

An ADTRAN White Paper



Reducing Network TCO with Value-Driven, Integrated Networks

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A New Approach

Although the economic slump in IT spending has reached a turning point, long term changes in purchasing behavior remain. Companies rely on the IT infrastructure today more than ever, and with tighter budgets companies are turning to value-oriented solutions. With heightened scrutiny on IT budgets it is increasingly important to minimize Total Cost of Ownership (TCO) through feature-rich, yet cost-effective, purchasing decisions.

In the past, network purchasing decisions relied mostly upon the initial cost of the hardware. Those were the items budgeted for and tracked; everything else was, for the most part, an incidental. Today, the situation is much different. IT/network managers must examine the total cost of a network purchasing decision. This means not only looking at the initial hardware cost, but also the costs incurred from feature additions, hardware/software upgrades, maintenance contracts, network management, etc.

Now, rather than having a standalone device for each function within the network, multiple functions have been combined within a single device. Add to this the effects of value-driven solutions, and the result is not only a simplified networking architecture, but one that causes a dramatic shift in the Total Cost of Ownership as well.

TCO Explained

Total Cost of Ownership is a very useful tool for analyzing the direct and indirect costs of owning and using a networking device. This model takes into account the “big picture” of an equipment purchase, and includes factors such as capital costs, technical support costs, administrative costs, and cost of downtime. The result is an accurate representation of how much an equipment purchase is going to cost over the lifecycle of the product.

TCO was originally developed in the late 1980s by the Gartner Group¹ to determine the cost of owning and deploying personal computers. Their initial findings, that the cost of a personal computer (PC) approached \$10,000 per year, was astounding and caused quite a stir in the technology community and particularly among Chief Financial Officers (CFOs). Gartner’s methodology was carefully examined and, over the ensuing years, has been accepted as a standard way to evaluate TCO.

Simply stated, TCO consists of the costs, both direct and indirect, incurred throughout the life cycle of an asset, including acquisition, deployment, operation, support and retirement. The Gartner TCO model utilizes two major categories to organize costs:

Direct costs: These costs generally cover the visible IT- and support-related investments and expenses, and include:

Hardware and software. This typically involves the initial purchase price. The cost of associated hardware (network equipment, option modules, etc.) is also included. Next, spare systems, spare parts, and the annual costs of needed supplies and materials are added. This should also include warranties, firmware upgrades, software upgrades, maintenance contracts, etc. These costs can be divided by the expected life of the asset, in years, to get an annualized figure.

Operations. This includes all labor costs for technical operations, support, and help desk. Service and maintenance contracts can be included here as well. If personnel such as network administrators or software maintenance staff are required, their costs should also be included. Operations costs also typically include the facilities costs for the appropriate share of the floor space used, as well as furniture purchased for the project.

Administration. Sometimes IT planning costs are included here. However, a significant portion of this category is typically attributed to training costs incurred for those using the equipment.

Indirect costs: These costs are less visible and usually are dispersed across the organization. These are comprised of:

End user operations. Frequently, an IT investment requires ongoing end user support within the organization. This generally relates more toward end user devices such as personal computers. Internetworking equipment should, in most cases, be transparent to the user.

Downtime. This occurs when end users are interrupted from their regular work due to equipment malfunction or network issues. Regular maintenance can also cause downtime when, for example, a software update scheduled during work time takes 30 minutes, resulting in 30 minutes of lost productivity.

All of the direct and indirect costs are compiled, computed on an annual basis and then totaled to provide the Total Cost of Ownership.

This exercise can produce some surprising results. Today, studies show that an average PC costs less than \$1,000. However the TCO of a PC continues to average over \$5,000 per year. Now imagine how that same calculation impacts the bottom line, especially when applied to an entire network. The results are astounding. This is why many network managers are seeking an integrated, value-oriented approach to networking.

