Powered Fiber Cable Adds Value to FTTH Networks

Powered fiber cables and PoE Extender technology open up new revenue streams for FTTH providers by enabling them to support such outdoor devices as surveillance cameras and Wi-Fi access points.

By Ryan Chappell / *TE Connectivity*

Operators of FTTH networks are looking beyond adding broadband subscribers to find new sources of revenue to better monetize their investments. One promising way to add revenue to an FTTH network is by deploying an outdoor network of Wi-Fi access points (APs) or HD video cameras and leasing access to these assets to entities such as municipalities, police departments, fire departments, homeowners associations or security firms. A powered fiber cable system, along with Power over Ethernet (PoE) Extender technology, can overcome power and protocol challenges to simplify the addition of Wi-Fi APs and HD video cameras to an FTTH network.

WI-FI AND VIDEO SURVEILLANCE ARE HOT

Video surveillance and Wi-Fi hotspots are both rapidly growing applications. According to Transparency Market Research, the global video surveillance market is slated to grow at an 18.1 percent CAGR from 2014 to 2020, and sales will increase from $14.98 billion in 2013 to $43.82 billion by the end of 2020. The drivers for this growth are an increased desire for security as well as rapidly declining costs for video cameras, which can now be purchased for as little as $80 each.

In the Wi-Fi space, municipalities' desire for ubiquitous Wi-Fi coverage as well as cellular carriers' need to offload mobile network traffic is driving growth. MarketsandMarkets forecasts the global Wi-Fi market to grow from $12.89 billion in 2014 to $26.19 billion by 2019. In terms of regions, North America is expected to be the largest market; Asia Pacific and Latin America are expected to experience increased market traction during the forecast period.

Though leasing access to FTTH networks for Wi-Fi and video surveillance is a good strategy for FTTH network operators, it poses challenges. Wi-Fi APs and HD video cameras require power as well as data connections, and these are not easy to establish in outdoor networks based on GPON technology.

THE CHALLENGES: POWER AND PROTOCOL

Access to power is the first challenge in adding devices to an FTTH network. The traditional method of getting power is to tie into local 120VAC power at the device location or to use PoE fed by the optical network terminal (ONT) inside a customer's office or residence (assuming the installed ONT offers PoE output and has this port available). Video cameras and Wi-Fi APs, however, are placed in outdoor areas, so it's not always feasible to use power from customer ONTs. That leaves local power as the primary option.

In any setting, HD video cameras or Wi-Fi APs must be placed in specific locations to perform as needed, but there may be no power

