

WHITE PAPER

Increasing Storage Efficiency and Reducing Costs in the Data Center Through Effective Capacity Management

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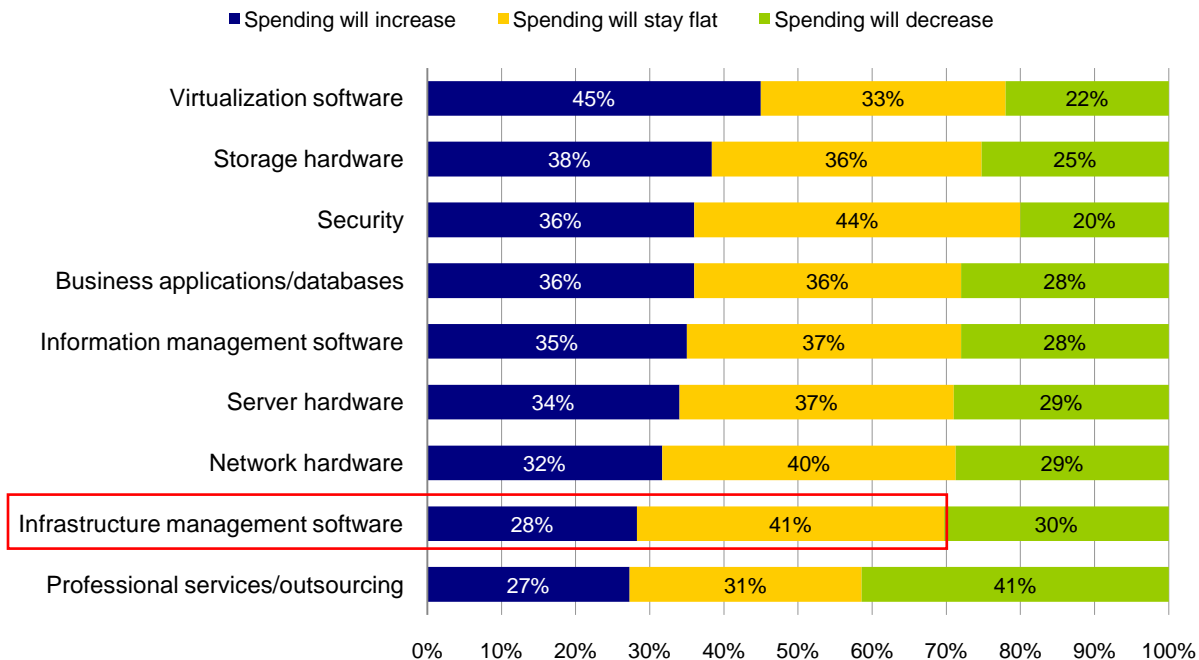
Introduction

Despite a faltering global economy and flat or reduced IT budgets, data growth continues unabated. Such growth presents a major challenge for storage administrators as they need to accommodate it in addition to other IT initiatives—all with the same or fewer dollars than last year. ESG research¹ (see Figure 1) has documented the fact that, despite the down economy and restricted budgets, about 75% of organizations will need to spend at least the same as last year—or more—on storage. With cutbacks in other areas, this means that a major portion of the IT CAPEX budget, up to 28%, will be spent on storage related equipment and projects. In order to fund other critical IT initiatives, organizations will need to find ways to more effectively manage their storage capacity.

This has led many organizations to look for tools that can help increase efficiency. According to Figure 1, 69% of organizations will spend the same or more on software that will help them better manage their infrastructure. Despite this projection, the tense economic climate and reduced overall budgets will make it more difficult to get an expense approved—every purchase needs to be able to quickly reduce operating and capital costs. ROIs that were previously measured in years have been reduced to months. Any and all purchases must have an immediate impact on efficiency and, more importantly, on the business’s bottom line.

