



Alphabet Soup – PON Style

By Jason Marcheck ■ *Confluence Research*

APON, BPON, EPON, GPON... starts to sound a little like Dr. Seuss. And who's to say that list won't keep growing? Over the past few years, it has become a generally accepted principal that if a company is going to rollout FTTx (fiber to the...), then it will be done over some sort of Passive Optical Network (PON) architecture. (Although don't tell that to companies like Wave7 Optics and PacketFront that are building nice businesses by selling FTTx solutions that do not utilize PON technology.) Nevertheless, the presence of PONs in the majority of FTTx network projects today requires that anyone who seriously studies this market become acquainted

with yet another long list of acronyms. Thus, in this installment of Fiber City, I want to look at how PONs differ, the advantages each offer, and which ones are likely to be adopted in mass.

cost advantages, because generally speaking, higher volumes of traffic can be transmitted over Ethernet networks than ATM networks. On the other side of that coin is a reliability issue.

“The primary advantage that Ethernet holds over ATM is simplicity.”

The Technology: APONs vs. EPONs

First, the easy stuff. APONs refer to ATM-PONs, which utilize Asynchronous Transfer Mode technology as its primary method of transporting traffic. Because it is easily used in conjunction with SONET, ATM technology is in wide use in most metro area and long-haul telecom networks. APONs can support a downstream transmission rate of between 155 Mbps and 622 Mbps. EPONs refer to Ethernet PONs, which utilize the Ethernet protocol as the primary mode of transporting traffic. Ethernet is practically ubiquitous in Local Area Networks, and has gained quite a bit of notoriety over the past several years as vendors and carriers seek to extend its use into metro and access telecom networks.

The primary advantage that Ethernet holds over ATM is simplicity. This simplicity translates into

ATM cells contain more information (called “overhead”) that allows the cells to be routed with a higher degree of accuracy than traffic transmitted over Ethernet networks. This difference is generally not noticeable when being used for applications such as high-speed Internet. However, when time sensitive services are involved, such as voice and video, this Quality of Service (QoS) issue becomes much more important. In fairness, I should point out that much progress has been made on the QoS front with respect to Ethernet. But, because ATM already exists in the networks of many carriers, ATM-based PONs have a pronounced advantage over Ethernet-based PONs in situations where carriers already have network equipment in place.

BPONs vs. GPONs

The waters muddy a bit when discussing the distinction between Broadband PONs (BPONs), and Gigabit PONs (GPONs). Because a true explanation of these differences requires an in-depth technical discussion that is not appropriate here, this section will provide only an overview of the key differences and similarities. However, for further technical



information I recommend consulting the websites of the PON Forum (www.ponforum.org) or FSAN (www.fsanweb.org), or the *Newton's Telecom Dictionary*.

While APONs and EPONs refer to a particular type of PON, B and GPONs refer to standardized technologies. BPONs are a recognized standard under the ITU-T G.983 Recommendation, and were the first standardized PON. The BPON standard calls for equipment that transmits optical signals using ATM protocol at rates between 155 Mbps and 655 Mbps. This has gained BPONs recognition as being the standardized version of APONs. GPONs, on the other hand, are most associated with Ethernet technology, and can transmit at rates up to 1 Gbps. This connection as the standardized version of EPON comes much to the chagrin of GPON vendors, because while GPONs are compliant with Ethernet standards,

they can also carry ATM traffic. GPONs have also achieved "Standardized" status by way of an ITU-T

impact on the flavor of PON you can expect to see in a network near you.

Going back to the previous section,

"As a building owner or developer, it pays to know the strengths and weaknesses of the products that might be serving your properties."

Recommendation (G.984).

The Market for PONs

As a building owner or developer, it pays to know the strengths and weaknesses of the products that might be serving your properties. It is even more valuable to know which products have the best chance of being deployed. In this section, I will discuss the market forces that will likely have a major

given that most telcos have preexisting ATM equipment in place, there is good reason to believe that most of them will tend to favor ATM-based PONs. However, since both BPONs and GPONs can carry ATM traffic, the good news is that it is highly likely that those companies using ATM technology will be able to choose from products that are standardized, rather than ones based on proprietary

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technology. To further shed light on this, the PON-based FTTP product offerings of both Alcatel and AFC

a living. Because of this, I believe that we will see GPONs being used more for Ethernet in the U.S. than for ATM.

“Property developers need to be aware of the type of PONs used to carry traffic, because it effects the type of Customer Premise Equipment (CPE) that is required to terminate the optical signal at the end user’s location.”

comply with the BPON standard. Thus, if you operate in an area served by Verizon or SBC, expect BPON to be the flavor of choice.

If you are like me and feel that, in the end, most homes passed by FTTP in the U.S. will be completed by RBOCs, then you might be tempted to say that things do not look promising for the makers of GPON and EPON equipment. This is a valid point, and one that these vendors are grappling with right now. First, in the world of ATM PONs, GPON is a disruptive technology. While GPONs can carry traffic at higher rates of speed than BPONs, the fundamental rule of marketing (that says being first is what counts) is holding true. I believe that for GPON technology to make a name for itself in the market, it will have to materialize in Ethernet networks in the U.S. and in foreign networks.

In the U.S., Ethernet has not permeated beyond the LAN, as the hype of two years ago would have had us believe. RBOCs recognize that it is cheaper, but have only made limited moves to install Ethernet equipment in certain metro networks. Thus, Ethernet PONs will likely take root in Greenfield areas (Sidebar: Is anyone as sick of hearing that as I am?), municipal build-outs, and in the networks of some progressive smaller carriers. In this regard, it is not likely that small EPON and/or GPON vendors will become the next Alcatel selling this equipment, however, there is no reason to believe that they cannot make

(Ironically, the opposite is likely true in Japan, where NTT, which already has over 300,000 APONs in service, is now evaluating GPONs).

Additional Factors to Consider

Property developers need to be aware of the type of PONs used to carry traffic, because it effects the type of Customer Premise Equipment (CPE) that is required to terminate the optical signal at the end user’s location. **Figure 1** provides a list of the leading PON vendors in the U.S. by technology. Most of these vendors produce their own CPE to go along with the equipment that resides farther out in the network. However, as a building or property owner, you should seek to be active in giving input to the telecommunications company installing equipment to your location.

Now, if you live in Verizon or SBC territory, there seems to be little opportunity to have your voice heard, right? Not true. Even as Verizon announced that its initial foray into FTTP deployment will be in the Philadelphia area, smaller companies



such as Campus Technologies, Inc. are busy installing custom FTTP build outs to universities and MDUs in and around the City of Brotherly Love. I can promise you that companies such as Campus Technologies are not limited to the greater Philadelphia area. This is an emphatic indication that as building owners you are not solely at the mercy of an RBOC or any other carrier if you truly want to take control of your property’s fiber future. So, undaunted by the alphabet soup of PON acronyms that will appear before you in the product brochures of the above mentioned vendors, go forward and shop with confidence. ■

About the Author

Jason Marcheck is the Principal Analyst of the Confluence Research Group, whose primary focus over the past several years has been the study of the market issues related to FTTP. The author may be reached by phone at 301-498-2661 or by email at jmarcheck@confluenceresearch.net

Figure 1 - Leading U.S. PON Vendors

BPON - ATM Only	GPON - ATM & Ethernet	EPON
Alcatel	Flexlight Networks	AllOptic
AFC	Optical Solutions	Motorola NextLevel
Hitachi-USA		Salira
Optical Solutions		World Wide Packets