2007 Metro Ethernet

By Steven Taylor and Joanie Wexler

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2007 Metro Ethernet

Metro Ethernet Overview

Ethernet technology, which accounts for more than 90% of enterprise LAN installations, is now gaining traction in metropolitan and wide-area networks, too. According to a recent survey conducted by Kubernan, business customers are seeking higher WAN access speeds to alleviate the bottleneck in the access network between the corporate LAN and WAN service to satisfy multimedia and business continuity requirements.

For their part, network service providers are discovering that they can leverage Ethernet's high speeds, widespread interoperability, and economies of scale to reduce capital and operating expenses and to grow their service portfolios. One technology enabler is the availability of "Carrier Ethernet" products, a class of Ethernet infrastructure equipment that supports carrier-grade quality of service (QoS), availability, restoration times, and service management. The Metro Ethernet Forum (MEF), an industry consortium, established the specifications for carrier-class Ethernet capabilities.

Metro Ethernet services comprise two primary categories:

- **Ethernet virtual leased lines.** These services function like point-to-point links between individual pairs of enterprise sites, between enterprise sites and the public Internet, and between enterprise sites and non-Internet WAN services, such as Multiprotocol Label Switching (MPLS) VPNs.
- **Virtual private LAN services (VPLS).** These make all intersite connections appear as one large LAN.

State-of-the-Market Report

Published By
Kubernan
www.Kubernan.com

Cofounders
Jim Metzler
jim@ashtonmetzler.com

Steven Taylor
taylor@webtorials.com

Design/Layout Artist
Debi Vozikis

For Editorial and Sponsorship Information
Contact Jim Metzler
or Steven Taylor

Kubernan is an analyst and consulting joint venture of Steven Taylor and Jim Metzler.

The Survey in Brief

In the fall of 2006, Kubernan surveyed the subscriber base of Webtorials[1] concerning Metro Ethernet deployment plans, expected uses, and implementation drivers and inhibitors. This report is a summary and analysis of those findings, collected from more than 225 Web-based survey responses. About 45% of the respondents described themselves as business customers or potential business customers of Metro Ethernet service. The service provider community represented the remaining 55% of the response base.

For those respondents identifying themselves as service providers, questions about deployment plans were asked and answered in terms of when and how broadly the provider expected to deploy and/or how they felt their potential customers would take advantage of Metro Ethernet services. For those respondents identifying themselves as enterprise users, questions were asked and answered in terms of when they planned to adopt the use of Metro Ethernet services or to use Metro Ethernet technology to build private enterprise network connections. Asking essentially the same questions of service providers and end users provides unique insight as to areas where the two communities are in sync with each other and where they diverge.

For additional detail on the survey database, see the "Methodology and Demographics" section in the Appendix.

Respondents' Scope of Influence

Seventy-four percent (74%) of respondents said they played a role in the decision-making process of Metro Ethernet purchasing and installation, either as decision-maker, recommender, or influencer.[2] About 53% of respondents worked in companies with more than 2,000 employees.[3]

The historical work experience of nearly half of the respondents (46%) was about equally divided across WAN and LAN technologies. Another 32% had their work experience roots in the WAN with a later move to include the LAN. Half that percentage (16%) started in the LAN with a later move to include WAN expertise.[4]

Key Findings

The Kubernan survey revealed the following Metro Ethernet deployment and usage trends:

- There is respectable demand for Metro Ethernet services, with 36% of enterprise user respondents saying they are already in widespread production and/or the implementation process.
- Limited service availability might be the single biggest barrier to usage and adoption in the business community.
- Paradoxically, the primary drivers behind Metro Ethernet also represent the primary inhibitors to its adoption. For example, respondents ranked the ability to gain higher-speed access connections at improved cost points as their primary interest in Metro Ethernet. But they also cited high service prices as their top concern, or the primary inhibitor, to service adoption.

These findings reflect two things: 1) User perceptions about services may not yet match up with reality, particularly in those organizations that have not yet deployed services and thus don't have procurement and cost experience with Metro Ethernet services; and 2) User and service provider knowledge and education levels

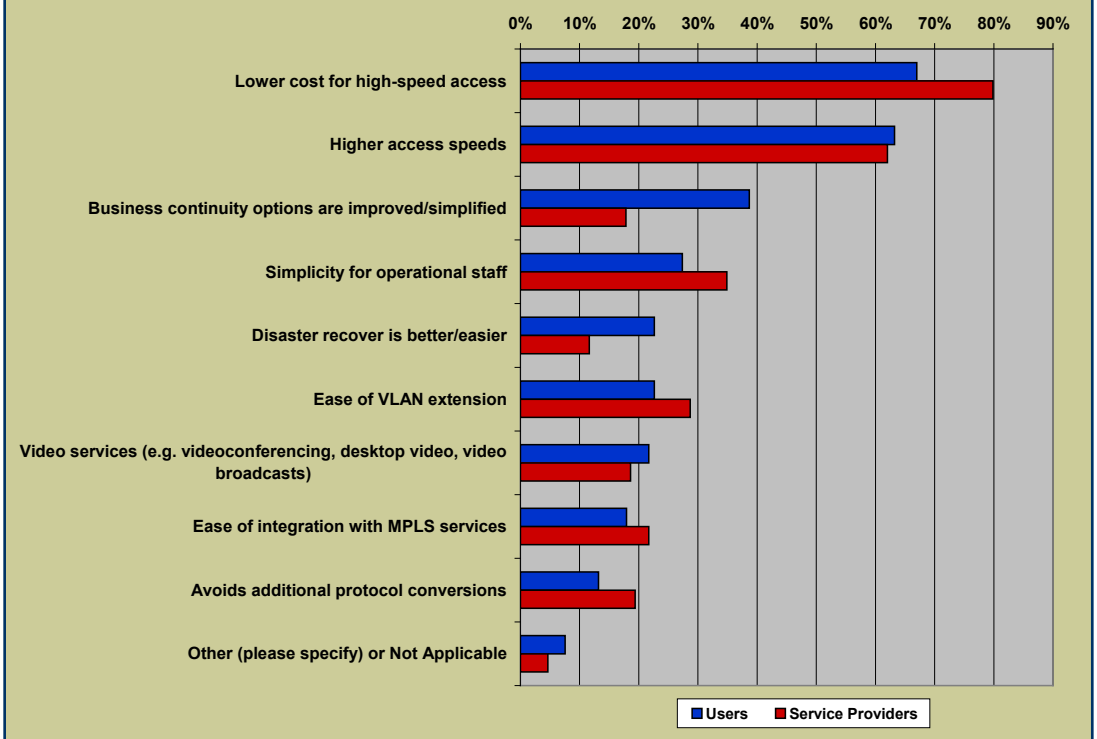
[1] *The editorial products and product distribution for Webtorials have been separated. The editorial products, including this and future state-of-the-market reports, are produced as Kubernan products, with the joint venture being led by Steven Taylor and Jim Metzler. For distribution of information, Webtorials remains unchanged.*