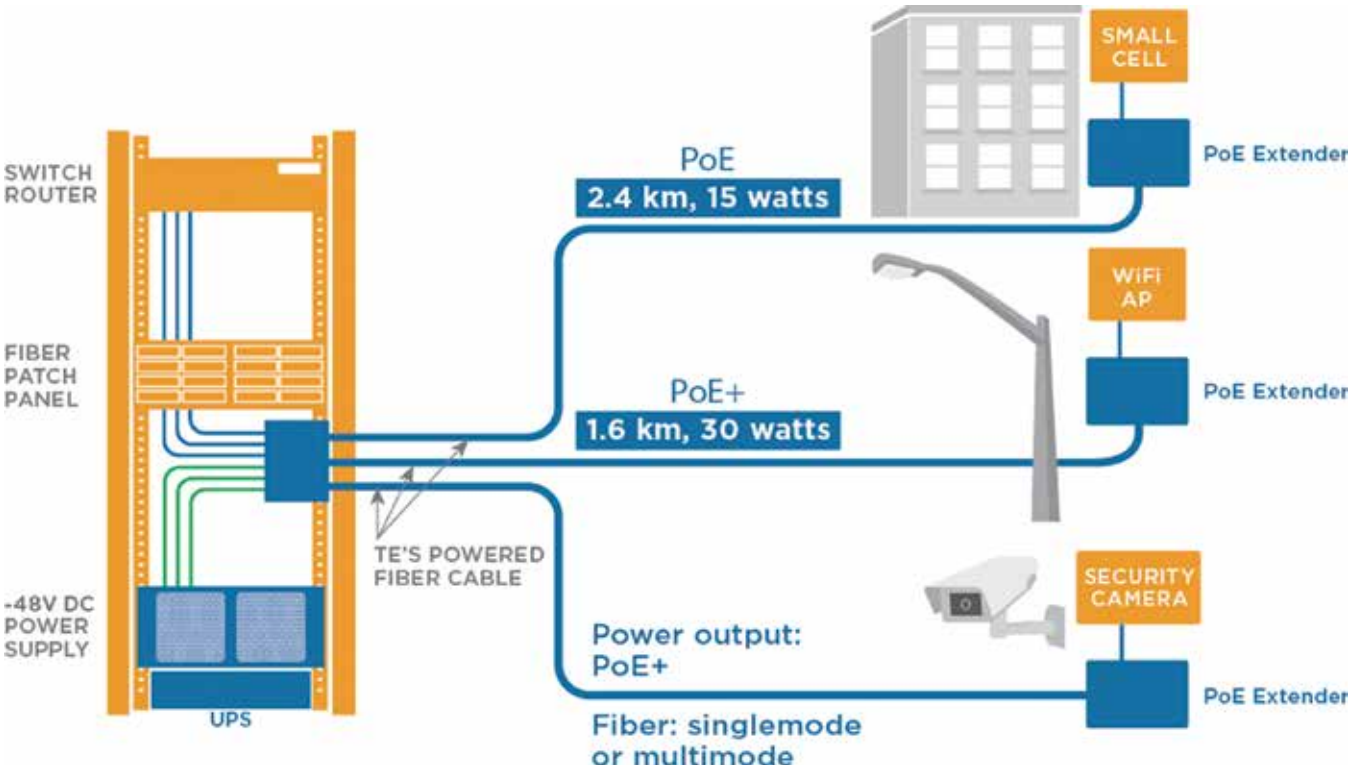

Figure 1: A powered fiber cable system

source near these locations, or accessing that power may be problematic. For example, a network operator that seeks to mount cameras or APs on powered light poles would have to negotiate with the utility company to get access to that power – a process that can take months and eat into the revenue the operator expects to receive from implementing the service. Some utilities may require operators to install expensive power meters to track power consumption and then require periodic payments based on individual meter readings. Alternatively, an operator may want to put a camera on the side of a building but then would have to negotiate with the building owner for power.

In any case, connecting to AC power requires an electrician to make the connection, which complicates the installation and adds time. 120VAC circuits may generally not be installed in the same conduits as communications cables because of electrical safety issues, so typically an AC connection must be installed in a separate conduit, adding expense and right-of-way issues into the mix. A configuration must usually then be custom engineered for converting AC to DC power, providing proper electrical protection for the outdoor environment, converting media properly (to GPON for most FTTx networks), connecting to the optical fiber network and building ruggedized housing to install this equipment.

PoE is a highly useful way of connecting and powering network devices such as HD video cameras and Wi-Fi APs. Because PoE functions within the low-voltage NEC Class 2 electrical code, PoE cables may be routed with other communications cables. However, the 100-meter maximum reach of PoE limits its applications. Some solutions exist to extend PoE marginally, but any real solution must bring power precisely where it is needed, even over considerable distances (up to a mile or more).

Converting the GPON protocol to PoE is the second challenge. Even if local power is available, the FTTH network's optical signal must be converted to an electrical PoE signal to power and communicate with cameras and Wi-Fi hotspots. A media converter usually handles this function, but media converters are bulky and not typically ruggedized for outdoor use.

POWERED FIBER CABLE AND POE EXTENDERS

A powered fiber cable combines single- or multimode fiber with copper power conductors. The cable system includes a rack-mounted power and optical fiber termination point, the cable and a remote termination node for each device that plugs into the cable. (See Figure 1.)

The system functions on low-voltage DC within the NEC Class 2 electrical code, so the network operator needn't have an electrician install connections at the remote sites. Staying within NEC Class 2 also allows the cables to be routed as any communications cable – no extra conduit runs are required as needed in typical Class 1 (120VAC) circuits. In short, a powered fiber cable system allows a network operator to

Powered fiber cable extends, rather than replaces, network fiber.

find a single power source and network connection and then extend that power and communication safely via hybrid optical/copper cable to all devices that need it.

The other part of the solution is called a PoE Extender. This small device connects to the end of a GPON network fiber and converts the signal to PoE for use with a video camera or an AP (Figure 2). Vendors that make optoelectronics for GPON networks have developed and offer GPON small form factor pluggable (SFP) transceiver modules, which an operator can plug into PoE Extenders to convert signals from GPON to Ethernet.

In the past, for low-voltage DC power transmission systems, electrical engineers and electricians had to calculate the voltage drop based on the power that devices drew and then size electrical conductors in cables based on that voltage drop. A PoE Extender eliminates this task because it automatically regulates voltage to a proper output at all distances up to its maximum range.

PoE Extenders include electrical protection against lightning strikes (gas discharge tubes handle up to 40k amp surges), accidental grounding (metal oxide varistors handle up to 4.5k amp surges), cable cuts, voltage surges due to AC line cross and other sources of interference. The electrical smoothing circuit "cleans" the power signal to correct for electromagnetic interference from sources such as nearby AC transformers, cell phone towers and radio towers over the long distance of the hybrid cable so that the power output to the camera or Wi-Fi AP is very stable. This power conditioning should improve device performance and add to device longevity by reducing heat due to electrical noise. Clean power input helps network devices perform more efficiently.

Together, a PoE Extender and a powered fiber cable make it possible to carry PoE for distances up to 3,000 meters. This capability overcomes the standard PoE distance limitation and makes it possible to power outdoor devices at an office park, a multifamily development or another venue.

Figure 2: A PoE Extender converts GPON signals to PoE and can extend PoE up to 3,000 meters.

DEPLOYMENT

Powered fiber cable does not replace the fiber in an FTTH deployment. Rather, it is used to tie into the FTTH network at a location where there is a power source (such as at the optical line terminal, or OLT) and extend power and connectivity to HD cameras and Wi-Fi APs. This allows an installer to tap into just one power source to power dozens of PoE devices.

At a golf course in south Florida, for example, the owners wanted to deploy 36 video cameras to cover the holes on the course. The farthest camera was 10,700 feet from the power source. Using powered fiber cable, the contractor was able to design a system that was $142,000 (14.5 percent) less expensive than running individual power and connectivity cables to each camera.

CONCLUSION

FTTH providers want to get more financial leverage out of their networks, and leasing access to HD video cameras or Wi-Fi APs is a good way to do that. Powered fiber cable and PoE extenders enable this monetization strategy by

- Extending PoE and connectivity to the precise location of each HD camera or Wi-Fi AP, wherever it needs to be for optimum performance
- Simplifying up-front network planning
- Converting GPON to PoE
- Eliminating the need for complex, time-consuming negotiations over local power sources
- Enabling low-cost labor by reducing the need for qualified electricians to install the system
- Reducing the cost to deploy PoE devices, thereby improving the business model. ❖

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