FIGURE 1. TECHNOLOGY SPENDING IN 2009

**To the best of your knowledge, to what extent will your organization’s 2009 IT spending for each technology listed below change relative to 2008?
(Percent of respondents, N=492)**



Source: Enterprise Strategy Group, 2009

A great example of an IT process that can be improved with new tools is provisioning. With current advances in technology—namely, server virtualization—organizations can provision new virtual machines in a matter of minutes. Provisioning the storage environment, however, often takes weeks. Part of this problem is related to a lack of real time visibility and effective management across multiple tiers of storage from multiple vendors. If the storage team cannot quickly and easily identify the appropriate available storage, either a manual process is

¹ Source: ESG Research Report, 2009 Data Center Spending Intentions Survey, March 2009.

used to identify the needed capacity or an inappropriate storage or service tier is provisioned. Manual processes consume additional time, often delaying an application roll out. And if storage is deployed inefficiently (i.e., the wrong tier is selected), a more expensive tier is often filled up unnecessarily, requiring additional top tier storage purchases. This can impact both capital and operational budgets, not mention the bottom line. Storage administrators need tools that can deliver visibility and effective capacity management. To be clear, for the purposes of this paper, “capacity management” in its basic form is defined as:

The ability to identify available, allocated, and orphaned storage across multiple tiers enterprise wide; determine its consumption rates; and proactively predict when more capacity will be needed while avoiding over- or under-provisioning.

More advanced capacity management capabilities would include the ability to provide the business with efficient tiering models tied to service levels and accurate chargeback and would also include the ability to identify and reclaim underutilized storage, spot candidate volumes for re-tiering, and help with VM-related decisions regarding where to allocate the next volume. Ideally, these capabilities would be heterogeneous and provide near real-time visibility and monitoring.

This paper will explore the common challenges organizations face as they try to effectively manage storage capacity, including both basic and advanced functionality, the steps required to create a more capacity-efficient environment, and the ways in which NetApp’s SANscreen solution can help to curb storage and operational costs and enable effective capacity management.

Capacity Management Challenges

Numerous barriers prevent organizations from managing their storage capacity in a more efficient manner. In general, these obstacles include:

- **Complexity in the data center.** The modern data center is becoming increasingly complex; driven by the need for IT to be more responsive to the business, Service Oriented architectures, and the ever more frequent use of composite applications (multiple dependencies with an environment). Add to this a mix of physical and highly dynamic virtual environments and effective management becomes exponentially harder. The storage landscape typically consists of multiple assets including Direct Attached Storage (DAS), Storage Area Networks (SAN), and Network Attached Storage (NAS) environments. In most cases, these heterogeneous environments require different management tools for each type and/or brand of solution. In some cases, different tools are required when working with different tiers of storage from the same vendor. In order to provide a unified view of a multi-tier, multi-vendor environment, organizations rely on time consuming and error-prone manual efforts, custom scripts, and Excel spreadsheets. All this complexity results in low utilization rates and inappropriately allocated storage.
- **Lack of visibility.** One of the biggest problems is simply a lack of visibility across different storage vendor’s products (as well as even models from the same vendor) in a data center. More recently, virtualization technologies have introduced a new layer of complexity to storage environments. The ability to map an application to its storage degrades when applications are playing hide and seek. Additionally, virtualized server environments require network attached storage. IT is challenged to balance storage with VM load requirements. In some environments, this leads to a rapid provisioning of additional SAN or NAS resources. Without real time visibility and monitoring capabilities across the entire storage infrastructure, there is greater chance for over provisioning across all tiers or provisioning the wrong tier. As a result, IT administrators must have an accurate picture of the SAN and the storage services that need to be delivered. Server virtualization implementations are often plagued with performance issues related to congestion in the SAN or contention for storage resources. Limited insight into those environments greatly delays problem resolution for IT organizations. Lack of visibility and monitoring results in a reactive capacity management approach.

- **Poor alignment with the business.** In many data centers, technology silos still operate as independent groups, not as parts of an integrated service organization. To further complicate matters, storage is often managed without first being aligned to the business. As a result, significant inefficiencies develop, like a Tier 3 application being hosted on Tier 1 storage. Without proper business alignment, organizations may be wasting considerable resources on incorrectly allocated storage. Remaining unaware of the choices that exist and their corresponding cost structures will continue to perpetuate these inefficiencies and inflate operational and capital expenses.
- **Inability to meet appropriate service levels.** In today's dynamic global marketplace, organizations need to respond quickly to changing requirements. Solutions include implementing service oriented architectures, composite applications, and server virtualization technology—all aimed at improving service levels and decreasing provisioning times. But, while virtual machines can be brought online in minutes, storage provisioning still takes several weeks. The inability to find and allocate the appropriate storage for an application has become a significant bottleneck in the data center, often leading to over- or under-provisioned storage. Using the previous example, a Tier 1 storage array may be supporting a Tier 3 application, which, as mentioned, is an inefficient use of storage. But this problem is compounded when additional Tier 1 storage is purchased to handle a load that belongs on a lower cost tier.

