Fiber Access: The Slog Continues

Eric Krapf

Fiber-based services such as metro Ethernet are a hot idea, but getting the fiber to the customer isn't getting much easier.

The notion of a "fiber glut" in the public network backbone has a corollary: If fiber could only be extended out to the end user, there'd be plenty of use for all that excess capacity in the core, and carriers' wholesale prices might stop plunging.

There are only two problems with this view: First, fiber cannot be extended out to very many users in anything like the near term—can't be done, period. Second, the carriers best positioned to deploy fiber access links—i.e., the incumbent local and long distance carriers—aren't driven by concerns about a core "fiber glut." They are extending fiber farther out in their networks, often to the premises—but on their timetables, for their business reasons.

At the same time, the architecture of metropolitan networks is undergoing a subtle but significant shift. With the rise of carrier hotels and Internet datacenters, traffic is being concentrated in new bandwidth "hot spots" within the metro, and these concentration points have become natural targets for large fiber deployments. This doesn't help end users who will settle for nothing less than fiber directly into their premises, but it could offer another way for some users to access higher-bandwidth, wide-area connections— at the cost of increased reliance on carrier services.

It's Still About Digging Up The Streets

Getting fiber down the last mile (or less) remains an arduous proposition. While many cities have large amounts of fiber in place, it's far from ubiquitous, according to Trey Farmer, executive vice president of FiberNet Telecom Group. FiberNet Telecom builds fiber connections among long distance points of presence (POPs), carrier hotels and large office buildings in New York, Chicago and Los Angeles. "Let's take New York," Farmer said. "There's a lot of fiber that runs up and down Third Avenue, Sixth Avenue, Ninth Avenue, but there's very little fiber that actually touches the buildings."

That means the carrier has to build "laterals," or fiber links that connect the building to the major route. These laterals might run two or three blocks, or as little as 60 feet, to a manhole just outside the building. These seemingly innocuous laterals can cost $150,000–$400,000 each, and getting the necessary permits from the city and the landlord can take three to nine months, according to Farmer.

"Every block is different, every building is different," Farmer added. "You have to negotiate with each building owner. And depending on what the substructure of each building is, there are zoning restrictions that may prevent you from punching through the basement wall on one side. You have to run around the building. It's very complicated."

And that's just to get one lateral into one building. If you want true SONET-level—five-nines reliability—you need physical diversity, which means two laterals.

Then you have to make arrangements with the landlord to enter the building and run the fiber up the riser—or, again, more likely, up two risers for diversity. The riser work can add another $200,000 to the cost, Farmer said.

It's not just relatively young companies like FiberNet that find this whole process a challenge. Jennifer Nisenoff, data products management at AT&T, said her company also has found that getting fiber into buildings has grown more complicated. "It's becoming more difficult to get that right of entry—dealing with property managers, dealing with landlords," she said.

One result is that carriers who once might have insisted on using only their own fiber, are now more open to swapping capacity with other carriers within the metro area, or wholesaling from a provider like FiberNet. Similar arrangements were common among the companies that built out the next-generation long-haul backbones.

Though AT&T prefers to use its own facilities, "We have a multi-vendor strategy," said Jennifer Nisenoff. "We have our own facilities and then we work with various CLECs and of course the ILECs to get services and fiber where we actually need it."

WorldCom has a similar philosophy, according to chief technical officer Fred Briggs. "We will look at swapping, we will look at doing, at times, joint builds, we will purchase capacity from each

Eric Krapf is BCR's *managing editor.*

other," he said. "We're a pretty pragmatic company. We will do what gives us the best business model."

Farmer said this attitude makes sense in the current capital-constrained times. "Two years ago, when capital was abundant, people might have said: I'll just build it myself. Well, today, people have to show immediate return, [they] need to get to the customers very quickly with the least amount of cap-ex."

