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CIO Alert: WANs Beware — The Ethernet ‘Terminator Machine’ Is Coming

CIOs, IT managers and network planners are keenly interested in insights on determining which wide-area network (WAN) designs and technologies should be adopted to best handle disparate — and changing — traffic, connectivity and application requirements of their enterprises. To assist those executives with their planning, Gartner points out that Ethernet was once LAN-only technology, but switching, optical advances and a new breed of service provider are positioning it to be the next major WAN service. Gartner advises enterprises to start preparing for the new WAN era.

It’s a LAN World After All

With its low cost, simplicity and rapidly expanding speed and capabilities, Ethernet has won the LAN wars and has emerged as by far the

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CIO Alert: Eight Ways in Which Metropolitan Ethernet Will Affect Your Networks

CIOs, network managers and other enterprise executives are vitally interested in getting insights on the network services that are essential to their enterprises to achieve the business goals. Consequently, to help those executives with their network planning, Gartner discusses why the bandwidth abundance of metropolitan Ethernet presents a major paradigm shift for how enterprise network managers design and operate networks. However, careful attention must be paid to redundancy issues.

Metropolitan Ethernet providers offer enterprises speeds of up to 1 Gbps for Internet access and LAN-to-LAN connectivity. That huge increase in bandwidth availability requires network managers to think “outside the

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In This Issue...

dominating LAN technology. But is it a LAN-only technology? Not really. Thanks to continued Ethernet developments, IP enhancements and rapid optical networking advances, Ethernet is now ready to take on metropolitan-area networks (MANs) and WANs.

It wasn't going to be this way. Several years ago, many people envisioned that asynchronous transfer mode (ATM) — a predominantly wide-area technology — was going to work its way into the LAN, resulting in a common networking technology extending from the desktop to sites anywhere around the globe.

Gartner firmly believes that a predominantly LAN technology will move out into the MAN and WAN. By 2005, more than 30 percent of high-speed WAN data services will be delivered over Ethernet (0.6 probability). Consequently, Gartner discusses why it believes that Ethernet will succeed in the WAN — and the profound implications that will have for enterprise networking.

Why Now and Why Ethernet?

All Enterprises Need Broadband

A nearly insatiable enterprise demand exists for additional bandwidth. MAN and WAN bandwidth demand continues to increase — even at today's prices — at 25 percent to 50 percent per year for the average enterprise. Moreover, Gartner considers that growth rate to be significantly attenuated due to relatively high prices for WAN services.

Many applications — such as application service providers, distributed data operations, Internet access, video, content distribution and storage-area networks and network-attached storage — demand higher network speeds. New networked applications will make sense only when LAN-like speeds can be economically attained in MANs and WANs. The industry has reached a point where this "nice to have" is now a need.

Your Father's Ethernet? No — And Yes

As originally defined, Ethernet had stringent distance limitations, unpredictable performance and did not scale well for time-dependent and mission-critical applications. The original Ethernet specifications clearly did not fit the criteria for a robust WAN or carrier-class network services.

Today's Ethernet technology, however, is Ethernet in name only. Ethernet technology has migrated from a restricted, shared environment with stringent limitations to a technology where all connections are fully switched, thereby allowing Ethernet to scale to much higher speeds and across distances never imagined by its inventors. The only tangible items remaining from the original Ethernet specification are the Ethernet packet structure and Ethernet's amazing simplicity. (Of all the technical specifications used in the networking universe, Ethernet is distinguished by being the only one that is written in understandable plain English.)

Therefore, Ethernet's limitations have largely been overcome for WAN use. Ethernet is now ready for 1 Gbps in the WAN and will soon be able to handle 10 Gbps, but its underlying simplicity has been preserved.

Low and Lowering Cost

Ethernet's simplicity, combined with universal interoperability, has enabled the different iterations of Ethernet to follow an aggressive cost reduction curve for many years. Ethernet switching costs typically decrease 30 percent each year. That dramatic cost curve is unmatched in mainstream WAN technologies such as time division multiplexing, ATM and Synchronous Optical Network (SONET).

The need for SONET and ATM aggregation in the network service provider (NSP) infrastructure has been eliminated by 1-Gbps and 10-Gbps Ethernet switches being coupled directly into optical core technologies. In so doing, overall capital costs are reduced by at least 30 percent and total cost of ownership is cut by more than 40 percent over traditional architectures. In addition, start-up costs for the new class of providers are significantly lower, because they can scale their Ethernet infrastructures more easily than traditional architectures.

By applying the simplicity, scalability and cost-effectiveness of Ethernet to the WAN, service providers can provision new services at a small fraction of the cost of more-traditional offerings. They can obtain a cost advantage over more-established players with traditional infrastructures and offer a major price break to enterprises.

Enterprise Benefits and Implications

10 Mbps for the Price of T1 — Now

Already Ethernet MAN service prices are at 75 percent to 90 percent below the price of traditional high-speed services such as SONET for equivalent bandwidth. (Those services do not cover all bandwidths. For Ethernet to make sense, multimegabit data rates are required to initially justify establishing a broadband fiber loop.)

By following the Ethernet price curve, even-lower WAN costs are on the horizon. By year-end 2002, Gigabit Ethernet WAN access will be available for $1,000 per month (0.7 probability). That is not a mere price reduction, but rather an order-of-magnitude change in a short time period and is a major inflection point.

Ethernet services not only reduce networking costs, but also enable enterprises to consider new options that previously were not economically viable. For example, locating content and data within networked data centers makes sense because, with Ethernet WAN services, they can be reached in the same way as resources on enterprise-owned LANs — the "LAN," in essence, is without geographic boundaries. Additionally, the same technology is being used in the LAN as with the Ethernet service, so no conversions or interfaces are required, and designing and managing the MAN or WAN are simpler.

You Want to Increase Your Bandwidth by 6 Mbps at 6 P.M. Today? You Got It!

In most cases for these services, the enterprise site is connected to the MAN network via fiber that can readily support 10 Gbps (faster speeds are possible using high-speed fiber or dense wave division multiplexing). Any data rate up to the fiber rate can be supported. That means the switches define the actual data rate transmitted, not the underlying transmission media.

