

Building Networks That Work

For apartment communities and rural communities, for wired networks and wireless networks, customer satisfaction was a common theme at **BROADBAND COMMUNITIES Summit 2012**. Networks must be designed and operated with a view to meeting customers' needs, today and in the future.

A BBC Staff Report

Challenges of Wiring MDUs With Fiber

"Bringing fiber into a multiple-dwelling-unit (MDU) property is one of the toughest things the industry has seen in a long time," Mark Boxer, applications engineering manager for OFS, said in the Summit's Vendor/Audience Roundtable on Inside-Plant Challenges. He identified tight spaces as the biggest challenge MDUs pose. "You have to go around doorframes and in hallways," he said. "There are unmanaged bends; you don't have the same latitude as in the outside plant, where you can control where everything goes. You need fiber that will actually make it there. Optical losses go up as the bends get tighter, and that problem is going to get tougher because the next generation of fiber to the home will use longer wavelengths. If you deploy a system today and you don't deploy the proper type of fiber, you can't upgrade to the next generation. The solution is bend-insensitive fiber."

Jay Borer, global business manager for 3M Communication Markets Division, cited another common MDU challenge: hallway aesthetics. "Why do I need a large raceway if fiber is so small?" he asked. 3M worked with Verizon to find a more aesthetically pleasing solution and came up with the One Pass Fiber Pathway. The size of a pencil, the One Pass runs almost invisibly down a building hallway; an even smaller form factor of the product is available for use inside apartments. "Now you can bring fiber to an outlet or to an optical network terminal (ONT) in a way that's unnoticeable to a tenant," Borer said.

Tight spaces, concerns about aesthetics and unpredictable building designs are among the challenges of delivering fiber to the unit.

Erik Gronvall, manager of product management for TE Connectivity, noted that the challenges of tight spaces and aesthetics combined to create a third challenge: unpredictable design variations. "You might have to put a product in a 5-foot by 5-foot space or in an air ducting system.... I can't tell you today what I'm going to need, so the product has to be able to be configured on site."

Small MDU buildings have special challenges because they have even fewer pathways for cables than high-rise buildings. "If cable pathways are too congested, you can use microduct," Borer said, "but that takes much time and labor. The One Pass Fiber Pathway is a possibility or square latch molding with individual drop cables. If you put the ONT in the living room, it's much easier to mount."

Inside wiring sometimes ends up on the outside wall if risers are full or unavailable. "You can start at the top or the bottom," Boxer explained, "and run the cable down the side of the building, putting individual drop bundles at the window spacings. This is one of the fastest, least expensive ways to install fiber. The downside is that it's ugly." Many products are available to disguise fiber on an

outside wall. Usually, the finished product looks like a downspout or a window treatment.

WHY RUN FIBER TO THE UNIT?

If retrofitting fiber to individual living units is such a challenge, one audience member asked, why not simply put ONTs in building basements and use existing copper wiring to reach the units? Gronvall explained that service providers can't always determine whether the existing copper will support the services they want to offer.

Boxer added that ONTs made for installation in apartment units are less expensive than outdoor ONTs because they do not require environmental protection. Because technicians can now provision and troubleshoot ONTs remotely, there is no longer any need to place ONTs in accessible places (basements, outside walls), so "there's a strong move toward indoors."

According to Borer, many deployers that once adopted fiber-to-the-basement strategies, such as China Telecom, are now migrating to FTTH for more reliable service. Verizon, which used eight-unit ONTs (generally one per floor) when it began MDU deployments in



Three vendor representatives answered audience questions about the challenges of wiring MDUs with fiber. All said they could customize solutions.

New York City, switched to individual ONTs because copper wiring was problematic. “There were so many issues in the quality level of Cat 3 fiber, and so much troubleshooting involved, that it was easier to bring fiber to the unit,” he said. (Some newer apartment buildings have reliable Cat 5e fiber or new coaxial cable running to the units.)

Moderator Steve Ross pointed out that even when copper inside wiring is adequate for home broadband and video, it may not be reliable enough for additional services that building owners want to install, such as telehealth for elderly residents. Certifying the reliability of fiber for critical services is much more feasible than certifying copper.

WHAT IF FIBER CAN'T BE RUN TO THE UNIT?

