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■ APPLICATIONS

'Fiber to the MDU' is residential broadband's last frontier

By DAVID MEIS

A lot of excitement has surrounded fiber to the premises (FTTP) deployments in recent years—and with good reason. Most of these FTTP deployments have occurred in residential areas, more specifically to detached single-family homes. What service providers (SPs) have largely overlooked in the residential broadband segment to date is the lucrative opportunity presented by residences within multidwelling units (MDUs).

Rolling out "fiber to the MDU" (FTTM) certainly doesn't come without its fair share of challenges. But through understanding some of the key approaches and hurdles to deploying FTTM, SPs can capitalize on this largely untapped subscriber base. In fact, the dynamics of service penetration rate can also play more favorably into the hands of an SP when delivering FTTM versus fiber to the home (FTTH).

How to get there from here

Entities planning deployments to MDUs must, at a minimum, consider the following important parameters: whether the building is a new or existing structure, the building's size, and if residential unit entry is internal or external to the MDU. It's important to understand that each possible combination of these factors governs not only the deployment methodology, but also the product set used to optimize the network.

Which came first—the fiber or the sheetrock—is quite possibly the most significant parameter. When we sit back and envision what a greenfield deployment looks like, we often conjure images of vast cleared lots with nothing but contractor advertisements staked into the ground. Unfortunately, when discussing MDUs, "greenfield" could involve a number of deployment states that can range up to virtually completed buildings awaiting the first resident. This variety obviously affects the deployment approach since some greenfields may more closely resemble overbuild deployments.

With greenfield MDU construction, the fiber cable pathway is the most crucial element to sequence with the rest of the project events. Generally, the optical hardware accompanying the network, such as fiber distribution hubs (FDHs), fiber distribution terminals (FDTs), and network interface devices, can be placed with considerable flexibility. However, cable routing and placement are a whole different story.

For the cable itself, SPs must choose whether conduit will be placed for protection and future network scalability. The placement of conduit for cable pathways, of course, adds incremental cost to the deployment—but it can also facilitate the use of less robust distribution and drop cables within the building. Alternatively, SPs can choose to merely route optical distribution and drop cables within the walls without conduit. Many regard the passive optical infrastructure as largely futureproofed, so there is little perceived value in having the ability to swap out optical drop cables to upgrade a network in the future. In either case, there are benefits to consider, and these must be carefully weighed in making the final deployment decision.

The importance of securing the cable pathway in greenfield MDU deployments is also dependent on the size and type of residential entry for the structure at hand. More specifically, with small MDUs, many of which feature external residential entryways, the drop terminal and the drop cable itself may be routed externally to the struc-

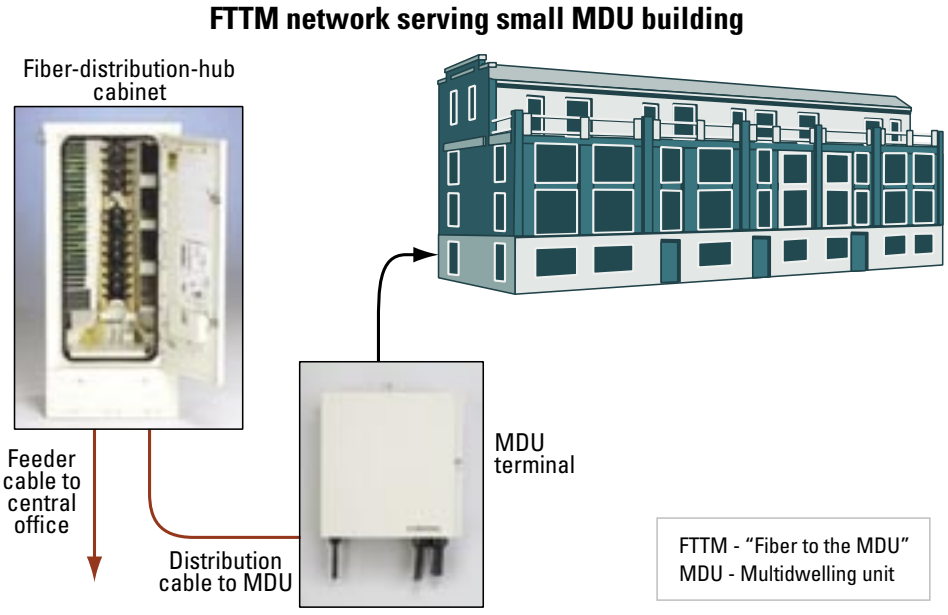

Figure 1. A fiber to the multidwelling-unit (FTTM) architecture can be similar to a single-residence PON. For a small multidwelling-unit (MDU) building, an MDU terminal can be mounted on the outside of the building. Separate cables run from this unit to individual subscribers within the building.

