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WHITE PAPER

The Impact of a Total Cost of Ownership Model

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IDC OPINION

Many factors and variables go into a major investment and purchase to enhance a network expansion or to replace legacy equipment. Surprisingly, not all these variables are always considered. As carriers move to deliver new services, build fewer and more powerfully connected datacenters, and work to secure their networks, the factors involved in making a capital decision include the product itself, support and service for that product, as well as cost and pricing options. Yet many carriers and providers fail to examine and analyze beyond the technical feature sets to incorporate operational and financial factors that can also influence their investment early in the purchasing process.

IDC believes that by not integrating technical, operational, and performance data with life-cycle replacement planning and a complete lease versus buy analysis, carriers could be incurring a higher cost than necessary when looking to replace or add equipment to their network.

- A good total cost of ownership (TCO) model incorporates hardware and software costs, installation and license tracking, warranties and maintenance agreements, as well as vendor financing options. It must also include operational expenditure (opex) such as power, testing, deployment costs, training, education costs, as well as security assurances and upgrades. Other major considerations are long-term expenses versus up-front costs, replacement of equipment costs, and future scalability requirements.

- A TCO model should include the impact of service growth and the network expansion over at least five years, which might be required to support the growth of video and mobile traffic. Increasing network capacity could lead to the use of multiple platforms, when an integrated platform can bring significant cost advantage over the life of the network.

- Seemingly low-cost alternatives, which often have lower first-year costs, often mask the increasing cost of customer service, support, or warranties over time. They also may not contain all the feature sets needed to deliver new IP services.

Carriers must have an open mind and evaluate all these factors in order to adequately determine the best total offer, value, and cost of ownership for the major purchase of networking equipment.

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IN THIS WHITE PAPER

We discuss multiple variables associated with network expansion or equipment purchase that operators should consider.

SITUATION OVERVIEW

Operators are increasingly focused on a basic formula: capital and operational costs divided by revenue. As investments in capital equipment and operational costs increase, the revenue for some operators is simply not growing at the same pace. Operators have to find a way to grow their revenues through new services, but they must also minimize their capital and operational investments at the same time. Therefore, all dimensions of the investment decision need be considered: short-term needs, long-term dollars spent, as well as feature sets and support that will help the provider through all the years of product deployment. Financial assistance to capital for equipment and/or services from day one should also be a consideration for any new investment.

Often, significant product differentiators and market influencers tend to drive purchasing of network equipment, while other factors that go into making a good financial and operational investment become a lower priority. Many operators look at only the first year of investment rather than the "whole picture" over five years. Influencers and differentiators stem from the core technologies, product architecture, and operating systems that are deployed. Scalability of that architecture must be considered when evaluating the growth of traffic over time. Sometimes a feature set or architectural decision is simple. Do I have more slots to add capacity in this box compared with the competition? If the answer is yes, then the capacity benefits are clearly there. One can discuss the benefits or drawbacks of one architecture or operating system versus another, but at the end of the day, these differentiators should be considered with all the other factors that can come into play over the deployment cycle of the product.

If a feature is immediately required, such as inline video monitoring, and only one product supports it, then a decision is easy. Video monitoring is a key feature in delivering reliable broadcast and video on demand (VoD) services over IP. And some percentage of online over-the-top content will need to be managed, also requiring video monitoring. A video monitoring probe can be in a standalone appliance or located on a separate "services" line card, which then uses up a precious slot on the router. Or it can be integrated directly onto Ethernet forwarding cards where the probe is now inline in the system, not requiring additional real estate. If one wants to monitor 50% of all IP video traffic, and it is passing through the router, clearly the integrated approach will be the most cost-effective.

For mobile backhaul applications, synchronous Ethernet is another example of where an inline solution saves on real estate and is integrated on the card without having to transfer the traffic to a separate line card performing only that function. These long-term cost benefits are critical to understand when comparing feature sets across competitors.

The fundamentals of the operating system are critical. Is it modular so that the failure of one process will not affect another process? Is it scalable in the control plane? Does it support in-service software upgrades (ISSUs)? Can a single feature be upgraded so that the entire operating system does not have to be requalified? However, details about operating systems and how they are supported can become murky and provide less clarity on the overall return on investment. Will a vendor provide customization? How long will that last? How long will the vendor support the specific feature?

