Metro Ethernet Offers Opex Gains

Gary Southwell

Next-gen services promise time and dollar savings for carriers when initiating, upgrading and expanding customer connectivity.

The recent interest in Ethernet services by enterprises, and the spate of service introductions by providers worldwide bodes well for the industry. Yet questions remain: Can the services be priced low enough to drive widespread adoption while leaving enough margin to make rollouts profitable in the long term?

Much work has been done on developing private-line Ethernet services with strong service level agreements (SLAs) that allow service providers to charge premiums and generate revenue. However, these types of services may not be able to drive the widespread adoption for which the industry hopes, adoption that would rival that of frame relay and high-speed TDM services in the mid-1990s.

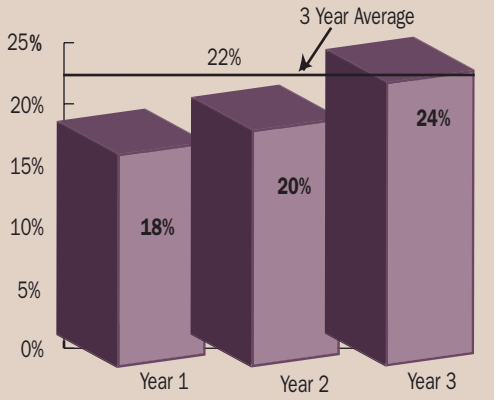
Widespread adoption means that the services provide higher value than the alternative for the end user, and a profit advantage for the provider. To the end user, the value is typically understood in a dramatically lower cost per bit. To the provider, the total cost of ownership has to be lower than the alternative.

Much has been said about Ethernet's lower capex costs. While this is true, the operational side of designing, installing, turning up, and managing new services can account for 40–60 percent of the cost attributed to a service. While the capital savings of Ethernet services are compelling, capex is not enough of an incentive if operational savings can't be found versus today's alternatives.

Can Ethernet service be operationally efficient enough to offer advantages over traditional services? The Metro Ethernet Forum decided to find out. Recently, it commissioned a set of independent studies of global business service deployments to examine the operational cost models of traditional TDM, frame relay and ATM services compared with that of recently rolled-out Ethernet services. PointEast Research studied the operational models of 36 North American and European service providers as well as 18 providers from Asia/Pacific. In both studies, PointEast found that Ethernet private line (E-Line) and Ethernet LAN (E-LAN), services can save service providers approximately 22 percent in opex on average over three years, compared with their TDM and frame relay/ATM rivals (Figure 1).

The two studies show that savings increase year over year for the entire study period. In performing these studies independently, PointEast was able to confirm and validate its original findings for the North American and European markets against the results from the recently concluded Asia/Pacific study. The results were nearly identical (Figure 2) and show conclusively that Metro Ethernet services have substantial operational cost benefits for service providers in comparison to legacy services and can materially affect provider profitability.

FIGURE 1 Metro Ethernet Savings For A Single Metro Area



Source: PointEast Research

The Studies

The objective of these economic studies was to compare the operational cost of delivering a single Metro Ethernet service to the cost of delivering a single legacy data service. Based on these comparisons, a business case for a medium-sized city over a three-year time frame was produced for each region. Operational models were then devel-

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oped for Metro Ethernet services delivered via an Ethernet-based network as well as legacy data services delivered via a legacy network infrastructure. For these studies, two Metro Ethernet services—E-Line and E-LAN—were evaluated against two legacy data services—TDM private lines and frame relay/ATM virtual circuits.

The studies examined and compared operational expenditure findings of 54 service providers currently delivering both legacy and Ethernet metro data services to end-user business customers. The studies projected the findings on a hypothetical three-year standardized deployment in mid-sized metro areas with populations between 1 million and 2 million, with 50,000–80,000 businesses.

Each study encompassed a cross-section of operator types including incumbent Bell operating companies, European and Asian PTTs, facilities-based competitive local exchange carriers (CLECs), facilities-based city service providers and wholesale service providers. Roughly equivalent numbers of each type of provider were examined, in order to prevent skewed data. Based on operator experience, assumed penetration rates were developed for each service type, taking into account the fact that point-to-point E-Line services would initially be more popular than multipoint E-LANs, given the lack of experience with the latter on the part of both the service provider and the customer.