Running fiber to individual building units may not always be possible. For example, some building owners may refuse permission to install it. In this case, Gronvall said, using an indoor distributed antenna system (DAS) to support wireless broadband may be a good solution.

In most cases, however, the “impossible” turns out to be possible because vendors are able to develop customized, creative solutions. New technologies, such as preconnectorized multifiber assemblies, have enabled a host of new designs because they allow deployers to fit more connections into tighter spaces. The presenters encouraged service providers and building owners to ask vendors how they would accommodate a tricky MDU situation. “If you have a strange scenario, you’re not the only one,” Boxer said. “The only way we learn is by hearing what those problems are.”

Challenges of Providing Wireless Broadband in MDUs

Not too long ago, wireless broadband inside MDUs was a nice amenity, David Daugherty, CEO of Korcett Holdings, said in his introduction to the Summit’s Metrics session. However, the proliferation of wireless devices – especially in

student housing – has brought wireless access to the fore. “The demands on wireless spectrum in dense housing are enormous and challenging,” Daugherty said.

Phillip Emer, technology director of the Preiss Company, a property owner, emphasized that wired and wireless broadband were complementary rather than competing. “Do we need wires? Absolutely. Wired is better,” he said. “But the reality is that university students arrive with their iThings and MacThings. The next MacBook won’t even have an Ethernet port. iPads already don’t. Many properties deliver Ethernet to the pillow, and then the students all bring their own rogue access points. It doesn’t matter how much bandwidth there is – there’s still lots of interference. Whether property owners deliver the wireless service or not, they still have to deal with it because they get the phone calls.”

UNLOAD ONTO THE WIRED NETWORK

Because of interference issues, network designers should unload wireless signals onto an MDU’s wired network as quickly as possible, advised Richard Holtz, CEO of InfiniSys Electronic Architects. “Owners will find that if they can’t unload their wireless networks, they won’t have happy residents,” he said, citing a Louisiana property whose owners spent more than \$1,000 per unit on a wireless network that will provide only a temporary fix.

Holtz added, “The new Wi-Fi standard, 802.11ac, is coming soon. The bandwidth is huge, and the standard doesn’t work well in high-density housing. It will support wireless TV, but multifamily owners can’t afford to do that, so they’re attaching their own TVs to their wired networks. High-definition IP cameras for security can also use a lot



David Daugherty, CEO Korcett Holdings

Wireless networks can quickly become congested unless signals are offloaded to the wired network – preferably fiber – as soon as possible.

of your backbone. They can actually see faces and license plate numbers.”

Several technical approaches are possible for wireless networks in MDUs, but Holtz’s preferred solution is to use a large number of low-power radios placed close to one another so no signal has to travel far before being transferred to the wired network, preferably fiber. “Some people say you should use high-power radios,” he commented, “but there are only x number of channels available on a radio. With a smaller number of high-power radios, you’ll get lots of bars of coverage but no bandwidth.”

Holtz added, “The reality is that wireless service isn’t free. A less expen-

sive solution may work this year, but it won’t work next year.” In luxury properties, he said, usage levels are extremely high “because people move there for the amenities.” Bandwidth in luxury housing may have to be twice as high as in student housing (400 Kbps/resident compared with 200 Kbps/resident) before complaints will stop.

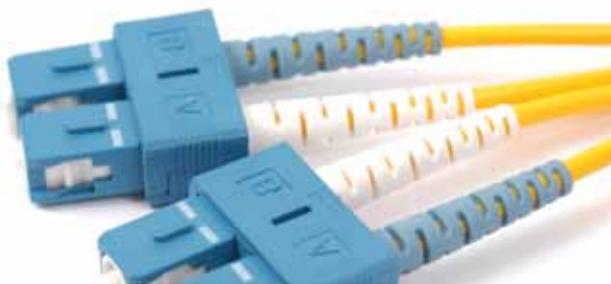
WIRELESS FOR BUILDING OPERATIONS

The proliferation of wireless devices – not only residents’ devices but building management devices that owners install – is complicating the design of wireless networks. Charles Flynn, chief

operating officer at Korcett Holdings, described a recent Korcett project where the owner’s design requirements failed to include the wireless devices for tracking power usage. “We turned up the network, and it was much weaker than we expected,” Flynn said. “We got a lot of support calls.” The owner spent \$75,000 to deactivate and send back the power-monitoring devices, and the damage to the property’s reputation was considerable. Daugherty cited a similar instance involving wireless thermostats that used a ZigBee mesh network.

