Overcoming installation challenges in the last 200 meters to the premises

Today's fiber-to-the-premises (FTTP) service providers are being challenged with maintaining adequate return-on-investment (ROI) ratios while cutting capital expenditures (CAPEX) to make their networks subscriber-ready. Nowhere in the network is this more apparent than within the last 200 meters to the customer premises.

So to set the stage, it's important to answer the question, "why is the last 200 meters of the optical network typically the most expensive part of the network to build?" The simple answer is that the overall deployment costs are no longer divided among multiple customers. You are dealing with a specific structure, such as an office complex or MDU. Yet, there are still lots of expenses associated with trenching cable, stretching cable across telephone poles or finding other ways to get from the access point of the network to the fiber distribution hub.

So whether deploying fiber to a new or existing structure, installers face unique obstacles that threaten both their time and cost plans for turning up service to new customers. From high-rise MDUs to condominiums and from rural commercial buildings to town houses, each building type poses different installation requirements and unique challenges for making the fiber connection. Despite even the most careful planning, installers must typically contend with unique obstacles that will slow and delay connections in the final push to the structure.

Limited space on poles, in hand-holes and other serving areas present new challenges in deploying service terminals, drop cables and other fiber equipment in the final 200 meters. Installers may even be required to route fiber under a driveway, through soil, around a septic system or into a building with limited conduit or equipment space. At other times, service providers often must contend with local municipality requirements, city ordinances and home association regulations, all of which can add to installation delays and make the final connection to the structure more challenging. Finally, service providers must consider aesthetics as they deploy their equipment. Property owners are extremely sensitive to unsightly equipment being installed in view of their paying tenants.

This paper will address how these unknown and sometimes unimaginable scenarios can compound labor, time and cost significantly when turning up even a single customer. It will discuss some of these installation challenges and offer strategies and solutions for improving cost efficiencies in the last 200 meters to the home or business. Alternative technologies will also be explored for enabling faster and easier connections and adding greater flexibility to this section of the network.

Installing the last 200 meters

Service providers must also deal with all the unique challenges posed by each building or property and all the owner concerns. This involves being as unobtrusive as possible to areas in and around the structure, as well as making everything as pleasing to the eye as possible. Aesthetics are a huge concern for property owners as they woo prospective tenants.

These are some of the challenges that really complicate and add cost to deploying this portion of the network. It's essentially the most unfamiliar area of the network to installers – the area over which they have little or no control. Even though the installer knows where the telephone poles are located, he may not know the exact distance (minus any obstacles) from the residence to a pole, distances between building floors, congestion challenges of an MDU, or other challenges that present themselves in the last 200 meters of the network. Cost surveys and variability costs can quickly run up overall costs in the outside plant (OSP) or MDU environment over the last 200 meters – more than in any other part of the network.

Connectorized or spliced architecture?

Much has been documented about the advantages and disadvantages of using connectors or splices in the network, and in the final analysis it typically boils down to which part of the network is actually being considered. Under different circumstances, splicing has advantages in some parts of the network while connectorization is better in other areas. The decision to splice or connect should always be a major consideration when planning the overall network.

In the final 200 meters, each approach will weigh in with its own set of advantages and disadvantages. For example, while a connectorized approach offers maximum flexibility and the lowest possible construction costs, in terms of components a spliced architecture lowers cost by eliminating connectors and adapters. Less connectorization also ensures the lowest possible optical losses.

The use of pre-connectorized equipment provides the fastest installation times and may make all the difference when facing an unexpected obstacle that requires an onsite "quick fix" to a potential progress-halting problem. Allowing an installer to use pre-connectorized products wherever it makes sense lowers construction costs that directly relate to the cost of labor. One the other hand, splicing eliminates overlength components and much of the need for slack storage. However, splicing requires the scheduling of skilled labor at the site, whereas plugging in a connector requires no special skills.

While a connectorized approach maximizes flexibility and easier growth potential for adding more customers to the network, a spliced approach may make the network more robust. There is less potential for anyone to tamper with the network following installation. The easier access provided through connectorization allows potential for the possible introduction of faults at more places in the network. Still, connectorization offers the advantage of delaying costs by enabling changes "on the fly" and faster troubleshooting/ maintenance times. For example, if a customer encounters an issue with a particular fiber, a different fiber path can quickly be established. The customer can be up and running even before repairs are actually made to the network. This also speaks to cost delay because providers are not required to have huge amounts of cable out to the network.

More simply put, service providers can either experience faster deployments by installing everything day one and incurring lots of immediate cost, or they can opt for connectorized products (or even splice after the fact) which will help delay much of the cost. The advantage of connectorization, however, is that it reduces the long-term cost while not incurring a lot of up-front cost. It becomes a matter of finding the "sweet spot" between spending big for everything at once or waiting to spend at the time of customer turn-up (keeping in mind that it's typically a single customer on the last 200 meters).

It's fair to say that a lot of the cost is incurred through splicing, so a brief comparison of the benefits between splicing and connectors is appropriate here. In any large FTTP deployment, there are infrastructure costs involved with maintaining many splices. Although it may appear in the initial plan that splices will be less expensive, there are certain realities to consider. First, are there enough skilled splicers available in the area? Even in low-cost regions where splicing may be a less expensive option, there are not enough skilled splicers available. And when time is money, this can add dramatically to time and cost.