Meeting SLAs also involves rapidly diagnosing problems and fixing them quickly. Difficulty troubleshooting a growing and complex storage environment without adequate tools can also lead to extended outages and further degradation of service levels. This is particularly true for virtualized environments, where many initial deployments suffer from performance problems such as congestion in the SAN or contention in an array.

- **Budget caps or reductions.** Every extra array purchased not only eats into the capital budget, it also incurs additional operating expenses. Over several years, this can easily exceed the original purchase price. Unless organizations change the way they manage capacity, they will continue to buy additional storage and SAN infrastructure to accommodate growth when it is not needed. Faced with flat or shrinking overall IT budgets, storage administrators are going to have to find ways to help stretch existing budgets. If storage purchases can be delayed for six months to a year, it might have a dramatic impact on operational and capital expenditures. IT groups are going to find it much harder to justify purchases of any new hardware, software, or service than in the past.

Creating a More Efficient Storage Environment

In spite of continued storage growth and increasing complexity in the storage domain, it is possible to reduce costs and improve responsiveness. Below are the recommended steps to enable effective capacity management and a more efficient storage environment. Organizations should:

- **Strive for complete visibility into the storage infrastructure.** The first step to effective capacity management is to get a complete picture of the environment. This visibility, ideally delivered in real- or near-real-time, needs to cover the entire infrastructure—from virtual machines, through the network, and into the storage. This should include heterogeneous support for vendors, technologies (SAN, NAS, etc.), and models. Only with this visibility can organizations understand what they have and make informed decisions to better align the storage infrastructure with business needs—proactively managing the environment.
- **Reclaim unused resources.** One of the fastest ways to cut storage CAPEX and potentially reduce OPEX spend is to reclaim storage that is not being used. With a complete view of the environment, storage administrators can identify and isolate storage that has been orphaned by configuration changes, modifications to SAN traffic patterns, or even changes in a VM state. Ideally, this storage would be reclaimed immediately and put back into use for production or the volume could be shrunk, if

possible. Unfortunately, depending on the storage, that is not always possible or feasible. At a minimum, the storage should be tagged for reclamation during the next technology refresh.

- **Run storage as a business.** Consider treating technology domains as their own businesses that need to deliver services to a customer—in this case, business units or application owners. Create well-defined offerings that are differentiated by features and cost. This would include treating each tier of storage as its own product, with its own level of performance and protection. Then, by providing cost awareness through either an active chargeback model or reporting, the business can make intelligent, proactive decisions regarding storage. Thus, the storage teams can ensure involvement and accountability from the business, provided that they understand the service levels and corresponding costs they are selecting. Finally, the storage team can demonstrate which applications/business units are consuming most of the storage budget.
- **Optimize the use of storage tiers.** This step can have a dramatic impact on an organization's budget as these storage tiers are often not well defined. Once the link between applications and storage has been made, storage teams can evaluate whether applications have been assigned the appropriate levels of service and performance. This step is closely tied to establishing a cost structure and chargeback capabilities. If the cost is the same, business units and application owners will always opt for higher levels of service and performance. However, once they understand the impact those higher levels will have on their budget, different choices may be made. Storage teams should consider creating a service catalog for business units and application owners to choose from. By outlining the costs and performance profiles of each tier, business units can make intelligent choices that balance cost and performance. Storage teams can drive a much more effective storage infrastructure and reduce the storage budget simply by optimizing the different tiers.
- **Create a more efficient supply chain for storage.** With an accurate view of storage capacity, it is possible to reduce costs by implementing a just in time purchase and delivery model for storage resources. By carefully monitoring the environment and understanding consumption rates, storage administrators can accurately forecast and plan future purchases. By creating an efficient supply chain, organizations can reduce capital costs by deferring storage purchases; this in turn will also reduce operational costs as it eliminates the need for additional data center floor space and the corresponding power and cooling requirements. In some cases, it may also defer the requirement for another storage administrator.

