Making the Smart Decision: Active Ethernet FTTH

P2P "active" networks are the most future-proof and flexible, and are more popular abroad than passive optical despite their sometimes higher first cost.

By Irit Gillath ■ *Telco Systems*

Web 2.0 applications like YouTube, MySpace, LinkedIn, and Facebook are booming. More and more people are purchasing HD-enabled TVs and embracing online videos, VoIP and instant messaging. A growing number of e-mail messages and telephone calls include video, using applications like Skype, MSN, Messenger, AOL, and Yahoo! IM. Ubiquitous e-learning is allowing interactive classroom participation, spurring a higher demand for bandwidth.

And gaming is hot. According to Business Week magazine, the online gaming market will reach $13 billion by 2011. This would be a 400 percent increase from the $3.4 billion spent in this market last year. This is fostering a seemingly unquenchable thirst for more bandwidth. With new resource-intensive applications emerging every day, residential users' bandwidth needs will soon equal, if not exceed, business use.

This should be good news for service providers; video is taking an exponential toll on existing networks. A typical residence with three HDTVs, for example, requires more than 50 Mbps if every set is on and tuned to HD programming. With VoIP and IPTV continuing to grow in popularity, service providers are being challenged to find cost-effective solutions to deliver carrier-class triple-play services. Passive optical networking (PON) technology will not be able to deliver the goods. But Active Ethernet will!

PON VS. ACTIVE ETHERNET

What technology will best propel companies to maximize profits and meet future consumer demands? Active Ethernet ultimately will come out on top over copper and PON, primarily due to cost advantages, higher bandwidth and superior innovation. Active Ethernet will endure longer than any version of PON, and with a better return on investment (ROI).

While PON is valid technology, it has significant limitations. PON technology provides shared bandwidth, so the amount of bandwidth varies widely depending on the type of PON (EPON, APON, BPON, or GPON) and the type of splitter (1:16, 1:32, or 1:64) that are deployed. Even in an optimal deployment, the highest bandwidth from a PON network is approximately 60 Mbps to each customer, and in most cases the speed is lower (see Figure 1).

This bandwidth is available to each customer connected to the same splitter. There is no easy way to allocate higher bandwidth to one customer over another. This presents a major obstacle to offering higher revenue-generating services for customers who request them.

On the other hand, Active Ethernet provides 100 Mbps or even 1 Gbps per customer. Lower bandwidth can be provided with traffic-shaping tools that are an integral part of the network's hardware and software. In fact, in many cases service providers can deploy 100 Mbps to a residence today and can upgrade the network to 1 Gbps tomorrow without replacing the customer premises equipment,. In addition, Active Ethernet allows the service provider to offer 10 Mbps or 100 Mbps to some customers and 1 Gbps or even 10 Gbps to other customers in the same area.

While some FTTH deployments today are based on passive optical networking, the advantages of point-to-point Active Ethernet are well documented. These include:

Active Ethernet is standards-based. Ethernet components that are 802.3 compliant offer full

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interoperability with other standards-based solutions from a broad base of vendors. The service provider is not tied to one vendor.

Since Ethernet is standards-based and is used universally, the cost of Ethernet-based products and components is decreasing rapidly. Residential and small-business subscribers with FTTH service will benefit from the cost savings as service providers continue to deploy additional equipment.

Active Ethernet offers subscribers dedicated bandwidth based on their individual requirements and offers differential services for residential and business customers in the same area. In a PON network, the available bandwidth per subscriber terminal is shared with all other subscribers in that area without being able to give different service levels.

Active Ethernet supports a pay-as-you-grow philosophy because new subscribers can be easily added to an Active Ethernet network within a 100-km-wide geographic service area at minimal cost. An economical deployment of a PON-network typically calls for one splitter

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for every 32 ONTs at the customers' premises (they are called ONUs in the Ethernet world) within a 20-km service area and are cost-effective only when at least 26 ONTs are connected.

Digital voice (VoIP) and video (IP video) services can be delivered using a single strand of fiber. This ability to provide dedicated bandwidth over a single fiber or fiber pair to multiple subscribers maximizes fiber capacity and keeps costs low.

Active Ethernet is easy to configure, and it is very easy to find affordable and

talented engineers familiar with Ethernet networks, while with PON, personnel need to be trained with the chosen vendor.

PONs requires detailed pre-planning to place splitters in the ideal location relative to the central-office OLT that support the maximum number of subscribers and ensure that each OLT reaches the maximum number of subscribers. If the assumed take rate is higher or lower than expected, the business case changes dramatically and the economics of the PON deployment become questionable. With Active Ethernet technology network elements, bandwidth, and additional users can be easily added.

