

Storage in a Tough Economy

Five Targets for Lowering Total Cost of Ownership

TCO is always an important consideration when you are looking to buy a storage system, but it is even more critical in challenging economic times. When determining a potential storage system's TCO, you must include both capital and operating expenditures, some which are easy to calculate and others which are less obvious. Xiotech has identified five targets to help you calculate storage TCO and lower your storage costs.

Total Cost of Ownership (TCO)

has always been an important factor in the buying process, but in tough economic times, it is critical. Your storage purchase has both short-term implications, which are typically capital expenditures (CAPEX), and long-term implications of operating expenditures (OPEX), which last through the product’s lifecycle.

While CAPEX accounts for 36 percent of storage TCO, OPEX contributes 64 percent, with about half of that coming from administration and operations.¹

To assist you in calculating true storage costs, Xiotech has identified five major contributors to TCO. This paper looks at each and offers suggestions for comparing storage system TCO.

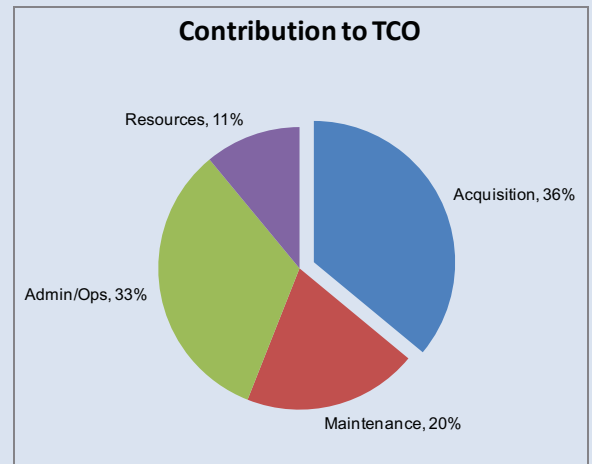


Fig. 1. Major Contributors to TCO¹

	TCO Target	Contribution to TCO
CAPEX	Hardware/Software Acquisition Storage and servers are often over-emphasized when comparing costs as they are the easiest to identify and calculate.	36%
OPEX	Maintenance Hardware and software maintenance costs are an integral part of TCO. Manufacturers may use maintenance costs to influence your future buying behavior through premature obsolescence.	20%
	Administration & Operations Ongoing operation is an important consideration for over-worked staff and under-funded IT budgets. How a system is administered, the required skill set and training, and its workload/financial impact on your organization, whether positive or negative, last the life of the system.	33%
	Resource Utilization Power, cooling, and floor space are increasing in importance for organizations, especially those located on either coast, or those with limited data center space and budgets.	11%
	Downtime Events Downtime costs are often glossed over until downtime occurs and is visible to the board of directors or makes headline news. Downtime events include both unplanned and planned periods when a system is unavailable.	Varies significantly by industry

Capital Expenses

Hardware/Software Acquisition

CAPEX may include hardware or software, and is “incurred when a business spends money either to buy fixed assets or to add to the value of an existing fixed asset with a useful life that extends beyond the taxable year.”² The strategy is not to lower CAPEX by sacrificing quality or capability, but by increasing efficiency and the useful life of the solution.

According to Wikibon, CAPEX is responsible for 36 percent of the cost of storage over its lifetime. It is the largest TCO category and the easiest to measure. The cost is irrefutable as it is the system purchase price. As a result, there is the risk of weighing CAPEX too heavily in TCO considerations.

You should consider three strategies to minimize hardware CAPEX:

- Purchase only what you need, when you need it.
- Maximize system utilization.
- Avoid forced obsolescence.

Purchase Only What You Need, When You Need It

Organizations too often purchase what they need for the life of the storage system. The premise is that it is cheaper to buy all the hardware up front than make incremental add-on purchases and introduce downtime for installation.

With storage technology today, you can purchase what you need, when you need it, and not incur downtime when adding the incremental purchase to your system. By deferring hardware purchases, you can take advantage of declining hardware costs, defined by Moore’s Law, and improvements in technology. For example, disk drive prices have historically declined 30 percent year-over-year. Why purchase three or even five years’ worth of capacity, when the cost is declining?