Holtz explained that ZigBee operates in the same frequency ranges – 2.4 and 5 GHz – as today’s Wi-Fi devices. “The fewer devices you have running wireless for property operations, the better off you are,” he said. “Better to spend \$10,000 to \$15,000 running a wire to an Ethernet switch and run these devices wired. ZigBee is great in houses but not in dense housing. And Z-Wave [an alternative standard to ZigBee] has similar prob-

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IF IT DOESN'T MOVE, WIRE IT

Emer added, "In general, if it doesn't move and it needs to be connected, wire is a good thing and cheaper. The desk phone, the refrigerator, the thermostat – anything that's bolted to a wall – just run a cable to it." The same applies to building systems such as fire panels and elevators, which once required proprietary hardware and software but now can be operated on standard data networks.

"Wireless is hard to manage," Emer said. "The problem may be someone doing something in a building next door to you. Most of it is out of your control... No one wants to provide a service-level agreement for wireless, but users don't know that. As far as they're concerned, the Internet access doesn't work."

For a property owner to offer wireless service, its infrastructure and support models must be designed to allow

"In a lot of cases, people say the asset has a good design, but I look under the hood and see Band-Aids in place. I know it will collapse."

for new devices to be added in an orderly fashion. "I think Verizon and AT&T should pay *me* to let them do wireless on my property," Emer said.

"Let's be honest with ourselves," Holtz responded. "Provider x offers to put in a wireless system for free, and then it all blows up. The owner sells the property, and the problem ends up with the next owner. In a lot of cases, people say the asset has a good design, but I look under the hood and see Band-Aids in place. I know it will collapse next year."

"We know today that Internet speeds are going up 10 percent to 20 percent per year. The ideal speed is what's rep-

resented by TV – that's what people expect from whatever device they're on. So we need a design that's good and sustainable over time. One property I can think of tried to do everything with wireless. Residents brought in their own cable modems and their own access points, and the owner had to retrofit the building with fiber at 10 times the cost."

Emer agreed, saying, "If you're going to go all wireless, you need a rock-solid infrastructure. If tenants don't have the option of cable, then their phones become rogue hot spots, and they complain that the wireless infrastructure doesn't work."

Broadband Doctors Cure Struggling Network Syndrome

"Networks sometimes get sick," said Gary Evans, president and CEO of Hiawatha Broadband Communications (HBC), and Milda Hedblom, a connectivity consultant for the company. Because HBC, a competitive provider that builds and manages FTTH networks in southeastern Minnesota, is known for its high take rates and excellent customer service, newer entrants to the field, including municipal providers, often ask the company for help and advice.

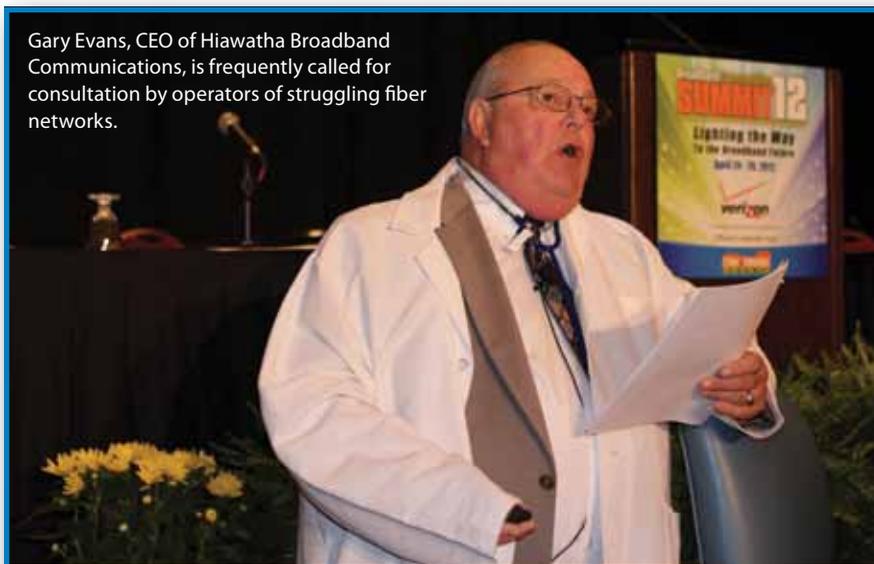
Just like medical doctors, network doctors Evans and Hedblom believe an ounce of prevention is worth a pound of cure. At the Summit, they dispensed the following advice to fiber overbuilders (to be taken with a grain of salt, according to Hedblom):

