Fiber to the Premises or Fiber to the Curb?

In most cases, FTTC will perform the same at a third the price, the author says.

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In the push to install FTTP, the telcos, Verizon in particular, have somehow convinced developers that this is the only technology to use. Developers have been blinded by the hype. As the telcos try to play catch-up with the cable companies, they have misled others into believing that without FTTP, they cannot offer competitive or enhanced services. Fiber-to-the-Premises or home can deliver superb quality, lasting performance and over-all great reception; others use splitters in the headend. Once the fiber reaches the area of interest, a node is installed to convert the fiber to 75 ohm coaxial cable. The cable is then run either directly into the home or through taps and then into the home.

FTTP goes directly to the home, but once there, the signal is typically carried by coax and shielded Ethernet Cat5e cable. What’s more, FTTP systems typically split the signal before it ever gets to the home.

Why, then, is Fiber-to-the-Curb, serving perhaps 75 homes on a single fiber, considered so much worse than FTTP with a recommended 32 homes or splits?

But then so can Fiber-to-the-Curb (FTTC) when handled correctly. As of last summer, the average FTTP capital cost per home served, aerial or buried, was $1,377 and cost per home passed was $1,113. The average cost of FTTC was $500, so even though FTTP costs continue to fall, they have a long way to go.

FTTC offers fiber from the headend all the way to the home site (Residential Curb). Some FTTC installations use optical splitters in the field while FTTP goes directly to the home, but once there, the signal is typically carried by coax and shielded Ethernet Cat5e cable. What’s more, FTTP systems typically split the signal before it ever gets to the home.

So why then is FTTC, serving perhaps 75 homes on a single fiber, considered so much worse than FTTP with a recommended 32 homes or splits?

Pushing Your Button

Who is promoting FTTP? In order to compete with the conventional private cable operators (PCOs) and franchise cable companies (CATV), the telcos need a better medium to keep up with or surpass cable. Cable has indeed been capturing subscribers away from the RBOCs. The telco alternatives, ADSL, DSL, ISDN, XDSL, SDSL, HDSL, and the list goes on to HFPL and HFP, all have limiting features or distance requirements making competition difficult. Hence, the attraction of fiber.

Likewise, PCOs and developers were told that without FTTP, a developer would be left behind in a cloud of under-capacity and obsolescence while CATV operators and telcos would eat their lunch. Developers, historically slow to spend money on TV, are now jumping in with both feet. As a long-time cable TV consultant and senior member of the Society of Cable TV Engineers (SCTE), I find that many developers believe the hype even when it can be shown that FTTC can perform the same functions, at lower costs for the outside plant (OSP) and with less cost in the home as well.

Until four years ago I, too, was an advocate of FTTP. I attended trade shows and made visits to manufacturers in order to gain a better, in depth, knowledge and to help myself consult on FTTP. Each vendor had a specific way to handle FTTP. Some offered PON, BPON, EPON, and so forth; some are now offering GPON. Most fell short of CATV requirements and few had an answer for many of the questions being asked by the industry. At this point, about half the homes
Telephone companies of course hope they can retain subscribers and reduce operating expenses while offering expanded services (such as hundreds of television channels) and compete with cable companies that are taking subscribers away from them.
Even with Fiber-to-the-Home, the fiber is converted in the walled cabinet to coax and Ethernet CAT5e cable for use in the home.

to capture this 12 percent and more from the other two. There are about 30,000 cable franchising authorities in the US. Going FTTP may make it possible for Verizon to avoid serving multiple franchises, each with its own channel lineup.

Fiber does help future-proof the plant. But even a flat 300 ohm wire can carry a 1 GHz signal (and thus, theoretically, 1 Gbps). The problem is distance, performance and radiation. Unshielded twisted pair (UTP) cables and even Cat5 coax and 5e Ethernet wiring, have a distance limitation. If RF is applied, there can be a radiation and performance problem.

Telcos hoped to overcome some of these problems with HPNA and various kinds of DSL. While at Cisco for a two-day training/consulting trip in 2002, I saw one of the engineers in the home environment lab who had a plywood board on the lab wall. Attached to this board was a tin can, attached to a measuring tape, attached to a barbed wire, attached to another piece of metal and so on. Cisco had added HPNA to this mess and at the other end of nearly 20 feet of the various metal parts came out broadband Internet and TV channels. The engineer also mentioned they had x10 devices hooked up and could open and close ports, perform security functions, turn lights on and off, and so forth. I wish now that I had taken a picture for this article.