The Effect of Value on TCO

The selection of the appropriate vendor can make a huge difference in the bottom line, both in initial hardware costs and TCO. In a scenario with features and functionality virtually equal, items such as service, support, firmware upgrades, and warranty can greatly impact the future cost of the product. Value-oriented vendors will often include many of these items at no cost, or at a lower cost than market-leaders to help drive sales. Finding reliable, feature-rich, value-driven solutions can often result in reduced up front costs, as well as a significantly lower TCO.

For example, some leading network equipment manufacturers require a maintenance contract for firmware updates. Even with a maintenance contract in place, in some cases there is still a charge for the firmware upgrade as well. On the other hand, there

are vendors that offer free firmware updates with no maintenance contract required. This alone can easily lead to a savings of thousands of dollars, depending on the number of hardware devices found in the network. Warranties are another place to look for added TCO savings. Some vendors only offer a 30-day warranty, while others offer warranties of five years or greater.

Vendors seeking to provide alternate solutions are, in many cases, adding value to their brand by incorporating some or all of these items in the initial cost of their product, and still coming to market at or below the price point of leading competitors. For customers looking to reduce TCO, finding a value-driven solutions provider may be the key to significant network savings, both in terms of initial hardware costs and long-term lifecycle costs.

The table below compares a value-driven approach with a standard approach.

Standard Approach		Value-driven Approach	
Device	List Price	Device	List Price
Switch	\$1,195	Ethernet Switch, IP Router, Firewall and Integrated WAN	\$1,595
Router	\$1,000		
T1 WIC Card	\$1,295		
<i>Add-on Costs</i>		<i>Add-on Costs</i>	
VPN/Firewall	\$2,400	VPN	\$ 495
Telephone Support	\$\$\$\$	Telephone Support	Free
Firmware Updates	\$\$\$	Firmware Updates	Free

Table 1: Comparison of Standard and Value-driven Approaches

The Traditional Network

Lets take a moment to look at a traditional network architecture. A typical branch office scenario is shown in Figure 1. In this illustration, a branch office is terminating a T1 using a DSU/CSU with a drop-and-insert port to groom channels from the T1 into a PBX. It is then sending IP traffic through the router to a switch for end user network access. A firewall is

placed between the router and the switch for LAN security. The price of this simplistic multi-device design adds up quickly, even when examining the cost of hardware alone, as shown in Table 2.

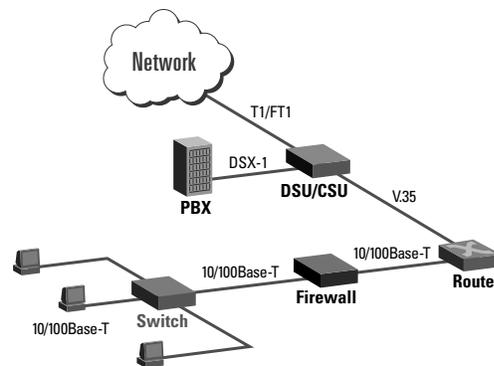


Figure 1: The Traditional Network

Device	List Price
DSU/CSU	\$1,995
Router	\$1,195
WAN Interface	\$ 400
Firewall	\$ 995
Switch	\$ 995
Total:	\$5,580

Table 2: Common Network Costs – The Traditional Approach

A simplistic network architecture, such as this, grows in complexity quickly when all the elements are examined. There are four devices to configure and manage. There are four devices that must be spared in the event of failure. There are four devices that must be maintained with maintenance contracts, upgrades, etc. In the event of a failure, there are four devices that must be evaluated. Also, cabling must be added, which not only adds cost, but also another potential point of failure and another area that must be managed. Multiple pieces of equipment also take more rack space, which can be critical in applications where space is at a premium. When these factors are added in, the initial cost goes from roughly \$5,500 to a number far greater.

Add-On Costs that Increase TCO

Most vendors require additional purchases for support, maintenance and upgrades. If a maintenance contract is required, this adds a significant cost to the overall network. Below is a sample service price structure for the traditional branch office network, Table 3. In this scenario, it is assumed that the customer requires technical support during normal business hours and access to firmware upgrades and bug fixes. The expected life of the branch office network equipment is five years, and cost is calculated by multiplying the annual cost of the service agreement by five. This results in costs of over \$2,220 for service alone, and increases the cost of ownership by almost 50 percent.