Factors to consider include:

- Purchase only the storage configuration and capacity size for your very near-term business needs—and ensure your storage system has components and software licensing with reasonable, scalable costs. Purchasing all components up front is ineffective and does not leverage Moore’s Law.
- Clearly identify upgrade costs for capacity, components, and software licensing. It is important to understand the cost of adding capacity, including the cost of disks, disk enclosures (i.e., drive bays), and installation—as well as upgrade fees or surcharges.

Moore’s Law:

The complexity for minimum component costs has increased at a rate of roughly a factor of two per year...³

- Implement thin (i.e., diskless) servers rather than servers with attached storage. This can provide a significant savings and is a key advantage of a storage area network (SAN) over direct-attached storage (DAS).
- Determine what evaluation metrics are most appropriate to your organization. A common pitfall is using cost per terabyte. While this is easy to calculate, it may mask underlying storage inefficiencies or not measure what is most important to your organization.

Achieve Greater Utilization

The next step is to identify how effectively a storage system can be utilized. Typically, this measure is not a reflection of business processes or administrator capabilities, but is inherent to the system itself. Most storage manufacturers offer best practice guides on how to achieve the greatest efficiency from their systems, but if the system is not designed to operate efficiently, no amount of “best practices” will overcome this shortcoming.

Typical impediments to efficiency include:

- **Low Usable Capacity.** The storage system must offer a high percentage of usable capacity. A common pitfall of traditional storage systems is the sacrifice of under-utilizing the capacity in order to achieve greater I/O performance. In the storage industry, this practice is referred to as “short stroking.” On the other hand, if greater capacity utilization is desired, it is typically at the sacrifice of I/O performance.
- **Lack of Tiered Storage.** The storage system must offer multiple tiers of storage. Tiered storage, according to Wikipedia, “consists of two or more kinds of storage delineated by differences in at least one of these four attributes: price, performance, capacity, and function.” Multiple tiers of storage allow you to match the value of your data to the cost of storage.
- **Inadequate System Performance.** Some storage systems compensate for inadequate performance by increasing the number of disk spindles, thus realizing the inefficient trade-off above (higher performance but lower capacity utilization). The greater the number of spindles, the greater the performance. This is cost ineffective if you are adding disks solely to maintain or improve performance rather than to meet increasing capacity needs.

Avoid Forced Obsolescence

A challenge to doing business with many storage companies is they force product obsolescence. Often this comes in the form of the dilemma of how long to “stretch” the useful life of the storage system when faced with expensive maintenance costs. Instead of the vendor dictating lifetime, you should be the one to determine how long you want to keep your storage system.

Hobson’s Choice:

A free choice in which only one option is offered, and one may refuse to take that option. The choice is, therefore, between taking the option or not taking it, colloquially formulated as “take it or leave it.”²

The often unrevealed truth is some storage manufacturers use maintenance fees to increase their margins and/or encourage you to purchase a new system. Shorter warranty periods force you to purchase maintenance contracts earlier, and often the maintenance fees are greater than the depreciation expense of a new system. The Hobson's choice is to either pay for expensive maintenance or purchase a new system, even when your current system is meeting your needs.

Purchasing a storage system earlier than truly required also results in both direct and indirect costs of migrating existing data. This cost may be included in the new system; however, it typically causes interruption to normal IT operations, requires planning, and introduces risk to your business.

Factors to consider include:

- **Length of the warranty period.** Does it match your expectations for the useful life of the system?
- **Maintenance charges for later years.** If the hardware maintenance costs are as expensive as a new system, include the costs for a replacement system in your TCO calculation, including data migration professional services and software licensing.

Software Capital Expenditures

Understanding storage software licensing is often complex and misleading. It may be based on the number of systems, performance, amount of capacity, features, or any combination thereof. How the manufacturer licenses its software can have a dramatic impact on future costs when it is time to scale or upgrade your system or components.

You should also consider the affect of other factors on software licensing. For example, the performance/capacity trade-off described earlier can result in significant, unintended software licensing costs. To increase system performance, you may decide to increase the disk spindle count. You purchase and install more disks, which increases the amount of installed capacity—requiring you to purchase additional software licenses for the added capacity. Thus, you have licensed more capacity when all you needed was better performance. In addition, you have incurred additional power, cooling, and data center footprint costs.