With a 1-Gbps or 10-Gbps port on the switch, any rate up to that port speed can be supported. Most sites are provisioned with a 1-Gbps link, but by 2003, Gartner expects the majority of large buildings to default to 10-Gbps connections. Therefore, provisioning data rates is a modest network adjustment, because no physical change is required (assuming a properly engineered network).

Ethernet service bandwidth adjustments can be made in a matter of hours rather than the weeks for traditional services. Taking this to the next logical steps, only proper provisioning of back-office systems stands in the way of real-time bandwidth adjustments or finally achieving the goal of bandwidth on demand.

Throwing Bandwidth at the WAN? Yes — But Not Very Far

Fueled by high adoption rates of Gigabit Ethernet, "bandwidth throwing" with appropriate application prioritization has become a mainstream LAN design principle. At least for Ethernet MANs, a similar design approach can be taken. Greater quality of service (QOS) provisioning will continue to be needed in the WAN at least through 2005, when costs will likely be at least 75 percent lower in major metropolitan areas than today's costs.

However, outside metropolitan areas, bandwidth will continue to be limited. Fiber will not be readily available and technologies such as digital subscriber line (DSL), while offering much greater capacity at reduced costs, will not keep up with demand. Gartner expects an even greater discrepancy between bandwidth "haves" and "have nots" in the future.

Bandwidth availability will become an increasingly important consideration for the location of certain business functions. For those not so fortunate, the importance of QOS and policy-based networking concepts will become even more critical to business success. Enterprises will have to be more cognizant about end-to-end QOS (e.g., Ethernet MAN site at one end, DSL sites at the other).

Goodbye WAN Router

By using common technologies with comparable speeds on both sides of the LAN / WAN boundary, much of the complexity of managing the WAN is eliminated. The need for WAN routers comes to an end, with a new breed of optimized Ethernet switches taking their place. Capital purchases will be primarily in the campus LAN, and the interconnection to services will migrate to native LAN technologies. Enterprises will have to transition their internal processes to focus on selecting and managing service levels, not technology.

Challenges

What Ever Happened to Convergence?

Ethernet MAN services do not handle multiple services (e.g., voice, data and video) well, but they do fill the void for economically addressing ever-increasing bandwidth demands for data traffic between enterprise sites and for Internet access. Ethernet services with differentiated service levels for different applications will be available in 2001. By 2002, the move toward voice, data and video convergence over IP will enable those new offerings to support a more-comprehensive set of offerings.

Coming to a Metropolitan Area Near You (But Not Yours)

Ethernet services are just beginning to be deployed. They are now available in about 30 North American cities, and that number will reach 100 by 2003 (0.8 probability). However, service in an enterprise's city does not guarantee that the enterprise can obtain service; the providers' fiber ring may not serve the enterprise's building.

However, Gartner expects rapid buildout within cities, as well as an increase in the number of cities served. By 2003, within an Ethernet-served metropolitan area, 60 percent of enterprise sites will be able to obtain Ethernet MAN services (0.7 probability).

Ethernet WAN services interconnecting the cities are sparsely deployed. By 2003, Ethernet WAN services (in addition to Internet access) will be available among at least 70 North American cities (0.8 probability).

Going beyond 2003, availability of Ethernet WAN services in and between major metropolitan areas will likely no longer be an issue. Despite slowdowns in other parts of network services, the business case to build out Ethernet WAN networks will remain compelling. In fact, one of the reasons to do so is to make use of the expanded capacity fiber backbones that have been put in place during the past few years. Those networks will be limited to the densest parts of major metropolitan areas.

What Was the Name of That Provider Again?

A new class of NSP is championing Ethernet services. Revenue streams are typically in the single-digit millions of dollars, and profitability in this rather capital-intensive business is years away. In today's tight investment climate, can enterprises rely on such providers to survive and thrive?

Many NSPs will not make it. However, the business case is compelling enough that several will be successful. Several players will likely be acquired by larger NSPs. Furthermore, traditional NSPs will likely begin to offer Ethernet-based services as well, but at a 25 percent to 40 percent premium compared to the new NSPs. New hybrid technology (e.g., MetroOptix) will enable traditional players to transition to the Ethernet model over time.

Bandwidth availability will become an increasingly important consideration for the location of certain business functions. For enterprises not so fortunate, the importance of QOS and policy-based networking concepts will become even more critical to business success.

Bottom Line

- By 2005, the new optical-enabled public network will move aggregation point and value-add services from the WAN router to the campus backbone Layer 3 switch in at least 30 percent of large enterprise locations (0.6 probability).

- Newly enabled high-speed services will change network design philosophies and shift the focus from WAN and router management to managing internal application-based network service-level agreements and NSP service integration.

- Enterprises will buy services with appropriate service-level agreements for smaller sites and massive pipes for large sites, and will have to evaluate service providers that provide tight integration between high bandwidth and IP services.

- Optimization will be focused on application content and individual user interaction both inside and outside the enterprise.

Written by Edward Younker, Research Products
Analytical sources: Mark Fabbi and Jay Pultz, Enterprise Network Strategies

For related articles published in Point-To-Point, see:
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CIO Alert: Eight Ways in Which Metropolitan Ethernet Will Affect Your Networks (continued from page 1)

box." Networks will not just get faster — new services will be available and networks will be designed and operated differently. Gartner presents eight examples of how metropolitan Ethernet will impact enterprise networks.

1. Redefining "Campus" LANs

With metropolitan Ethernet providers offering 1 Gbps of bandwidth, the boundaries of the LAN have changed. LANs will no longer be confined to a building or a campus. Now, a "campus" LAN can extend to multiple buildings throughout a metropolitan area. This abundance of bandwidth will enable enterprises to centralize application servers and centralize and consolidate support staff for those servers.

2. Shifting of the Demarcation Point

With today's WAN (wide-area network)-based managed service offerings, a traditional software-based router serves as a service provider's demarcation point. However, in metropolitan Ethernet networks, the provider replaces this router with an Ethernet switch, which becomes the new demarcation point (see Figure 1). As the metropolitan Ethernet market matures, its service providers will take a greater role in managing enterprise intranets. Those service providers will be able to leverage the trouble-shooting and support resources that they have developed in servicing metropolitan Ethernet networks and move the demarcation point deeper into enterprise intranets.