FiberNet wholesales to carriers including Broadwing, Qwest and, most recently, Verizon, as well as to foreign carriers such as Singapore Telecom and Deutsche Telekom. FiberNet aims to position itself as a neutral third party so that building owners only have one infrastructure provider to deal with, and service providers don't have to contend among themselves for exclusive building access rights. Farmer explained that since FiberNet is committed to providing only the fiber infrastructure, other carriers don't have to worry about competing against them for end-user customers.
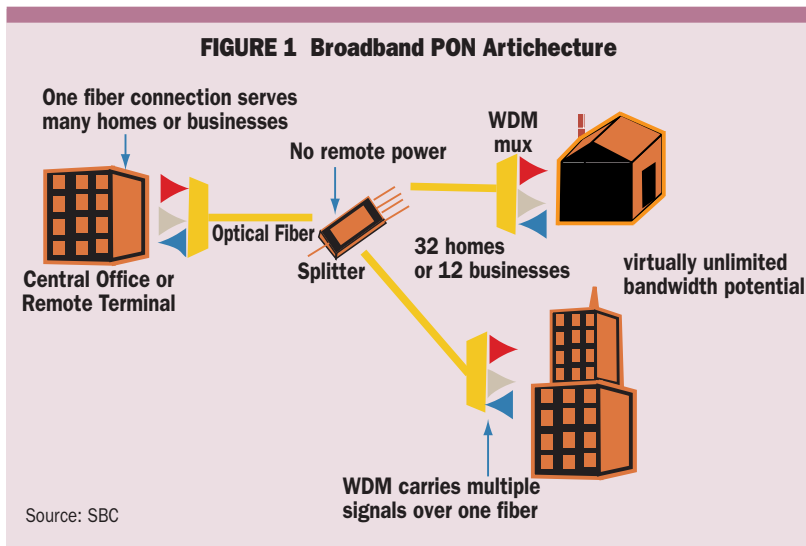
FiberNet has access into more than 20 Class A office buildings, including the Chrysler and Seagram buildings in New York. The company also serves 10 carrier hotels in its three cities, including New York's 60 Hudson Street, the world's largest such facility. Farmer said the key relationship for FiberNet is with the landlords: "They have the strongest relationships of anyone with permitting bodies and the contractors. That's their business."

Carrier Buildouts

But FiberNet's approach to its buildout illustrates the sheer magnitude of the task of trying to bring fiber to end users on a large scale. As a result, the company is deliberately focusing its efforts very narrowly.

"The density concept is very important for us," Farmer said. "If you were to hand FiberNet all the money in the world, we would do five or six cities, and that's it….We need cities where you have an immense amount of carrier traffic, where you have carrier hotels that the carriers need to interconnect their traffic and where you also have a dense urban setting with large buildings."

The incumbent carriers' buildouts reflect these harsh realities as well. They're continuing to invest in fiber networks, but with an eye on cost containment as much as on upgrading customer access. For example, Sprint has focused its metro fiber strategy on securing dark fiber connections between the IXC's POPs and incumbent local exchange carrier (ILEC) central offices (COs),

FIGURE 1 Broadband PON Artichecture

One fiber connection serves many homes or businesses

No remote power

WDM mux

Optical Fiber

Splitter

32 homes or 12 businesses

Central Office or Remote Terminal

virtually unlimited bandwidth potential

WDM carries multiple signals over one fiber

Source: SBC

according to Ben Vos, director of network design. "We have a program to drive cost out of our business to the extent that we can. That's really the number one focus of what we're doing with our metropolitan area network," Vos said.

Sue McCanless, Sprint's director of access planning, added that the company is looking to cut its costs by 30 to 40 percent by leasing dark fiber and lighting it up themselves, rather than leasing lit ILEC facilities, as it has been doing. "The first phase of our MAN takes our network from our POP out to the end office serving the local customer. The second phase of MAN [is] the last mile, and we're looking at various ways of solving that, whether it's fiber to the building, or wireless or to stay with the local exchange carrier either through access or through an unbundled element."

AT&T has a similar approach, according to Jennifer Nisenoff. She believes there's strong customer demand for access bandwidth above the T1 range promised by digital subscriber line (DSL), but said AT&T is actively looking to technologies such as 38-GHz wireless as a way of avoiding the cost of running fiber.

