The Economics of FTTN vs. FTTP

In overbuilds, network planners may have to choose between "broadband now" and "broadband for the long term" – FTTN or FTTC to start, FTTP later

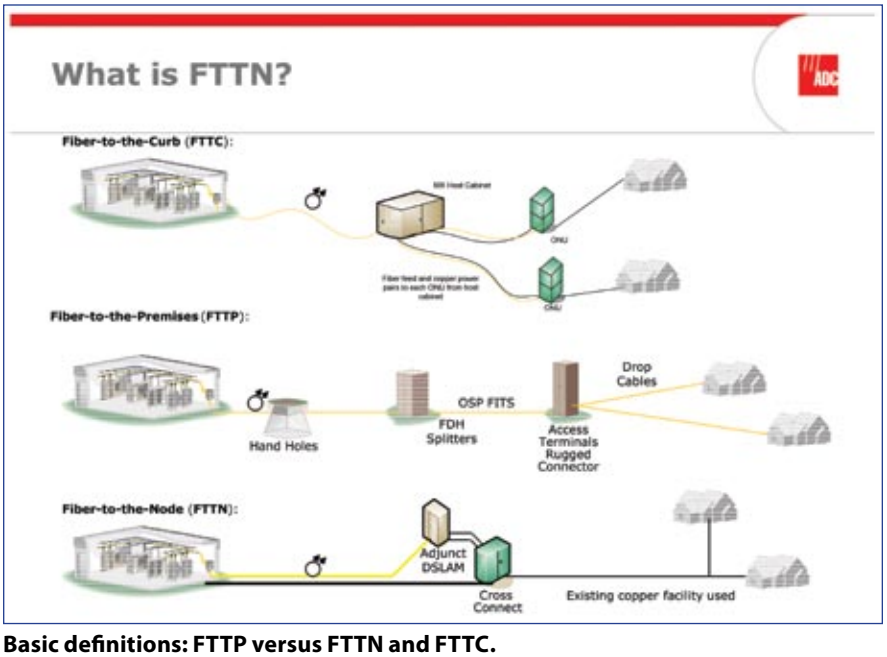
By Bryan Kennedy ■ *ADC*

There are three main schools of thought regarding how telcos can meet the ever-increasing bandwidth needs of consumers and businesses. Fiber-to-the-premises (FTTP) architectures take optical fiber all the way to the home or office and offer the most future-proof solution in terms of pure bandwidth capabilities. But in some cases, FTTP may not be the optimal solution in terms of overall cost and the value of existing infrastructure.

Fiber-to-the-node (FTTN) solutions offer an alternative solution to provide the bandwidth required by today's voice, data, and video services while taking advantage of existing infrastructure. In many cases, FTTN can actually complement FTTP deployments.

Finally, there is a fiber-to-the-curb (FTTC) solution that can support up to 80 Mbps to the home. The unanswered question about FTTC architecture is whether 80 Mbps will be adequate, and for how long.

For any provider, the key consideration in choosing which architecture will work best boils down to bandwidth – now and in the future. This article addresses several key considerations in helping service providers decide whether FTTN makes sense for all or part of their network.



Basic definitions: FTTP versus FTTN and FTTC.

For example, if a high percentage of a provider's network is already designed using digital loop carrier (DLC) remote terminals, it may make more sense from an economic standpoint to deploy FTTN. Traditional telephone service providers seeking to offer additional broadband services over an existing copper-based voice network may find FTTN more advantageous and less costly than building a new network that takes fiber all the way to the customer.

The Business Case

Every operating company must consider its own business case in relation to the capabilities of its existing network. Since an FTTN strategy seeks to leverage existing facilities as much as possible, the answer will ultimately come down to what each carrier sees as the demand for customer bandwidth – and where that demand will be five to 10 years from now.

Additionally, whether you choose FTTN or FTTC strategy as an early alternative to FTTP for rapidly providing broadband services to customers, it's important to ensure network longevity. Any solution should include an easy migration path to FTTP once future bandwidth demands exhaust the bandwidth capabilities of the current infrastructure.

Installation cost is always the primary concern in making a business case for the network architecture. The FTTN architecture will be less expensive to install than FTTP because it reuses legacy infrastructure for the final

3,000 to 5,000 feet. But installation costs alone should not dictate choosing FTTN over FTTP, particularly if the FTTN overbuild network will only have a five-year useful life.