From there, it was a simple matter of comparing the numbers for deploying a single E-Line service compared to a TDM (T1/E1, T3/E3 or OC-n/STM-n) private line or for a single E-LAN service compared to a single frame relay or ATM virtual circuit.

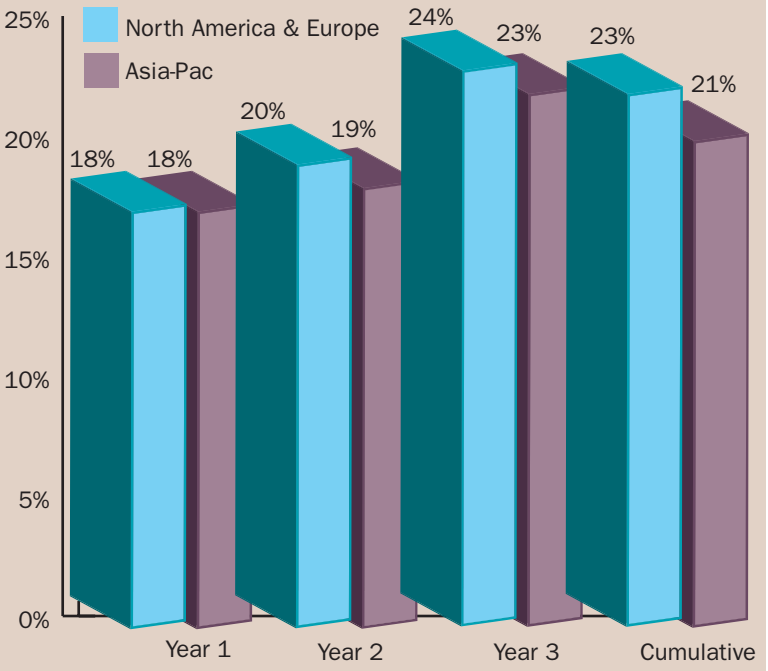
Actual operating data for all service types was collected over the course of several months from on-site visits to service providers that were already deploying Ethernet services. Each visit consisted of cross-functional meetings with marketing, technology planning and network operations personnel to obtain a clear understanding of the entire service lifecycle, from business plan to pricing to network deployment and maintenance, to ongoing service monitoring and troubleshooting. Workflow models for each service type were developed from these meetings, and labor costs were obtained for each step in the process.

Specifically, the study examined the labor costs incurred in four operational areas—planning, field operations, central office (CO) operations and network operations center (NOC) operations—for five distinct customer service lifecycle tasks. These tasks were:

- Initial service provisioning from the time the customer order was placed to the time the service was activated.
- Service bandwidth upgrades and changes.
- New service additions (i.e., connecting new ports).
- New customer site additions (same customer in a new location).
- Service monitoring (alarm resolution).

More than 27,000 services deployed to nearly 4,400 office buildings were studied in order to provide an adequate sample size.