Factors to consider include:

- Software licensing must be clearly defined and easily understood to accommodate future component and capacity growth.
- Software licensing should be scalable to accommodate new features or expanded functionality.

Understanding CAPEX is an important first step in TCO. While it is the most visible, and easily compared of the TCO factors, it must not be overemphasized in the analysis.

Emprise™ 7000 & CAPEX

Xiotech's Emprise 7000 storage system uniquely addresses hardware and software CAPEX challenges.

Buy only what you need, when you need it.

- The scalable architecture of Emprise 7000 leverages Moore's Law—you can add capacity, components, and features when you need them, without experiencing downtime or costly upgrade fees.
- Intelligent Provisioning enables you to purchase the storage you require today and expand LUNs as needed—without the risk of over-consumption. You can add storage on the fly without disrupting operations.
- Emprise 7000 supports thin servers and flexible boot from SAN without server-side software, enabling faster server installation, maintenance, and replacement.

Leverage greater utilization.

- Emprise 7000 is built on patented Intelligent Storage Element (ISE™) technology, which delivers consistent, fast performance regardless of utilization. Significantly fewer components are needed to maintain performance as capacity usage increases (no utilization/performance trade-off).
- Emprise 7000 supports three tiers of storage to address business needs and the value of data. Rather than placing all data on a high-performance tier, you can place data that is accessed less frequently (e.g., archive) on a less expensive option. This can save 20 to 200 percent of your storage costs.
- ISE technology reduces capacity requirements by letting you use more of the capacity you buy. Many Xiotech customers utilize more than 90 percent of their systems' capacity, helping them achieve the lowest TCO in the storage industry.

Avoid obsolescence through an industry-leading five-year warranty.

- Emprise 7000 comes with a five-year hardware warranty. This extends the system's useful life, and lets you upgrade when you want, not to avoid an expensive maintenance contract.

Simplify licensing to reduce software CAPEX.

- Xiotech offers simple, flexible software licensing, based on functionality, not the amount of capacity being used. You only pay for the software you use, and do not over-pay due to utilization inefficiencies.

Operating Expenses

The remaining four TCO targets: hardware/software maintenance, administration, resource usage, and downtime are considered operating expenses (OPEX).

Hardware/Software Maintenance

Based on industry averages, hardware and software maintenance comprise 20 percent of storage TCO. This area typically is easy to measure because maintenance is a direct cost and usually is billed on a monthly or annual basis.

Within the storage industry, hardware warranties typically range from one to three years depending the type of system and its intended market. Hardware warranties of four and even up to five years are offered; however, they are the exception.

Once a system is past its warranty, a hardware maintenance contract is needed to protect the system. Again, many storage vendors treat maintenance as a means to drive greater profitability. Also this can force you into a newer system sooner than you would like.

Factors to consider for hardware and software warranties include:

- The warranty should match the useful life of the storage system. If not, negotiate an extended warranty to cover the warranty gap, or identify the additional maintenance costs up front.
- Base your TCO calculations on the longest provided warranty for an “apples-to-apples” comparison. If the warranty periods do not match, ensure TCO calculations include the cost of maintenance extensions for the system(s) with the shorter warranty period(s).
- Your TCO calculations should include the costs of spare components to reduce downtime during the replacement process.

OPEX for hardware and software maintenance is often not considered at the time of purchase. The warranty period may appear to be adequate, or you may not give it much thought. However, once the warranty expires, the reality of maintenance costs can have a strong influence on—or even dictate—your decisions.

Emprise 7000 & OPEX: Hardware/Software Maintenance

Xiotech’s ISE technology provides reliability that other storage systems cannot touch. Instead of relying on individual disk drives, Emprise 7000 utilizes sealed DataPacs. Preventive technologies keep the disk drives within the DataPacs running longer, and self-healing capabilities repair those that do fail—in place, without human intervention and without impacting operations.

Minimize failures with preventive technology.

- Reduced heat and vibration significantly extend the life of each DataPac.
- Reconditioning and error-detection processes locate and fix potential problems before failure occurs.
- Redundant, hot-swappable components ensure continued availability.

Avoid replacement through repair capabilities.