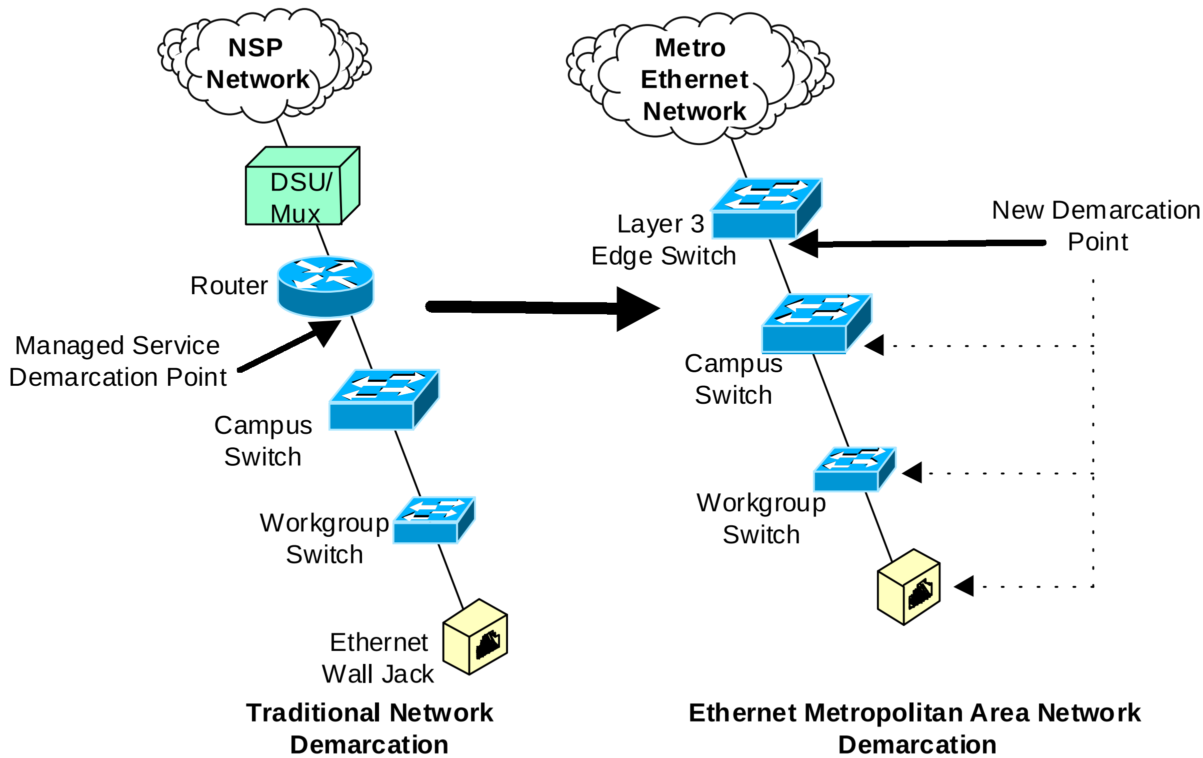
By 2005, 50 percent of large enterprises will use the Ethernet wall jack as the demarcation point for a portion of their networks (0.7 probability). That trend will also be driven by building local-exchange carriers and managed LAN services vendors.

3. Networked Storage

Metropolitan fiber networks will fuel the growth of the emerging storage service provider (SSP) market, which Gartner expects to reach $8 billion by the end of 2003. Enterprises will either partner with the SSPs to distribute storage resources among

CIO Alert: Eight Ways in Which Metropolitan Ethernet Will Affect Your Networks (continued)

Figure 1
Demarcation Point Before and After Metropolitan Ethernet



DSU Data service unit
Mux Multiplexer
NSP Network service provider

Source: Gartner Research

geographically dispersed storage centers or will use high-speed public networks to build their own networked storage solutions between data centers. Implementing hybrid SSP and privately owned network storage solutions should also be considered.

4. Breaking Down Application Service Provider Barriers

A significant obstacle for application service providers (ASPs) is the lack of quality of service (QOS) on the Internet. However, ASPs that partner with metropolitan Ethernet providers will be able to offer guaranteed service-level agreements, due to the providers' ability to implement QOS in their tightly controlled networks. Enterprises seeking to outsource their applications should consider ASPs with points of presence that are linked to metropolitan Ethernet networks.

5. Overprovisioning — A Thing of the Past

Many enterprises overprovision bandwidth as an insurance policy for covering peak traffic periods that occur throughout the year. Now, in an era in which bandwidth-on-demand requests are fulfilled within hours, it is a waste of money to overprovision bandwidth. While it is still important to provision for peaks in daily traffic patterns, bandwidth-on-demand services should be used to accommodate bandwidth intensive events that are anticipated (e.g., live, all-company webcasts) and unexpected (e.g., "flash crowds," such as those flocking to weather portals during storms).

An important factor is that unlike frame relay, metropolitan Ethernet services do not allow subscribers to burst above their committed information rates. Thus, although an enterprise may be paying only for 4 Mbps of a standard 10 Mbps Ethernet link, it does not have access to the additional 6 Mbps unless it makes an explicit request. To make the most efficient use of the new bandwidth-on-demand services, enterprises should benchmark their traffic utilization and monitor it regularly to ensure that provisioned bandwidth is in line with daily requirements.

6. QOS — Responsibility Shifts From Enterprise to Service Provider

Even with bandwidth-on-demand capabilities, enterprises cannot ignore QOS. Throwing bandwidth solves many problems in data-only networks. However, QOS is necessary for ensuring that real-time voice and video traffic is protected from random delays even in an era of bandwidth abundance.

Many enterprises have deployed rudimentary QOS capabilities via router-based queuing mechanisms or traffic-shaping appliances. However, metropolitan Ethernet providers will offer multiple service levels in 2001. Once those providers have demonstrated an ability to meet their service-level agreements, enterprises will abandon their internally implemented QOS solutions in favor of service provider solutions. For example, just as an enterprise using public asynchronous transfer mode services would request a constant bit rate class of service for its real-time traffic, an enterprise will request "premium" service from its metropolitan Ethernet provider for its voice and video traffic.