NetApp SANscreen Delivers Results

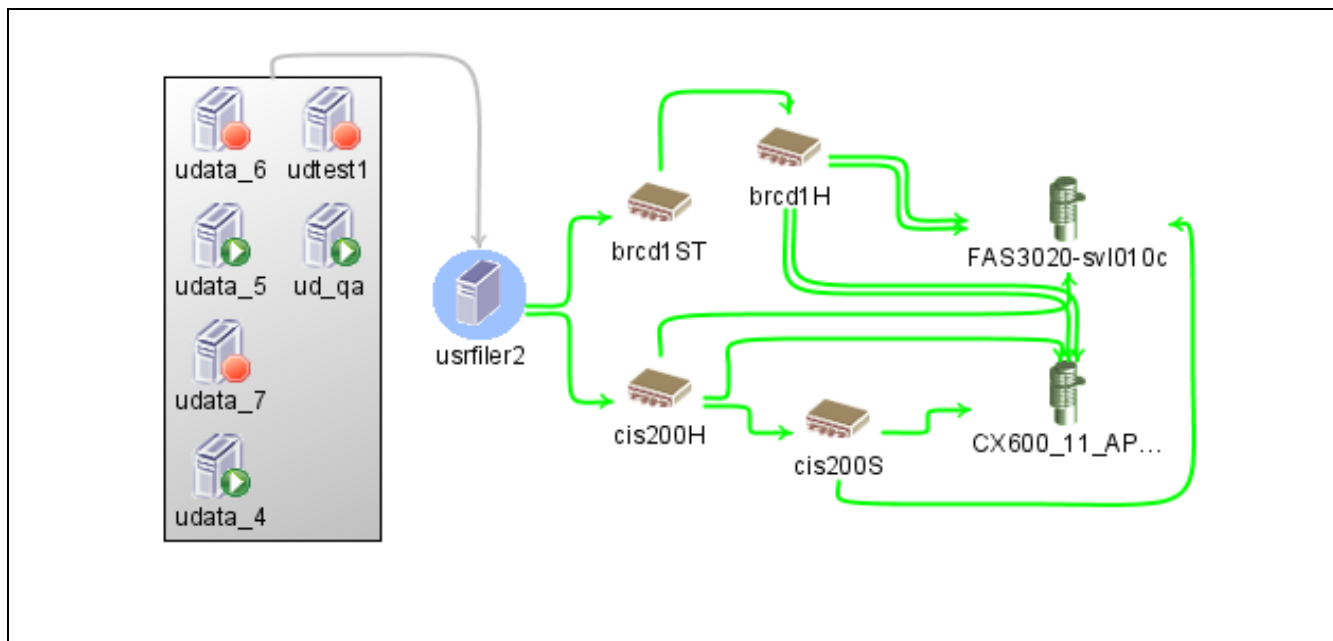
An effective capacity management solution enables the business to run more efficiently as it allows IT to deliver the appropriate service to the business at the right time. However, IT can't do this with Excel spreadsheets and Visio diagrams—organizations need to invest in proven solutions that deliver a significant return in a timely manner. They require an enterprise solution that is easily deployed (agentless) and maintained, but can still meet the most demanding and complex environments. To help overcome these shortcomings, NetApp SANscreen enables true data center-wide solutions by providing:

- **Heterogeneous support.** Providing visibility and monitoring capabilities across the entire storage infrastructure and placing the storage in the context of a service is critical for modern enterprise data centers. Considering that the majority of enterprise organizations leverage at least two different vendors and multiple different models to accommodate tiering, a single view of all available capacity can save time and drive greater efficiencies for reporting. The ability for one management solution to support many different vendors and models will increase the value of that solution and enable organizations to derive greater returns from a single investment. Figure 2 highlights SANscreen's heterogeneous capabilities, showing support for storage arrays from EMC and NetApp as well as storage switches from Brocade and Cisco. SANscreen currently supports arrays from: EMC (FC, now also NAS), HP, HDS,

IBM, Engenio, 3PAR, Sun, and NetApp (FC+NAS). It supports switches from Cisco, Brocade/McData, QLogic, and EMC OEM'd models. In the server domain, it covers all Operating Systems (agentlessly) and VMware. More importantly, the SANscreen architecture supports the ability to add new vendors and products on an “as-needed” basis, rather than having to wait for a major or dot release.