In addition, key intangible differentiators include brand awareness, ease of use and reliability, and partnership sharing, all of which are difficult to realistically measure and value as part of the investment process. These influencing factors tend to have emotional and passionate ties to them, which can sway the decision process, often in a direction away from the comprehensive analysis based on all the major factors and variables.

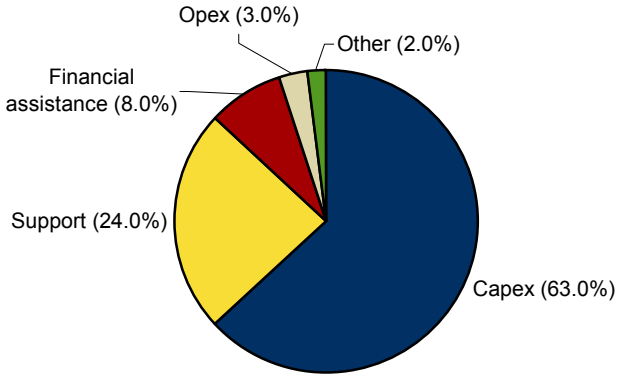
Using a Total Cost of Ownership Model

IDC believes that the following factors and variables should be analyzed when making a decision on capital equipment: the capital expenditure (capex) for the product itself, services (professional and support oriented, including maintenance), opex, and financial assistance. We address each of these areas to fully understand their impact.

As shown in Figure 1, capital expenditure for a product is often the largest contributor to the decision process. Second in importance is services and support including maintenance, followed by financial assistance and then operational expenditure and "other."

FIGURE 1

Proportion of the Decision Process



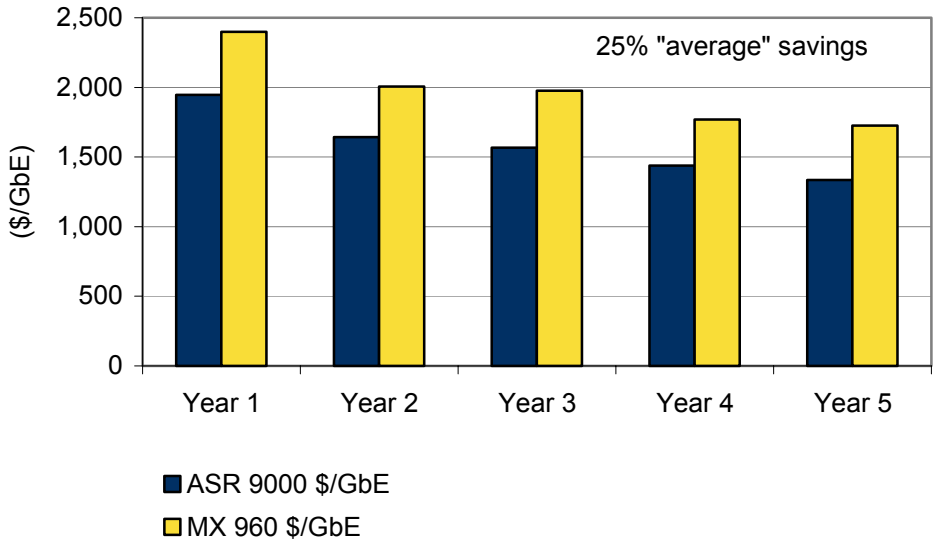
Source: IDC, 2009

This quickly leads us to a total cost of ownership (or operation) analysis, defined by Wikipedia as a "cost basis for determining the economic value and viability of the capital investment." Let's take an example of one TCO assumption. Rather than looking only at first-year costs, one should consider a more realistic approach, which would be to do an "apples to apples" comparison of product installations over a five-year period. Cisco, for example, is often considered a price "leader," meaning the product can often appear to be the most expensive on the market. But if one takes the following analysis in which we compare the list price of a mix of Gigabit Ethernet ports and 10 Gigabit Ethernet ports as a function of capacity, plus standard maintenance over a five-year period, one can see there is a benefit over a similar competitive product over the life cycle as it is deployed.

The following TCO analysis compares a Cisco ASR 9000 with a Juniper MX 960 in an aggregation mode: Each node in the network has exactly the same feature sets and is in a Layer 3 edge router aggregation scenario with data sheet performance, which includes up to 50% network growth each year (conservative relative to the Cisco VNI traffic growth study, which shows 100% growth). The ASR 9000 was modeled with 80Gbps per slot using multiple 40x1Gbps Ethernet and 8x10Gbps Ethernet modules available on the price list today. Eventually, the ASR will also be able to support the 16x10Gbps Ethernet and scale up to 400Gbps per slot. The MX 960 today supports 40Gbps per slot with 4x10Gbps Ethernet and scales to 100Gbps per slot. With typical carrier discounts applied, the cumulative costs for Cisco in a five-year period are lower than those of the competition when evaluating just the basic feature sets and Gigabit Ethernet or 10 Gigabit Ethernet forwarding capacity (see Figure 2).

