Deployment of Intelligent ODN in Distribution Communication Access Network

Zhenfeng Wang, Hailun Wang *, Chenqiang Fan, Jiamin Lian

[1]School of Electrical and Information Engineering, Quzhou University, 324000, China

*Corresponding Author:xiaohong1920@126.com

Abstract

Starting from the shortcomings and problems of traditional oDN, this paper expounds the constituent nodules and technical advantages of intelligent oDN technology, and analyses the key points of intelligent oDN deployment, so as to meet the requirements of EPQN communication system in distribution communication access network for the construction of optical distribution network. Provide reliable support for the construction of distribution communication access network.

Keywords

Access network, Communication, Intelligence, ODN.

1. Application of ODN in Distribution Communication Access Network

Distribution communication access network is an important part of distribution automation. Its function is to realize real-time transmission of data in distribution communication system. The reliability of distribution communication access network has a decisive influence on the realization of distribution automation function and operation reliability. At present, there are many communication modes in the construction of distribution automation communication network, among which EPON (Ethernet Passive Optical Network) technology has advantages in security, reliability, real-time, high bandwidth and network flexibility, and is widely used in distribution communication access network.

The classed EPON system to OLT(Optical Line.), ONU(Optical NetworkUnit), ODN(Optical Distribution Network). ODN in the network is defined as the line part from OLT to ONU, including optical cable, wiring part and spectrometer. As an important part of EPON system, its function is to provide optical transmission channel between OLT and ONU, which has a vital impact on EPON system. (as shown in Figure 1).

2. Disadvantages of traditional ODN

Traditional ODN still has some shortcomings in management and maintenance, mainly in the following aspects:

1. Paper wiring labels have short life, messy pasting, and can’t be automatically checked. Correctness and reliability can ’t be guaranteed.

2. Data input and update depend on manual operation, which leads to high error rate and poor timeliness of updating. When the data is delayed, the inconsistency between the resource data in the database and the actual resource data will occur.

3. Insufficient management and control ability, the wiring port errors can’t be found in time.

4. The overall management of optical fiber resources is difficult. When locating and restoring faults, the available ports must be searched manually, and the ports have no indication, so the correctness and efficiency can’t be guaranteed.

In this context, in order to ensure the long-term safe and efficient operation of distribution communication network, it is necessary to introduce intelligent means to strengthen the management of ODN network.

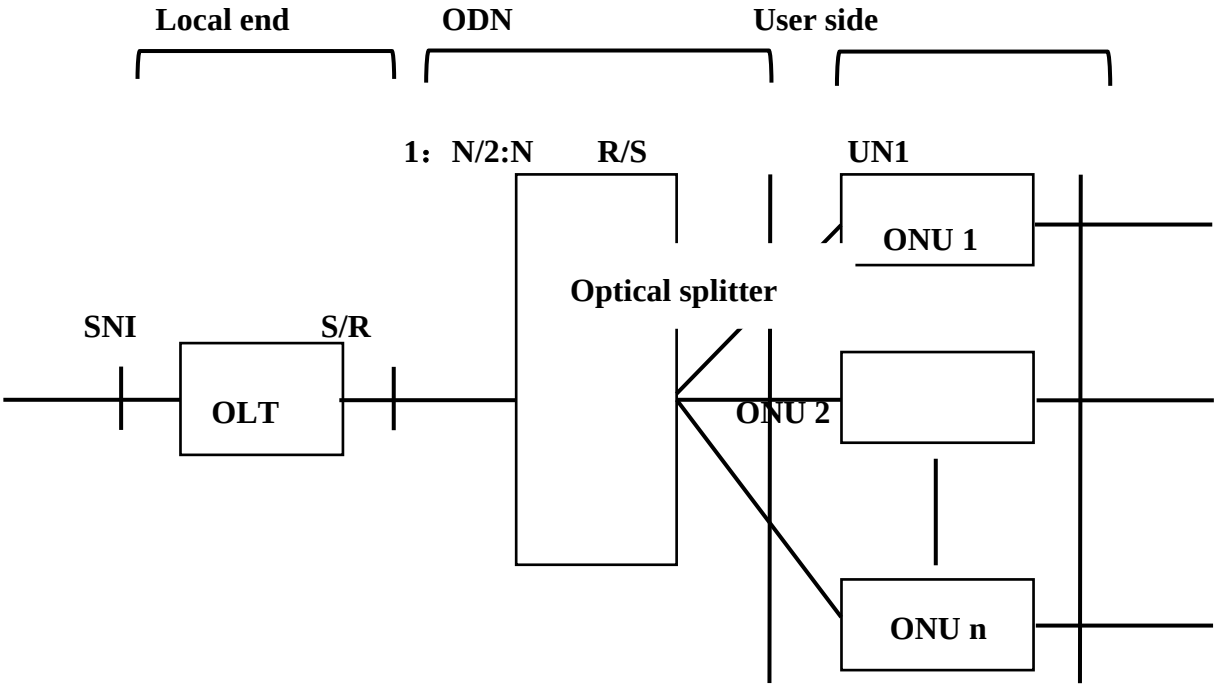

Figure 1 ODN delimitation

3. Intelligent ODN Technology

3.1 Intelligent ODN Structure Analysis

Intelligent ODN consists of intelligent ODN management system, intelligent management terminal, intelligent ODN equipment and electronic tag carrier.