[2] *See Figure A1 in the Appendix for details.*

[3] *See Figure A2 in the Appendix for details*

[4] *See Figure A3 in the Appendix for details.*

Figure 1. Implementation Drivers



Service providers see Metro Ethernet as more cost driven than do enterprises, which are eyeing the technology in large part for potential business continuity improvements.

about Metro Ethernet technology, service availability, and prices may differ (see Figure 1).

Uses and Sources for Metro Ethernet

The user survey respondents indicated less of an orientation toward using Metro Ethernet for Internet access, compared with provider expectations. The majority of users cited their planned usage within the next 24 months as primarily for site-to-site metro area communications (72%) and access to WAN services other than Internet services (65%).

Service providers expect users to deploy Metro Ethernet services primarily for site-to-site metro communications services (93%) and access to non-Internet WAN services (90%). They also expect users to deploy Metro Ethernet for generic Internet access (88%). Access to Internet VPN services registers much more loudly on service provider radars (89%) than on user deployment plans for Internet VPN access (58%) during the same time frame (see Figure 2).

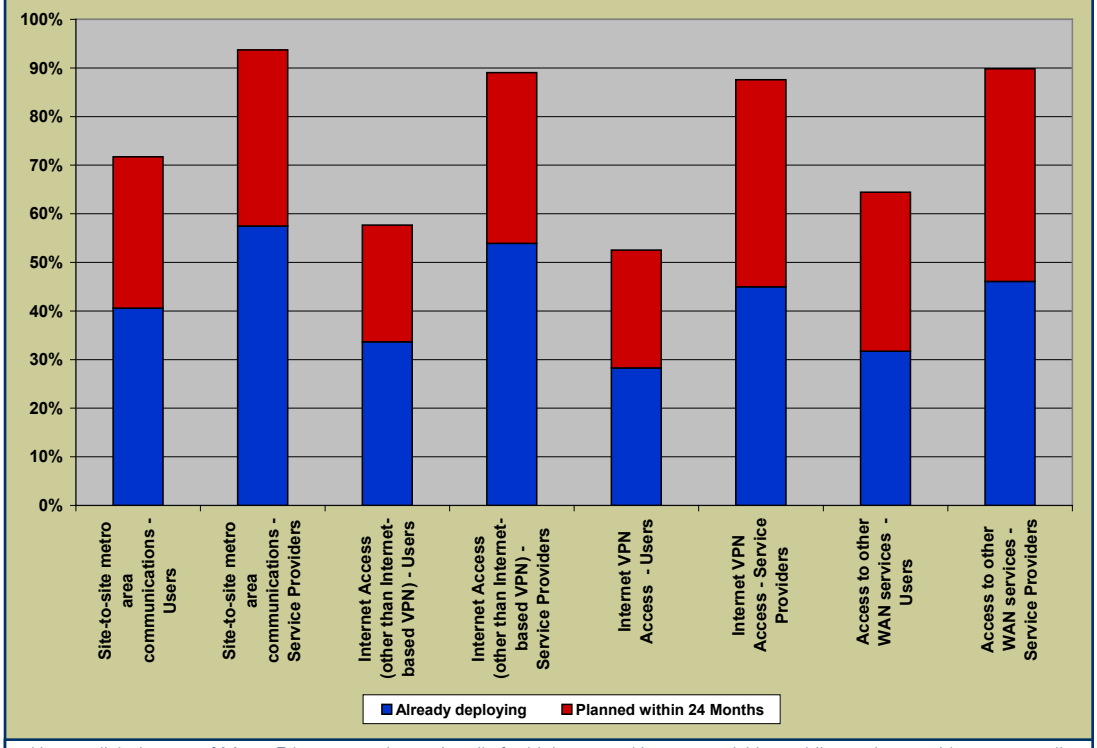
The fact that service providers seem much more bullish about the use of Metro Ethernet services than users do is understandable from at least a couple of perspectives. First, the carriers who responded to the survey would naturally select themselves to be those who have a keen interest in these services. Second, carriers must deploy their infrastructures before users can take advantage of services that run on them.

The majority of users and service providers alike envision customers getting the benefit of Metro Ethernet primarily in the form of a service delivered by a traditional provider. Users ranked this option as a 3.6 on a 5.0 scale, while service providers ranked it a 3.9. (The scale went from a value of 1 indicating "Not a chance" to 5 indicating "Definite.")