FIGURE 2 Regional Opex Savings Comparison



Source: PointEast Researc h

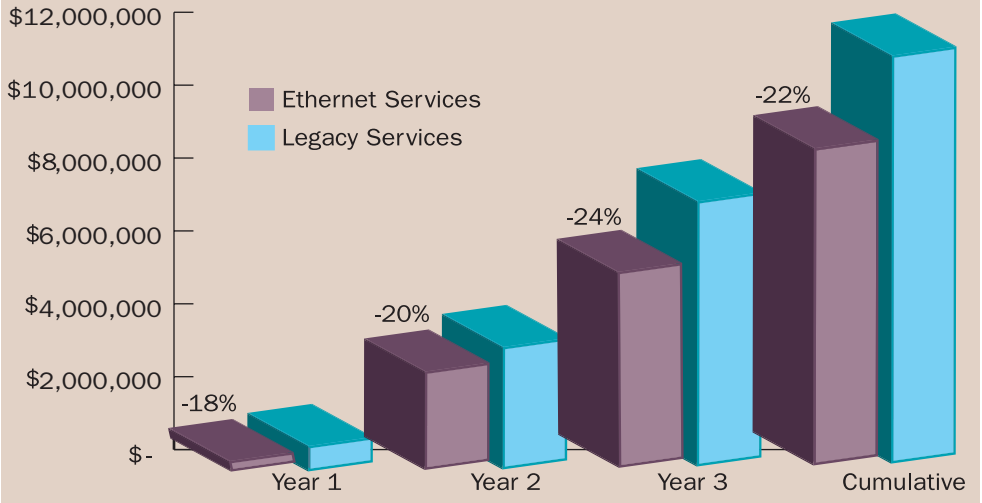
Results

Once the data was collected for each service, it was fed into the operational models for each service type, and the models were compared. The result, as noted above, was an average 22 percent savings in operational expense over a three-year period.

The study revealed that most of the operational savings came in the areas of bandwidth changes and service additions. This means that the savings actually increased consistently over the three-year time period, from 18 percent in the first year to 20 percent in the second year to 24 percent in the third year (Figure 3). The average impact on an operator in a medium-sized city was nearly $2 million during that period.

According to several providers that participated in the study, these cost benefits are compelling enough that they believe Ethernet inevitably will become the standard for the metro network. They also believe that these savings will actually increase as providers move down the "Ethernet learning curve" and become more efficient at deploying and managing it. In fact, two of the

FIGURE 3 Comparison Of Metro Ethernet OPEX To Legacy Services



Source: PointEast Researc h

providers in the Asia-Pacific study are already generating operational cost savings in excess of 20 percent today. Because these studies were conducted in all the major global regions and included a wide variety of service providers in each region, the study also demonstrates that these operational benefits are not restricted to certain types of providers or only to areas where there might be regulatory or cultural advantages.

Sources Of The Savings

The major sources of the savings came from initial provisioning, bandwidth changes, service additions and site additions. The one area where Ethernet services came up slightly short were operations, administration and management (OAM) savings measured at the NOC.

■ **Initial provisioning:** For initial provisioning tasks, the savings are 13 percent to 22 percent, depending on the service type, while the savings for bandwidth upgrades and service additions can be in excess of 80 percent. These savings are entirely due to the fact that the bandwidth of Metro Ethernet services can be adjusted via software in the NOC, whereas legacy services require a truck roll to the customer site to change the connection at the customer demarcation point.

For the purposes of the studies, initial provisioning of a service was defined as the time and tasks required between when the customer orders a service and when that service is delivered to the customer. Included were:

■ *Planning Engineering:* Verifying customer order and performing credit check, verifying capacity availability, equipment availability and scheduling of the technician.

■ *Field Technicians:* Truck roll to the customer site, setting up equipment, provisioning and testing the circuit.

■ *CO/NOC Technicians:* Cross-connecting circuits and attaching jumper cables, occasionally assisting with testing and occasional travel time.

The results varied slightly by region and by service type but were in the range of 10 percent to 20 percent (Table 1). These savings are mostly due to the reduction in truck rolls and time needed by field technicians to provision and test Metro Ethernet services versus legacy services—though there are some additional savings in planning engineering from leveraging more automated Ethernet-based provisioning systems.

■ **Bandwidth upgrades and changes to existing service deployments:** Tasks here involve planning engineering, field technicians and CO/NOC technicians. The savings are much greater—more than 80 percent in some cases—due almost entirely to the fact that the bandwidth of metro Ethernet services can be remotely adjusted from the NOC via software (Table 2). This is an enormous advantage compared with the process required for legacy services. Truck rolls to the customer site to change the connection at the demarcation point mean lots of travel time and cost for field technicians.

There also were additional savings associated with CO/point of presence (POP) technicians for similar reasons. The cross-connects associated with Ethernet bandwidth changes are made with a simple software adjustment by a single NOC technician, while for legacy services, manual connections must be made at the central office.

■ **Ethernet service additions** can be as simple as

TABLE 1: Metro Ethernet Savings For Initial Provisioning

	E-Line Savings	E-LAN Savings
North America/ Europe	13–19%	17–22%
Asia/Pacific	10–17%	11–20%

Source: PointEast Research

TABLE 2: Metro Ethernet Savings For Bandwidth Changes

	E-Line Savings	E-LAN Savings
North America/ Europe	66%–82%	69–83%
Asia/ Pacific	55%–63%	62%–67%

Source: PointEast Research

physically connecting another port, without making any hardware equipment changes, and provisioning the circuit remotely. Legacy equipment used to deliver private line services typically requires additional line cards and end-to-end time-slot provisioning to accommodate a new high-bandwidth service.