Cisco engineers noted that HPNA would allow not only these technologies, but more. In a sales call to one of my clients, folks from the local Cisco business office actually laid out 300 feet of barbed wire in the parking lot and performed a similar test with good results.

I might add that Cisco had a complete CATV headend in another building, with thousands of modems attached, all working online for testing purposes. Cisco would purchase these from distributors and add them to the headend and plant installed inside this building to test the performance of their equipment while also testing throughput specs, distortion characteristic and SNMP software. The building had around 10,000 modems attached and many large-screen TVs.

Fiber obviously can transmit broadband Internet, and at low customer costs. Other technologies’ prices are dropping, too. T1s once cost $2000 a month and now are down to around $400 a month. Some wireless providers offer an Ethernet connection of 3 to 4.5 Mbps or more, point-to-point, for $300 a month. The price of the Cable Modem Termination Server (CMTS) has come down as well. The CMTS is the device that allows Internet access to be placed onto the cable plant. Basically T1 in, RF out. It contacts the modem in the home or office and talks to it. It is this device that tells the modem to allow greater speeds or to go slower depending on pricing and other features. High speeds are available over coax in the home, and some cable companies are experimenting with 27 Mbps down, or data delivered to the basement via fiber. Speed and performance are not the problem with coax, although distance can be.

If a home is structurally wired, the coax entering the home is first placed into a cabinet or box on the outer wall. Also attached is the modem, router, switch, alarm, splitter and so forth. This is where the phone and Internet terminals are placed. It is from here that the modem and coax become king, putting out broadband Internet and telephony (POTS or VoIP). RF is distributed to multiple rooms. An alarm panel can be installed. What more could a developer ask for? Even with FTTH the fiber is converted in the walled cabinet to coax and Ethernet CAT5e cable.

What about IPTV and Digital services? It is true that fiber can carry the 870 MHz IPTV signal to the home and it can be converted to RF for analog TV, digital channels and broadband Internet (VoIP included). It is true that fiber can carry 1 Gbps and much more – easily enough for multi-channel HDTV service. But so can coax. Distance still remains a problem, with attenuation a main factor for coax. But if a FTTC system is designed properly, those signals are a piece-of-cake to deliver via coax from the curb or the basement to the dwelling unit. Imagine an FTTC system with no active electronics other than the nodes themselves and a maximum of 75 homes per node. This system can rival a FTTP system and cost much less, depending on the size of the system – at today’s prices a third to a tenth as much.

Coax, compared to fiber, is very forgiving outside buildings; fiber needs extra care.

1 to 10 back.1 City Telecom in Hong Kong delivers 1 Gbps over coax in apartment buildings, with the signal

Not only is FTTP more expensive than FTTC but this technology would require more money in the home as
well as on-the-home. Remember that IPTV, basically, requires at this time a set-top box or computer. The signals do not reside on the fiber but are in the headend. When you press channel 33, a signal races back to the headend or NOC (network operating center), and tells the server to deliver channel 33 to that box. Thus, if you have four TV’s in a home, you will need four set-tops.

Multiple FTTP standards don’t help, although each RBOC has its own ideas (Verizon with passive ATM, for example). The telcos do lean toward the idea that the conversion should take place at the home’s NID box or ONT (optical networking terminal) while some want fiber directly to the back of the set-top. Developers like the idea of analog RF to the customers’ sets because it does not require set-tops while cable companies prefer the set-top converters, with and without memory.

The lack of standardization doesn’t end with just PON (ATM) verses BPON or GPON, or DSL verses ADSL verses ADSL2, nor is it passives in the field verses some actives in the plant. How much bandwidth is enough? If you want to allow 100 homes the option of 40 Mbps each, what does that say about the size of pipe you need coming into the optical splitter in the field? What does it mean for the size pipe coming into the headend, CO (central office) and NOC when you have thousands of units?

Who can pay for pipes that big? FTTP systems are often designed with massive beam splitting anyway -- a 4-way optical splitter, feeding an 8-way, feeding a 16-way, so that in the end, the FTTP is over 200 homes per single fiber from the NOC. Most advocate 32 homes per fiber splitter, but there is no absolute norm or standard. The congestion on the return and the switching requirements have to be monumental.