FIGURE 2

Standard TCO Analysis Including Capital and Operational Expenditures



Source: IDC, 2009

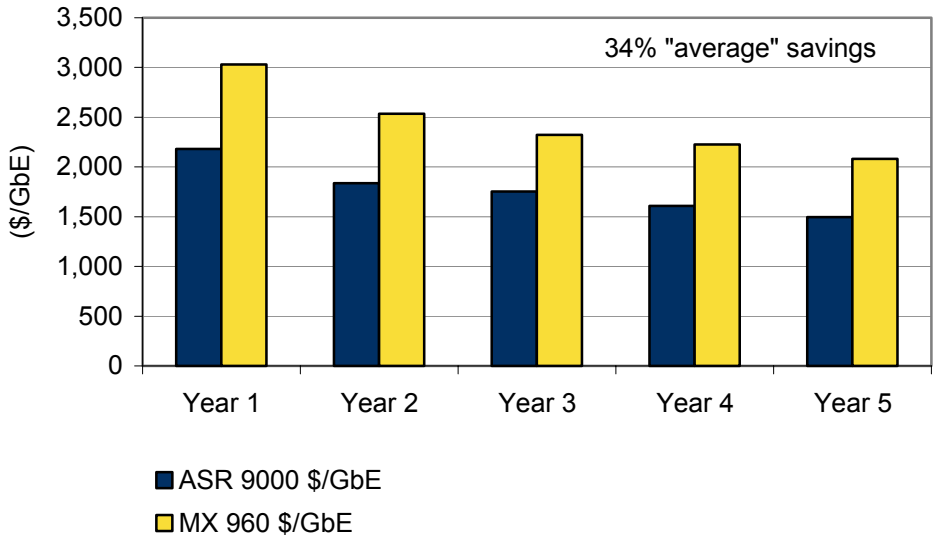
What should be noted is that this example assumes a 50% growth rate for network expansions. Should the network expand at a faster rate, distinct advantages increase, as do the capital advantages.

And with the growing importance of video in many services and applications, one should carefully consider how video is deployed and monitored. The ASR 9000 employs inline real-time video monitoring on all of the Ethernet line cards. When video monitoring is deployed, operators should examine carefully the benefits and advantages of the deployment options available to them.

This scenario shows that Cisco can match and exceed competitive pricing when applying a TCO model approach on basic feature sets alone. And this is just one example. If one adds Cisco financing, as shown in Figure 3, the offer can be extremely compelling and actually significantly surpass the competition in total cost.

FIGURE 3

Standard TCO Analysis Including Use of Cisco Capital



Source: IDC, 2009

These are just a few scenarios that can be analyzed; different approaches can be made depending on deployment, but the general base feature sets are adequate enough to dispel any myth that Cisco pricing is higher than that of other vendors. Another point of consideration is the offer for a midcycle equipment swap. An operator may purchase equipment today from a vendor that offers a swap-out for next-generation equipment sometime in the next few years. If that is the case, an analysis based on the impact and effects of the swap-out should be carefully completed.

Cisco Capital

An often overlooked option in the TCO model is whether or not a vendor provides financing options for its customers. Cisco Capital offers this service. Cisco's vision is that it would like its customers to "feel free to acquire, deploy, protect and refresh their technology investments with creative and competitive financing solutions that help maximize profitability and cash flow." In 2009, when IDC asked survey respondents "Does the availability of leasing and financing of personal computers impact who you choose as your equipment supplier?" as part of our annual survey of IT organizations that lease and finance equipment, the percentage responding "yes" rose to 75%, a truly overwhelming majority. Leasing and financing tend to provide a predictable yearly payment, allowing better visibility into long-term costs (see *IDC's 2009 IT Leasing and Financing Survey Results*, IDC #218599, June 2009), and tend to increase the guaranteed level of customer support and provide more financial choices and flexibility into how costs are allocated. It is important to note that Cisco Capital benefits from the significant cash flow that Cisco has as a company (over $30 billion). Another benefit is that Cisco Capital will also connect its customers to alternate local financing if necessary.