Because of its packet aggregation capabilities, Ethernet also has the potential of being the "single-port" for multiple services. A customer can order a single 100-Mbps port to deliver Internet access, transparent LAN, voice and video services, and keep them separate simply by using different virtual LAN (VLAN) tags. With legacy services, multi-service connectivity is much more difficult and expensive to manage and operate, and given the 45-Mbps limit of frame relay, may require multiple connections.

Savings from service additions are marginally lower than those from bandwidth upgrades, but were still 40 percent to 80 percent (Table 3). Here again, Ethernet allows most service additions to be completed via a software adjustment as opposed to a truck roll. Service additions were lower because a truck roll may still be required in some cases to assist the customer with the connection to the demarcation point and new VLAN tagging; if the customer is sophisticated and maintains an internal IT department, this truck roll may not be required. For this scenario model, it was assumed that a truck roll would be required for 10 percent of Ethernet-based service additions and 90 percent of legacy service additions.

■ **Site additions for existing customers:** A site addition is similar to initial provisioning, and the steps necessary include planning engineering, field technicians and CO/NOC technicians. However, once the equipment is in place, the customer has the power to create its own subnetworks to connect departments, suppliers etc., without requiring operator intervention.

Based on study results, metro Ethernet services provide opex site addition savings of approximately 30 percent in North America and Europe and 15 percent to 20 percent in Asia/Pacific. These savings were mostly due to reduced times needed by field technicians to provision and test metro Ethernet services versus legacy services. There also were occasional savings with planning engineers, leveraging more automated Ethernet-based provisioning systems.

■ **OAM:** The last lifecycle task was the NOC, including network monitoring, fault isolation, troubleshooting and network administration.

NOC technicians typically work shifts of 12 hours on followed by 36 hours off, with the average NOC technician working 182.5 hours per month. Other than 12 percent operational savings from simplified circuit provisioning and upgrades, there are no material OAM savings realized. In fact, several providers have had to invest additional money to develop their own OAM systems for Ethernet services.

However, this is an area to look for future savings as Ethernet service OAM&P (operations, administration, maintenance and provisioning) techniques are refined and standardized. Today, most Ethernet equipment does not have carrier-class monitoring and alarm features, but this is beginning to change. As these devices mature and acquire TDM–like functionality, operational savings could rival or even surpass that found in the other areas. Providers can eliminate having to send technicians to multiple locations just to pinpoint the source of a fault and determine its cause.

The implications are that the providers today have to invest more up front to operationalize Ethernet services. Yet once this investment is made, the payback on the effort starts immediately.

TABLE 3: Metro Ethernet Savings For Service Additions

	E-Line Savings	E-LAN Savings
North America/ Europe	50%–80%	55%–80%
Asia/ Pacific	40%–60%	41%–62%

Source: PointEast Research

Providers have to invest up front to operationalize Ethernet, but the payback starts immediately

Conclusion

Ethernet services offer significant operational savings over the manual processes required by legacy T1/E1, T3/E3 and OC-n/STM-n private lines, as well as frame relay and ATM-based virtual circuits. Service providers realize these savings by using Ethernet's flexibility and service scalability. Multiple services can be multiplexed off the same device and sold to the same or multiple customers, saving tremendous upfront operational installation and service turn-up cost. Service upgrades can be performed remotely, and moves, adds and changes require less time on site.

While Ethernet still faces a learning curve as well as capital cost hurdle on the OAM front, these up-front costs can be made up fairly quickly. As metro Ethernet continues to mature, standards are finalized and put into practice, and as providers find new ways to leverage Ethernet's benefits, it can be reasonably assumed that these savings will only grow over time.

Ethernet equipment also takes time to be adopted into a network. Most service providers have a large installed base of legacy equipment serving existing customers. As Ethernet works into this legacy network, the provider will be better able to leverage its efficiencies over a greater number of services and customers. For a provider operating in an increasingly cost-competitive environment, the benefits of deploying metro Ethernet are too hard to ignore□