- Cross domain visibility.** Complete visibility into an environment is the key to management—decisions should not be made in a vacuum, but rather with full knowledge and awareness of adjacent domains. SANscreen is able to map the environment from the virtual machine to the volume in the storage array. Armed with this information, storage administrators will have a greater understanding of the entire environment and will be able to manage it within the context of the services being delivered. Based on that, IT can quickly discover inefficiencies across multiple domains. This view enables storage administrators to increase utilization across the entire environment. By reclaiming improperly configured or underutilized resources, organizations can reduce both capital and operating expenses. More importantly, SANscreen can accurately track the service being delivered to the application and ensure that service levels match those offered to the business. A view of this cross-domain visibility can be seen in Figure 2.

FIGURE 2. NETAPP SANSCREEN CROSS DOMAIN VISIBILITY IN A HETEROGENEOUS ENVIRONMENT



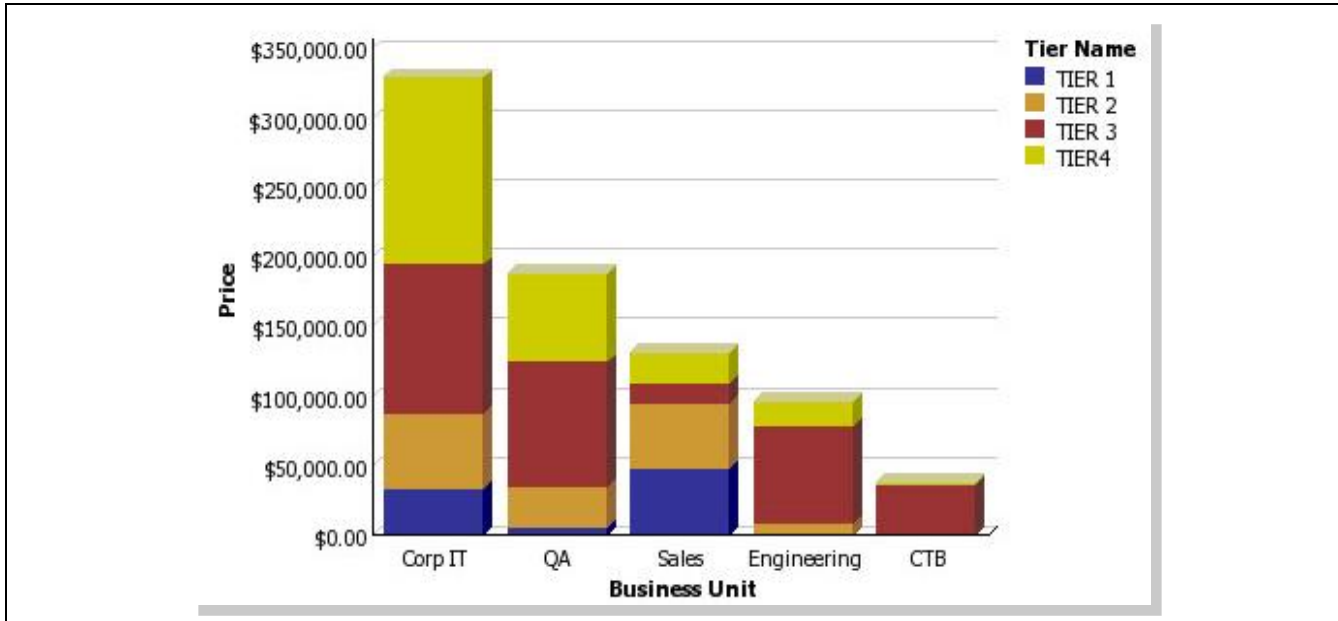
Source: NetApp, 2009

- Greater insight into the impact of SAN and array performance as it relates to storage services delivered.** The ability to monitor switch and array performance information is a critical factor in determining the success of storage service delivery. Being able to rapidly identify storage or data paths with little or no usage is a good indicator of orphaned storage or underutilized resources. Conversely, data paths constantly maxing out throughput indicate that additional paths or the next higher tier of storage is required. This insight will enable storage administrators to be able to define the appropriate tiers of storage and storage networking resources to enable optimal performance and maximum utilization.
- Optimized utilization and management of storage tiers.** SANscreen is able to identify not only multiple tiers and associate the cost to business units (Figure 3.), but to do so down to individual applications. Furthermore, it maintains a historical record of storage usage and is able to track this capability to enable users to create a more efficient storage supply chain. Figure 4 illustrates SANscreen’s reporting capability for identifying and associating different storage tiers as well as tracking

