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**The Flexible Architecture Series:**  
The Role and Value of Connectorization  
Throughout the Network



## The Flexible Architecture Series:

# Role and Value of Connectorization

### Throughout the Network



When building Next Generation Networks, service providers around the world obviously must balance construction-cost considerations with the need to install flexible, reliable and long-lasting networks. Leading service providers are discovering that one way to achieve that balance is to use connectors, rather than splicing, wherever possible to create junctions in the network.

For more than 20 years, service providers have benefited from the advantages provided by connector interface points inside the central office (CO); these advantages include easy access for troubleshooting, re-configuring the network and turning up services. Now, more and more service providers are achieving the same advantages throughout the network; specifically, they are using connectors at appropriate locations not only in the CO but also in the outside plant (OSP) and at the customer premises. In the case of the latter, connectors are proving to be especially valuable in multiple dwelling unit (MDU) installations.

By adopting a connectorization or "plug-and-play" strategy wherever possible across the network, service providers can:

- quickly deploy flexible, reliable fiber infrastructures
- reduce the number of splices, splice technicians and splice crews required for installation and maintenance
- lower their operating expenditures (OPEX)
- turn up services quickly
- deliver bandwidth cost-effectively
- speed up return on investment

## In the CO

Within the CO, one of the most valuable aspects of a connectorization strategy is the multi-fiber push-on (MPO) connector. Using an MPO connector, a technician can terminate multiple fibers with one connection, rather than needing an SC connector to terminate each individual fiber. Although the MPO connector first appeared several years ago, its use generally was limited to multimode fiber applications within data centers. It is relatively new to the CO, in part because of the higher initial costs of connectorization, relative to splicing. However, for many service providers, these higher up-front costs may be offset by the lower opex that results from having to make fewer splices and from needing only one MPO connector to make multiple connections on the back of a panel. The MPO connector now is an industry standard, and the Telcordia GR-1435 specification defines the baseline requirements for MPO performance levels.

Within the CO, where physical space is at a premium, and single-mode applications are necessary, service providers clearly want a small form factor footprint. Vendors such as ADC have responded by producing 8- and 12-fiber MPOs, thereby making high-performance connectorization possible for much of the active equipment. In fact, ADC produces MPOs for use in applications in the CO, using large MPO connectors in distribution-type cables to house higher fiber counts. The interconnect cables, which typically contain 8 or 12 fibers, function as single-ribbon patch cords. Original equipment manufacturers (OEMs) also use MPO connectors as well, including inside the passive panel used for fiber management and in a termination panel on a large frame containing a switch or router.

Another plug-and-play approach in the CO centers on a “breakout style” assembly—a more rugged cable that plugs directly into the active equipment on one side, with the frame on the other side. Although it resembles a patch cord, the breakout assembly contains up to 24 fibers. Plugged directly into a transceiver—for example, video equipment—and with only one cable required for each shelf, the assembly makes it much easier for service providers to configure the network.

## Throughout the OSP

If service providers expect to maintain adequate return-on-capital ratios and to reduce the capital expenditures (capex) required to make the network subscriber-ready, they obviously need to build an efficient fiber distribution plant. Ever since service providers began more than a decade ago to build fiber networks, they typically have created the distribution segment by splicing drop cables at drop points during the actual construction phase.

However, the emergence of hardened connectors and adapters has enabled service providers across the globe

to expedite construction of their fiber distribution plants. By dramatically reducing the number of splicing hours required to turn up new serving areas, hardened connectors and adapters also have helped service providers save on labor costs during network construction. These savings in time and cost translate into even more savings when it comes to deploying services.

Technological advances, along with increases in the volume of fiber equipment, have significantly improved connector quality and performance in the network. Manufacturers now design and test hardened connectors specifically for use in the OSP. Improved manufacturing processes, combined with stringent performance standards, such as the Telcordia GR-326-CORE specification, have resulted in:

- lower insertion and return loss
- automated tuning
- superior endface workmanship
- vastly improved factory-termination methods

Manufacturers integrate hardened adapters into environmentally sealed, pre-terminated multiport service terminals; with pre-terminated cables, using 50 to 2,000 feet of OSP cable in 2-, 4-, 6-, 8- or 12-fiber configurations. With each MST tail returning to a centralized splicing point, splicing crews now need much less time than before to make the same number of splices.