Device	Service	List Price
DSU/CSU	8x5 support, next day replacement	\$ 150
Router	8x5 support, next day replacement	\$ 96
Firewall	8x5 support, next day replacement	\$ 143
Switch	8x5 support, next day replacement	\$ 55
	Total:	\$ 444
	5-Year Total:	\$2,220

Table 3: Service Costs for a Traditional Network

Another issue to be addressed is downtime. Even with a service contract, the traditional network architecture brings inherent problems. With multiple devices in the network that could be at fault for any outage there is a great deal of time spent determining which piece of equipment is at fault, then troubleshooting that piece of equipment. These indirect costs cannot be easily calculated, but add significantly to the Total Cost of Ownership.

Moving Toward Integration

In an effort to make networking more efficient and lower the Total Cost of Ownership, many equipment manufacturers have begun integrating the functionality of multiple pieces of internetworking equipment

into one device. In many cases, this trend is rendering the traditional network obsolete.

If you apply this integrated approach to the network example in Figure 1, the network becomes much simpler. Originally, the network had four devices for LAN/WAN connectivity: DSU/CSU, router, firewall, and switch. Many vendors now include firewall and VPN functionality in routers, thus eliminating one device from the network architecture.

In Figure 2, the functionality of a firewall is integrated into the router. This is generally less expensive, and also provides enhanced security over a firewall placed behind the router. This is because firewall protection can now be used on the router itself as well as the LAN behind it. Many equipment providers also include optional VPN functionality in the router, further reducing overall equipment costs, and further simplifying the network.

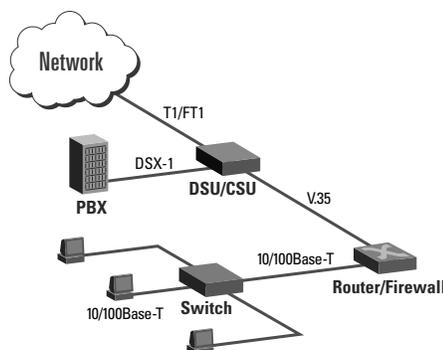


Figure 2: The Partially Integrated Approach

The initial cost savings, space savings, and simplified network administration of this approach all contribute to a lower TCO and are the first steps toward an integrated solution.

Another Step Closer

While combining the firewall and VPN functionality in the router aids in reducing cost and complexity the network, the network can be simplified even

further. Figure 3 illustrates this with a T1+DSX-1 DSU/CSU option module placed in the router. Until recently, DSX-1 or dial backup required an external DSU/CSU. Now, several vendors provide this functionality in the form of network interface modules that are inserted into the router. Since this branch office application requires PBX connectivity, a drop-and-insert port on the network module negates the need for an external DSU/CSU, further simplifying the network and its administration.

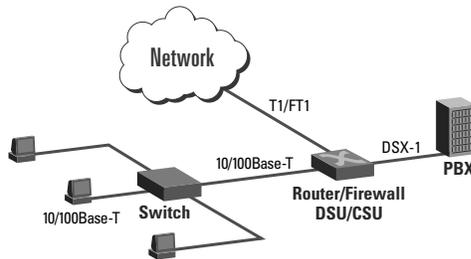


Figure 3: The Modern Network

Device	List Price
T1 + DSX-1 Module	\$2,500
Router/Firewall	\$1,895
Switch	\$ 995
Total:	\$5,390

Table 4: The Modern Network

By integrating functionality, there is an initial cost savings of about \$200 on the hardware alone. This difference could be greater depending on the vendor selected and the functionality (PBX connectivity) required. In this instance, with little change in the hardware cost, one might wonder how integration will affect the Total Cost of Ownership.