One driver influencing this trend is that enterprises using traffic-shaping appliances will find that those devices are not applicable for metropolitan Ethernet networks, because the appliances are designed to support speeds only up to T3 (45 Mbps).

Another driver is that enterprises using router-based queuing, which in this scenario is limited to classifying and prioritizing packets at the edge of the private or public network, will opt for the end-to-end service-level guarantees and the reporting capabilities offered by metropolitan Ethernet providers.

7. Virtual Private Network Scalability

The availability of Internet access at Ethernet speeds allows for greater scalability of remote access virtual private networks (VPNs). Thousands of remote users can now simultaneously access the enterprise's intranet via the Internet, provided that the enterprise has appropriately scaled its VPN switches. While high-speed Internet access has been available for years via Synchronous Optical Network, the Ethernet-based services will be more popular, due to their lower cost and their ease of bandwidth scalability.

8. Network Redundancy

Enterprises must pay special attention to network redundancy. Many remote sites use Integrated Services Digital Network (ISDN) as a backup for its WAN links. In the case of branch office routers, the ISDN terminal adapter is built into the router itself, and the ISDN connection can be automatically triggered on failure of the primary link.

However, ISDN is not a suitable backup for Ethernet speeds, and no comparable backup solution currently exists for the Ethernet customer-premise equipment devices (generally 10 / 100 Mbps workgroup switches) deployed by the service providers. However, the providers are laying redundant fiber paths to the buildings they service, and enterprises use those alternate paths to design and test network redundancy.

Additionally, for at least the first six months of its contract with a metropolitan Ethernet provider, an enterprise should ensure that it has backup network access via a vendor with a traditional carrier infrastructure.

Bottom Line

- Network managers should begin planning for applications, services and network designs that are enabled by metropolitan Ethernet.

- Enterprises that are late to embrace or that outright ignore metropolitan Ethernet services

CIO Alert: Eight Ways in Which Metropolitan Ethernet Will Affect Your Networks (continued)

will miss out on cost savings, operational efficiencies and new service offerings.

- However, before committing to metropolitan Ethernet, enterprises must ensure that they are protected via redundancy and fail-over mechanisms that are equal to or better than existing solutions.

Written by Edward Younker, Research Products
Analytical source: Lawrence Orans, Enterprise Network Strategies

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CIO Update: 10-Gigabit Ethernet Scales the WAN

The arrival of 10-Gigabit Ethernet is key to the future of drastically lower wide-area network (WAN) prices delivered through new Ethernet access services. Work is well underway for a 2002 standardization, with pre-standard products arriving in 2001.

10-Gigabit Ethernet Standardization Coming

With the upcoming standardization of 10-Gigabit Ethernet (10GbE), the IEEE (Institute of Electrical and Electronics Engineers) has recognized Ethernet's potential to be used as a metropolitan-area network (MAN) and WAN technology. With Ethernet's historical limitations stripped away through the adoption of a full duplex, fully switched architecture, Ethernet can now provide access services into the WAN, which is critical to the scalability of new service offerings in the adoption and availability of 10GbE products.

10-Gigabit Ethernet Applications

The applications for 10GbE range from the obvious expansion of LAN backbones to MAN and WAN services. In the LAN, 10GbE will be used primarily as a switch-to-switch link in large backbone networks. It will also play a smaller role as an aggregator between workgroup switches where Gigabit Ethernet is justified at the desktop. 10GbE will not be found in end systems and servers until server I / O technology migrates to a higher-capacity architecture such as InfiniBand. Just as with the migration to Gigabit Ethernet, enterprises running very large campus backbones must ensure that their switch platforms have the necessary backplane and buffering capacity to adequately support 10 Gbps links.

The more interesting applications for 10GbE are for new WAN services. The 10 Gbps standard is being defined with two separate physical interfaces — one running at exactly 10 Gbps, the other at 9.952 Gbps (Optical Carrier-192) to enable Ethernet to map directly to the WAN Synchronous Optical Network (SONET) and dense wave division multiplexer (DWDM) infrastructures. Those options will enable two types of Ethernet-based carrier services.

- The first will be MAN services running at native Ethernet speeds, constructed with a mesh of high-speed Layer 3 switches.

- The second offering will be WAN-based, with rate adaptation to OC-192 speeds.

By using SONET framing and DWDM capabilities, the distance limitations of standard Ethernet links are eliminated. Those offerings will dramatically shift the price / performance curve of WAN services. New Ethernet-based services are already offering a 2.5 times to 25 times increase in price / performance. By 2002, Ethernet-based services will offer up to 100 times improvement over traditional WAN offerings (0.8 probability).

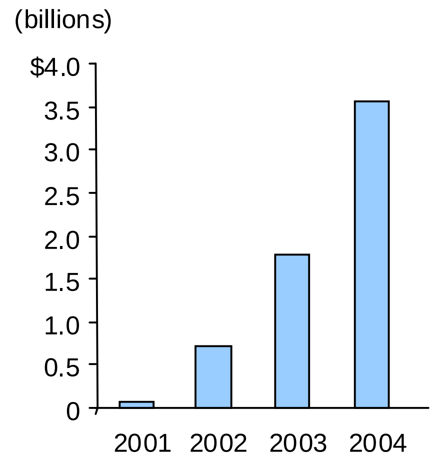
Work Proceeds on the Standard

Work is well underway to complete the 10GbE standard. The 802.3ae Committee was formed in January 2000 at the recommendation of an IEEE study group that examined the feasibility of extending the Ethernet standard. Unlike Ethernet standards of the past, the 10 Gbps standard will no longer support shared media access. It is highly unlikely that any significant work will be done on copper standards for 10GbE in the near term. The 802.3ae Committee is working toward a standard that will support a short list of criteria.

The 10GbE standard should be completed by 1H02, although pre-standard products will start appearing on the market from nearly all providers of high-speed Layer 3 switching products during 1H01. As the standard nears completion, prices will likely reflect the typical incremental costs of previous incarnations of Ethernet.