Users envisioned themselves implementing their own service over dark fiber as the second most likely

application of the technology (2.75). Service providers were more optimistic about users' willingness to procure services from non-traditional players (3.0) and to have a third party install and manage a service over the customer's own dark fiber (2.5). Users gave this last option the lowest ranking (2.2). This last finding, in particular, indicates that service providers within the surveyed community continue to see a rosier future for managed services than do users. This is consistent across several recent Kubernan surveys, indicating a continued need for education by the service providers concerning the advantages of using managed services. In addition to this education, though, the service providers must excel in providing these services, fulfilling the promise by building an excellent track record.[5]

Figure 2. Purpose of Metro Ethernet Service



Users relish the use of Metro Ethernet services primarily for higher-speed intranet activities, while service providers are equally optimistic about intranet and Internet access applications of the technology.

Service Availability and Speeds

One of the key sticking points for Metro Ethernet service adoption by enterprise customers is the lack of (or perceived lack of) service availability across all of the sites where a distributed business might want to use it. For example, 19% of enterprise user respondents said that Metro Ethernet services were not available in any of the areas where they had company sites in which they might wish to deploy the services. Only 4% said that services were, indeed, available in all the sites where they wanted to use them.

One of the more interesting disparities between service providers and users came in the projection of whether Metro Ethernet services would be available in 67% to 100% of the sites where they would be needed after 2007. Fifty percent (50%) of service providers projected this degree of nearly ubiquitous service availability, while just 21% of users anticipated it. These responses were offset by the "Don't Know" category, where 44% of the users indicated a lack of knowledge as compared with only 15% of the service providers.[6]

[5] *See Figure A4 in the Appendix for details.*

[6] *See Figure A5 in the Appendix for details.*

Though several large incumbent carriers have deployed Metro Ethernet services in the U.S. and Europe, just 42% of the carriers who responded to the survey said they were already in widespread production and/or in the implementation process of making Metro Ethernet services available (see Figure 3).

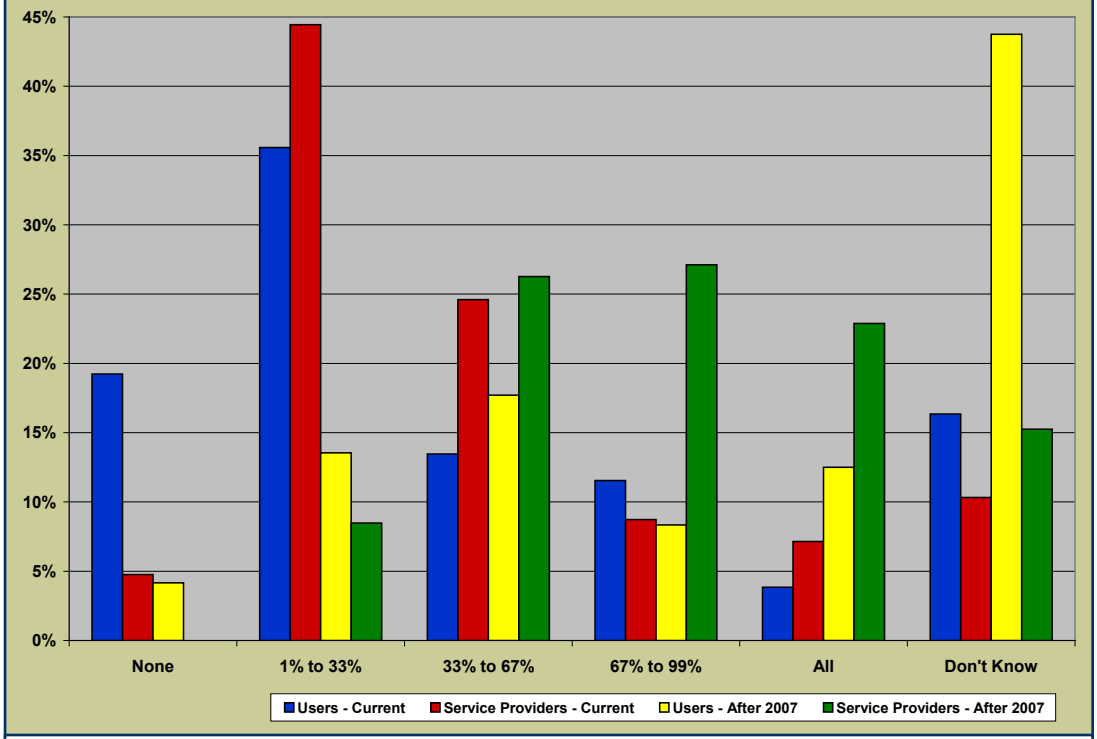
The hit-and-miss availability situation is likely due to a couple of factors. First, from a technology standpoint, most Metro Ethernet is delivered via relatively expensive optical fiber, which has not reached mass-market penetration yet, particularly in North America and Europe. Fiber to the premises is much more abundant in Asia, where most businesses and residences are in multitenant buildings and where countrywide networks are physically smaller and denser, and can thus be built out more quickly. In these countries, consumers have an average of 50- to 100-Mbps broadband home connections, compared to the 1- to 5-Mbps connections typical in the U.S. and Europe.

A second reason for the currently spotty service coverage of Metro Ethernet is simply that Carrier Ethernet standards for alternative media, such as voice-grade copper wiring, are also relatively new. IEEE 802.3ah (informally known as Ethernet in the First Mile, or EFM) was added to the IEEE 802.3 standards family in 2005 and includes a specification for copper wiring. As a result, equipment is still in the process of being rolled out into service provider infrastructures, and services simply have not yet had time to propagate widely across very large network infrastructures.

The speed discrepancy mentioned above is one explanation for why the survey results show that the near-term "sweet spot" for Metro Ethernet falls in the 10- to 100-Mbps range. Users want (and service providers realize they must deliver) significantly higher-bandwidth experiences than are currently available using traditional DSL and cable modem technologies, which deliver 3- to 6-Mbps speeds.