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ture, terminating at an optical-network terminal (ONT) mounted outside each unit. In these cases, standard outside plant (OSP) cables that do not carry flame ratings can be used, which also saves material cost. Buildings of this type allow an SP more flexibility in the approach and timing of FTTM deployment.

Overbuild FTTM deployments, or network overbuilds within existing buildings, require a good deal of planning to determine how the rollout of the network will result in minimal impact to the building and its eager occupants. It should come as no surprise that once again the optical-fiber pathway presents the major hurdle in these types of deployments. Things become much more complicated when the availability of hidden pathways for cable placement are either scarce or nonexistent.

When it comes down to it, deploying in overbuild situations may call for a touch of creativity. Today, there are innovative solutions available that turn attractive crown molding and baseboard runs into robust optical pathways, never to be noticed by the unsuspecting non-telecom-savvy resident. There is no need to get through or behind walls in most situations, with the exception of tapping a small path into the residential unit itself for the drop cable.

Options like these and others now afford SPs the opportunity to overbuild networks in the countless MDU buildings in existence already. Owners of MDU buildings should consider investing in these pathways independent of the SP to be prepared for a competitive communications infrastructure to attract tenants.

Putting it all together

Now that we have discussed some of the driving factors and design considerations that influence the direction of FTTM deployments, it's time to identify the network components that compose the optical link to these buildings. Bringing fiber to MDU buildings is really just an extension of a standard FTTH network in many respects. The biggest difference rests with the network topology; the true system architecture (i.e., PON with 1×32 splitting or a point-to-point network) remains the same. Additionally, the product mix will vary depending on the size of the MDU structure.

For deployments to smaller MDUs such as apartment buildings, condominiums, or town homes, the feeder and FDH portions of the network remain exactly the same as for an FTTH network servicing single-family homes. Where the two deployments diverge in topology is the fiber service terminal, also known as the network access point (NAP). Rather than a NAP terminal installed on an aerial strand or in a hand hole or pedestal in the neighborhood, a small MDU is most easily serviced with an MDU terminal that mounts directly on the outside of the structure.

An MDU terminal really serves the same function as an FTTH NAP terminal, which is a demarcation point for connecting drop cables to distribution fibers. These devices typically house connection ports for up to 12 drop cables that serve the units within the building. From the MDU terminal, drop cables can be incrementally added in a rapid manner as subscribers take service. For small MDU applications, these drops can be routed internally or externally to the structure to terminate at the individual residential ONTs. Figure 1 represents an approach for deploying fiber to small MDU buildings.

Stepping up to larger MDUs such as high-rise residential buildings, the network topology diverges even more from an FTTH product set. In residential buildings of this size, which commonly feature a basement or utilities space, the physical location of the FDH can actually be transitioned inside the structure. Therefore, a feeder cable from the central office or headend directly services this point in the network. For a PON, the FDH would hold the number of passive optical splitters required to serve the number of residential units within the MDU. The FDH for an MDU application differs from an OSP FDH in that it does not require the same level of environmental protection, and it can be wall-mounted in the interest of space preservation.

From the FDH, riser cables serving one or more floors are distributed in a manner anal-

