

How to Operate

China Telecom Quanzhou champions FTTx

Located in the southeast of China, Quanzhou is one of Fujian province's three prominent cities. An economic powerhouse, the city has boasted the highest GDP for 11 consecutive years in the province. It is also well-known for being the ancestral home to many overseas Chinese and Han Taiwanese, who have long been an important driving force behind its socioeconomic development by establishing factories or sponsoring charities.

To improve the investment climate, IT infrastructure construction is picking up in Quanzhou, with optical access emerging as the mainstream broadband access mode. In 2006, China Telecom Quanzhou began researching fiber-optic access technology and developed an access layer ODN plan that trialed FTTx in one district, two towns, and three development zones. In 2009, the operator set the strategic goal of enabling 30Mbps services for residential users and 100Mbps services for business users. It has since been committed to building a highly competitive, all-optical network that can help local enterprises to evolve and grow.

The operator's FTTx deployment has involved developing a long-term strategic partnership with Huawei. As

part of the FTTx Strategy Research Program, both have jointly implemented research projects such as the Quanzhou FTTx Network Business Plan and Solution, Quanzhou ODN Planning and Construction Solution, Quanzhou FTTH Network Operations and Management Research Project, and Quanzhou FTTH Equipment Interface Standards Research and Equipment Functionality Improvement Project. Each has increased the experience of both parties and provided an insight into how to best optimize FTTx network construction, service provisioning, and O&M.



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Accelerating massive FTTx deployment

Rapid large-scale ONU deployment

ONU deployment in an FTTx network is often hindered by a complex installation environment, enormous construction difficulties, a long deployment cycle, stringent skill requirements for installation personnel, and the need to dispatch software testing engineers to conduct onsite tests. Faced with such difficulties, China Telecom Quanzhou was struggling to formulate a viable project.

After jointly researching these challenges with the operator, Huawei developed a centralized NMS batch predeployment solution to achieve plug-and-play and automatic network equipment upgrades through a user-friendly unified ONU authentication technique. Equipment-specific data is deployed via a work form, and a configuration template is used for common data; these combine to accelerate the deployment process. This solution nicely fit the operator's need for rapid, large-scale ONU deployment.

When deployment was complete, acceptance presented another challenge to China Telecom Quanzhou. The large number of distributed ONUs entailed multiple site visits during the acceptance process, resulting in low efficiency and a long acceptance cycle. Inexperienced acceptance personnel meant that equipment center personnel and even the project inspector frequently had to leave their duties to complete the procedure.

This prompted Huawei to develop a standard remote ONU acceptance solution for the operator. The solution allows testing engineers to conduct simulation tests for ONU broadband and narrowband services. Notably, it enables service personnel to remotely conduct service test and acceptance, monitor service status and locate any fault, significantly boosting the quality and efficiency of ONU acceptance.

Standardized ODN construction

As a vital part of the FTTx network, the ODN is pivotal in promoting FTTx services and improving ROI. In 2009, China Telecom Quanzhou identified nine research topics based on an in-depth analysis of domestic ODN construction experience, current network status, and future development trends. It then established a joint research project team with Huawei and local telecom design institutes to look into how to build a cost-efficient, highly scalable ODN that is easy to implement, manage, and maintain, and that can be smoothly migrated.

To effectively optimize and perfect E2E ODN specifications and provide effective construction guidelines for project subcontractors, the project team developed a complete ODN technology plan. Its content includes the ODN business development plan; new materials and new techniques; optical cable resource management; and specifications for design, laying optical cables, standardizing equipment, installing and commissioning equipment, project acceptance, and O&M inspections.

Aiming to improve project quality and maintenance efficiency, China Telecom Quanzhou was the first operator to develop the "ODN construction standardization" concept to standardize ODN project acceptance and maintenance methods and reference indicators. Its ODN experience has greatly benefited other branches of China Telecom in Fujian.

Improving FTTx O&M efficiency

Rapid and accurate network diagnosis

FTTx O&M statistics show 70% of faults occurring at the user side and 20% at the ODN side. Rapidly and accurately defining fault types can ensure that work orders are sent to the correct

maintenance personnel. China Telecom Quanzhou proactively approached O&M under a unified management system, which has significantly reduced the user complaint rate.

Alarm analysis: To assist maintenance personnel in sharing experience for professional competence improvement, China Telecom Quanzhou has sorted out and simplified the mass of ONU alarm types and strengthened alarm root-cause analysis. It has also provided each maintenance engineer with analysis guidelines and solutions for each alarm type, with the solutions recorded in the alarm knowledge database.