- Self-healing processes enable the DataPac to recover from most failures. A true self-healing architecture allows the failed component to remain in place, repair itself, and return to operation without human intervention. Other manufacturers offer “fail-in-place,” which still requires an administrator to swap out the component.
- Spare-in-place technology automatically rebuilds data to another area within the DataPac if needed.
- Data recovery in small increments yields faster rebuilds.

Save with a five-year warranty.

Xiotech offers the industry’s only five-year hardware warranty. This warranty provides substantial savings compared to other vendors’ one-, two-, or three-year warranties with high maintenance charges in later years. These charges are often designed to provide greater service margins for the OEM or force system refreshes.

Administration and Operations

The third TCO target is storage administration and business operations, and it is important to make the distinction between them. From a TCO standpoint, storage administration refers to the effectiveness of managing storage, while business operations are how business processes are improved by the storage system.

Administration and operations are often overlooked expenses. One reason is that IT personnel are already budgeted, they are overworked, and savings may be difficult to quantify. Nevertheless it is important to include them in the TCO equation.

According to Wikibon, administration and operations are responsible for 33 percent of the cost of storage over its lifetime. While the cost savings may not fall to the bottom line, more efficient administration will provide staff additional time to take on new and more valued tasks to support the business.

Storage Administration

Storage administration tasks are work activities focused on managing the storage system. These are performed by a storage administrator and include creating LUNs, migrating data to lower-cost storage, expanding volumes, adding capacity, assigning LUNs to servers, etc. These tasks are often repetitive and mundane, but are necessary to ensure continuous operation of the storage system.

An example of this is provisioning storage within a VMware ESX Server environment. The administrator must complete 16 or more steps and use three separate management consoles (storage, ESX server, and operating system). This activity often occurs on a frequent basis, even daily, based on the organization's storage and virtual machine growth rate and storage management practices.

From a TCO standpoint, “storage administration” refers to the effectiveness of managing storage, while “business operations” are how business processes are improved by the storage system.

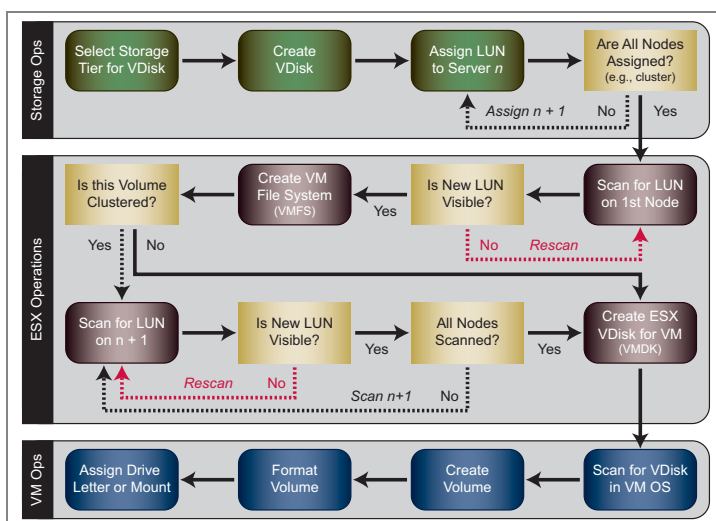


Fig. 2. Traditional Storage Provisioning for VMware ESX Server

Another area affecting storage administration cost is ease of use. Are tasks easy to perform, or do they require a specialist? Some storage manufacturers require that only their highly trained and billable people be allowed to manage the storage system, particularly when it comes to system reconfiguration. This means you must contact the vendor for every change, regardless of complexity or risk.

Storage administrators should be able to perform common or routine tasks easily themselves using intuitive wizards.

A third area, which is rarely considered in TCO discussions, is the cost of supporting disk failures. In a Carnegie Mellon University study, disk drives failed an average of 5.4 percent per year.⁴

A typical disk failure requires four hours of an administrator's time, including:

- Locating, removing, packing, and shipping the failed drive.
- Receiving, installing, formatting, and labeling the replacement drive.

For large storage systems with several hundred drives, this can take more than 15 percent of an administrator's time. Making matters worse is that as many as half of disk failures are determined to be "No Trouble Found." Thus much of the time spent replacing drives is unnecessary.