Service providers may have to decide whether it is more prudent in the long run to reach customers ahead of competitors with an FTTN overbuild that may require upgrades in a few years, or to spend more for a new FTTP network that will provide all the bandwidth needed for years to come. In other words, FTTN has the potential for faster return on investment, yet it may require a complete overhaul at some point – possibly sooner than later, depending on consumer bandwidth demand.

Another consideration in choosing between FTTN and FTTP is how much of the network is rural and how much metropolitan. FTTN may be a faster and less expensive way to bring broadband to rural customers.

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How Much Bandwidth Is Enough?

The biggest unknown in the broadband services equation is how much bandwidth will be needed to support video into the next decade. Will 50 Mbps be enough? Or 80 Mbps? Or 100 Mbps? For the moment, high-definition television (HDTV) encoded with MPEG-4 requires about 9 to 10 Mbps, enabling consumers to receive four HDTV stations from a 50 Mbps asynchronous digital subscriber line (ADSL) service. But we don't know the content requirements of the future or how much bandwidth will be required to deliver new applications and services. A service limited to 50 Mbps could easily come up short in just a few years.

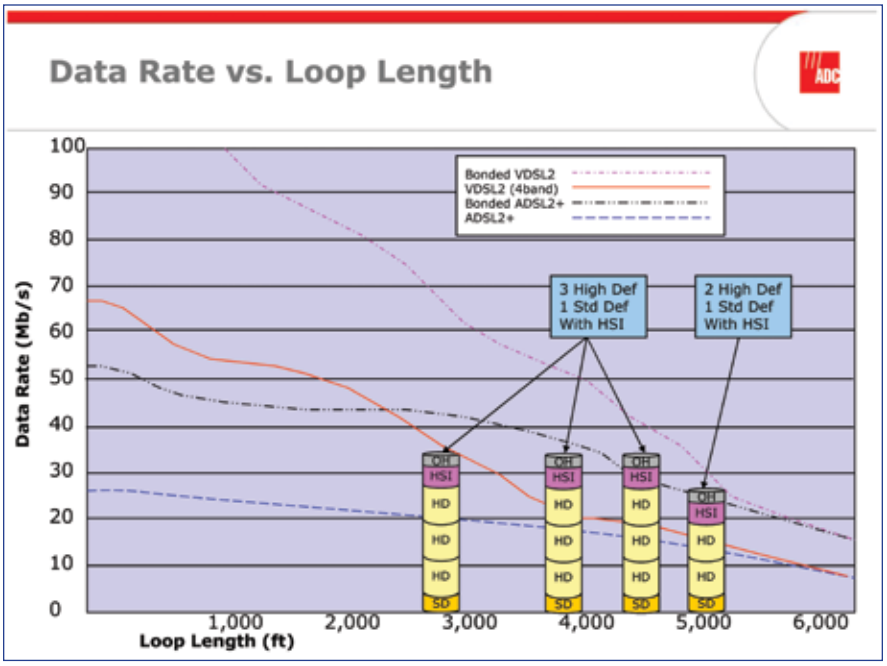
Pair bonding can be used to produce higher bandwidth capability in FTTN buildouts that use copper in the last mile. This technique enables the electronic bonding of two DSLAM output ports in order to double the bandwidth to a single customer. This solution requires the availability of two continuous copper pairs to the customer premises. Also, the service delivery platform, such as the cross box or interface, must support the pair bonding.

Pair bonding raises other issues, too. For example, this technique requires using more of the DSLAM to serve fewer customers. A 192-circuit DSLAM may be capable of handling only 96 customers if each residence demands multiple HDTV services.

Also, if the distribution area requires resectionalizing as reachable distances decrease (for example, deploying VDSL will require new cabinets for reaching customers outside a 3,000-foot perimeter), it may be necessary to deploy additional adjunct DSLAMs. If existing cross boxes do not have the necessary binding posts to support them, this initiative can quickly become very complicated and expensive.

Another wild card in the decision between FTTN and FTTP is the improvement in active components over the next few years. As these components improve, the bandwidth guessing game gets more and more complicated. Recently Dr. John Papandriopoulos wrote a new algorithm that enables 100 Mbps ADSL, for instance. But what if most FTTP subscribers can receive 1 Gbps five years from now? Then FTTN will appear rather inadequate to consumers. Where does this leave the network architect?