Active Ethernet is easy to support. Because traffic is pure IP, no translation between protocols is required. Management of all network elements is simple, using off-the-shelf products and standards. Active Ethernet can send information to the NOC (network operations center) using SNMP, EFM OAM, MPLS, or any number of management protocols used by the provider. Passive splitters cannot generate and send data, so troubleshooting a problem requires dispatching a technician to the site – or multiple sites.

WHY CARRIER ETHERNET IS THE BETTER OPTION IN THE LONG RUN

Active Ethernet–based networks give the service provider the ability to provide services that have a higher quality than can be provided using PON. The quality of service can be measured by several different elements. The most important element is remote manage-

P2P Vs. PON Customer Bandwidth, Mbps, Current Standards (No WDM)

(chart categories from top to bottom: Active 1GigE, Active 100M, GPON 1:32, EPON 1:32, GPON 1:64, EPON 1:64, APON 1:32; x-axis 0 to 1000; legend: Upload, Mbps; Download, Mbps)
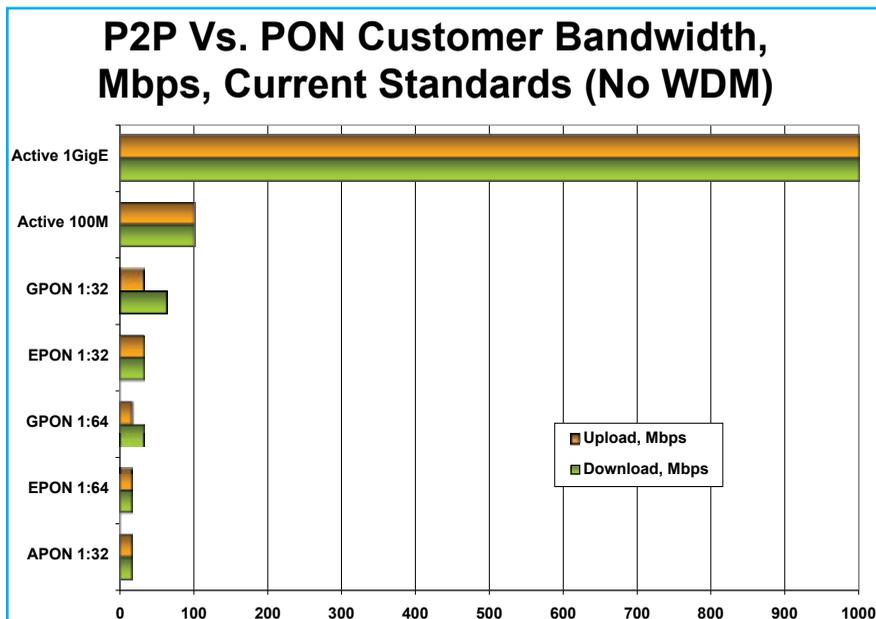
Figure 1: The highest theoretical bandwidth for Active Ethernet is far greater than for passive optical networks and, at the moment, more symmetrical. PON builders point to lower first cost, especially in settings where many customers are close together, and say they will make up for splitting by adding wave division multiplexing – multiple wavelengths of light riding the same fiber. But WDM adds to PON costs, and could be added on top of the already faster P2P Active Ethernet as well.

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ment. As PON-based networks are passive, they are unable to notify the service provider of a failure in the network. If a unit in the network fails, the service provider is dependent on upset customers to contact them.

With Active Ethernet the network components can be constantly tested, and can propagate an alarm in case of a problem in the networkwhen a test fails. This is especially important when providing service to high-end residential or business customers. Using the Metro Ethernet Forum (MEF) standards, the network can be fully tested for bandwidth, delay and other parameters that are essential to a good service level. A line of demarcation products is available in the market that provide end-to-end testing, alarm propagation and management.

Active Ethernet opponents are stating that the longevity of an active component network is lower than that of a passive network. However the MTBF for Active Ethernet components has been measured for over 10 years and has been field-proven to be very long. Active Ethernet standards protect the network from failure by use of architecture and protocols that ensure resiliency and survivability.

IS ACTIVE ETHERNET RISKY?

There is low risk when using Active Ethernet. Active Ethernet is a technology that has been deployed by major organizations around the world for over 30 years. It has proven itself to be reliable and efficient. Active Ethernet gives the service provider the ability to build a smart and flexible network that is ready for the future and will not require replacement for many years to come. **BBP**

About the Author

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