

The Right Solution

Despite being a small project with few resources and modest goals, fiber was the best choice for Polk County, N.C. Now that choice has become a milestone.

by Guy Swindell

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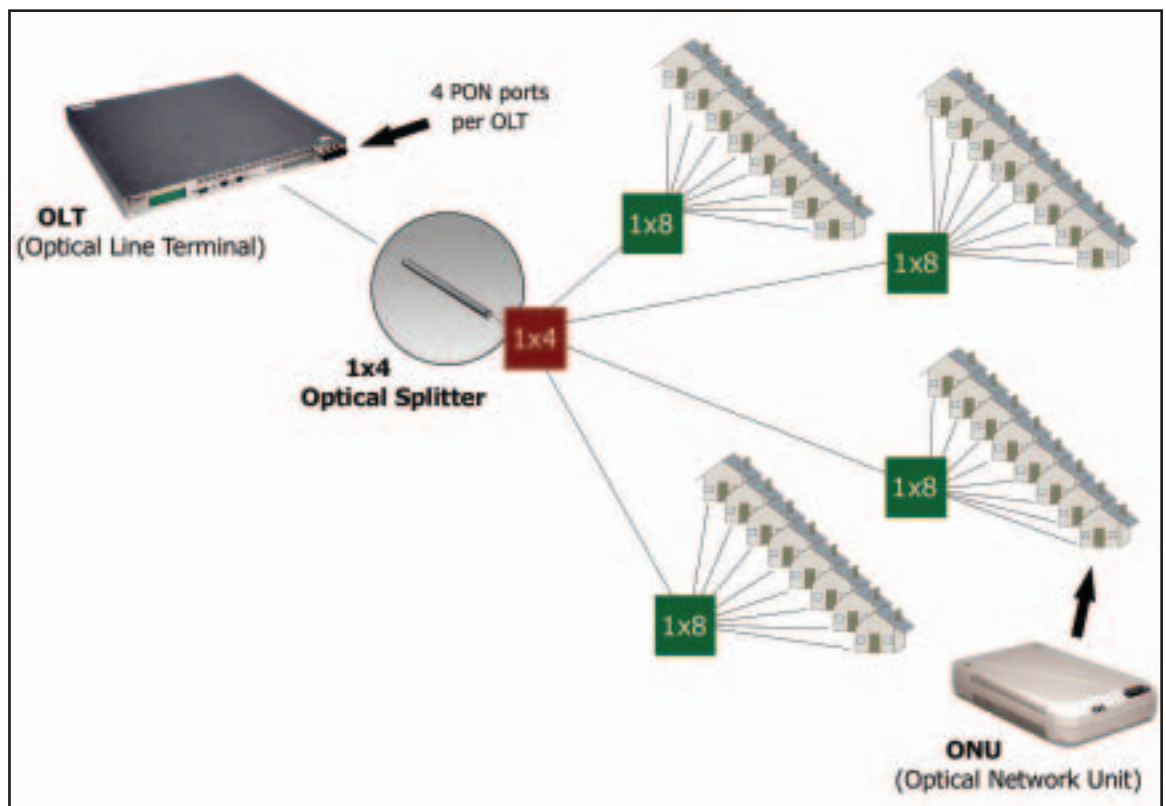
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Polk County, NC, sits just north of the South Carolina border. It is best known for equestrian sports, Appalachian scenery, and the annual North Carolina barbeque competition. Earlier this year, Polk County also became home to PANGAEA Internet and staked a claim as one of the first true fiber-to-the-premises (FTTP) deployments in North Carolina. While the debut of PANGAEA made news in the local community, however, few outsiders paid attention.

The inattention may be understandable. Major players in the telecommunications industry are announcing fiber deployments to serve millions, and their news easily obscures a small grassroots initiative like PANGAEA. But to overlook PANGAEA is to disregard an

interesting development with significant implications. With modest goals and specific targets, PANGAEA shows a fundamentally new way to deploy FTTP.

PANGAEA started as e-Polk, a community-based broadband initiative centered on a grant from the North Carolina e-NC program. Using the grant, Polk County constructed a seven-mile aerial fiber optic network between the towns of Columbus and Tryon. After the fiber was in place, a modest equipment room was built in the basement of the Columbus town jail and a connection was established with an Internet service provider in the nearby "big town" of Greenville, SC. E-Polk was then renamed PANGAEA — a reference to the hypothetical "proto-



PANGAEA's Passive Optical Network can serve up to 32 customers on a single fiber strand.

continent" that according to geological theory formed Earth's original landmass – and its board began searching for ways to provide the citizenry with a connection to its new network. The board had to choose wisely; PANGAEA has a sparse operating budget, a few volunteer supporters and one executive director. Finally, when all factors were considered, it was decided that the best choice would be a fiber optic connection all the way to the premises.