Business cases must be determined by customer needs today and the best de-



With FTTN, bandwidth depends on the length of the copper loop, and the exact version of DSL used to carry the signal on it. This chart superimposes the data rate versus distance, and the kinds of video services a customer can expect at a given distance from where the copper is attached to fiber.

termination of their future needs. The one thing everyone agrees on is that the demand for bandwidth will increase due to cutting-edge broadband services. But will the network upgrade to provide that additional bandwidth be a simple matter of swapping out cards at each end of the network? Or will it require a higher-quality fiber plant to support high-end services? Will factors like better forward error correction techniques enable longer use of existing infrastructure?

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The Long and Short of FTTN

FTTN offers several short-term advantages to operating companies that want to be first in reaching customers with today's broadband services. Because FTTN re-uses existing infrastructure to the customer, turn-up can be achieved faster to meet immediate consumer demand. For the same reason, FTTN is less expensive in overbuilds and therefore will provide a faster return on investment, particularly in many brownfield situations.

However, the many unanswered questions about long-term bandwidth demand cannot be ignored. FTTN architectures will continue to have bandwidth limits that may be exceeded by demand – perhaps in five years or less. FTTP is certainly a more future-proof network design. In greenfield models, there is no question that FTTP is the architecture of choice. It cannot be overstated that any decision to deploy an FTTN overbuild network should include a solution that provides a relatively easy migration to FTTP.

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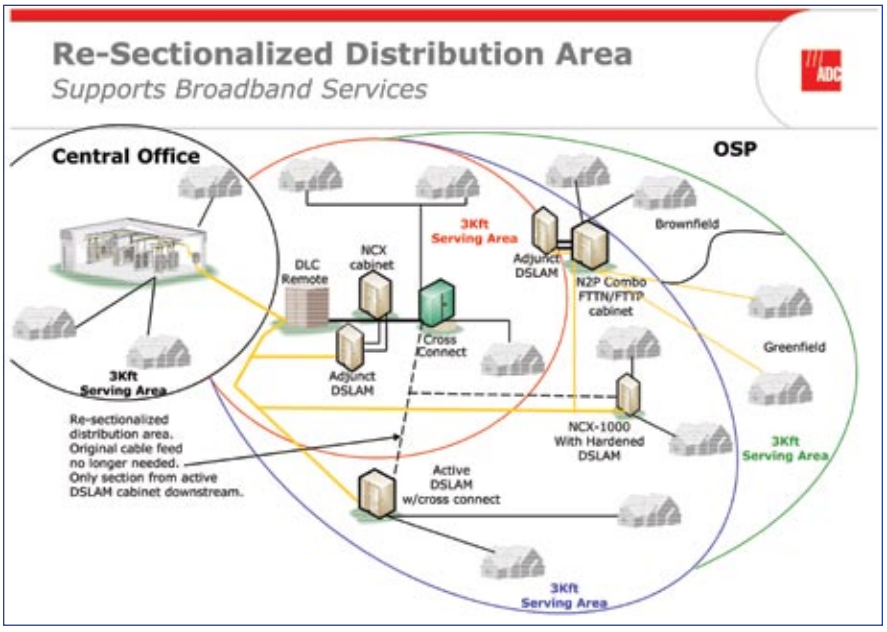
In the end, the decision boils down to current architecture and several considerations that each operating company must resolve: Is it more advantageous to opt for an initial cost savings model with faster return on investment? Can we depend on technology improvements that will allow us to avoid the need to upgrade in the near future? Or is it more important, despite additional costs, to upgrade directly to FTTP to ensure future-proofing the network against any future bandwidth demand?

There is no "one size fits all" solution for providers transforming the traditional switched network into a high-speed, high-capacity broadband network. These are challenging days for any service provider – but making decisions based on today's information, coupled with a concern for the future, will help network architects develop a solid business plan that meets each unique situation. **BBP**



Making the copper loop shorter. Here's how a conversion can be done, to gain bandwidth.

About the Author

Bryan Kennedy is a Product Manager for ADC's Global Connectivity Solutions Group. He can be reached at 770-441-1014 (office) or 770-335-2228 (mobile), and at bryan.kennedy@adc.com.