The third major IXC, WorldCom, seems more committed to running fiber direct to end customers—where it makes sense. "That's one of the things we're very careful about," said WorldCom's Fred Briggs. "We take a very careful look at what is the business case—what is the opportunity—and deploy facilities as needed."

That may be easier for WorldCom than just about any other metro carrier, thanks to acquisitions it made in the late 1990s—MFS, Brooks Fiber and MCI all had major metro fiber deployments going back 10 years. WorldCom currently has 50,000 U.S. office buildings and campuses on fiber in 100+ markets. "A lot of what we do today is simply extend the capability we may already have in an existing metro market," Briggs said.

By contrast, newer providers, like Broadwing, which has just completed a nationwide all-optical

network, focus on specific targets of opportunity, according to Chris Rothlis, VP of network engineering. "You're not going to see a huge build-ahead plan [or] anything that just blows out a whole lot of capacity in the metro just because we think we can do something," he said.

PONs

And then there are the RBOCs. Here, the most noteworthy development has been SBC's announcement earlier this year that it would use passive optical networks (PONs) in the next stage of its Project Pronto initiative to bring broadband to the wider market.

The company announced it would use a "Broadband PON" or BPON architecture (Figure 1) to deliver fiber access to end customers. According to company spokesperson Ashley Blaker, the RBOC's target market for BPON-enabled services is businesses that currently have multiple T1 lines that are deployed using repeaters—in other words, the carrier's focus is on saving money within its infrastructure. Shifting repeated-T1 customers over to BPON also would improve the range and service quality of SBC's DSL offerings, since T1 signals can interfere with DSL.

SBC calculates that the PON architecture could be a replacement technology for customers with as few as two T1s (Figure 2). However, according to Blaker, even though the service would be delivered over a PON architecture, it would continue to be tariffed as T1s, though he added that the PON architecture paves the way for future services such as metropolitan area Ethernet.

The PON architecture fits well with the remote terminal-based fiber-to-the-neighborhood approach that the RBOCs are deploying (see *BCR*, November 2000, pp. 70–76), according to Jeff Gwynne, VP of marketing for Quantum Bridge, which manufactures PON gear (though isn't part of SBC's deployment). "It obviates the need to pull facilities all the way back to the central office, POP or headend in order to serve all those endpoints," he said. This represents a savings both in the field and at the CO.

Gwynne believes SBC is being forward-looking, and isn't just thinking about its immediate infrastructure costs in going with PONs. "If you had enough [high]-quality copper going to everybody, you'd just keep that, if T1s were all you were going to sell forever," he said. "But they're looking to put new stuff in, because they're running out of copper that's good enough to provide T1s. And even though they've never really sold anything besides T1s and a handful of DS3s, they know Ethernet's coming and they have to figure out how to sell Ethernet services."

However, don't hold your breath waiting for a large-scale migration by SBC. It is projecting it will move 1,000 T1 customers to the PON architecture by year-end, and some 9,000 in 2002.

