Is Plug and Play The Future of FTTH?

An FTTH innovation first introduced a decade ago has finally come of age. Plug-and-play solutions now offer practical alternatives to splicing drop cables, even in MDU applications.

By Brian Schrand ■ *Clearfield*

Today, service providers, consultants, engineering companies and contractors are combining forces to develop new ways to build fiber-to-the-home networks. The methods they use are, in most cases, based on a set of traditional standards developed during many years of deploying copper cables. The methods used to install twisted-pair, coax and fiber cables in networks are very similar.

There are two types of deployments. In the aerial method, cables are lashed to a steel messenger cable from pole to pole. An opening is made on a cable to access the conductor or, in some cases, the coax conductor. A protective cover or terminal is then placed over the opening.

In the underground method, cables are pulled through a conduit from a manhole, pedestal or handhole. Again, an access point is opened on the cable, and an interface or terminal is placed. From this access point or terminal, a drop, or service cable, is connected and run to the living space or home.

In copper and coax networks, hooking up drop cables is relatively simple. A technician terminates the cable by stripping the insulation off the conductors and wrapping the cable around a post – or, in the case of coax, by putting on a connector and screwing it into a tap. This is a simple and easy technique for techs to perform in the field. However, that's where the similarity between copper and fiber stops. Because fiber is glass, placing a connector on it requires a skilled tech and expensive equipment.

As a result, building an FTTH network in the traditional way is labor intensive, especially in the area of splicing. In most cases, 70 percent of the capital outlay goes to labor costs. Because of this, manufacturers are being pushed to develop a more cost-effective way to build these networks.

PLUG AND PLAY THE FTTH WAY

The next evolution in FTTH is a decade-old innovation that has finally come of age: plug-and-play network elements. When connectorization replaces splicing, the need for skilled labor is reduced and the cost of deploying an FTTH network goes down.

Of course, reliability is as important as cost. When a tech places a connector on a fiber, the fiber is exposed to the elements. Dirt is a major enemy of fiber. A speck of dust can affect the light traveling through the fiber, resulting in optical loss and directly bearing on the level of service. For this reason, connectorizing fiber inside in a controlled environment is almost always safer. Any time fiber terminations can be mass-produced indoors in a controlled environment, the cost will go down and reliability of connectors will increase.

Companies tend to look at labor and material costs independently when they build FTTH networks. Price is still a sticking point for modular products when they are compared with more traditional network elements. However, if the total cost of labor and materials is examined, the modular design will win out.

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Consumers have adopted the plug-and-play approach for the sake of convenience. For example, when a person

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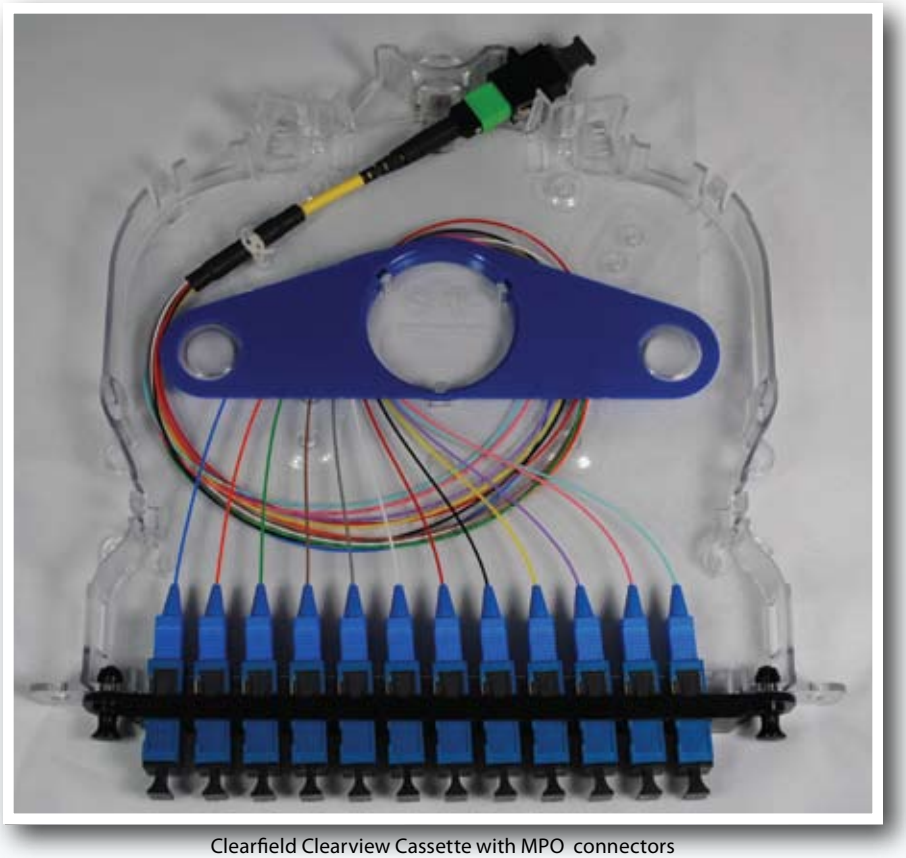

Clearfield Clearview Cassette with MPO connectors

buys an RJ45 patch cord to connect a modem or network interface device to a home computer, the cord is terminated on both ends. Why don't service providers do this?

Currently, mechanical transfer pull-off/multifiber push-on (MTP/MPO) connectors are available in 4-, 8- and 12-fiber configurations. This type of connector first gained popularity in enterprise networks, where data was the only content being delivered and where the distance between network elements was short enough that loss was not a significant issue. However, these connectors were not nearly as popular in service provider networks because of their performance limitations.