This discrepancy between the two communities at the 10-Mbps and the sub-10-Mbps ranges is particularly striking. Respondents were asked to rank the probability of use at these speeds on a scale of 1 to 5, with 1 indicating "Virtually no deployment" and 5 indicating

Figure 3. Site Availability



Network infrastructure build-outs have far to go before they are available to all who might want them.

"Nearly ubiquitous deployment." At 10 Mbps, users indicated a value of 3.2 while service providers indicated a value of 3.8, a difference of 0.6.

For sub-100-Mbps Metro Ethernet usage, the discrepancy rose by 50% to a difference of 0.9. Service providers ranked the probability of service usage at these speeds at 3.5 while users assigned sub-10-Mbps service speeds a ranking of 2.6. There are at least two factors at work here. First, the sub-10-Mbps, or "mid-band," services probably have a higher visibility to the service provider community than to the users. Second, there is significant competition in this speed range, as mentioned, from DSL and cable modem services.[7]

Conclusions

User and service provider plans for Metro Ethernet services are in the ramp-up phase. Interest by both groups is high, but deployments are in the early stages. From the enterprise perspective, the reason has mostly to do with a lack of consistent service availability across all enterprise sites that might require it. The spotty service availability has a few legitimate excuses: Deployment of high-cost fiber to the premises in most parts of the world is still in its infancy, and Carrier Ethernet infrastructure equipment—which brings enhanced levels of service management, uptime, and reliability to traditional Ethernet in the LAN—became available only recently. It takes time for large network service providers to get their carrier-class Ethernet infrastructures installed and deployed across their entire serving areas, which can be global in nature.

While users say they view high-speed access at lower cost points as their primary motivation for considering Metro Ethernet, they also cite high costs as their No. 1 concern.[8] This seeming paradox may be due to the fact that users, who are long familiar with the economies and simple operations of Ethernet, hope that the economies of scale will port over to metro- and wide-area Ethernet services. However, since a good number of them do not have much experience with such services yet, they worry that service providers will charge a premium, at least in the early days.

Finally, enterprises and users alike think the near-term sweet spot for services lies between 10 Mbps and 100 Mbps. These speeds are substantially higher than what is available with DSL and cable modem technologies and can surpass traditional time division multiplexing (TDM) access capabilities, such as T1/E1 and T3/E3 services, with simpler and much lower-cost Ethernet alternatives.

About the Authors

Steven Taylor is a co-founder of Kubernan and Editor/Publisher of Webtorials. An independent consultant, author, and teacher since 1984, Mr. Taylor is one of the industry's most published authors and lecturers on high-bandwidth networking topics.

Joanie Wexler is an independent technology analyst and editor who reports on trends and issues in the computer-networking and telecommunications industries. She authors the "Wireless in the Enterprise" newsletter for *Network World* and contributes frequently to industry trade publications such as *Business Communications Review* and *Computerworld*.

[7] *See Figure A6 in the Appendix for details.*

[8] *For more details on inhibitors to rolling out these services, see Figure A7 in the appendix.*

Pushing Ethernet Out the Door

(In a Good Way!)

By Richard Byrd,
VP, Strategic Marketing, Metro Ethernet Networks, Nortel Networks

From the Sponsor

NORTEL

Low-cost carrier-grade infrastructure alternatives for scaling Ethernet services will help metro and WAN offerings quickly ramp up.

Network and application convergence is driving multimedia applications that require additional bandwidth in access networks. Well-proven Ethernet technology is a strong candidate for addressing the last-mile bandwidth challenge efficiently and cost-effectively. Being able to expand staff Ethernet skill sets, speeds, and economies of scale into the access network allows enterprises to affordably mitigate the discrepancy in throughput that exists between their high-speed corporate LANs and comparatively slow WANs so that they can maximize the performance of their high-volume applications.

Video is one of the emerging application areas driving Metro Ethernet service deployment. Providers' business customers are in the early phases of adopting desktop videoconferencing and collaborative multimedia applications that will make use of the Ethernet services en masse. In addition, service providers are seeking a way to satisfy the appetites of the consumer market. The teen/tween market, for example, is quickly devouring video-based content from YouTube and Web sites offering Internet TV programming. Because Ethernet has invaded many residences, with families sharing Internet connections using home Ethernet networks, Ethernet in the metro and wide area holds the potential to provide a natural extension to those services.

Nortel organized to address these opportunities about a year ago, announcing its Provider Backbone Transport (PBT) infrastructure in April 2006. Combined with Nortel Provider Backbone Bridging (PBB), PBT is set to revolutionize metro networking as providers look for migration strategy that will enable them to support the growing demand for high-bandwidth video and data services in their metropolitan networks. These solutions deliver a simple, cost-effective metro evolution strategy that is scalable and easy to implement and manage.

Currently making their way through standards bodies, PBB and PBT—in conjunction with new Ethernet operations, administration, and management (OAM) standards—extend the capabilities

of Ethernet to transform it into a true carrier-class technology. Nortel's Carrier Ethernet solutions are thus able to help solve current Ethernet challenges in order to bring determinism, hard quality of service (QoS), scale, 50-ms resiliency, and carrier-class OAM tools to native Ethernet.

PBB enables millions of service instances to be deployed in a single metro area, compared to just over 4000 with traditional Ethernet. PBT is an innovative technology that, for the first time, delivers the TDM-like connection management characteristics with which providers are familiar to Ethernet, which is traditionally connectionless. In the Nortel PBT architecture—which was selected by BT for all its 21st-century networking in January 2007—specific items within standard Ethernet such as broadcasting, MAC address learning, and Spanning Tree functionality are effectively "turned off" to enable connection management functionality.

Using PBT, providers can create point-to-point Ethernet tunnels and specify the path(s) that traffic will take across their Metro Ethernet environments. These paths reserve appropriate bandwidth and support the provisioned QoS metrics that allow providers to guarantee and enforce customer service-level agreements (SLAs).