But more important is the cost of ending up with much less flexibility within the network. If a problem occurs in an all-spliced network, there are only two test access points

available – at the residence (taking the customer out of service) and at the central office (by taking down multiple customers). Without any connectors along the way, it can be very difficult to pinpoint the problem. Connectorization provides multiple points of access.

For example, if a drop cable goes bad, the technician can simply go to the terminal, make a quick replacement, and have the customer back in service within an hour. The idea is to quickly re-establish service to the customer, so even if a temporary pre-connectorized cable is placed across a yard, service can be resumed while the bigger issue is addressed and corrected. The bottom line is that a connectorized solution within the last 200 meters provides maximum flexibility to troubleshoot and correct a problem much faster than in a spliced solution – critical when there are cost implications to excessive downtime.

Reducing space requirements

Challenges related to space and size must be met with proper equipment and techniques in premises locations. Gaining access to homes and businesses by such methods as drilling through floors or walls can be very disruptive. Equipment and cables in years past were not developed specifically for premises networking where space is a huge concern, much like in the central office areas.

However, new technologies, such as reduced bend-radius fiber and miniaturization techniques, have made connectorized products extremely adaptable to much smaller spaces, even all the way to the desktop optical network terminal (ONT). Therefore, speed of installation is achievable without intruding on the customer premises. Even though an all-spliced solution may be smaller at the premises, new versions of connectorized solutions using smaller bend resistant cables, strippable drop cables, miniaturized MPO connectors and other space-saving technologies, are providing a much less intrusive connectorized plant within a premises building environment. Therefore, installers can use connectorized solutions that provide much more flexibility all the way to the desktop.

In the OSP portion of the last 200 meters, spliced solutions require more space due to the space requirements to access larger cables. The result is large spools hanging from telephone poles, large splice cases and, in general, much larger pieces of equipment throughout the OSP network. However, as previously mentioned, splicing still reduces the potential for introducing faults to the network and, ultimately, minimizes optical losses.

Tools and techniques

Speed of installation is a key component of deploying a successful FTTP network, but it's particularly true for the last 200 meters. Although product selection and the decision to splice or connectorize are important elements, as previously stated, the standardization of tools and techniques cannot be overstated. Developing standardization in the installation process equates to faster deployments and cost savings.

When installation crews are faced with having to be creative in deployment methods, both in the OSP and the MDU environment, time and money is wasted and the installation is delayed. On the other hand, when crews can take a standard set of products to the site, the "look and feel" will always be similar and familiar, with the only exception being the typical engineering work that is required.

Products are on the market today that allow this type of standardization. Fiber cable reels, strippable drop cables, hardened connectors, miniature cables and connectors, and other equipment all contribute to standardized practices and techniques that can be used in numerous different deployment scenarios.

Reduced inventory

This standardization of tools and techniques also adapts itself to reducing inventories, not just in warehouses, but also on the trucks that are rolling out to the installation sites. As previously stated, FTTP deployments can be riddled with unexpected issues and challenges to the installers. Connectorized products are being adapted to meet these challenges head-on. For example, using miniaturized cables

with reel technology provides a huge amount of flexibility when distances might vary due to obstacles. New innovative solutions that directly integrate over-length cable storage are already available for wall plates, drop cables and indoor/outdoor terminals.

Miniaturized cables and connectors offer more flexibility and are another way to standardize inventories. Strippable drop cables that can run end to end while stripping out single cables where required also reduces inventory requirements. Inventory reduction and standardization work together to help installers develop repeatable techniques that will work in the majority of FTTP deployments, and save time and money in the last 200 meters.

Appeal to the eye

Once the service is installed and operating, the biggest concern of the end-user is how the equipment actually looks inside and outside the building. Exposed cables, bulky cabinets and noticeable equipment are unacceptable. Once again, this is where "smaller is better. For instance, reduced bend-radius fiber is now available in smaller diameters for use inside any type of structure to provide maximum overall fiber management.

If cables must be visible, they should always be very intuitive and present a clean look, as opposed to bulky cables or hanging wires. Aesthetics also relates to flexibility. For example, if an installer is faced with the challenge of hanging a cumbersome box on a wall where it's not going to look good – having a "wall-mount-only" piece of equipment is going to present a considerable challenge in terms of the aesthetics. But if that same box has the flexibility to be mounted on a wall, pole or in a hole, the installer is left with options and can make a quick decision.

Expecting the unexpected

The last 200 meters is by far the most challenging piece of any FTTP network in terms of cost, installation time and ROI. Service providers have come to expect the unexpected. But much of the challenge can be minimized by making good architectural, technology and equipment decisions through careful planning. Although every deployment will present its own set of obstacles and unique circumstances to the installation crews, there are techniques and solutions that will significantly reduce labor and cost.

A pre-connectorized fiber architecture provides maximum flexibility and the lowest possible construction costs. New and smaller equipment and products specifically designed for FTTP deployments will save space, reduce inventories and provide proper aesthetics. Finally, overcoming installation obstacles and speeding up installations can be achieved by leveraging standardized installation techniques, practices and technologies and making them the norm for all FTTP deployments.

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