Storage administration factors to consider include:

- **Disk drive and hardware component management.** The number of components in a traditional storage system is strongly correlated to the amount of time required to manage them, such as handling disk failures.
- **Amount of time it takes to complete administrative tasks.** Creating and expanding volumes, changing RAID sets, and other common tasks can easily consume much of an administrator's time.
- **Amount of storage an administrator can manage.** This is reflective of the type of technology (DAS, NAS, or SAN) and the architecture of the storage system itself.
- **Tools or wizards for management.** These should be included, at no charge, to streamline repetitive storage tasks.
- **Ability to perform routine administration** without having to contract OEM professional services.
- **Amount of staff time to migrate data** due to forced obsolescence, including planning and project management time.

Emprise 7000 & OPEX: Storage Administration

Xiotech's Emprise 7000 system lowers storage administration OPEX through its ease of use and unique design.

Never touch another disk drive.

- Emprise 7000 utilizes sealed DataPacs, rather than individual disk drives. With no drives to replace, you save valuable time and eliminate the risk of associated data loss.
- Patented ISE technology provides more than 100 times the reliability of regular disk drives, minimizing storage-related service events.

Manage more storage than traditional SAN or DAS offerings.

- ICON Manager makes storage administration tasks fast, easy, and intuitive.
- ICON Manager includes wizards that guide you through common and repetitive tasks. You do not need extensive training or a PhD in storage.

Eliminate professional service fees.

- Xiotech's Emprise 7000 system is designed so that IT personnel can easily perform administrative functions.
- You have full access and all administrative rights to your system—no expensive vendor services are required.

Save time with no server-side storage software.

- With DAS and most networked storage options, when you upgrade the storage system (controller) firmware, you must also upgrade or patch the associated software or agents on every server that accesses the storage system. Emprise 7000 requires no storage software on the server, eliminating this task entirely.

Business Operations

Business operations tasks are work activities done to support a business process or transaction. An example is how a large university has streamlined its process for allocating storage to students and professors, reduced storage administration time, and reduced storage costs through Web Services.

Challenge: At the start of every semester, the university's IT department would create virtual machines for every student and professor by course. The steps were: receive a student request, verify status, provision storage, create virtual machine(s), and notify the student of system access. The process was labor intensive and time consuming for both IT staff and the student. Then at the end of the semester, IT would deprovision the virtual machines, by student, to recover the storage.

Solution: The university IT staff has automated the process with Web Services. IT provides login credentials to the professor for each class. This allows each student access to a landing page, where they can select the operating system and applications they want, have a virtual machine created, and request capacity based on pre-configured templates. At the end of the semester, IT deprovisions all assigned virtual machines and recovers all the storage capacity.

The savings to the university include eliminating administration for ESX servers and storage, not having to train an intern every semester, and efficient recovery of all storage.

Business operations factors to consider include:

- Ability to create scripts or implement templates to automate business processes without extensive training.
- Tools or wizards to streamline repetitive tasks.

Power & Cooling

The fourth target for TCO is power and cooling. According to Wikibon, power and cooling costs account for 11 percent of TCO, and they have taken on greater importance in recent years. While green initiatives or greater environmental awareness have focused on reducing power consumption, it has been the impact to the IT budget that has spurred action.

Power and cooling are taking a bigger slice of IT budgets for supply, UPS and HVAC equipment, floor space, and electrical consumption costs. According to Michael Bell of analyst firm Gartner, energy costs will emerge as the second-highest operating cost in 70 percent of worldwide data center facilities. In addition, analysts expect U.S. companies will spend twice as much on power and cooling by 2009 as they did to acquire their IT devices. Today, servers account for 40 percent of the data center's overall power consumption. Storage isn't far behind, taking 37 percent of the overall power.

Emprise 7000 & OPEX: Business Operations

Emprise 7000 improves business operations through automation and wizards, helping your organization be more productive.

Speed operating system and virtual machine configuration.

- Xiotech has created a number of wizards that automate storage provisioning and assignment in Windows, Linux, and VMware environments.
- Physical servers and virtual machines can be ready for end user activity much more quickly than with other storage options.

Automate business tasks.

- Web Services, an industry standard, allows you or other business partners to easily build applications to automate business functions. This automation can improve business processes and save valuable staff time.

The Emprise 7000 system's ease of use positively affects storage administration and business operations. Being able to manage more storage and improve operational efficiencies, while maintaining a flat (or declining) budget, is a winning combination.