The merits of FTTP are well-documented and often debated. Its mention usually conjures visions of ambitious deployments supported by deep pockets to deliver a full suite of telecommunications services. PANGAEA does not fit the mold. Columbus and Tryon offer few prospects for the types of customers who pay big dollars for fiber connections in metropolitan communities. Furthermore, the PANGAEA board of directors harbors no ambition to compete against the incumbent carriers for legacy voice and video services. Overall, conventional wisdom would seem to suggest that PANGAEA does not have the revenue potential or economy of scale to justify an FTTP deployment. Interestingly, however fiber-to-the-premises was chosen for this project with little regard for "killer applications" and "triple-play" (voice, video and data services) revenue streams. Rather, FTTP was chosen by the PANGAEA board because fiber was seen as cost-effective, and because it was easy.

From the vantage point of a FTTP subscriber in PANGAEA's "Technology Corridor," receiving a fiber connection is an inauspicious event. Customers pay a modest fee to register for service and receive a small box called an ONU or Optical Network Unit. This device resembles a cable modem, except for the small fiber optic cable routed into the back. A technician plugs the fiber optic cable into the ONU and typically leaves it on a desktop or mounts it to an inside wall. The fiber connection in the ONU then hooks back to a small box on the outside of the customer's home that looks almost exactly like an ordinary telephone line connection box. This box is connected to the PANGAEA backbone by a cable with a

diameter just slightly larger than a ball-point pen, and connections are made using the same type of connectors that technicians have deployed in local area networks for years. ACSInc.NET, an internet service provider in Greenville, manages services through the ONU, but the device is owned and powered by the subscriber. Therefore, PANGAEA owns nothing in the field but glass and plastic cable with connecting apparatus. This is important for an entity that needs to generate cash flow to stay in business, but which has a sparse operating budget.

Now, Polk County has a generous amount of fiber in its new network. But because the business model calls for it to be an open-access network – one that is accessible to competitive entities that will make use of so-called dark, or unused, fiber – PANGAEA's fiber is a valuable commodity and must be treated sparingly. With that in mind, it was decided that customers would be supported by a Passive Optical Network or PON. A PON employs a technology that allows power on a single fiber strand to be physically "split" to serve up to 32 customers. It is a technology conceived by and normally associated with major telecommunications carriers and large deployments.

In the basement of the Columbus jail sits one of the most curious elements of PANGAEA's network: a small switch that distributes high-speed Ethernet directly over fiber to as many as 128 customers using the PON. Manufactured by Fujikura of Japan, the slim profile of the FNP2101 Optical Line Terminal (the technical name) inspires the moniker "Pizza Box PON." In Japan, where fiber-to-the-home is more common, the device has been widely deployed. But here in North America, PANGAEA represents only the fifth commercial deployment of the Pizza Box PON. It helps that Fujikura's largest subsidiary in North America (AFL Telecommunications) is located twenty minutes away in Duncan, SC.

Certainly, the PANGAEA project is small. But its implications for both carriers and developers are major.

Fiber is the undisputed "ultimate infrastructure" for anyone considering

a wire-line telecommunications service. However, it is typically considered only for those applications where a small number of subscribers need enormous bandwidth or where a larger number of subscribers will pay for a full suite of voice, video and data services. There are few in the North American telecommunications industry who ever argued for fiber-to-the-premise on the basis of simplicity. PANGAEA, however, is the standard bearer for that argument.

What could have been easier for PANGAEA than FTTP? Wireless was limited by the dense vegetation and mountainous terrain of Polk County. A transition to metallic media such as copper might have reduced some of the installation labor costs, but would have increased operating expenses by introducing field devices that require maintenance and power. From a materials perspective, the fiber optic cable used to connect customers actually costs the same or a little less than comparable metallic products.

To be sure, for all its apparent innovation, PANGAEA did not break new ground. The exact same PON equipment and optical technologies used to wire the small number of customers in Polk County already serve thousands in Japan. Well over a million subscribers already have fiber-to-the-home in Japan and the deployment rate currently exceeds 60,000 subscribers per month. Telecommunications pundits are quick to point out Japan's population density and its customer demand for high bandwidth as reasons for FTTP's success in that market. Polk County isn't like Tokyo. Population density cannot be used as a justification for PANGAEA's decision to use FTTP. Moreover, the fact that some of PANGAEA's initial customers have opted only for slower cable-modem speeds negates bandwidth arguments in favor of FTTP for Polk County. The real significance of PANGAEA is it demonstrates that a tiny carrier with a limited budget can opt for FTTP because it is a conservative, economically sensible thing to do.