By year-end 2001, multimode 10GbE ports will cost approximately $3,000 to $6,000, and single-mode pricing should be in the $15,000 to $20,000 range. Prices will drop by at least 50 percent during the first year, followed up by the historically proven Ethernet price decreases of 30 percent annually. The market for 10GbE is projected to grow to $3.5 billion by 2004 (see Figure 2).

Figure 2
10 Gbps Ethernet Market Projections



Source: Gartner Research

Significant Cost Savings

Key for WAN services are the significant savings over traditional solutions. By directly coupling new Ethernet capabilities with a more robust optical core, service providers are able to eliminate SONET aggregation and transport layers. That gives new and nonlegacy operators cost savings of up to 10 percent above traditional carrier infrastructures.

Another key indicator is the start-up activity in this market. While a couple of pure Ethernet plays exist, the majority of the activity is in the area of optical and Ethernet integration and using Ethernet for last-mile technologies (see the sidebar, "Selected 10-Gigabit Ethernet Start-Up Activity"). In addition, new and established service providers are making major investments in Ethernet-based services. Those new offerings are providing stringent service-level agreements and are starting to drive down price points for WAN data services.

Selected 10-Gigabit Ethernet Start-Up Activity

- Force10 Networks
- World Wide Packets
- Lantern Communications
- Bandwidth9
- EZchip Technologies
- Atrica

Bottom Line

- While the 10 Gbps standard is still nearly two years off, enterprises are already starting to benefit from the adoption of Ethernet as a WAN technology.

CIO Update: 10-Gigabit Ethernet Scales the WAN (continued)

- In the campus LAN, very large, high-capacity networks will benefit from pre-standard 10 Gbps links as a tactical upgrade in high-capacity areas, although caution must be exercised to ensure that switches have the capacity to deliver something approaching 10 Gbps link performance.

- For WAN services, enterprises must negotiate strict service-level agreements, and should, for the short term, use traditional services as backup.

Written by Edward Younker, Research Products
Analytical source: Mark Fabbi, Enterprise Network Strategies

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CIO Update: When to Use Ethernet WAN Services

Metropolitan Ethernet providers are offering much more bandwidth for a lot less money than traditional carriers. Before committing to those new services, however, enterprises must fully understand their risks and limitations.

The Metropolitan Ethernet Provider

A new breed of service provider has emerged — the metropolitan Ethernet provider. Metropolitan Ethernet providers are blurring the distinction between the LAN and wide-area network (WAN) by offering high-bandwidth, Ethernet-based WAN and metropolitan-area network (MAN) access. Metropolitan Ethernet providers are giving enterprises new options for provisioning bandwidth capacity and availability. By building metropolitan backbone networks based on Ethernet, those providers free enterprises from the traditional carrier hierarchy (e.g., fractional T1, T1, DS3) and the long lead times (up to six months) associated with bandwidth upgrades.

Depending on the vendor, enterprises can buy bandwidth starting at 1 Mbps and going up to 1 Gbps, with pricing varying dramatically. For example, Cogent Communications offers a flat rate throughout its coverage area of 100 Mbps for $1,000 per month. Yipes Communications, however, commits to delivering twice the bandwidth at discounts ranging from 50 percent (for lower data rates) to 80 percent (for higher data rates) of the incumbent local-exchange carrier (ILEC)-provided bandwidth (half of what Yipes delivers).

In addition, some vendors offer the ability to add bandwidth on demand (with lead times today measured in hours — but by year-end, measured in minutes), enabling enterprises to scale bandwidth over a single Ethernet connection. However, before making a commitment, enterprises must be aware of the limitations of these services and the risks of the new vendors.

Metropolitan Ethernet Services — Two Primary Applications

The new services that are appropriate for the applications are discussed below.

Internet Access

In the Internet access application, the metropolitan Ethernet provider acts as an Internet service provider (ISP), complete with public and private peering arrangements. That "fat pipe" access to the Internet has immediate implications for enterprises:

- It minimizes the need to perform traffic shaping on the ISP link.

- It increases the scalability of remote access virtual private networks (VPNs). Thousands of users are able to simultaneously access the corporate intranet via a high-speed Internet connection (enterprises must implement their own VPN solutions, because Ethernet-based service providers do not offer managed VPN services).

LAN-to-LAN Connectivity

Because of their regional focus and their Ethernet-based technology, these service providers enable LAN-to-LAN connectivity via their metropolitan fiber rings. Those services are excellent choices for enterprises that must connect multiple offices within a localized geographic area. In this situation, no peering is required, because the vendors are the sole owners and operators of their networks. This degree of control gives the providers the option to offer various quality of service levels to their customers.

Metropolitan Ethernet vendors also offer intercity LAN-to-LAN connectivity, either via partnerships with interexchange carriers (e.g., Yipes) or via their own national backbone (e.g., Cogent).

Is All This Too Good to Be True?

A way to get a lot more bandwidth for a lot less money, packaged with bandwidth-on-demand capabilities. It sounds too good to be true. Metropolitan Ethernet providers are clearly forcing a paradigm shift in the model for bandwidth cost and availability, and these services will likely gain broad and rapid acceptance. By 2005, 80 percent of enterprises will have deployed Ethernet-based WAN and MAN services (0.8 probability).

But what about today? Enterprises should consider certain caveats as they evaluate services.

Risks

The leading companies in this market are unproven. Yipes and Cogent were founded in 1999, and GiantLoop Network was founded in 2000. Their financials cannot be audited, because none of the companies are publicly traded. Another unknown is what impact growing pains may have on their ability to meet promised service levels. In light of the recent financial troubles experienced by many competitive local-exchange carriers (CLECs) and digital subscriber line (DSL) vendors, many enterprises are unnerved by the prospect of doing business with new service providers.

While the business models of metropolitan Ethernet providers are very different from CLECs and DSL vendors (a lack of dependence on incumbent local-exchange carriers is the most significant differentiator), vendor stability is a valid concern.

To mitigate the risk factor, enterprises should thoroughly investigate the following information about their potential vendors:

- Financial backing (level of funding and the pedigree of its largest backers)
- Revenue growth rate
- Prior track record of its management team
- The satisfaction levels of reference accounts

Enterprises should further protect themselves by specifying penalty clauses and contract termination clauses for failure to meet service-level agreement commitments.