Telcos have in the past used mechanical splices instead of fusion splices. Even today, many use mechanical splices and overcome the excessive losses by using high output lasers. If a 12 dBmV will work in an FTTC configuration, a telco might use a 16 dBmV to overcome the mechanical losses.

Can Fiber to the Curb compete?
Coax, compared to fiber, is very forgiving outside buildings. Fiber, in the vaults, in the northern regions has been known to freeze and crack. Yes, fiber infrastructure is getting better. But if water enters the vault, even with good drainage, freezing takes place. One
And if they opt for FTTP, why not truly future-proof the system by avoiding splits between the Network Operating Center and the premises, and even distribute fiber to each separate room in the dwelling unit?

Fiber splicer informed me this winter that he worked on a fiber system in New York for ten years with the telephone company and freezing was the biggest issue. They would withhold splicing or adding splices until the temperature was raised either by natural means or with heaters.

Let's assume a typical scenario where you have a house with a set-top converter. The coax leaves the TV/set-top area and runs back to the splitter either on the outside of the home or in the garage or attic. Let's assume that run is 85 feet of coax and let's assume that there is a 4-way splitter. What is the difference whether fiber is 10 feet away from the splitter or 100? What if you run coax not 85 or 100 feet back to the fiber, but 300 feet or even 500? What if fiber could not be run directly to the outside of a home, but due to the layout, the fiber is run to a detached garage, then converted to coax and then run 100 feet into the guest house and then 200 more feet into the main house, amplified, and split to several areas and TVs? Is this still FTTH? Just how far back can fiber run and still be called FTTH?

What if a developer wanted the conversion, from fiber to coax, to take place in a pedestal near the home but not on the home and wanted the pedestal to support two homes and be powered by a common street light in his development instead of the home? Would this be FTTH?

If the argument is Internet and phone and not TV, then the structured wired box would settle that problem and it works with either FTTH or FTTC. It is in this box that the conversion takes place and the coax is split to handle the modem and the modem to handle the phone. In this box, phone lines and Internet lines merge from all the locations in the home as well as the coax.

Once punched down, all locations, in each room, can have all three services at each outlet. This box is also where the alarm panel can be mounted. In larger homes, larger boxes can be installed to handle x10 and other control functions. Just what do we consider the advantages to FTTH are?

According to Telephony Magazine last fall, “Verizon’s chief argument for the necessity of FTTH is that no amount of stretching and stuffing of copper loops will give them the bandwidth necessary to ultimately trump the cable industry. Long term, Verizon says, FTTP will allow big bandwidth applications that perhaps haven’t been invented yet.”

In conclusion, as a consultant to many developers, I have to advise them constantly about technology, cost considerations and increases, new apparatuses and devices, as well as techniques and distribution methods.

A developer or a CLEC or ILEC, building a system for the developer, has more of a chance to garner a return than a cable company since the developer has a captive audience and can hide much of the construction expense in the development cost and not in an ROI for communications.

But FTTC is still the better bet. And if they opt for FTTP, why not truly future-proof the system by avoiding splits between the NOC and the premises, and even distribute fiber to each separate room in the dwelling unit? ♦

About the Author
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1. “Cable modem speeds vary widely, depending on the cable modem system, cable network architecture, and traffic load. In the downstream direction (from the network to the computer), network speeds can be anywhere up to 27 Mbps, an aggregate amount of bandwidth that is shared by users. Few computers will be capable of connecting at such high speeds, so a more realistic number is 1 to 3 Mbps. In the upstream direction (from computer to network), speeds can be up to 10 Mbps. However, most modem producers have selected a more optimum speed between 500 Kbps and 2.5 Mbps. An asymmetric cable modem scheme is most common. The downstream channel has a much higher bandwidth allocation (faster data rate) than the upstream, primarily because Internet applications tend to be asymmetric in nature. Activities such as World Wide Web (http) navigating and newsgroups reading (nntp) send much more data down to the computer than to the network. Mouse clicks (URL requests) and e-mail messages are not bandwidth intensive in the upstream direction. Image files and streaming media (audio and video) are very bandwidth intensive in the downstream direction.”

DSL verses Modem, Cable Labs online article. www.phoneplusmag.com/articles/0c1cover.html.