Compounding the cost of power and cooling is the ever-increasing amount of data. With data growth forecasted at 60 percent on a five-year compound annual growth rate⁵, larger systems are needed to store this data, which only fuels greater energy consumption.

Storage architectures have historically applied more resources to address the symptoms rather than address the underlying cause. An example of this is if a storage system is suffering from poor performance, the historical solution has been to install more spindles. This addresses the symptom of poor performance but does not get to the root cause. With the addition of more spindles, performance improves. However, over time, capacity utilization increases and performance begins to lag, and the cycle repeats itself.

Gartner projects that by 2012, due to the increased density of IT equipment, the economic ratio of power to cooling will hit 1:1. This means that for every \$1 spent powering equipment, \$1 will be required to cool it.

Power and cooling factors to consider when selecting a storage system, include:

- **Effective disk utilization.** Disk drives consume the same amount of power whether they are 10 percent utilized or 90 percent utilized. The more capacity on a disk that you can actually use, the fewer number of resources to power and cool.
- **Reduced floor space.** Less floor space is typically more efficient and requires less power and cooling resources. Many data centers have become “land locked,” as their physical space is near capacity. Adding equipment may necessitate either a data center expansion or a new facility. By utilizing efficient storage, you may be able to expand your storage capabilities within the space you have today.

Power and cooling have come to the forefront due to their budget impact. Going green is no longer a buzzword, but reflects the importance of saving green—money—within IT.

Minimizing Downtime Events

The fifth area of TCO is how SANs can increase the reliability, availability, and serviceability of data. The financial impact of downtime can be significant—from tens of thousands to millions of dollars each hour. In addition, some industries are faced with governmental regulations and financial penalties if data is inaccessible.

The challenge with downtime events, whether planned or unplanned, is these are soft or indirect costs, and may be more difficult to measure. Nonetheless, downtime has a very real impact to your organization.

Emprise 7000 & OPEX: Power & Cooling

Xiotech addresses power, cooling, and density through its exclusive ISE technology, which provides significant energy-saving benefits.

Reduce power consumption.

- Emprise 7000 achieves greater performance with fewer disk drives; thus, for a given I/O workload, Emprise 7000 is able to satisfy that workload using fewer watts than typical systems.
- Performance remains constant as utilization increases. A traditional storage system will begin to degrade performance as utilization increases, resulting in the utilization versus performance trade-off.

Reduce cooling costs.

- ISE technology is architected for improved cooling. From improved layout of components to minimized power and maximized airflow, it consumes less power and cooling for the performance and capacity it delivers. (For more information, see Xiotech’s Storage Efficiency white paper, available at www.xiotech.com.)

Use less floor space.

- Xiotech’s Emprise 7000 system provides efficient space utilization through the use of DataPacs, rather than individual drives and drive bays.

Within each 3U of rack space, Emprise 7000 provides 14.3 percent more capacity than a typical system utilizing 3U drive bays or disk enclosures. This yields significant rack and floor space savings.

- Emprise 7000 lets you use more of the capacity of each disk than typical storage systems, which further reduces the floor space required.

Gartner research indicates that the causes of unplanned downtime can be grouped into three categories: operational, application, and platform errors.

- About 40 percent of downtime is caused by operational errors.
- Another 40 percent is caused by application errors (sometimes bugs, but more often misconfiguration).
- The remaining 20 percent is caused by actual platform problems, including the network, operating system, or hardware.