The Nortel PBT's 50-ms recovery times match the benchmarks set by existing SONET/SDH networks. Providers can set up working and protection PBT paths and, by leveraging the Carrier Ethernet OAM capabilities defined in IEEE 802.1ag standards that provide fault notifications in milliseconds, achieve carrier-grade failover times.

PBT implements a service and tunnel layer paradigm similar to other technologies. Because the tunnel or transport layer can be "abstracted" from the service layer, PBT is service agnostic; it can be used to deliver any service type. In addition to Ethernet services, it can support Multiprotocol Label Switching (MPLS) services and any type of voice, video, and data traffic over a variety of media, including both copper and fiber optics. As a result, service providers gain a simpler network that is easier and less expensive to operate and troubleshoot.

Appendix

Methodology and Demographics

The Webtorials subscriber base was asked to participate in an online survey about their experiences with and plans for deploying Metro

Ethernet. All questions were in a multiple-choice format and included a "Don't Know," "Not Applicable" or "Other (please specify)" option.

Whenever appropriate, the order of the multiple choices rotated randomly so as not to bias the survey respondent by the order in which the options were presented.

The Webtorials survey was conducted in late 2006.

The following figures are included for your further information about issues and demographic details that were not covered in the report.

Figure A1: What is your role in your company's Metro Ethernet implementation?

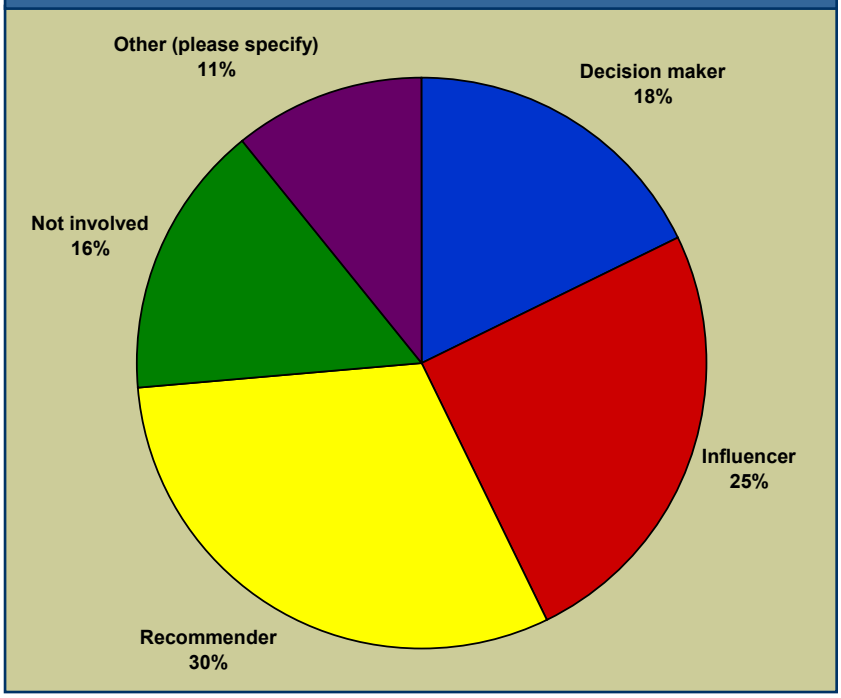


Figure A2: How many employees are there in your organization?

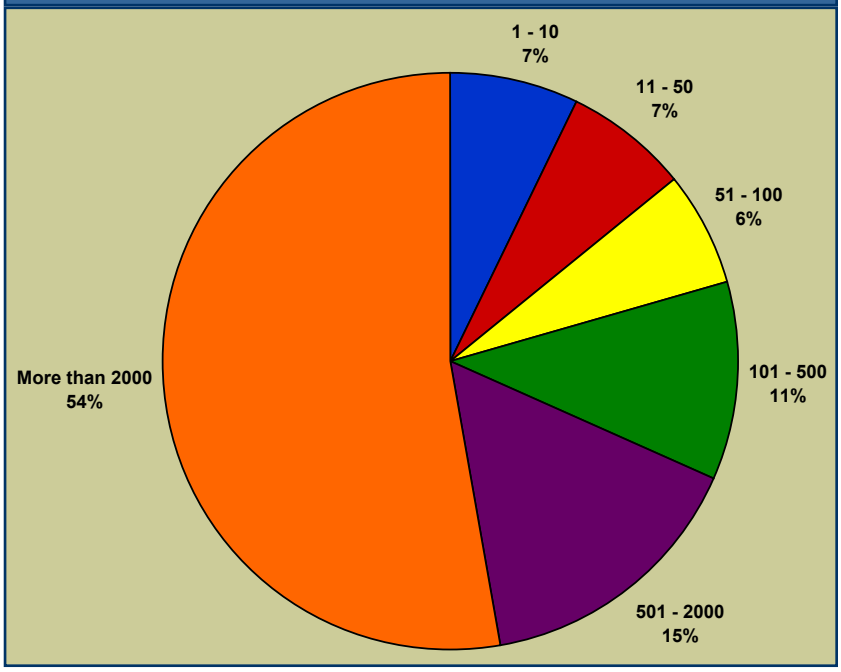


Figure A3: Which of the following best describes your historical networking expertise?