Limited Geographic Coverage

Enterprises seeking to use such services face limitations because metropolitan Ethernet providers are still building out their networks. For example, as of year-end 2000, Yipes offered services in only 20 cities and Cogent in only four. However, all vendors in this market have announced aggressive expansion plans for 2001. Nonetheless, due to limited coverage areas, many enterprises will have to deploy hybrid networks in which they mix traditional carrier infrastructure with Ethernet.

More Coverage Issues

Just because an enterprise is within a provider's coverage area does not mean that it has access to Ethernet WAN services. Generally, an office building must be within a quarter-mile of the provider's dark fiber ring to gain network access. If that distance limitation is exceeded, the provider will likely be unwilling to dig up asphalt to extend its network to the building.

CIO Update: When to Use Ethernet WAN Services (continued)

Forget Voice/Data Convergence for Now

Through year-end 2001, Gartner advises enterprises to forgo running voice over IP (VoIP) traffic over metropolitan Ethernet networks. The vendors have yet to demonstrate that their IP networks can reliably transport voice traffic. For the remainder of 2001, Ethernet WAN vendors will likely focus on building out their networks to increase geographic coverage and on growing their customer base by offering data-only services.

However, by early 2002, networks from the leading metropolitan Ethernet providers will be capable of supporting VoIP traffic (0.7 probability). Therefore, vendors will have to implement tiered service levels for differentiating between real-time voice traffic and non-real-time traffic. In addition, those vendors will likely deliver off-network voice services via public switched telephone network gateways. However, enterprises should approach such VoIP services with caution until vendors prove that they can reliably deliver on their service-level agreements. Enterprises seeking to deploy VoIP over metropolitan Ethernet should have a backup plan for voice traffic, and should plan to adopt VoIP incrementally after demonstrating success with smaller and less-critical sites.

Limited Service Offerings

Voice is not the only service that is unavailable from metropolitan Ethernet providers. Other common offerings that are also unavailable from those vendors are security options, such as managed firewalls and VPNs, and multiple service levels. During the next 12 to 18 months, Ethernet providers will likely add those services (and voice services) so they can generate additional revenue streams.

Backup is Important

Due to the newness of metropolitan Ethernet networks, enterprises should not become totally dependent on such services. For at least the first six months of a contract with a metropolitan Ethernet provider, enterprises should ensure that they have backup network access via a vendor with a traditional carrier infrastructure.

Bottom Line

- Due to the availability of metropolitan Ethernet services, network managers must change the way they think about bandwidth.
- The bandwidth / cost model of the new providers is so revolutionary that enterprises should strongly consider such services.
- However, enterprises must factor in the vendor risk factor, limited coverage areas and the data-only nature of the services into their evaluation processes.
- Due to the data-only nature of metropolitan Ethernet providers, enterprises will still have to rely on alternate providers for common offerings such as voice and VPN services.
- However, the additional administrative overhead that comes from managing multiple providers is far outweighed by the cost savings and bandwidth increase that can be realized with metropolitan Ethernet services.

Written by Edward Younker,
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- *"CIO Alert: Public Network Changes Impact the Enterprise Network," 26 May 2000*

Cross Talk

Rhythms NetConnections Retreats From Enterprise DSL. Rhythms NetConnections (RNC), a U.S. nationwide provider of digital subscriber line (DSL) service, will abruptly end enterprise-class service in 33 cities. Enterprises in the affected markets should immediately look for another provider.

On 2 February 2001, RNC sent a letter informing subscribers in 33 markets that all DSL services in those areas would be discontinued as of 28 February 2001. The move affects 1,000 customers, most of which RNC says are individuals and small businesses. RNC made no offers to assist with transitions to other carriers.

RNC has taken an urgent measure to contain costs in a competitive market that is proving too expensive for it to support nationwide. Even if RNC's move stabilizes its operations, Gartner believes that the short notice and lack of assistance for transitions to another provider will cause hardships for customers. Whether customers are small or large, their networking needs are important, and the abrupt end to service without assistance belies RNC's normal attention to detail. RNC will likely find it difficult to rebuild relationships with dropped customers. RNC has given insufficient notice for users to be assured of acquiring new service. Since the lead-time for DSL and DS1 activation can be months, RNC customers in affected areas risk going offline and facing business interruptions.

Gartner advises customers of RNC and its partners (e.g., WorldCom) to look primarily to their incumbent local-exchange carriers (ILECs) for alternative offerings for DSL or DS1 services. After all, the local ILEC provides the underlying facilities (i.e., local loops) which carry RNC services. However, Gartner also recommends that affected customers approach RNC for assistance in transitioning to a new service. Even though the providers of the underlying facilities can be identified, in many cases the providers are not prepared to work directly with RNC customers because the services have been set up as independent circuits that RNC manages. RNC customers not affected by this announcement should also review their contracts and consider their alternatives now — rather than gambling that this may be the last such announcement. Customers seeking alternatives may also wish to consult DSL portal sites (e.g., www.dslreports.com) for leads to additional providers.

RNC is not the only non-ILEC broadband access provider facing difficulties. For example, Covad Communications Group has cut its workforce and slowed its expansion plans, and NorthPoint Communications Group has filed for Chapter 11 bankruptcy protection. Hence, Gartner customers using these service providers should also review their contracts and service options.

Analytical sources: John Girard and Jay Pultz, Enterprise Network Strategies

A Lesson in Managing Security Risks of New Technologies. On 2 February 2001, a group of computer scientists associated with the University of California at Berkeley announced that they had discovered a flaw in the 802.11b Wired Equivalent Privacy (WEP) protocol that enables notebooks to connect wirelessly to LANs. The flaw could enable hackers to intercept the transmission of data to and from the notebook, to read the contents, and to modify them without detection.

The first generation of any technology is inherently insecure. Until researchers and hackers have scrutinized a technology and attacked implementations, any software will inevitably contain serious security vulnerabilities. Gartner has predicted that these vulnerabilities will become even more prevalent as vendors take shortcuts to build encryption and authentication into wireless devices that have limited processor and memory capabilities. Complex protocol stacks, weak encryption, shared keys, user confusion, bandwidth and device restrictions encourage vendors to take shortcuts with emerging mobile devices and services.