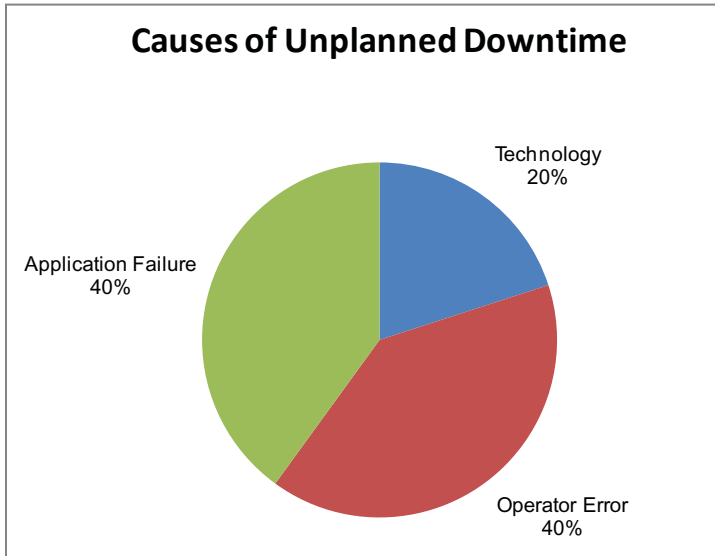


Fig. 3. Causes of Unplanned Downtime

Within a storage system and its environment, there are several factors affecting planned and unplanned downtime.

- Planned downtime considerations:
 - System refreshes should be based on the useful life of the system and its ability to meet business needs. Too often you may be faced with high maintenance costs designed to force a system refresh. This incurs downtime to migrate data from the old to the new system and takes staff time away from their regular duties.
 - Software and hardware components must be able to be upgraded online.
- Unplanned downtime considerations:
 - The storage system must be architected for reliability, not only from a hardware perspective, but also for its overall behavior. Too often *redundancy* is mistaken for *reliability*, and is used to compensate for poor hardware components or substandard architecture.

Emprise 7000 & OPEX: Planned/Unplanned Downtime

Emprise 7000 addresses downtime through its ultra-reliable architecture and easy management with ICON Manager.

Stay online with a reliable architecture.

- ISE technology features advanced heal-in-place capabilities; improved system telemetry; reduced vibration; improved cooling; and increased reliability of the backplane, connectors, power supplies, and fans. The result is that DataPacs provide 100 times or more the reliability of individual disk drives.
- DataPacs eliminate the time and risk of replacing failed drives, a common task with typical storage systems.
- The system's distributed cluster architecture offers automatic component failover and fallback, to keep data and applications available more of the time.

Replace and upgrade servers faster.

- Failed servers can be restored or replaced instantaneously from a snapshot image.
- Booting from the SAN speeds server updates. The operating system, service packs, applications, and patches do not have to be installed separately.

Do more with easy-to-use wizards and Web Services.

- Wizards automate routine tasks and help prevent human error. This helps to ensure tasks are performed efficiently and accurately every time.
- With Web Services, Xiotech enables the automation of storage-related business processes. Not only is this a significant time savings, but it helps to ensure accuracy.

Reduce system refreshes and data migration with a five-year warranty.

- The five-year hardware warranty gives you the freedom to choose when you have outgrown or maximized the useful life of your storage system. This reduces the number of system refreshes over the life of your data.
- Because high maintenance costs do not force you into a new system sooner than you really need, the frequency of data migrations is reduced.

An example of redundancy versus reliability is the Yugo, a car known for its poor reliability. Redundancy is buying a second Yugo to drive when the other one is being serviced. Clearly, even though redundant Yugos are an option, it does not improve reliability or eliminate downtime.

- The storage system should be architected to minimize the chance for human error. Performing routine administrative or configuration tasks may cause inattention or fatigue. This can easily lead to errors, such as deleting or over-writing data by pressing the wrong key. Wizards and automation capabilities can dramatically reduce these types of errors.

Human error also can occur when managing disk drives and hardware components. Pulling the wrong drive during a drive swap can cause downtime or, worse, data corruption.

It is inevitable that failure or downtime will occur with any mechanical or electronic device. What separates storage systems is the architecture and tools they have in place to reduce failures and recover quickly and efficiently when a failure does occur.

Summary

A TCO analysis provides tremendous insight for organizations considering a new storage system. While CAPEX is the “tip of the storage iceberg,” OPEX accounts for a greater percentage of the TCO and must be factored into any TCO calculation.

A TCO analysis should address the impact of these five targets and how they impact storage costs:

- Hardware/software acquisition
- Hardware/software maintenance costs
- Administration and operations
- Resource usage: power, cooling, floor space
- Planned and unplanned downtime events

Based on revolutionary new ISE technology, Xiotech’s Emprise 7000 storage solution offers an extremely low TCO, while providing a solid foundation of reliability, performance, and scalability for your organization.

To find out how Emprise 7000 can lower your TCO, contact your local Xiotech representative, visit www.xiotech.com, or call us toll free at 1.866.472.6764.

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