1) Intelligent ODN devices. Intelligent ODN equipment includes intelligent ODF, intelligent cable junction box and intelligent cable divider, which are used to realize cross-connection of optical fibers and data acquisition of resources. It mainly completes the functions of data acquisition and control layer. Intelligent ODN devices are realized by installing intelligent labels and port status acquisition and display devices on optical fiber wiring racks, handover boxes and other devices.

2) Electronic tag carrier. Electronic tag carriers include optical hopping fibers, tail fibers and optical splitters with electronic tags on optical fiber connectors, which mainly carry electronic tags and data storage functions. After the intelligent ODN device is connected with the electronic tag carrier, the electronic tag information can be read.

3) Intelligent management terminal. As a portable terminal for field use, intelligent management terminal is a bridge between intelligent ODN equipment, intelligent ODN management system and OSS (Operation Support System). The interaction of system data is accomplished through intelligent management terminal. The intelligent management terminal implements the functions of information management query, work order management and visual operation guidance of equipment by installing corresponding management software.

4) Intelligent ODN management system. Intelligent ODN management system is the core of Intelligent ODN system, and it is an information system that intelligently manages the whole ODN network. There are two ways to realize it. One is to directly manage the intelligent ODN device, the other is to realize the function of managing the intelligent ODN device through the intelligent management terminal. Intelligent ODN management system should have the functions of resource

management, configuration management, fault management, performance management and safety management. It can automatically and manually configure optical fiber links according to business requirements and optical fiber resources, monitor the operation of optical fiber wiring ports, and provide guidance for daily inspection and field construction work of operation and maintenance personnel. (as shown in Figure 2).