The real difference can be seen in pricing for service, as shown in Table 5, below. In the original network, service and support were estimated to cost about \$2,200 (see Table 3) over the course of the anticipated five-year lifespan of the equipment. Compare this

with the anticipated cost for the integrated network, as shown in Table 5, and there is a significant savings.

Device	Service	List Price
Router with Firewall	8x5 support, next day replacement	\$ 96
Switch	8x5 support, next day replacement	\$ 55
	Total:	\$151
	5-Year Total:	\$755

Table 5: Service Costs for a Modern Network

With no additional service fee for DSU/CSU or firewall, the five-year difference in service costs between the traditional approach and a partially converged approach changes from \$2,220 to \$755, a difference of almost \$1500. In addition, when you look at costs such as cabling, installation, troubleshooting, sparring, and downtime, the result is a much lower TCO and without degrading functionality.

Fully Integrated LAN/WAN Connectivity

This example can be taken yet one step further. There are vendors that are now offering complete LAN-to-WAN connectivity through use of an integrated switch-router. This device combines router, firewall, DSU/CSU, and managed 24-port Ethernet switch in one device. Functionality can be extended even further with optional VPN, dial-backup, and gigabit uplink for stacking. The result is a dramatically lower TCO than competing solutions.

Figure 4 demonstrates the simplicity of the fully integrated platform.

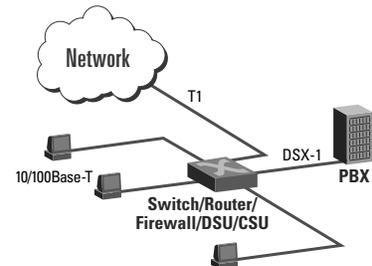


Figure 4: The Fully Integrated Solution

By simplifying network administration, reducing configuration, conserving rack space, and minimizing downtime, the value of the fully integrated solution continues to reduce TCO long after the initial purchase price. However, the price of this application is still much less than multi-box solutions. The table below (Table 6) shows initial costs for the LAN/WAN connectivity in Figure 4.

Device	List Price
T1 + DSX Module	\$ 450
Router/Firewall/Switch	\$1,195
	\$1,645

Table 6: The Fully Integrated Solution

This level of integration often raises questions concerning downtime and single point of failure. Do fewer devices mean greater downtime? The answer to this question is no. In mission critical networks, a valid concern of the choosing the converged approach may be a single point of failure. However, with a fully integrated solution, this is a benefit as opposed to a drawback. In the event of a network problem, time is not spent trying to isolate the unit on the network that is creating the issue. This results in reduced downtime and a quicker resolution to network problems. Also, optional PPP dial backup, which is available for current models, can automatically establish an analog or ISDN backup connection, providing access to applications even when the main network is down. Furthermore, with a price lower than many standalone switches, routers, or DSU/CSUs, a spare unit is a cost-effective investment.

In Summary

Today's networks must be reliable and cost-effective. When selecting networking solutions, TCO must be examined. Selecting value-driven solutions is the first step to decreasing TCO. In addition, a move to network integration further improves the bottom line.

As shown in the typical pricing examples in this paper, when utilizing value-driven integrated solutions over a five year period with service contracts included, a single branch office can save over \$4,200. Compared to a traditional network, savings are greater still. Savings of \$5,860 are possible on equipment and service costs alone over the example provided for a traditional network approach.

When all costs, both initial hardware costs and recurring costs are examined, the integrated hardware approach coupled with a value-driven hardware vendor results in overall lower TCO due to savings on support, warranty, firmware updates, and maintenance contract costs. These add-on costs must play a factor in accurately assessing a network's Total Cost of Ownership and are changing the way many network managers are looking at networking.

1 Excerpts regarding the calculation of TCO taken from question 74 in Business Driven Information Technology, edited by David Laube and Raymond Zammuto Laube, (c)2003 by the Board of Trustees of the Leland Stanford Jr. University. All rights reserved. Further reproduction, distribution or any use is prohibited without the written permission of the publisher.

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