- Compete on services, not on price. If you compete on price, you will lose because entrenched incumbents have deeper pockets than new entrants. Instead, choose differentia-

tors that your competition can't or won't match – for example, customer service. Call new customers to thank them for their business. Call them after service calls to make sure everything has been attended to. The

prebuild frenzy, as busy as it is, is the most important time to focus on what potential customers are saying. Pay attention even to little things, such as complaints about having to learn a new channel lineup. Give

Gary Evans, CEO of Hiawatha Broadband Communications, is frequently called for consultation by operators of struggling fiber networks.



Pay attention to what customers tell you – don't give them a reason not to use your service. Call them to make sure their problems are resolved.

them one less reason *not* to switch to your service.

- Mobilize the community. You can never have enough helpers, so reach out and get them. This is critical for new networks, but it's a prescription for the health of established networks as well, particularly if you're battling competition. Look for people who are well known in your area and who are respected by the classes they represent (different age groups, etc.).
- Take a community fitness test. Do you have the critical capital you need, such as political will, leadership and economic resources? Understand what your community needs, what services already exist and what its potential is for economic development.
- Do a business reality check. Study market conditions closely – don't just rely on your hopes and estimates. Adopt goals that fit the community.
- Recruit specialists for planning, design, engineering, finance, rollout strategy and other components of your deployment. Make sure these experts educate community leaders. Many networks built on the strength of emotionalism are now struggling because this education didn't take place. For example, one community built a fiber-rich network, and then its municipal electric utility built a second fiber network for a smart grid. Community leaders need to understand that a fiber network can and should serve multiple purposes.
- Develop sound business and operational plans that you can speak convincingly about. Be ready to respond to misrepresentations and to correct distortions when needed. The big broadband story is optimistic in the long term, but you need to explain that in the short term, the network must repay its costs.

- When customers precommit to buy services, it's a sign that they believe in the network and will help repay the costs of building it. Investors are very interested to know about the strength of community interest and the community's willingness to pay.
- Promote applications that resonate with area residents. For an older demographic, gaming will not be a big selling point, but telehealth might be.
- Find a general manager from the local market if at all possible. The GM must understand the plan and the finances and have great people skills – it's a tough job because a GM must stay close to what's happening without micromanaging. Recruit other key people locally, too, and hire them early enough to train them adequately before the rollout. To help train your people, find a similar company that uses best practices.
- Open a local office to establish presence and visibility. It should be in a location suitable for providing service, and the interior must be friendly. One project we worked with had a customer service office



Milda Hedblom,
consultant to HBC

that looked more like a city jail! In Winona [HBC's headquarters and first network location], our office was designed by employees to be friendly and inviting and to enable discussion. It has a living room area where customers can watch TV, eat cookies and drink coffee. If you make customers feel welcome, they will produce customer after customer for you by talking to their neighbors.

- Hold a community dinner to introduce yourselves. Hire local restaurants to provide the food, invite the community and have people sign up for service. In one community, we had 65 percent signed up before we began to build the network. In bigger communities, hold neighborhood barbecues and hire local caterers.
- Once the network is up and running, develop indicators to measure success and manage to the indicators. React immediately to anomalies because if you stumble, your competitors will react quickly. Is there an unusual outage pattern? Can customer complaints give you a tip about what's wrong?
- Develop good processes and monitor them closely. Don't let excess costs creep in.
- Keep the business plan updated, especially if large, unforeseen events occur.
- You may not need to offer a traditional video package, which is expensive and hard to sell in the current environment. Assume no practice is sacred.
- If major changes are needed, refinancing may be possible. Investors may accept altered terms to preserve long-term operation. Seek specialist help!
- Always remember why you started the network in the first place. If there have been benefits to the community, it isn't a bad idea to remind your constituency why you did it and what happened as a result.
- If you need help and advice, reach out to another network operator who's been in a similar situation. ❖