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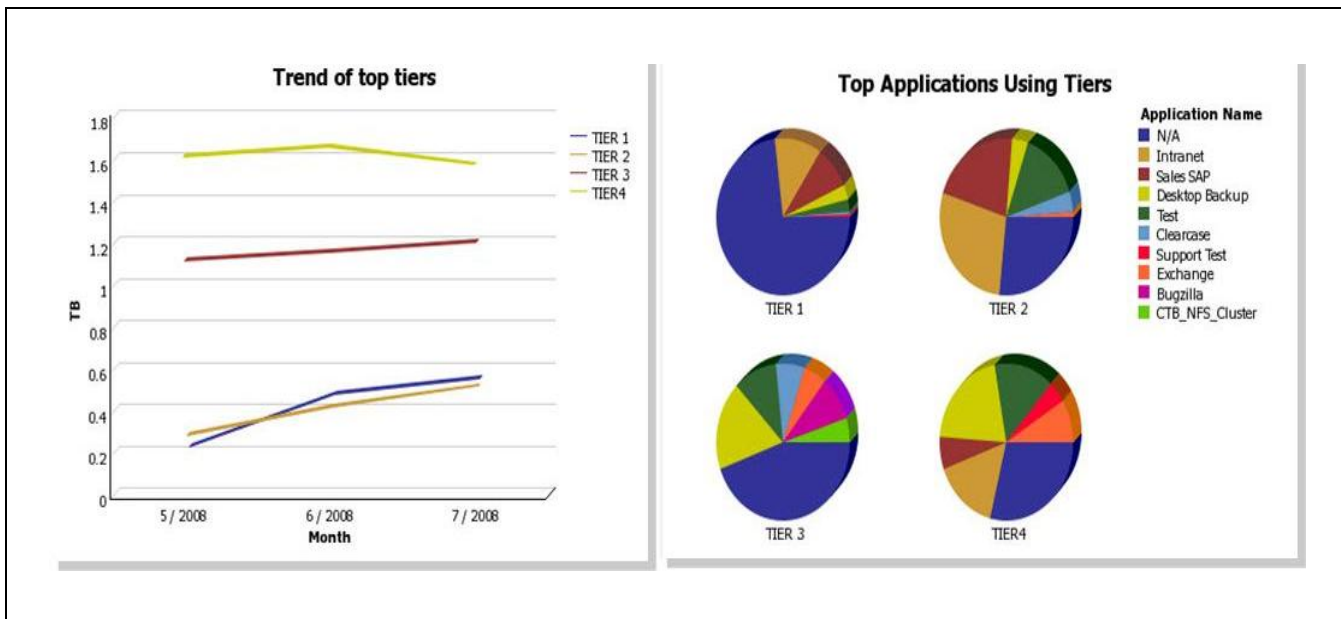
usage rates and planning for future needs. This ensures mapping of the right tier to the right application based on service requirements as well as determining usage trends by business unit and/or application.

FIGURE 3. PRICE CONTRIBUTION PER BUSINESS UNIT VIEW



Source: NetApp, 2009

FIGURE 4. USAGE AND TRENDING OF STORAGE TIERS



Source: NetApp, 2009

- Accurate chargeback of storage infrastructure to business units and application owners.** By providing detailed information to the business regarding the different levels of support and their associated costs, users can weigh cost vs. performance/protection and make the appropriate choices. Storage administrators can now deliver reports to the business on not only the capacity

