Smartening up fiber optic networks with intelligent ODN

Shaanxi Mobile has deployed intelligent fiber optic networks at the core and aggregation layers of its network, boosting management efficiency and laying the foundations for broadband services.

Despite fiber optic networks (FON) growing in size, many operators still manage a massive number of ports, fiber optic cores, and aggregation servers manually. Poor management in this way seriously restricts the development of fiber optic services.

In 2015, China Mobile subsidiary Shaanxi Mobile got round this problem by deploying intelligent Optical Distribution Frames (ODF) on all its cores and aggregation servers, and upgraded existing ODFs to intelligent ODFs.

By building a FON with a smart layer of cores and aggregation servers, the carrier boosted network management efficiency and paved the way for broadband.

The challenges

Shaanxi Mobile began constructing fiber optic broadband in 2010, and has since covered 2.6 million users with its fixed network. But, the increasing complexity began to restrict the growth of its fiber optic service.
Handling data by hand

In the project implementation phase, Shaanxi Mobile engineers relied on paper print outs of engineering drawings and carried out operations manually. All information about the network was recorded by hand or manually entered into a database.

Human error and imperfect resource management processes often led to out-of-date information, with error rates for network resource data topping 30 percent.

Paper labels

Engineers recorded information about fiber optic ports on paper labels that they stuck onto ports after installation, a task that was either forgotten or error-prone, as labels would fall off, become damaged or, when updated, become illegible. Data on port and fiber optic resources was incomplete and unreliable.

Manual O&M

O&M on fiber optic resources involved manually identifying fibers and manual searches on the passive network. Efficiency was very low, and poor FON management had slammed the brakes on Shaanxi Mobile’s broadband service.

Lacking an information-based system, all work orders were also handled manually, and tickets took an average of 20 days to close.

Intelligent ODN

Intelligent ODN (iODN) boosts FON O&M efficiency by replacing paper and manual tasks with eID chips, iField site assistance tools, and an NMS for traditional ODNs.

iODN replaces paper labels with electronic tags (eID) on fiber jumpers at both ends. The system automatically reads and collects data on port status, connectivity, and topology for maximum accuracy. iODN uses iField or NMS channels to carry out automatic backhaul and reporting on resource data, eliminating human error and giving 100 percent accuracy.

To construct the intelligent ODF system, Shaanxi Mobile had to transform existing ODFs and integrate existing processes, but its network used multiple vendors’ ODFs and various sizes of ODF equipment arrays. Completing the network upgrade without interrupting services would require a large number of customized products to accommodate these different sizes.

Huawei performed thorough analysis and trials to develop its uniform transformation solution for arrays, which involved adding adjustable telescopic clasps at both ends of new arrays. In this way, the original arrays didn’t need to be replaced, and the original fiber optic routing didn’t need to be altered – by adjusting the distance between the retractable clasps, the solution easily fit different-sized arrays. Shaanxi Mobile could then upgrade its ODN with intelligent ODFs quickly and economically, without needing a large amount of customized equipment or lengthy service downtimes.

With the ODF transformation issues resolved, the remaining obstacles were integrating service processes into the iODN and overcoming legacy service process problems with offline
operations, complex work orders, slow ticket transfer, inefficient closed-loop management, and limited quality checks.

Shaanxi Mobile and Huawei designed engineering and embedding processes for intelligent fiber optic cables that automatically generated feedback results on managing fiber optic cable resources, eliminating the need for time-consuming resource comparisons and maximizing accuracy.

To resolve low monthly completion rates on work orders and delayed tickets, the following solutions were added to create a real-time closed-loop system: intelligent fiber core scheduling, network handover processes, unified IT processes, an OI hybrid network for issuing work orders in a unified way, and an automated ticket system.

Shaanxi Mobile and Huawei also worked with an OSS vendor to seamlessly integrate different IT processes into the iODNNMS, including the resource management, work order, and warning systems. The iODN digital O&M process linked disparate network service processes to completely solve problems relating to offline operations and inefficient management.

**iODN: Expected results**

**100 percent fiber port data accuracy**

Shaanxi Mobile has built 1,000 new intelligent ODFs and transformed more than 1,000. Optical fiber resource accuracy rate is now at 100 percent. In places where the network has been fully upgraded to the iODN system, all fiber optic equipment uses electronic tagging and automated data reports, making all resources visible in the resource management system and increasing fiber optic accuracy rates to 100 percent.

**Higher O&M efficiency**

O&M efficiency is expected to rise by more than 60 percent, and ticket closure efficiency by 90 percent. Moreover, the iODN management system has eliminated the manual resource inventory thanks to automated collection and verification. This alone is expected to save Shaanxi Mobile millions of yuan in O&M costs each year.

The electronic transfer of work orders through the iODN makes service provisioning much more efficient, and the closed-loop duration of work orders had dropped from an average of 20 days to 2 – a 90 percent increase in efficiency.

**A great team**

With total port shipments exceeding 10 million units, Huawei has deployed iODN in more than 100 networks for national broadband projects for operators including China Mobile, China Unicom, Singapore Telecom, and carriers in New Zealand. Standing together with operators, Huawei can rapidly integrate the iODN solution with operators’ O&M processes, helping them simplify usage, improve fiber optic management efficiency, and reduce O&M costs.