With simple, fast mounting options, the MST not only reduces splicing time and costs but also accelerates the overall rate of service deployment.

Each terminal ships with a bracket or adapter that is specifically designed for the OSP environment, and technicians can install them in hand-holes or pedestals, mount them on utility poles, overhead strand or simply secure the terminals to any flat surface.

At service turn-up, connectorized solutions begin to deliver operational savings as well. With a splicing approach, installers may have put in the drop cable during initial plant construction, or the service provider may have to dispatch splice crews to turn up new customers. However, technicians now can install the drop cable without splice labor by simply inserting the factory-connectorized cable into adapter ports at the MST and at the optical network terminal (ONT) on the customer premise.

Hardened drop cables are factory-connectorized assemblies with hardened connectors on each end. Manufacturers pre-test them and certify that they satisfy performance requirements. Further, a cap or plug protects each hardened connector and adapter until a provider puts it into service and, after the connector is engaged with the adapter, a watertight O-ring seals it. An arrow on the hardened connector aligns with a



notch on the adapter to ensure precise alignment into the optical port. Finally, simplified connector cleaning techniques make it even easier for technicians to connect and maintain the OSP portion of the network.

### Into the MDU

As shown thus far, a connectorized or plug-and-play solution accelerates the installation of all portions of the fiber network. Yet nowhere is that speed-of-installation advantage more evident than in MDUs—and a building owner is much more likely to choose a fiber architecture if the fiber installers can be in and out of the building as quickly as the construction workers.

For example, within a mid- or high-rise building, a service provider deploys on the lower level an indoor fiber distribution hub (FDH) with several 144-fiber stubs. Residing on each floor of the building is a fiber distribution terminal (FDT) that routes 12 or 24 fibers down to the indoor FDH where technicians splice them in. In this scenario, technicians would have to splice 288 fibers between the FDH and the FDTs. This approach creates another splice point because it is impossible to predict the exact length of each cable.

Compare that scenario with using a plug-and-play solution within the same MDU. Again, an FDT resides on each floor, but in this case, an MPO connector is mounted on the stub end of each cable. Installers deploy the fiber from each FDT to the indoor FDH, which now also has built-in 12-fiber MPO connectors. Installers can easily plug each connection into the FDH from every floor. In other words, installing fiber in an MDU is a simple matter of mounting the enclosures and making plug-and-play connections with the cables.

Further speeding up and simplifying the installation work is a built-in fiber spool on the FDT. Because the distance varies from each FDT to the FDH, the spool holds up to 500 feet of fiber cable. Installers can easily spool the cable out to the FDH and plug it in, and any extra cable remains neatly coiled on the spool. Installers can lock down the small box containing the spool with a shroud that covers and protects the excess fiber.

A connectorized strategy enables installers to get into and out of the building much faster. Equally important, it minimizes one of the biggest problems service providers encounter throughout the network: the cost, in both time and money, of splicing operations, especially in MDUs. A technician typically takes about an hour to splice 12 fibers; that labor cost may be as high as \$100 per hour. In addition, a service provider has the capex costs of splicing—including the splice machines themselves, which cost as much as \$30,000 each, plus cleaving machines and stripping equipment. After comparing a connectorized approach with splicing, in terms of installation time and labor plus capital-equipment costs, more and more service providers today

recognize that connectorization offers tremendous advantages over splicing.

### A Connectorization Strategy Delivers Competitive Advantages

Connectorized fiber is enabling a growing number of service providers around the world to strike a practical balance between network construction costs and long-term network flexibility and reliability. By using connectors where they make the most sense in the CO, the OSP and on the customer premises, today's top service providers achieve several advantages they cannot get from splicing, including:

- easy access for troubleshooting, re-configuring the network and turning up services
- reduced labor cost
- lower OPEX
- more cost-effective delivery of bandwidth
- superior long-term performance of the network
- faster return on infrastructure investments

Today's next-generation connectorized solutions are proving their value throughout fiber networks around the world. For more and more service providers, connectorization is an essential component for long-term success in an increasingly competitive market.

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