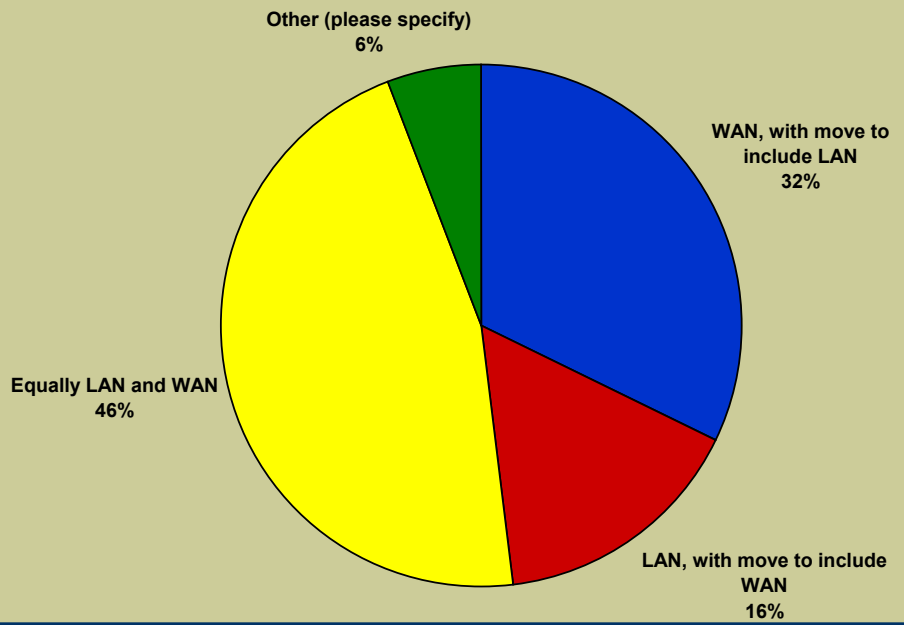


Figure A4: For users, "When planning for Metro Ethernet products and services, what is the likelihood that you will deploy using each of the following for at least a part of your implementation?" and for service providers, "When planning for Metro Ethernet products and services, to what extent do you think your customers/prospects will consider using each of the following for at least a part of their implementation?"

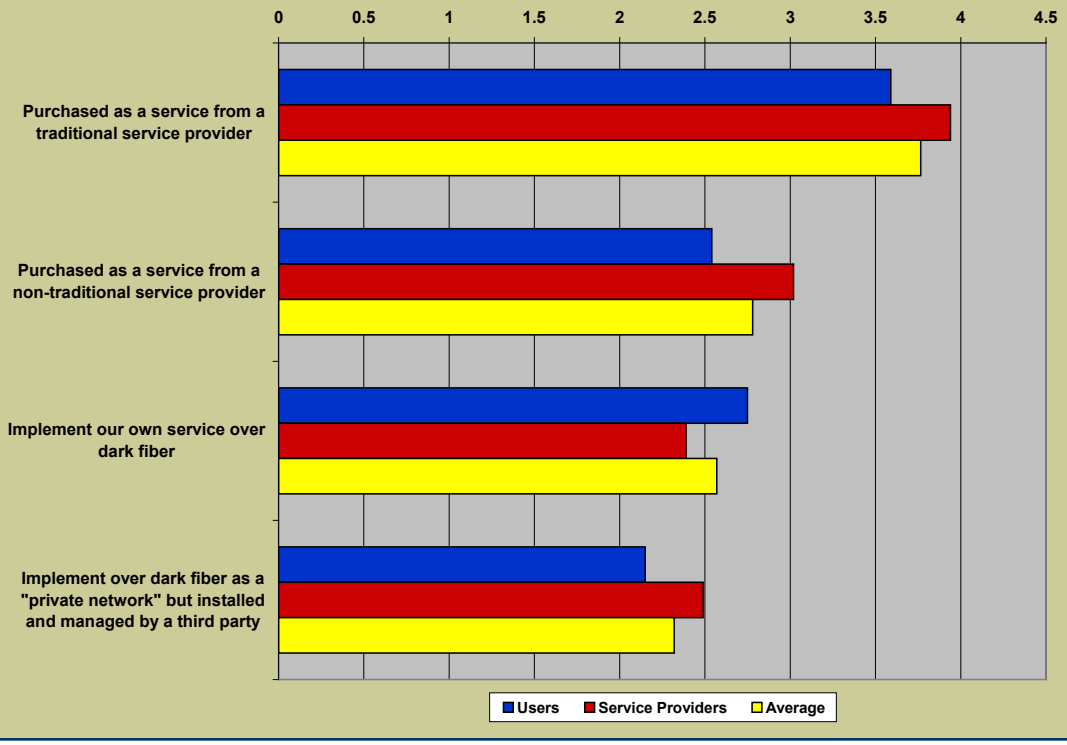


Figure A5: At what stage is your company in deploying Metro Ethernet technology?