Fault diagnosis and location: China Telecom Quanzhou has used Huawei's professional line test system to tackle problems such as the complex ONU environment, the large number of ODN passive nodes, and difficulties in fault location. Able to rapidly determine if a problem exists in the optical fiber or the ONU, the system cooperates with the ONU's remote simulation test function to improve the fault location accuracy and shorten the troubleshooting time for improved customer satisfaction.

Remote network monitoring: China Telecom Quanzhou has a mass of equipment installed in a range of complex scenarios. To minimize labor and maintenance costs, the operator remotely monitors the ONU environments and environment/power alarms so as to enable real-time status queries. It uses a remote centralized monitoring system to monitor performance and status of OLTs and ONUs in upstream and downstream directions. The system has effectively alleviated the onsite maintenance burden by automatically detecting and reporting the xPON port status and optical module parameters, and by monitoring the temperature, offset current, voltage, and optical power.

Standard full-service distribution and unified automatic upgrade

Though FTTx supports full-service bearer, the BOSS cannot unify the

distribution of Internet access, VoIP, IPTV, enterprise private line, and mobile bearer services as each service has its own procedures and requirements.

Therefore, the R&D Center of China Telecom Quanzhou began testing and verifying the configurations and planning the project based on the network environment and business demands. The resulting specifications served as direct, effective guidelines for the maintenance personnel in the various centers to distribute services in line with a workflow. In the event of a service distribution failure, the equipment automatically rolls back.

Numerous business demands and frequent version upgrades affect new equipment at the initial stage of FTTx construction. To streamline the process, the automatic batch upgrade function can significantly facilitate upgrading the deployed ONT terminals.

Improving network resource management systems and standards

Managing such a large volume of optical fiber and cable resources was a huge challenge to China Telecom Quanzhou. The operator has explored all-optical access resource management models that center on the existing network resource management architecture and operating habits, especially Huawei's comprehensive resource management concept. After thoroughly analyzing existing optical cable resources and conventional management methods and operating habits, the operator standardized the label identification of equipment, modules, optical cable and fiber on E2E links, and provided guidelines for project implementation and O&M management. It has also developed a systematic solution for network resource management after proposing a range of customized system development requirements.

Finally, China Telecom Quanzhou integrated the resource management

system and the centralized ONU predeployment system. Doing so has not only met the requirements for rapid and massive deployment but also provided a simple and clear management model for routine maintenance.

Organizational restructuring to ensure FTTx success

As the new FTTx technologies and multi-service operations posed a new challenge to the traditional O&M organizational structure and personnel of China Telecom Quanzhou, the operator adapted to the new network's O&M requirements by undergoing fundamental organizational restructuring. It delegated part of the terminal maintenance work to the branch offices while asking China Telecom Fujian to facilitate core network maintenance. Special access maintenance centers were established to adjust local networks and enhance access layer network maintenance. Optical access maintenance teams were also set up in key counties and cities by integrating original equipment personnel with line center personnel.

Meanwhile, Huawei partnered with China Telecom Quanzhou to deliver a three-tier training program: 1) training on product introduction, installation instructions, and ONU and ODN operation guidelines was provided for the line centers and project installation teams at county and city levels and in Quanzhou; 2) real case training on OLT and ONU product and service configuration, planning, and commissioning was given to equipment center personnel at county and city levels and in Quanzhou; 3) training on network management, problem analysis and solutions was provided for key network control and equipment center personnel.


Through this organizational restructuring and multi-level training, the equipment center personnel can

now perform 50% of OLT and ONU commissioning and deployment on their own.

Remarkable progress in FTTx

Following China Telecom's guidelines for optical access network promotion, China Telecom Quanzhou has made remarkable progress in FTTx construction. FTTx construction in 2007 and 2008 was consolidated by large-scale FTTH construction in early 2009 after the company's strategic business shift, and 2010 will see the deployment of 300,000 lines.

Quanzhou Municipal Government is one of the key customers of China Telecom Quanzhou, and requires high-grade voice, data, video, and e-government services. To enhance their business relationship, the China Telecom Quanzhou-Huawei joint FTTx research team relocated to the Administrative Service Center in Quanzhou to build an FTTH network. After a thorough study of FTTx construction and project models in ODN FTTB and FTTH scenarios, the team successfully built a fiber to the desktop (FTTD) network in the Donghai Administration Building. The network and the services it facilitates are instrumental in raising the government's image and promoting socioeconomic benefits.

After being debriefed on the FTTx project and assessing the project themselves, senior officials of Fujian Telecommunications Administration highly commended the joint FTTx research team for their "forward thinking and systematic architecture". They expressed their hope that both operator and vendor can continue their successful partnership in more areas. 

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