission alone. In this mode, in the long-distance transmission network, because dispersion compensation is not needed, the number of amplifiers on the link is greatly reduced, which can more effectively reduce the network construction cost of operators. At the same time, in the metropolitan area network, the dispersion change caused by the problem of routing length is no longer considered by the designer, which makes the whole network more flexible and more efficient.

5. Conclusion

Through the above analysis, it can be seen that under the background of the new era, the telecommunications network has achieved a greater degree of development, and has fully entered the full-service era, with more diversified service types. Under such circumstances, there are stricter requirements for the transmission capacity of data networks, which require larger transmission bandwidth and more flexible scheduling and networking methods. To fully realize intelligent operation, it is necessary to apply optical network transmission technology more effectively, so that the technical advantages can be fully exerted.

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