Previous versions of MTP/MPO displayed insertion and return-loss performance that failed to meet the tight link-loss requirements of the networks service providers were building. Losses of between 2 dB and 5 dB were not uncommon and would have forced service providers to invest in expensive equipment to compensate. What's more, producing multiple-count fiber connectors was expensive because of the precision required in the manufacturing process. Manufacturers would have had to sell large quantities of connectors to recoup their costs.

Another obstacle to producing low-count multifiber connectors has been the fact that different manufacturers produce cables, fiber terminations and network equipment. These manufacturers need to share technologies and work together to develop a group of products that will mesh. No service provider is likely to jump into using expensive connectors that are inconsistent in their performance across all channels.

THE ONLY CONSTANT IS CHANGE

Many things have changed. MTP/MPO connectors are now built to a standard, even though the varieties of male, female and keyed connectors can still be confusing. Performance has dramatically improved. A premium connector now will yield a guaranteed .3 dB of loss across all channels. For a 12-fiber connector, this is impressive.

Improvements in manufacturing processes and techniques are producing capable, repeatable and higher first-pass yields, resulting in more acceptances in the industry. This, in turn, is driving prices down to more attractive levels. Considering standards, performance and cost together, new multifiber connectors can now compete for the favor of service providers looking for a more flexible, modular and rapid way to deploy fiber into access networks.

Before the introduction of FTTH, outside-plant engineers used fiber mostly for the transport of large amounts of data between offices. Fiber cables were terminated on a patch panel in an office where circuits were patched through via single- or dual-fiber patch cords. Hence, the single-fiber connector was, and still is, the most widely used.

The advent of FTTH creates a need for connectors with counts between one and 12, especially in the MDU environment. Typically, an engineer designs an FTTH network with terminals feeding between four and six homes – a carry-over from the days of designing copper networks.

This design has been carried over to allow ease of service hookup for the installation technician (hence the industry term "time of dispatch"). In the FTTH world, decreasing the time of dispatch has been a challenge for all carriers. Because a typical service installation requires anywhere from four to eight hours, any time that can be shaved off the install translates into cost savings and a better customer experience. A modular network helps reduce the labor required for installation as well as splicing.

In MDU applications, some providers are taking fiber only to the building and terminating it to active electronics. From the optical network terminal, they use twisted pair and coax to deliver services to individual living units. This helps minimize the labor associated with installation, but in the long run, it will limit the amount of bandwidth that can be delivered to each customer. To avoid this problem, many providers now deploy fiber all the way to the living unit, a labor-intensive approach that results in spending more capital.

For providers that want to deploy fiber to each living unit, the plug-and-play solution is the best fit. Bringing multiple

FieldSmart Fiber Crossover Distribution System loaded with two Clearview Cassettes

FieldSmart Fiber Crossover Distribution System, rear view (MTP visible)

connectorized fibers to a common distribution point where single connectorized drops can home-run to each living space greatly reduces the time and skill level needed for installation.

MPO IS BACK

The new and improved MTP/MPO connectors designed for service provider networks are now making their way into the product development roadmaps of active and passive gear manufacturers. Manufacturers are beginning to incorporate this technology into fiber terminating equipment so they can offer plug-and-play solutions.

MPO is also an attractive solution because, like "stick and click" (SC), it is a de facto industry standard. The ability of the MPO design to accommodate from one to 12 fibers also makes it an attractive option for plug-and-play products. The only factor holding up the usage of MPO connectors is cost. Because MPO products haven't been widely developed in the industry, this standard is still not seen as a cost-effective option.

Now that single-fiber, double-ended drops have become the most rapid way to deploy final connectivity to the user, the same approach can be pushed further upstream. MPO technology can also be used to connect primary distribution feeds to an access point. As MPO connectors can be used in counts up to 12 (which is, not coincidentally, the way most fiber constructions are built today), a fiber management solution that consolidates, distributes and protects 12 fibers at a time makes sense. That is the Clearfield Clearview Cassette.

The Clearview Cassette is an independent, portable 12-fiber management device that becomes the multiplier for the entire Clearfield product line throughout the access network and, in particular, MDU environments within the access network. The Clearview Cassette has an MPO connectivity feed that supports pushable, terminated solutions to and from the cassette, such as the optical fiber protection system from Miniflex. In the Miniflex system, a preterminated MPO and single-fiber drop with a high-density polyethylene (HDPE), ruggedized, 3 mm crush-resistant jacket are pushed through a slightly larger 10 mm HDPE duct. This provides a rapid and small-profile-footprint way of getting fiber where it's needed, fast.

COLLABORATING ON SOLUTIONS

In conclusion, with the increasing deployment of fiber in FTTH, data center, smart-grid and wind-farm applications, the demand for skilled splicing technicians will grow. Today's limited pool of technicians will not be able to keep up with demand, and the learning curve for future techs will be too great. There is a need to develop a simple, cost-effective, low-count fiber connector that can be incorporated into a full gamut of products. The MTP/MPO connector is currently leading the race.

However, a connector alone does not make an entire fiber management solution. Modular and scalable building blocks that accept the MPO and then provide a seamless transition to single-fiber connectivity to the user in an intuitive and repeatable way will reduce learning curves and service turn-up time with minimal labor costs. Manufacturers of fiber network gear must collaborate to provide complete plug-and-play solutions. The Clearfield FieldSmart product line based on the Clearview Cassette, along with the Miniflex Optical Fiber Protection System, is an example of such a collaboration of technologies. **BBP**

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