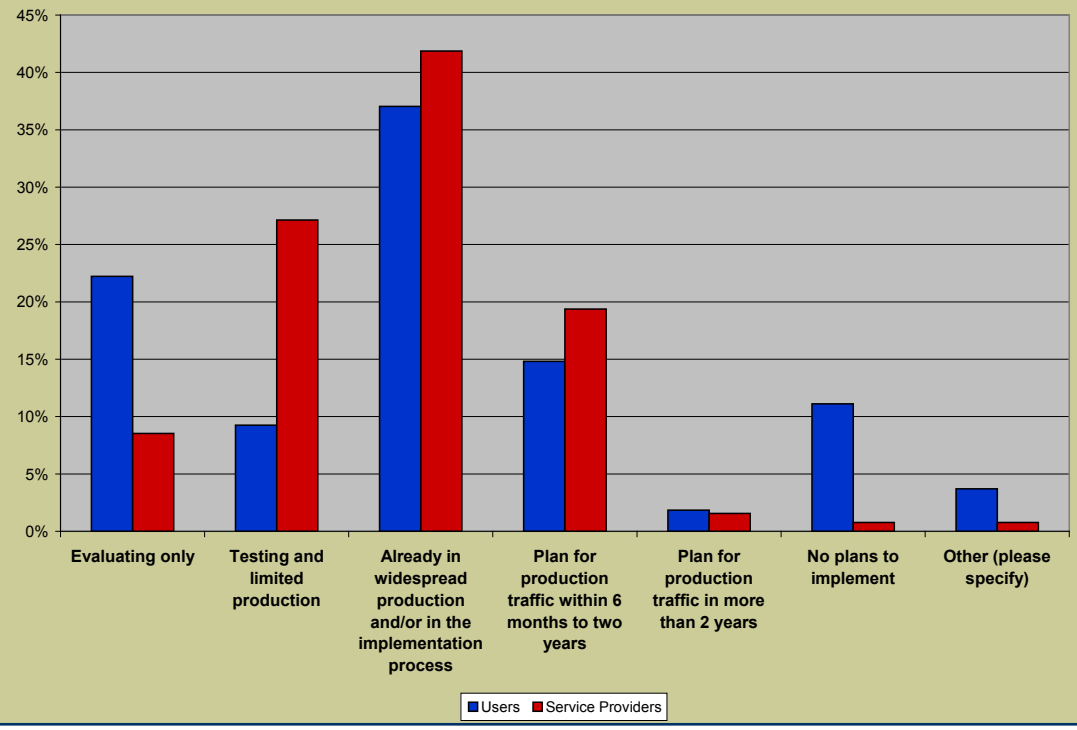


Figure A6: For users, "Which of the following speed services do you see being deployed in your network in the foreseeable future?" and for service providers, "Which of the following speed services do you see being needed by your customers in the foreseeable future?"

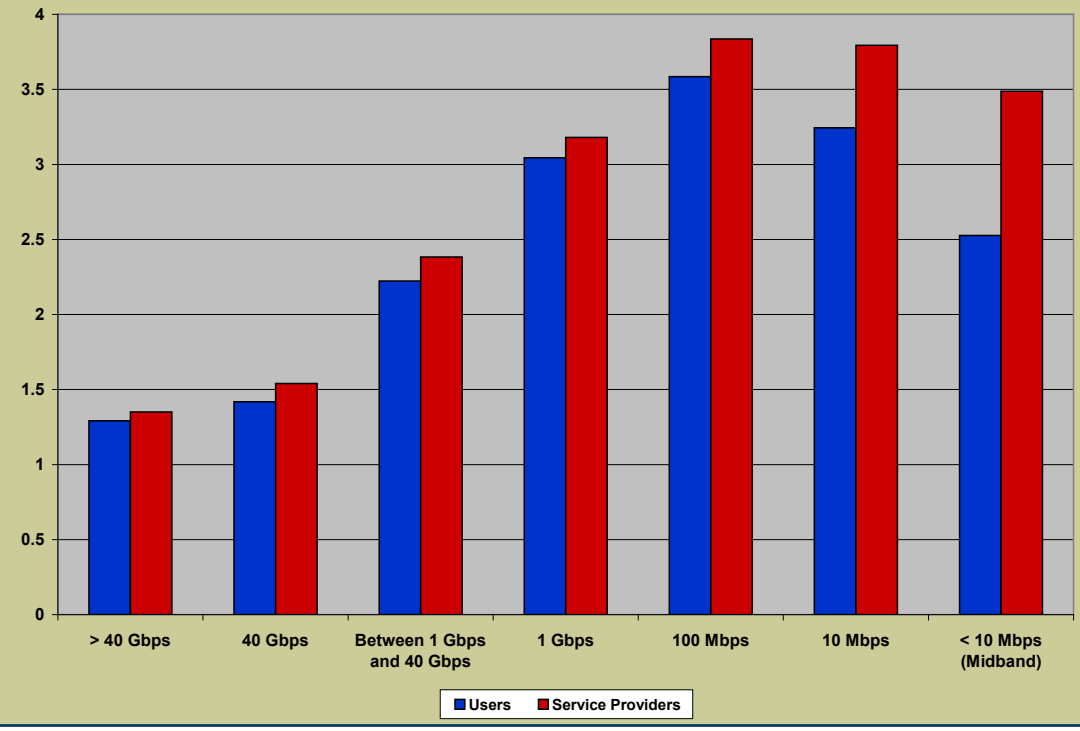


Figure A7: For users, "What are the THREE most challenging factors in justifying or deploying Metro Ethernet services?" and for service providers, "What do your customers see as the THREE most challenging factors in justifying or deploying Metro Ethernet services?"