- While most of Cisco's systems are designed for long-term installation, some state-of-the-art carriers want the latest versions of line cards to maximize density, throughput, and service delivery. Business dynamics often require new feature sets, which carriers must have in order to maintain competitive advantages. Financing options also lend assistance in this area.

- Most carriers used a standard five-year amortization period for the life cycle of the equipment, which often results in equipment being fully utilized and rarely replaced before the life cycle is completed. However, often a life-cycle analysis will show that equipment upgraded or replaced earlier will have beneficial effects and a higher return on investment if the equipment has been properly analyzed as to when it will reach its maximum contribution. Equipment vendors in general build products to exist in networks for far longer than five years; however, markets cycle and change, requiring new services or features that may necessitate new line cards to provide new capabilities or higher capacities. Therefore, leasing options at various term rates are appearing more attractive now than ever.

- While many organizations may complete the analysis of lease versus buy, on the surface there does not appear to be a real differentiator, with leasing often appearing more complex and therefore less attractive. However, in the details of this lease versus buy analysis, there are many benefits. As the product life cycle plays out, support problems as well as software upgrade issues tend to increase over time. Cisco offers a technology "migration" program that maintains the same lease cost while allowing the provider to swap out older technology for new technology. IDC has documented that desktop and support issues in the PC market tend to increase with the life cycle of the product. Mandatory upgrades that include security features can also significantly affect and slow down the processing of equipment. These issues should be considered in the lease versus buy analysis when purchasing new equipment.

- Adopting the latest technology can actually *lower* capital expenditure. When one examines integrated features versus separate appliances, purchasing separate appliances for each application can drive up capital expenditure costs as much as 30%. Certification of each appliance is also taxing to the operational staff. While a router that incorporates switching, WAN optimization, security, and monitoring features clearly reduces support costs, it also reduces reliability issues across multiple products and reduces operational costs by simply having the feature sets residing in one integrated product. IDC has reported that for modern IT platforms, 30% of the total cost is for acquiring the equipment and 70% is for labor and services to configure, maintain, upgrade, reconfigure, and, ultimately, decommission that equipment. Therefore, one product housing all these appliances is clearly an economic advantage.

- Operators may choose to have the total cost of both capital and services look like a monthly *operational* expense if they have no access to additional capital budget and the operational budget has not been fully exhausted. This shifting of costs can often be done on a temporary basis to achieve an immediate network expansion or upgrade.

- Often forgotten are network expansions or upgrades that include major bandwidth adjustments. Datacenter consolidation, for example, results in fewer connections between datacenters and radical savings on real estate, power, and cooling; however, it often requires increased bandwidth between those datacenters. This bandwidth change should be reflected and included in a monthly cost charge with the adjustments to capital and operational expenditures.

The decision, therefore, should be not only around what to specifically purchase but also around how to purchase. Managing equipment life cycles with end-to-end financing not only lowers the total cost of ownership of the solution but also provides the carrier and service provider with more flexible options while protecting the operator's immediate cash position.

Operational Models

The operational model extends the cost components across the life cycle of the product. It crosses the domains of deploying, operating, maintaining, and upgrading the product. Clearly, the largest savings within the operational model come when only a single vendor is deployed. In the single-vendor deployment scenario, additional training is not required because the CLI and feature capabilities are consistent across all products from that vendor. There is also significant savings in sparing of hardware. Element management and provisioning tools are the same, and technical support teams understand that across the products, the interaction and configurations are far more easily deployed and often pretested.

The savings result primarily from a number of known sources: reduced engineering and operations training requirements, improved staff productivity, simplified and enhanced vendor support, lower maintenance contract costs, reduced hardware and software costs, and fewer quality-related issues. To quantify these costs and the relative savings potential, the opex portion benchmarks and averages historical costs

from actual equipment and services contracts with different service providers. Next, activity-based costing (ABC) methodology is applied to apportion these costs to core operational activities in the network's life cycle. Then the cost savings is calculated by looking at a single-vendor network versus a multivendor network and comparing the cost of individual activities in each scenario.

Within the network life cycle, operational costs should be decomposed into the activities that constitute *network deployment*, *operations and maintenance*, and *upgrades*.

The case for a single-vendor Cisco solution is compelling. Carrier Ethernet, mobility, and video solutions from Cisco are offered with a network availability service agreement based on conforming with Cisco Validated Design (CVD) guidelines and operational practices that further tend to increase the overall savings.