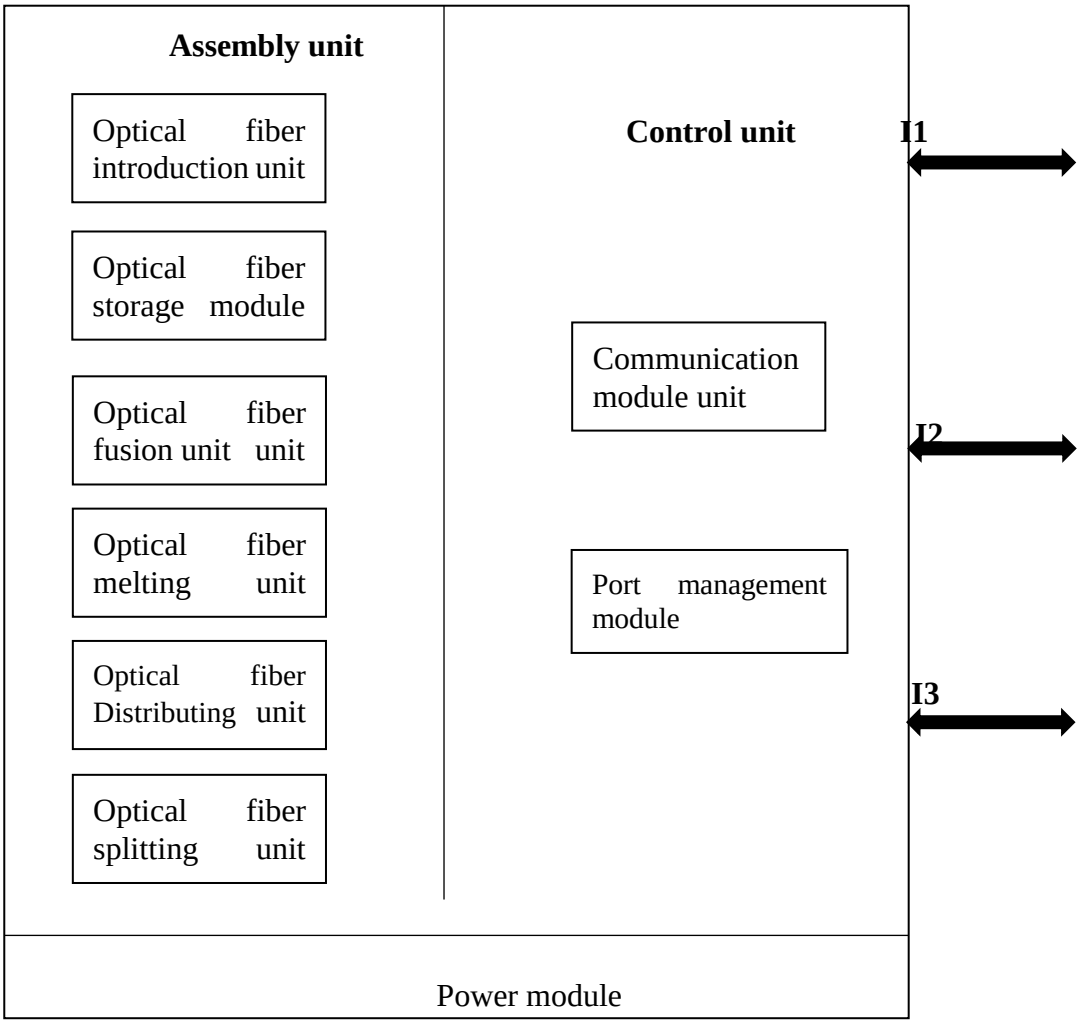

Figure 2 Intelligent ODN Management system

3.2 Intelligent ODN advantages

Without changing the characteristics of traditional ODN network, intelligent ODN adds some intelligent characteristics to ODN network. Compared with traditional ODN, intelligent ODN has the following outstanding advantages:

1) Improving the accuracy and real-time updating of data. Intelligent tags are used to realize the electronic transmission of all resource information data, to automate the transmission of resource data for optical fiber wiring, and to improve the accuracy and real-time updating of data.

2) Improve the security and reliability of network operation. Through automatic line inspection and fast fault location information, the fault can be quickly located, organized and processed, so as to facilitate the rapid identification and recovery of the fault.

3) Intelligent on-site operation and maintenance. Through the detection of port status, electronic label content on jumping fiber or tail fiber, and port controllable lighting, the construction guidance of jumping connection can be realized, and the work efficiency can be effectively improved.

4. Key Points of Intelligent ODN Deployment

1) Census of existing resources. Traditional ODN data resources lack of efficient acquisition technology, so in the early stage of upgrading, it is necessary to conduct a survey of existing resources and input equipment information in advance, including terminal information, core terminal information, terminal usage information and other data to ensure the accuracy of data.

2) Hardware compatibility. The full deployment of intelligent ODN is difficult to achieve in a short period of time. In order to maximize the investment of existing equipment, the traditional ODN can be upgraded to intelligent ODN smoothly. In the construction stage of traditional ODN, the compatibility of hardware structure must be the basis to fully consider the construction requirements of intelligent ODN. For example, the construction of traditional ODN should reserve installation space for intelligent components, ensure uninterrupted business in the process of adding electronic labels to optical fibers, and design of walking fibers should take into account the space requirements of upgrading, so as to facilitate upgrading operation.

3) Integration of network management. In order to reduce the cost of management and operation, intelligent ODN network management should take into account the management needs of traditional ODN equipment, and manage the intelligent ODN and traditional ODN in a unified way to achieve the unified scheduling of resources. Only by unified management, unified process and unified dispatch can ODN better support the business needs of distribution communication access network. For traditional ODN devices, visual management is needed in network management to support real-time data checking and updating with network management assisted by intelligent maintenance terminal.

5. Conclusion remarks

Intelligent ODN, as the development direction of optical fiber communication network, can realize the perception of optical fiber communication network by monitoring the port status and collecting information. Intelligent ODN can quickly identify faults, provide guidance for operation and maintenance management, site construction, and update wiring data. It solves many problems existing in traditional ODN, effectively improves the efficiency of operation and maintenance, and improves the security and reliability of distribution communication access network. In order to realize the smooth transition from traditional ODN to intelligent ODN, the existing traditional ODN needs to be reformed. Therefore, under the premise of ensuring the safe operation of distribution communication access network, the smart transformation of ODN with minimum cost will be an important problem to be solved in the next step.

Acknowledgments

This work was partially supported by National Science and Technology Innovation Project for College Students(No.201711488004)

References

[1] Wang Xiang, Fan Qiang, Zhang Jun, Hu Yang. Design of ODN for distribution communication access network based on EPON. Power system communication.

[2] Chen Jie. Consideration of Intelligent ODN. Telecommunication Network Technology, 2012 (10); 10-11.

[3] Wang Jiajun.Intelligent 0DN Architecture and Key Technologies Analysis [J].Communication World, 2015 (10); 10-11.

[4] Zhou Xiaodong, Lian Jiwen, Li Hongfa. Application of Intelligent 0DN Technology in Electric Power Communication.