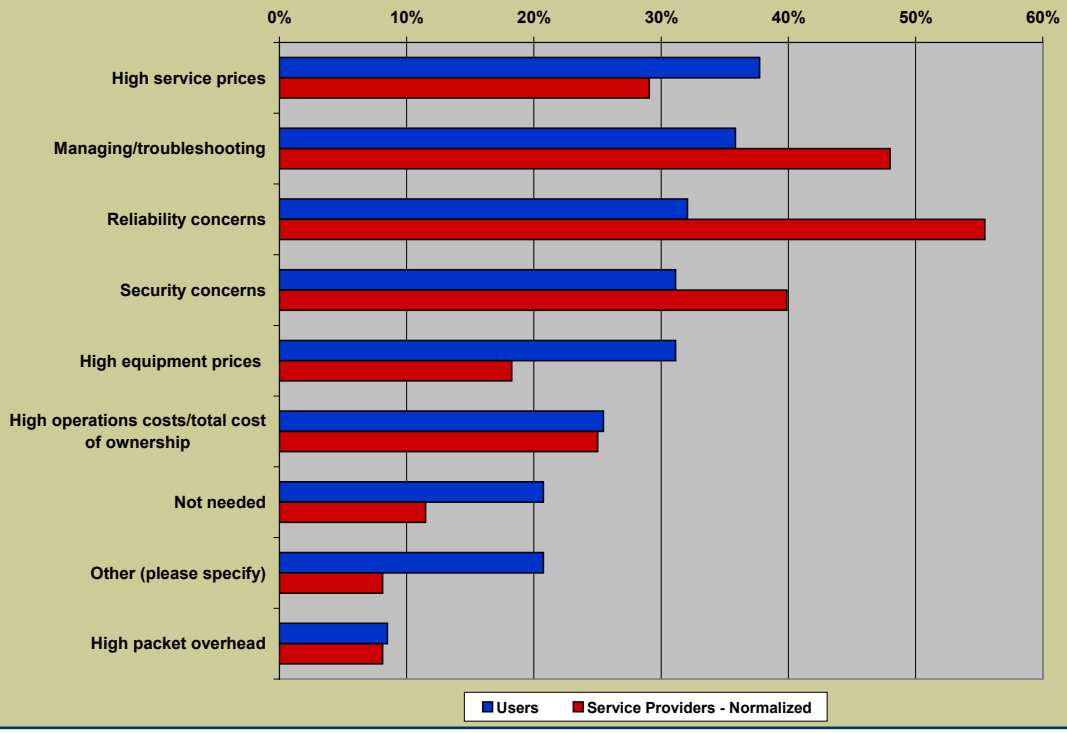


Figure A8: For users, "Have you been able to calculate a hard ROI/payback with an existing or planned Metro Ethernet implementation?" and for service providers, "Do you think it will be important for your customers to calculate a hard ROI/payback with an existing or planned Metro Ethernet implementation?"

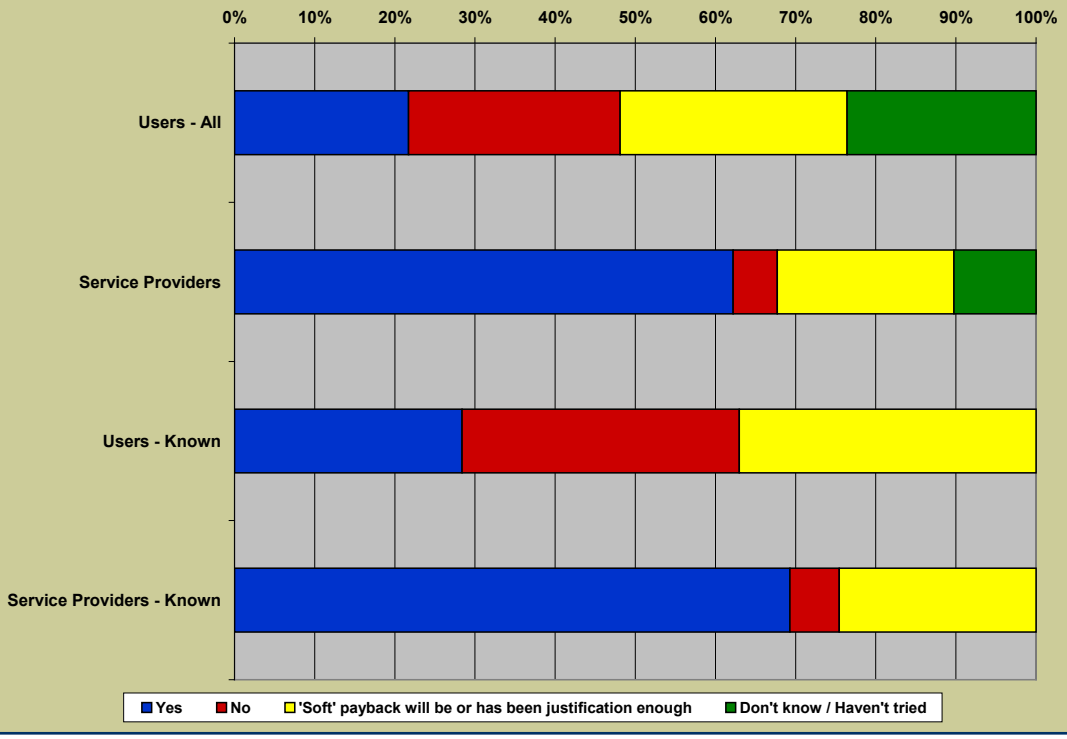


Figure A9: Where is your company headquartered?

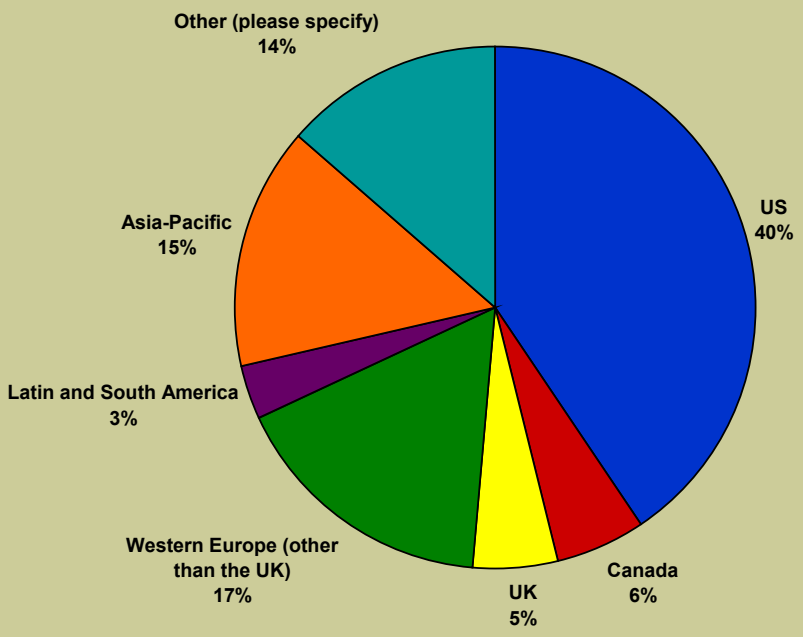


Figure A10: How would you rate your company relative to how rapidly it adopts new technology?