Although attacks against wireless 802.11 networks require close physical proximity to the network, flaws in the current implementation would allow a relatively unsophisticated attacker to intercept and inject LAN traffic while sitting in a parking lot outside of a building. Enterprises using laptops with 802.11 wireless interfaces should use virtual private network (VPN) client software on the laptops to encrypt communications over the wireless interface and use VPN servers in conjunction with the wireless gateway. WEP implementations that correct the flaws discovered by the Berkeley group likely will not be available until at least 1Q02.

Analytical source: John Pescatore, Information Security Strategies

Volera Gains Its Independence From Novell. On 2 February 2001, Novell announced the formation of a new company, Volera, whose offerings seek to increase the delivery speed of Internet content by combining Web caching with content management. Novell's Net Content Services group will form the core of the employees of Volera, and Simon Khalaf, former manager of Net Content Services, will lead Volera as president. Volera will receive a total of $80 million in capital from Novell as well as from Nortel Networks and Accenture (formerly Andersen Consulting), which signed definitive agreements to provide some of the capital in exchange for minority stakes in Volera. The parties expect these deals to close by 2Q01.

Novell has seen its stock price languish; recently it reached a little more than $5 per share — down significantly from its 52-week high of almost $45 in February 2000. Novell also faces a situation where its flagship product line, NetWare (representing more than 50 percent of Novell's revenue), continues to lose market share to Microsoft's Windows 2000. Novell's problems have hidden a few bright spots, including its Internet Caching System (ICS) software that Novell will transfer to Volera. (To improve its growth potential, Gartner believes that Novell considered, among other options, breaking up the entire company but chose instead to spin off this one division.)

In Gartner's opinion, being associated with Novell's broader corporate problems has hampered ICS, as have its fundamental differences from Novell's traditional products in respect to business model (rental), channel and target market. Meanwhile, vendors offering products similar to ICS, such as Akamai and Inktomi, which have not yet become profitable, have gained widespread publicity and (until recently) were favorites of Wall Street. Spinning off Volera will allow this caching technology to generate more growth and directly benefit the shareholders of Novell — much as the Palm Computing spinoff did for 3Com. Volera's success will directly benefit Novell shareholders at least through late 2002 — when Novell says that an initial public offering (IPO) of stock might occur.

In the long term, for Volera to succeed on its own, it must evolve its ICS software into a content delivery solution by year-end 2002 in advance of any IPO. For now, the spinoff of Volera will not affect enterprises that use ICS technology in other Novell offerings. OEMs (e.g., Compaq Computer and Dell Computer) will still license ICS technology and make it available in appliance form. Customers of BorderManager, which remains with Novell, will still be provided caching technology as a part of the product. Enterprises looking at caching solutions should consider the Volera offering independent of the larger problems of Novell.

Analytical source: Neil MacDonald, Local Area Networking

Ericsson to Stop Terminal Manufacturing, But Not Terminal Sales. Ericsson has announced a deal that will break up its troubled mobile phone manufacturing and sales business. Flextronics and others will take over the manufacturing while Ericsson focuses on terminal R&D, sales and marketing.

On 26 January 2001, Ericsson announced that it will cease to manufacture mobile phones. Ericsson has signed a memorandum of understanding that calls for Flextronics to take over Ericsson's plants and 4,200 employees in several countries, starting 1 April 2001. Ericsson also agreed with electronics manufacturer GVC to take over Ericsson's development and manufacturing operations in Taiwan (a responsibility GVC will share with Arima, under a previously announced agreement).

Ericsson's mobile terminal business has burdened the company financially for some time. The weight of the terminal unit's poor profit margins and Ericsson's focus on higher end phones became clear in Ericsson's financial report for fiscal 1999, and rumors and speculation abounded in 2000 as to how Ericsson would fix the problem. Gartner believes that the company realized late just how important fashion and ergonomics have become in the cellular terminal market. Nokia was probably the first mobile phone vendor to recognize this and react. As a result, Nokia's share of the world market has grown while its margins have remained robust. Other vendors quickly caught on, and Motorola and Siemens now have very attractively engineered phones in their product ranges.

By selling its phone manufacturing sites worldwide to Flextronics and transferring some of the Consumer Products Group's staff, Ericsson continues a process it started in 1997 by selling its printed-circuit production sites to Flextronics (and to Multek, a Flextronics subsidiary). At the same time, Ericsson also plans to sell off the distribution arm for its voice customer-premises-equipment unit, which further indicates that it is getting out of end-user equipment manufacturing.

By retaining R&D, Ericsson will ensure that it keeps key terminal expertise critical to the future of the mobile infrastructure business. Ericsson will also retain marketing and sales of Ericsson-branded phones made by Flextronics. Thus, Ericsson will likely retain a significant portion of design control over new terminals. Although Ericsson's terminals are known for being robust electrically and mechanically, Gartner believes that Ericsson will need to boost this internal technical expertise with better ergonomics and more fashionable design. Perhaps the most direct way of doing so would be to collaborate with a consumer electronics company that has a proven track record.

This announcement will certainly contribute to solving the problems Ericsson faces with its consumer products business and will allow the company to increase the focus on its infrastructure business — good news for infrastructure customers. Ericsson and Flextronics already have a well established relationship, which should help smooth the transition to outsourced fabrication of mobile phones; that in turn should reduce the concerns of users of Ericsson terminals. Still, the company has not clearly indicated how it plans to shed its image of reliable but dull terminals; they still lack the “life style” element.

Analytical source: Nigel Deighton, Enterprise Network Strategies Europe

Cisco Takes Its First Step Toward Office-in-a-Box. On 22 January 2001, Cisco Systems announced the availability of its IAD2400 Series of integrated access devices (IADs), which connect enterprise networks to those of service providers. The IAD2400s will allow network service providers (NSPs) to help small and midsize businesses (SMBs) migrate from circuit-switched to packet-switched access networks, thereby facilitating the convergence of voice and data traffic.