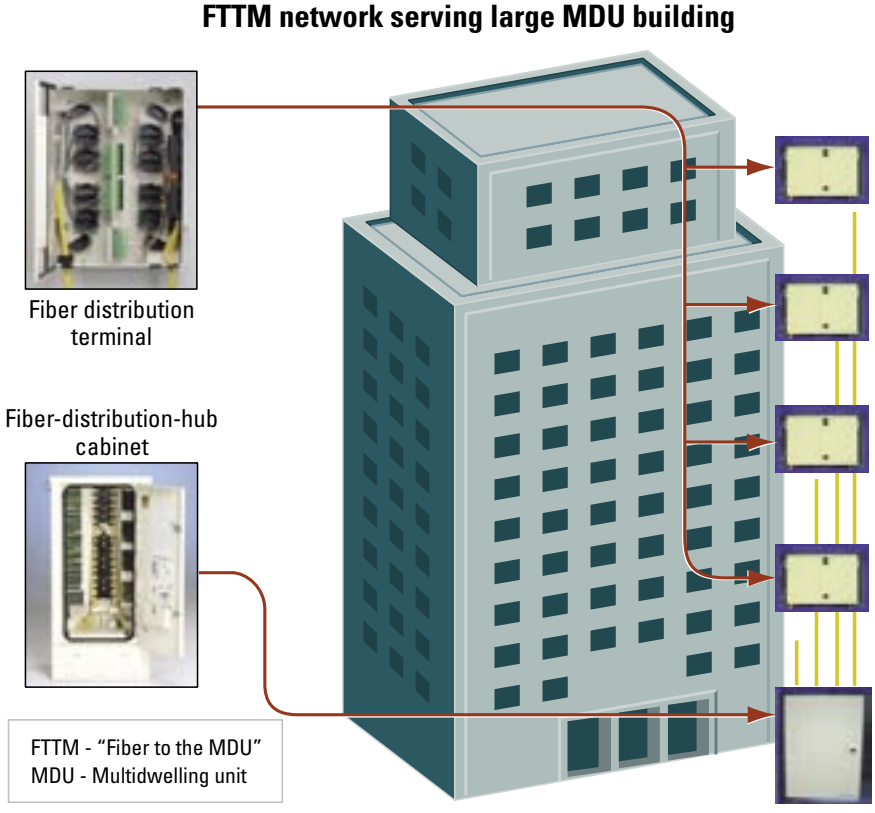

Figure 2. In a large multidwelling-unit (MDU) building, a feeder-distribution-hub cabinet can reside in the basement. Riser cables lead to fiber distribution terminals on each floor, from which distribution cables run to each subscriber.

ogous to the OSP distribution cable link in an FTTH network. These riser cables connect the output ports of the splitter for a PON or the feeder patch for a point-to-point network to the FDT. The FDT is essentially a thin-profile wall-mountable device that enables connection of drop cables to the distribution fibers. This component serves exactly the same purpose as the NAP terminal for an FTTH network and the MDU terminal for servicing small-sized MDU buildings.

From the FDT point, individual drop cables are connected and run to residential units, where the ONT resides just inside the living space. Figure 2 represents an approach for deploying fiber to large MDU buildings.

When exploring connectivity options between the optical hardware components within MDUs, there are some very advantageous approaches available that are facilitated by the very environment of the deployment spaces. Unlike OSP deployments, optical-link distances in an MDU structure are typically quite short. Additionally, there is really not a whole lot of difference in vertical floor spacing from one structure to the next, regardless of building size. Thus, the reasonably predictable floor and unit spacing coupled with short optical-link distances allows the optical components to be engineered, produced, and delivered in a customized form straight from the factory, should this option be chosen.

Certainly, each of the connection points in this type of deployment, from the FDH to the drop, can be fusion-spliced as the network is constructed, but a fully connectorized approach can greatly simplify and accelerate deployment within the building. In any case, the technology to make the optical network truly plug and play is available today and should be given serious consideration to optimize the deployment.

Ready, set, deploy

Looking at some of the issues and solutions surrounding the approach to FTTM deployments, it is apparent that this largely untapped residential broadband market is now ripe for the picking. Mass deployments of FTTH have already done wonders in aligning component costs with the budgets of SPs everywhere, from the largest of regional Bells to the smallest of independent telecommunications companies. This evolution in cost, coupled with many of the advanced labor-reducing products available today, have brightened the deployment picture and eliminated major barriers to entry for those looking to deploy this technology.

As the competitive battle for winning over residential subscribers will only continue to escalate in the years to come, there are now technology options available to service providers that enable these entities to cost-effectively place the advantage in their own hands. FTTH, and now FTTM, are the differentiating network technologies that ensure this advantage not only today, but also well into the future.

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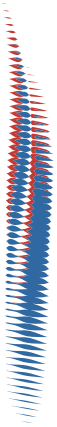

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