The Flexible Architecture Series:

Connectorisation in the OSP

ADC
KRONE

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When designing a next generation fibre network, every service provider wants to build an extremely flexible and reliable infrastructure–and to do so as quickly as possible and at the lowest possible cost. To achieve all of these objectives, carriers around the world increasingly rely on connectorised ("plug-and-play") solutions, rather than splicing, to create junctions throughout the network, including in the outside plant (OSP).

Specifically designed to ensure network reliability and flexibility, connectors reduce the number of splices required in the OSP and minimise the need for additional splice technicians. As a result, service providers can reduce both their installation costs and operating expenditures (OPEX). Connectors make it possible for technicians to handle installation, maintenance and troubleshooting tasks quickly and easily.

The Costs of Splicing

Efficient construction of the distribution plant is necessary if the service provider is to maintain adequate return-on-capital ratios and reduce the capital expenditures (CAPEX) required to make the network subscriber-ready.

In a typical FTTP architecture, for example, construction places a large distribution cable, containing anywhere from 48 to 216 individual fibres, from the Fibre Distribution Hub (FDH) directly to the service terminal. The service terminal can be a splice case, a pedestal, a hand-hole, or a pole-mounted terminal. When using a splicing approach, technicians must prepare the fibres at the service terminal, and connect the drop cables to the distribution fibre in order to deliver service to each home.

The rest of the distribution cable continues to the next service terminal where technicians again prepare fibres and make them available for service. Each time the provider is ready to turn up service at a particular home, a technician must go to the terminal, cut off the appropriate length of drop cable from a large spool, place the cable from the terminal to the optical network terminal (ONT) at the home, and splice both ends. This procedure often requires two sets of workers: a drop-placing crew and splice technicians.

The typical spliced approach, compared to a connectorised approach, incurs more overall manpower costs and numerous trips to the service terminals by experienced technicians, all of which increases the start-up costs and time required for the fibre build-out.

Connectors Offer a Faster, More Economical Solution

A connectorised strategy in the OSP reduces both initial construction costs and time, as well as the costs incurred by turning up service for each new customer. Because hardened connectors and adaptors mean the service provider does not have to dispatch a splicer, labour costs are much lower–and installation of the drop goes much faster.

ADC KRONE's Multi-Port Service Terminal (MST) uses hardened adaptors for the optical ports, and each port is sealed with a threaded dust cap to protect against dirt and moisture. MSTs are available in 2-, 4-, 6-, 8- or 12-port configurations, and the optical ports accept subscriber drop cables that are terminated with hardened connectors. After the technician has secured the MST, pre-connectorised drop cables provide easy connectivity from the MST to the ONT at the subscriber's residence.

Utilising a solution like the MST also eliminates the need for splice cases at the service terminal, which means the hand-holes or pedestals that store the service terminals can be much smaller and therefore can reduce materials costs, as well as simplify installation.

When using hardened connectors, technicians place smaller cables–up to 12 fibres each–from a centralised splice location to each MST service terminal location. Consequently, they do not need to run large cables and access those cables at numerous locations. Typically, the set-up accounts for a large portion of splice costs but, with a central splice point, the technician has to set up only one time.

Connectors Designed and Tested for OSP Reliability

Because hardened outdoor connectors are a critical link in the distribution network, they must undergo a full suite of tests to ensure the highest performance and reliability levels for OSP applications. A full qualification program includes an extensive sequence of harsh tests performed under the same real-world conditions likely to be found in the OSP during the service life of the connectors. They must meet Telcordia standards, such as GR-326, GR-771 and GR-3120, designed to test for robust and reliable environmental performance.

To comply with these and other standards, vendors such as ADC KRONE conduct a battery of tests to expose the rugged connector and adaptor to thermal aging, thermal cycling, humidity aging, humidity condensation cycling, and post-thermal cycling. These components then undergo vibration testing and a full range of mechanical stress tests, including flex, torsion, proof, and transmission with applied load.

Additional requirements include impact and crush-resistance testing to simulate normal incidental forces. Vendors test for water intrusion while submerging the connectors in 3.05 metres (10 feet) of water while also applying mechanical stresses. The hardened connector system undergoes still more tests to certify that it can withstand cyclical freeze-thaw conditions while fully submerged. A variety of optical monitoring tests verify the connector's ability to withstand the rigours of the harsh testing environment while maintaining required insertion loss and reflection performance during and after the extreme exposure. In addition to service-life testing, a full regiment of reliability tests certifies the longevity of the hardened connector system.

Proven OPEX Savings

Using an ADC KRONE cost study featuring the MST as an example (see table on last page), it is possible to illustrate how connectorised solutions begin to deliver operational savings after service turn-up as well. Consider a 192-home subdivision and compare splicing vs. a connectorised approach using the MST. Despite the additional costs of adding more service terminals, the savings in fibre cable, cable placement, and splicing more than offset the added expense of the hardened connector system. In fact, the study confirmed that the hardened-connector approach incurs lower overall installed costs throughout the fibre network.

ADC KRONE continues to make it easier for service providers to construct, operate and maintain fibre networks that are cost-effective, flexible and reliable. The use of hardened connectors and adaptors requires fewer splicing technicians, minimising splicing costs and allowing easy access for troubleshooting and maintenance. This translates into faster service turn-up and huge operational savings for service providers. Not surprisingly, leading service providers around the world are adopting a connectorised strategy to save time and money in the OSP and other areas of the next generation network. In doing so, they are gaining an unbeatable competitive advantage in the marketplace.

Table 1. Connectorised Savings (In U.S. Dollars)

SPLICED APPROACH		HARDENED DROP CONNECTOR APPROACH	
Hand-Hole Costs	$ 10,000.00	Hand-Hole Costs	$ 11,194.00
Cable Costs	$ 15,000.00	Cable Costs	$ 1,5380.00
Cable Placing Costs	$ 75,000.00	Cable Placing Costs	$ 56,650.00
Splicing costs	$ 9,072.00	Splicing costs	$ 2,988.00
Terminal Costs	$ 0.00	Terminal Costs	$ 16,072.00
Total Costs	**$ 109,072.00**	**Total Costs**	**$ 88,772.00**
Cost/Home Passed	**$ 568.08**	**Cost/Home Passed**	**$ 460.63**
Specific cost model based on a phased project for a U.S.-based 192 home subdivision featuring eight homes per block.			

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