The implications for carriers are obvious. Many thousands of small and home-based business customers are

served in North America by outdated copper connections. Meanwhile, fiber owned by the local telephone, cable television, or power utility company runs unlit down the street. Carriers that are still trying to figure out the triple-play could easily leverage their existing fiber assets to generate some immediate cash flow, and the argument for fiber is even more compelling when it is based upon a cost-parity comparison with copper and reduced operating expenses.

PANGAEA used a clever system of optical "taps" that allowed it to access a single unlit fiber strand at multiple locations along the straight line between Columbus and Tryon. With this system, PANGAEA will serve more than a hundred customers while using only four fibers from its backbone and without adding any powered cabinets or intermediate electronics. There is no shortage of larger carriers that could replicate this scenario.

The implications for developers are more subtle yet still compelling. Builders of gated developments, apartment complexes and condominiums have recognized the value of connected communities. However, they also recognize the commitment required to deliver a full suite of old-fashioned voice and video services. And even with the commitment in place, the proliferation of wireless voice services and satellite television creates pitfalls for the most captive of markets. Furthermore, it is perceived that there must be a high economy of scale to justify an investment in voice and video network equipment.

Arguably, the merit of PANGAEA's network is that it has all of the capacity and features to support emerging applications such as voice and video over IP. However, it may be more important to recognize that it does not need to support those applications to generate revenue. For a developer, this is intriguing. Perhaps that new apartment complex with fifty units is a candidate for FTTP after all. It would be easy and inexpensive to run fiber to each unit during construction, and then to deploy electronics incrementally as tenants subscribe to the service. The subscriber could purchase or lease the "modem,"

and a local internet service provider could manage the service. The developer owns glass and plastic cable within the buildings and some Ethernet transceivers in the gatehouse. Becoming an "FTTP Community" might cost less than putting in a pool.

Unlike the semi-rural deployment in Polk County, many developments would not necessarily benefit from the point-to-multipoint advantages of a technology like PON. Some would be better served by simply routing a single fiber from the customer back to a centralized telecommunications room. This is a plus since the equipment to support such a "point-to-point" deployment typically offers a lower cost-of-entry and less expensive customer premise equipment. Either PON or point-to-point offers the opportunity to deploy telecommunications infrastructure that can support all current and future services, and should remain technologically viable for the foreseeable future. If fiber is also approaching cost-parity with copper for installation in new developments, it should certainly receive strong consideration.

What if data is not the primary application for a new network? Can a fiber solution be deployed to support an application that consists primarily of legacy video? PANGAEA does not offer an answer, but it does provide some inspiration. Satellite television providers offer commercial packages to developers who will redistribute video content over community-owned infrastructure. The expense to convert this video content into something that can be transported over Ethernet is too significant for smaller developments. However, fiber certainly is capable of supporting analog video, and devices such as Foxcom's "HONU" receiver have been developed to receive satellite video content over a fiber connection. It represents a different technology and application from PANGAEA's deployment, but it is a similar business model: A carrier deploys the ultimate fiber-based infrastructure at or near cost-parity with analog solutions. Then it defers a modest expense to the subscriber, who owns and powers an analog receiver. Technologies that support ultra

high-speed data and voice services can share this same fiber connection.

While FTTP continues to garner headlines for large metropolitan roll-outs, applications such as PANGAEA signal a shift in the paradigm surrounding these technologies. Advocates of FTTP have always tied their fate to the assumption that the first carrier to deliver a full suite of voice, video and data would be the "winner." Technology, however, is shifting the telecommunications industry. Time may prove that the "winner" was the carrier who built the largest-bandwidth pipe for the least amount of money. A clever approach can enable an FTTP deployment to withstand either outcome. A small deployment in North Carolina and a very large deployment in Japan could be the benchmarks. ❖

Success Is Set Early

To its early backers, the business potential of PANGAEA Internet's FTTP deployment always was apparent, says Ken Rossen, a founder of e-Polk.

"PANGAEA took advantage of a confluence of factors" that gave rise to "our window of opportunity," Rossen recounts. Polk County was a telecom "backwater," he explains, and the PANGAEA territory was served by a local phone company that is technologically backward. Moreover, North Carolina law enjoins municipalities from owning telecom utilities. So, Rossen says, the "obvious" best way to bring high-speed access to the county was to form a community organization.

Rossen says it was believed from the start that PANGAEA could be financially self-sustaining and could attract customers and funding from surrounding communities.

That goal may be met soon. Last month, PANGAEA Internet was working to secure more than \$150,000 of funding to extend its network in a 40-mile regional fiber ring serving neighboring counties.