

Serving Up Ethernet - What Every SP Needs to Know

By Dan Blacharski

Ethernet has long been the foundation of the LAN. Gigabit Ethernet made quite a splash with its extreme speeds, and has since formed the backbone of many enterprise networks. But the Ethernet gods weren't satisfied with that, and made it even faster, releasing 10-Gigabit Ethernet, a telecommunications technology that provides an extremely efficient and comparatively inexpensive solution to moving data over backbone connections. Running over optical fiber, 10-Gigabit Ethernet, also known as Carrier Ethernet, can become an effective replacement, or complement to, ATM or SONET technology.

As a WAN/MAN technology, Carrier Ethernet can support up to 300 meters on multimode fiber, or 40 kilometers on single-mode fiber. Its development is overseen by the Metro Ethernet Forum (MEF), and it is rapidly gaining carriers' attention as a way of delivering new, high-bandwidth services to both business and residential customers. An increasing number of carriers have already started phasing out Sonet/SDH in favor of Carrier Ethernet.

Carrier Ethernet is now rapidly moving into the space that was previously the exclusive domain of SONET technology, including high bandwidth, Quality of Service, and self-restoration. There are five defining factors that bring Carrier Ethernet into the realm of telco providers: Scalability, protection, hard QoS, TDM support and services management. The protection attribute makes Carrier Ethernet competitive with SONET's self-healing functionality; Carrier Ethernet offers an end-to-end restoration capability in the event of failure.

The 802.3ah, Ethernet in the First-Mile (EFM) standard, has gone a long way in pushing Ethernet into carrier networks. The release of the EFM standard was the final link in the chain necessary to bring Ethernet up to the next level. This standard creates several new Ethernet physical layers for multimegabit transmission over P2P fiber, PONs, and copper pairs, while also adding the carrier-class attributes mentioned above.

ATM, when it was first released, brought many advantages to the telco world in terms of QoS and intelligent switching; Carrier Ethernet evens out the playing floor for service providers rolling out network infrastructures. Is there any reason to still use ATM? It's expensive and unwieldy, it's complicated, and there are far too many acronyms involved. For a brand new WAN/MAN rollout, 10Gig-E is a no-brainer, but there are a number of situations where retaining the old ATM network may be advantageous, particularly in the event of a migration. Gradual migrations are often the best as opposed to an all-out cut-and-switch, and in that case, running the ATM network alongside Carrier Ethernet would be essential. Although early on, carriers were a bit hesitant to embrace Ethernet as a carrier technology, its predominance in

the enterprise market has made it a winner in the carrier realm as well.

The two alternatives for serving up Ethernet services are Ethernet over IP/MPLS, or Ethernet over SONET. RBOCs and other providers who met the demand for providing Ethernet services by adding Ethernet interfaces to existing SONET networks did so to take advantage of the QoS and resiliency offered by SONET, but there are limitations to this approach. SONET does work spectacularly for voice and private-line TDM traffic, but is not nearly as cost-effective in delivering Ethernet services.

The two alternatives for serving up Ethernet services are Ethernet over IP/MPLS, or Ethernet over SONET. RBOCs and other providers who met the demand for providing Ethernet services by adding Ethernet interfaces to existing SONET networks did so to take advantage of the QoS and resiliency offered by SONET, but there are limitations to this approach. SONET does work spectacularly for voice and private-line TDM traffic, but is not nearly as cost-effective in delivering Ethernet services.

The rollout of new Carrier Ethernet platforms, and the introduction of carrier-grade features onto existing platforms, has already begun to revolutionize the telecom services market. Carrier Ethernet's high bandwidth, which can deliver in excess of 20Mbps to each subscriber, is well-suited to the triple play. According to a recent study, 45 percent of carriers deploying Carrier Ethernet are doing so in order to support triple play offerings. In addition, new carrier Ethernet initiatives targeted at both enterprise and residential customers will inevitably trigger substantial growth in sales of Carrier Ethernet hardware. The market for Carrier Ethernet switches and routers in particular is set to explode, as switch makers jockey to support new telecom initiatives. This segment was worth \$155 million in 2004, but is expected to exceed a billion dollars by the end of 2007.

The dominance of residential triple play serves as a major driver for new Carrier Ethernet platforms, while at the same time, the market for Frame Relay, ATM and private line services continues to erode, due to the simple price equation--Carrier Ethernet offers advanced IP services and includes carrier-class attributes that make it a functional equivalent of ATM, yet it's more cost-effective. According to the Metro Ethernet Forum, Carrier Ethernet is 25 to 40 percent lower in cost than TDM, Frame Relay, or ATM interfaces; it is 10 times lower in cost than high-speed SONET interfaces; and is more readily scalable for meeting increasing needs for bandwidth.

In addition, studies from Infonetics Research indicate that Carrier Ethernet is well suited to supporting out-of-franchise solutions--creating spectacular revenue opportunities for carriers and equipment providers alike. Carriers are encouraged to add services on top of their basic connections, such as VoIP, broadcast video, VoD and gaming; in addition, carriers may also benefit by expanding outside of their service area to gain new sources of revenue. In fact, many providers, RBOCs and others already support an existing base of SONET, Frame Relay, ATM and IP

networks. However, providers in this highly competitive area are seeing Carrier Ethernet as a primary method of aggregation.

Many providers, in order to stay competitive and increase revenues, are seeking to expand out of their traditional boundaries, both to gain new customers and to serve existing ones that have locations outside of the carrier's traditional service boundaries. There are benefits to using Carrier Ethernet to facilitate this movement. In moving out-of-franchise, expanding a SONET or IP network would increase the financial burden and require substantial CapEx and OpEx investments, not to mention delay time to offer. The Metro Ethernet Forum suggests that by moving to Carrier Ethernet, cumulative OpEx savings will reach 23 percent after three years when compared with legacy private line, Frame Relay or ATM services. CapEx savings are further achieved due to the cost-effectiveness of Ethernet equipment, economies of scale, and relative simplicity of the technology.

Whether using Carrier Ethernet to expand Ethernet services within a carrier's existing domain, or out-of-franchise, there are several strategic options to consider. Carrier Ethernet is by far the most promising technology to accommodate the growing demand for high bandwidth Ethernet services.