Service, Support, and Maintenance Considerations

The portfolio of technical and advanced services offered by Cisco bridges the gap between technology architecture and business operations. While the "build and operate" service segment includes system installation, integration, and testing, the assurance service segment covers technical support as well as service-level agreements. In addition, professional and advisory services are available to all clients.

Advisory services cover the initial service delivery needs as well as assessment and readiness of the operator to provide new services. Advanced services such as Telepresence are also available and supported in numerous ways as are collaborative services such as WebEx. When initial levels of services are deployed, advisory services can help initiate and provision these new services, resulting in a faster time to market and thus increased revenue in order to remain competitive. Cisco also offers migration services and tools to help operators transition their networks to expedite expansions while reducing the operational efforts.

Cisco offers baseline support and optimization of network assets; however, extending that capability to network assurance, stability, and service awareness is clearly a forte of Cisco and a benefit for its customers. Ultimately, service assurance and predictability result in reversing the capital expenditure outlay by rapidly bringing in revenue to address the current business climate.

One example is a European provider that rolled out hosted unified communications and managed services for Telepresence in Europe and North America. In another example, Cisco helped a North American carrier achieve five nines reliability for its IP/MPLS network. These examples indicate that the services clearly have had a major business impact. Additional solutions from Cisco include end-to-end IPTV delivery, datacenter virtualization, and mobile backhaul (IP RAN), all of which assist in convergence and network transformation, accelerated time to market, and improved network availability.

FUTURE OUTLOOK AND OPERATOR CHALLENGES

Because the first-year cost is often the highest barrier to entry, operators need to clearly evaluate all their options over the life cycle of the product. This evaluation is often difficult to do, especially when a product is needed in a short time frame. But the long-term cost of fast decisions may cause the operator to have to outlay higher capital and operational dollars in the long run.

Operators fall into four general categories of purchasing behavior (see Table 1).

TABLE 1

Operator Purchasing Behavior

Behavior	(% of Operators)
Short-term fix (band-aid approach to upgrade or expansion)	53
Slow mover (when traffic increases, capex increases)	22
Fast adopters (deploy immediately, examine costs later)	12
Long-term planners (tend to make the decision a long process)	13

Source: IDC, 2009

Some operators need to make a decision within a very short time frame; for example, network outages, serious capacity restraints, or greenfield opportunities can all prompt quick decisions. As a result of these short horizon decisions, if services and/or warranties are included in the first-year price, an operator often jumps at the offer before evaluating the long-term cost of the services and warranties. IDC estimates that this group is about 53% of the worldwide operator community, where a quick TCO analysis might have resulted in a different product choice. This current "band-aid" approach will ultimately fall out of favor and is a less successful deployment that often results in additional network cost.

The operators that make up the category of slow movers, which IDC estimates to be about 22% of worldwide operators, often watch the early adopters to see how the product is working and tend to be driven only by increasing traffic and capacity requirements and not new network architecture changes or designs.

Operators that are fast adopters want to deploy the latest and greatest technology. IDC estimates that about 12% of operators worldwide are in this category, and they are willing to test early versions of hardware and software because it allows them to turn up new services faster and be more competitive. Some of these early adopters of

technology base their purchasing decision on product and feature set only, with little consideration for financing or support options. These operators are responding to the "box" approach rather than reviewing what could be an end-to-end solution. They would really benefit from a quick TCO analysis that incorporates support and operational costs as well as financial options for deployment.

The long-term planners, roughly 13% of the operator type, take a very long time to make a decision, often run multiple TCO analyses, and tend to wait until protocol issues are settled and the market has decided on a direction that they then will likely follow.

Whichever category an operator falls into, a TCO process and analysis still clearly provides an advantage to avoid increasing costs at a later date.

CONCLUSION

Operators need to clearly understand the full impact of their decision on products and product architecture, and this impact should be evaluated over a reasonable time frame and not be based solely on the first-year deployment cost. In addition, they need to evaluate the impact of the network and services growth on their decision. If the network expands, what are the ultimate long-term costs?

Operators should also consider the overall "value" of the install base. Does it increase when a single vendor is deployed, and are operational costs reduced? In order to frame these economic decisions, operators must carefully review all the factors with an equitable view of the impact on their overall business and service delivery costs: technology, architecture, support, financing options, operational cost of bandwidth and service delivery, as well as the long-term solution benefits and the relationship the vendor provides them.