Demand For Future Services

The question underlying all of the discussion about fiber access centers around demand. As Briggs suggested, the very largest enterprises with an unquestionable need for extremely large bandwidth and high reliability will pay the price to get fiber. The question is how deep the demand runs below this top tier.
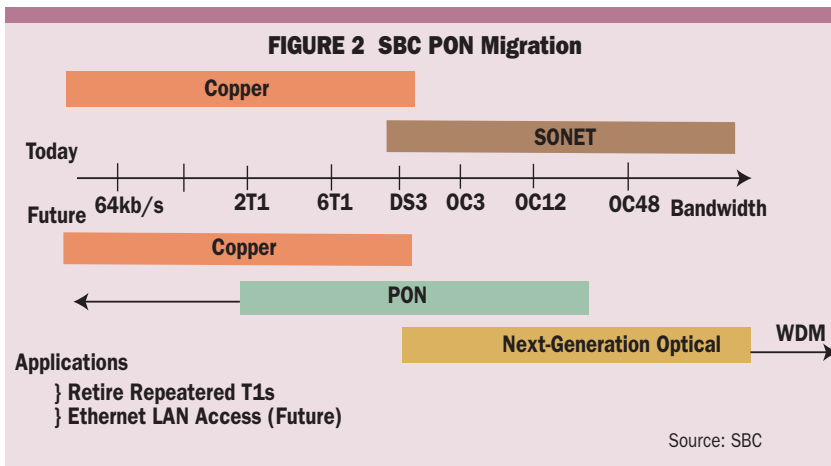
The early progress by Ethernet providers such as Yipes has established an expectation that incumbents and others feel obliged to respond to. SBC announced a metro Ethernet service a year ago, and Qwest and Broadwing both announced similar services this spring. But it remains to be seen how aggressive these companies will be in pushing the new services. Meanwhile, Sprint is holding off from any such service announcements, according to Ben Vos. "Certainly you can read a lot about [metro] GigE in every publication," he said. "How real that demand is, I think, remains to be seen."

Instead, much of the focus on metro optical networking has to do with improving the technology for those already connected via fiber, specifically with the improved provisioning intervals promised by new optical switches and other gear. "If you can provision capacity quickly, you will win business, even at higher rates," said Broadwing's Chris Rothlis. "That said, the access piece tends to be the long lead item in any provisioning interval. So, the more distribution you have, the more likely it is that you can provision in a shorter interval."

WorldCom's Briggs likewise ties the new optical technologies to the overall ability to expand fiber deployments. "Because [the new equipment is] more cost effective, not only in terms of the capital but the maintenance, you can afford to extend your local footprint," he said.

New Access Tier

Fiber will continue to reach more end user sites, but at a very slow pace. In the meantime, the arrival of a new layer of the metro

FIGURE 2 SBC PON Migration

Today

Future

64kb/s   2T1   6T1   DS3   OC3   OC12   OC48   Bandwidth

Copper

SONET

Copper

PON

Next-Generation Optical   WDM

Applications
} Retire Repeatered T1s
} Ethernet LAN Access (Future)

Source: SBC

architecture will complicate the picture: Carriers have begun collocating equipment in "carrier hotels" to facilitate their need for many-to-many interconnection. Those sites then become a focal point for carriers like FiberNet, which estimates it gets 90 percent of its revenues from its 10 carrier hotels, compared with 10 percent from its 20 office buildings. In other words, a major target for fiber deployment is in a carrier's-carrier environment, not end-user access.

Similarly, WorldCom's Briggs, when asked about alternate last-mile technologies like wireless, talks instead about Internet hosting and data centers. Essentially, he said that rather than bringing the fiber to the customer, WorldCom wants to bring the customer to the fiber.

"In many respects, data centers are really a different way of providing that last mile," Briggs said. "Instead of being a DS3 or OC-3 from a central office to a customer's location, we now literally put [their data center] right on top of the backbone—it may be a piece of fiber from a server over to our backbone, dozens of feet inside a data center. Data centers, in effect, are changing the nature of local access…. When you get, say, an OC-192 in one of our data centers, it's a very different cost model than hauling it across a town."

Of course, this also fits very neatly with WorldCom's desire to sell higher-value services. "The connectivity is good, but we're going to offer a whole class of customer service on top of that network, and that's where the real value-add comes and what we focus on," Briggs said.

Conclusion

Briggs's solution might just seem like slick carrier marketing if the reality of fiber deployment weren't so stark. But the reality is that there isn't going to be universal fiber access anytime soon.

Enterprises that have lived without fiber this long will probably be able to make do, while those that choose to outsource new applications to Internet hosting sites may find themselves with access to higher bandwidth there. Whether that will be enough to drive migration to the new carrier services remains to be seen□

Companies Mentioned In This Article

AT&T (www.att.com)
Broadwing Communications
  (www.broadwing.com)
Deutsche Telekom
  (www.telekom.de/dtag/ipl2e/cda/t1/)
Fibernet Telecom Group (www.ftgx.com)
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