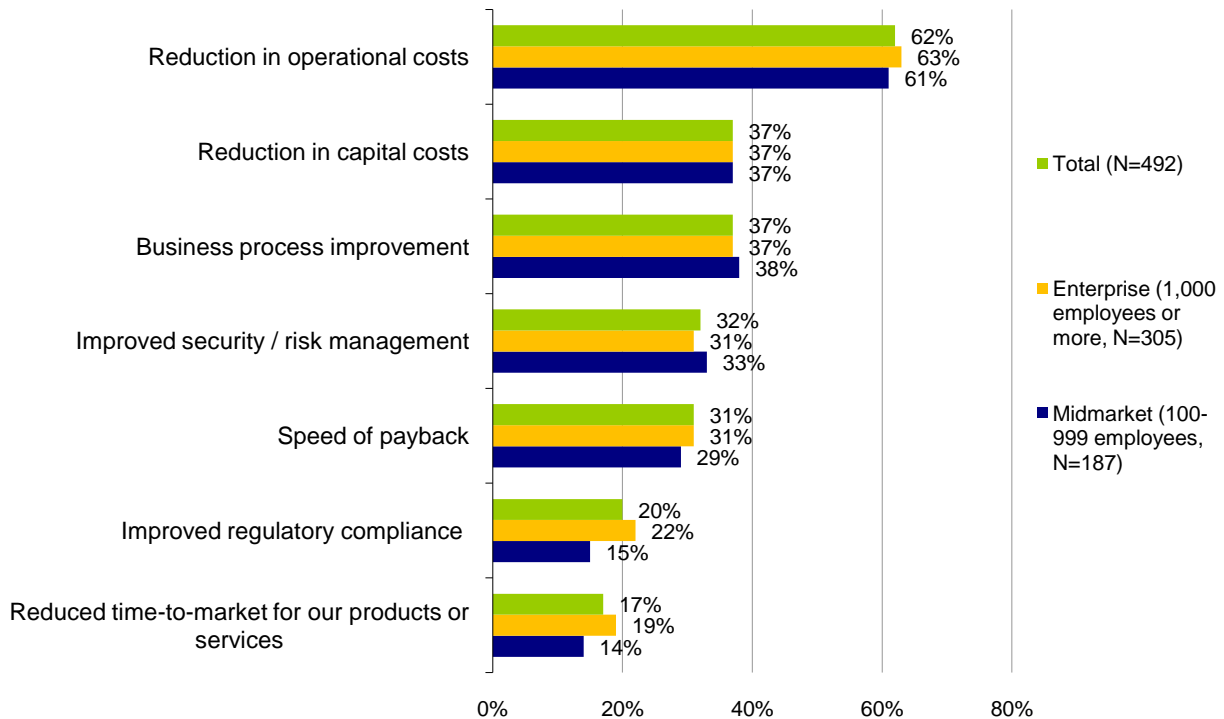
used by each business unit, but also on the estimated cost contribution of each of those business units, ultimately increasing cost awareness and accountability for the capacity they are consuming.

The Bottom Line

IT organizations are under tremendous pressure to deliver higher levels of service while reducing costs. One of the best ways to accomplish these tasks is by making appropriate investments in hardware, software, or services to create a more efficient environment. However, justifying those investments can prove to be difficult. A recent ESG Research survey² on data center spending asked organizations what their most important considerations will be for justifying IT investments over the next 12-24 months. The results (shown in Figure 5) indicate that, regardless of company size, organizations will be overwhelmingly focused on reducing operational costs, followed by reducing capital costs and improving business processes (efficiency).

FIGURE 5. JUSTIFYING IT INVESTMENTS

Which of the following considerations do you believe will be most important in justifying IT investments to your organization's business management team over the next 12-24 months? (Percent of respondents, multiple responses accepted)



Source: Enterprise Strategy Group, 2009

This is where solutions like NetApp SANscreen can have a big impact on an organization's bottom line. SANscreen provides the requisite visibility and monitoring needed to manage the end-to-end storage environment more efficiently. Leveraging the information SANscreen provides, organizations can proactively manage capacity to reduce operating and capital costs by operating more efficiently (i.e., reclaiming orphaned storage, tiering storage effectively, and delaying additional capital purchases). It can also enable more effective business processes by better aligning applications to the appropriate IT infrastructure and service levels. This will be critical for virtual server environments that need to carefully balance speed of provisioning, performance, and

² Source: ESG Research Report, 2009 Data Center Spending Intentions Survey, March 2009.

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utilization. Organizations that need to reduce costs and drive efficiency in a heterogeneous storage environment, and especially those with virtualized server environments, should strongly consider implementing an effective capacity management solution.



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