This announcement indicates that Cisco has started taking the SMB market more seriously. Gartner believes that this market represents the next battlefield where NSPs and network equipment vendors will fight for opportunities to grow. SMBs need state-of-the-art networking products and services to support e-business while not bleeding their networking budgets dry, and Cisco has obliged with a flexible technology for a reasonable price. Specifically, the IAD2400s target NSPs that serve SMBs. The IAD2400s support three types of network architecture: the traditional time division multiplexing, IP-based architecture and the new “soft switch” (i.e., network software-based) approach. The latter will enable the NSP’s network to provide functions such as voice / call processing in the network rather than in hardware residing at the SMB.

This announcement likely represents Cisco’s first step toward developing an “office-in-a-box” networking device. Such a device would include functions now performed separately by a WAN access device, router, PBX switch and the like. Today, SMBs and branch offices typically have separate devices for each networking function — resulting in typically six or more devices at a small site (these equipment items are scaled down versions of would be located at larger sites.) An office-in-a-box device would lower total cost of ownership, simplify network management at SMB sites and make it easier for NSPs to offer a value-added service to completely manage the networking needs of an SMB site.

Gartner believes that Cisco will next add IP-based telephone switching or key systems to its IADs and that it will debut an office-in-a-box device by early 2002. However, other large vendors have already incorporated these functions. Nortel Networks and Marconi did so after acquiring SMB networking vendors Sonoma Systems and Mariposa Technology, respectively, in October 2000. Office-in-a-box technology will lead to solutions offered by single equipment vendors and NSPs for small and branch offices.

However, Gartner believes that SMBs should look to obtain services from NSPs that also provide equipment at the office — especially office-in-a-box technology; such approaches should go a long way in resolving problems with SMB network management and support. In addition, SMBs should investigate how soft switch technology can enable them to place their call processing features on the NSP’s network.

Analytical source: Jay Pultz, Enterprise Network Strategies

Canadian Wireless Auction Reinforces Big Three Carriers. Bell Mobility, Rogers Wireless and Telus Mobility accounted for almost the entire amount raised in Canada's latest wireless auction. Thus, the major incumbents effectively shut out potential new rivals from the marketplace.

On 1 February 2001, Industry Canada announced the completion of its auction of PCS spectrum in the 2 GHz range. The winning bids totaled C$1.48 billion for 62 licenses across Canada. Bell Mobility bid $720 million for 20 licenses, including two in southern Ontario, with which it plans to support current and future services. Rogers Wireless pledged $394 million for 23 licenses, and Telus Mobility bid $356 million for five licenses; both vendors came away with one license apiece in southern Ontario.

This auction brought no surprises. The three largest incumbents successfully defended their turf against three smaller rivals, two of which — Microcell and Sprint (U.S.) — dropped out of the bidding early. The third, W2N, won licenses scattered across several provinces (Alberta, British Columbia and Quebec), but Gartner believes that these limited locations will not justify the construction of new regional services. Gartner forecasts that these licenses will come up for sale again within a few years or never be used. A fourth bidder, Thunder Bay Telephone, successfully bought additional spectrum in northern Ontario.

Bell, Rogers and Telus now have additional spectrum in all major areas in Canada with which to continue their buildout and service improvements. In the most important development, Bell acquired licenses in Alberta and British Columbia where once partner, now competitor Telus was the provider. Gartner believes that Bell will work quickly through 2002 to build out its own wireless infrastructure, thereby removing much of its reliance on Telus. With its acquisition of Clearnet in 2000, Telus had already removed its long-term reliance on Bell and its alliance partners — SaskTel, MTS and Aliant.

The new licenses will mainly lead to improved quality of service within carriers' established coverage areas — particularly in populous southern Ontario where spectrum is now overtaxed. Gartner reiterates its best-practice advice to enterprises seeking wireless services in Canada to issue requests for proposals and to negotiate price for all services.

Analytical source: Bob Hafner, Enterprise Network Strategies Canada

Lower VoIP Prices Do Not Outweigh Quality Concerns. On 2 January 2001, Netcom announced that it cut its charges for voice over IP (VoIP) telephone calls by about one-third — and by 50 percent on calls to North America. On 1 January 2001, new regulations governing telecommunications charges went into effect in China. They lower China Telecom's long-distance charges and allow VoIP providers to set their own rates.

The new regulations will make the IP telephony market more transparent. The four providers (China Telecom, China Unicom, Jitong Network Communications and Netcom) have carried on a price war by selling calling cards at substantial discounts — e.g., on the street, a 100 yuan card may sell for as little as 44 yuan ($5.30). Whether this practice is legal has never been established, but by allowing providers to set their own prices, regulators have also allowed the discount war to proceed openly. The market will thus be more efficient.

Cross Talk (continued)

Netcom's move will likely pressure other VoIP providers to cut prices further, which could reduce their revenue in the near term and possibly affect their stock listing plans. In the long run, the move will benefit China's domestic IP and telecommunications market, which must prepare for the entrance of global competitors. Price competition will particularly help former incumbent China Telecom become more competitive while its rivals (e.g., Netcom, Jitong and Unicom) must concentrate on improving service levels (e.g., by increasing bandwidth and implementing network software for quality control). Only if they can sustain domestic competition will they be able to face global telecommunications giants. However, the VoIP rate cuts raise potential concerns. Since IP telephony uses the Internet, the network's performance, including bandwidth, decides quality of service. Despite improvement efforts, bandwidth and coverage remain too narrow for IP services. Callers have experienced unclear voice, lower quality, broken lines and difficult access during peak hours on certain carriers' backbones.

For many consumers, the lower price of VoIP compensates for quality problems. For enterprises, quality is more important, and they should continue using traditional phone service through 2003 and review service quality annually thereafter. 2005 marks the end of China's Tenth Five-Year Plan with its focus on building out information infrastructure. By then, China's network infrastructure will be upgraded and expanded to meet enterprises' need for high-speed connections (0.7 probability). Small and midsize enterprises in China that need the savings VoIP can offer should choose a provider based on bandwidth rather than lowest price.

Analytical source: Louisa Liu, Enterprise Network Strategies Pacific