

**Total Cost Comparison:  
IT Decision-Maker Perspectives on EMC®, HP®, and NetApp®  
Storage Solutions in Enterprise Database Environments**

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**OLIVER WYMAN**

*Prepared for:*



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## ■ Executive Summary

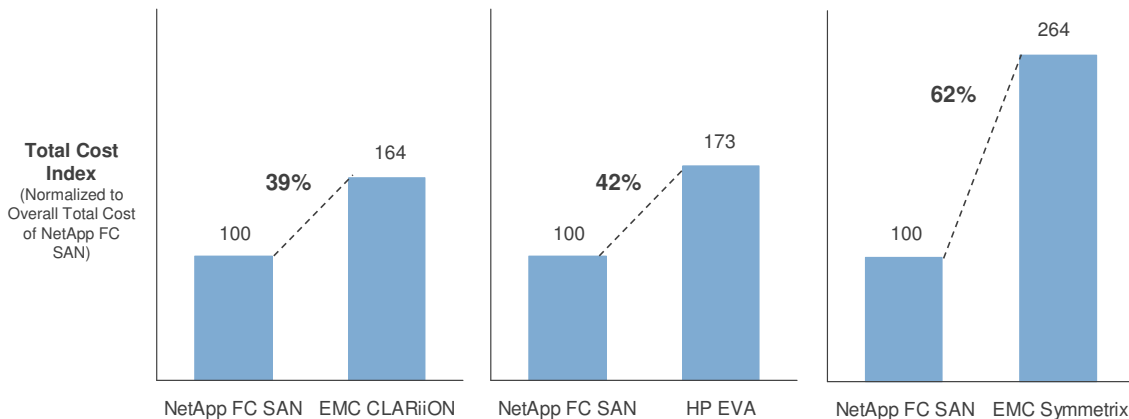
Oliver Wyman, a global strategy consultancy, was engaged by NetApp to conduct primary research with IT decision makers to determine the total cost of acquiring, deploying, operating, and managing storage environments from various vendors for database applications. This study was designed as an update to a similar study that Oliver Wyman conducted for NetApp in March, 2006. The principal focus of this study was a comparison of the total cost of enterprise-level NetApp, HP, and EMC storage products used for Oracle and other similar database environments. The findings included in this study are Oliver Wyman’s, and are based exclusively on actual cost data provided by the database storage administrators and IT executives from more than 25 midsized and large companies and organizations from various industries across North America, Asia Pacific, and Europe.

The key findings of this research include:

- ***The total cost of a NetApp Fibre Channel SAN solution is significantly lower than comparable solutions built around EMC CLARiiON™, HP EVA™, and EMC Symmetrix™.*** Based on typical configurations and storage management policies, a NetApp solution deployed in a Fibre Channel SAN environment is 39% less expensive than a typical EMC CLARiiON solution, 42% less expensive than a typical HP EVA solution, and 62% less expensive than a typical EMC Symmetrix solution for the same sized database. This data is highlighted in figure 1.

**Figure 1: Relative Cost Advantage of NetApp vs. Comparables**

Typical 4 TB Enterprise Database Deployments



Study participants identified three primary reasons why NetApp solutions provide a total cost advantage over comparable EMC and HP deployments.

- ***NetApp allows more efficient disk utilization.*** Based on data from study participants, NetApp environments typically require 51% less primary disk space than typical EMC or HP environments. For instance, to store a 4 TB database, NetApp customers typically acquire 15 TB of primary and data protection storage space, while EMC and HP environments typically acquire more than 30 TB. This difference is driven by higher utilization rates because of the reduced overhead required for Snapshot™ copies and thin provisioning. One respondent explained that he was able to achieve higher utilization rates by using NetApp systems: “We are

*using thin provisioning, which allows us to scale and reduce as needed; we have seen savings of about 50%.”*

- ***NetApp environments experience lower internal operational costs resulting from easier management of the storage environment and lower power, cooling, and space costs.*** Study participants suggested that NetApp solutions were easier and less time consuming to manage than their EMC and HP counterparts. NetApp’s software improves capacity planning, LUN provisioning, and management of replication and mirroring so much that NetApp storage administrators who take advantage of these functionalities typically manage twice as many TB as do EMC or HP storage administrators. One NetApp customer highlighted the benefits that he has been able to achieve: “Through switching to NetApp, we [reallocated] the need for 4 FTEs from storage [to other value-added tasks].” Additionally, study participants highlighted lower power, cooling, and space requirements for NetApp systems compared to competitor environments.
- ***NetApp software allows faster recovery in the event of application errors.*** Participants explained that the ability to recover from application errors or file corruption is the most important factor in controlling unscheduled downtime. Study participants with NetApp environments reported restoration speeds at least 2x faster than those experienced by participants with EMC or HP environments. According to one IT manager, when restoring a database, “*The size of the data [we are] trying to recover does not impact time, because when we revert to Snapshot copies, we are changing metadata pointers to different location on disks, not copying disk blocks. Changing these metadata blocks takes a matter of seconds.*”
- ***The cost advantages of NetApp vs. EMC and HP are magnified in an IP-based environment.*** When compared to a NetApp NFS solution, cost savings are even more striking; NetApp is 45% less expensive than EMC CLARiiON, 48% less than HP EVA, and 66% less than EMC Symmetrix. Customers observed reductions in both up-front hardware costs and internal operating costs corresponding with the increased ease of use with an NFS environment.
- ***SnapManager® for Oracle® drives additional advantages for NetApp.*** The direct cost impact of SnapManager for Oracle is not included in this report’s calculation of total cost because the software was not used widely across all NetApp customer deployments. However, a few NetApp customers who are early adopters of this product were able to highlight specific advantages. Customers suggested that SnapManager for Oracle significantly reduces the resources required to manage a database storage environment. Through automating backups, recovery, cloning, and other routine tasks, and by providing the ability to restore the databases at a particular point in time, respondents explained that Snap Manager for Oracle improves data protection while significantly reducing the internal efforts required for database administration. A NetApp customer highlighted benefits that he has realized from SnapManager for Oracle: “*We have taken our backups from 6-8 hours to 5-7 minutes with SnapManager for Oracle, which extracts all the low-level commands for the DBAs and gives them a friendly environment to manage at an application level.*” Another user elaborated on the management benefits: “*We have one person working 20 hours a week to administer all our storage. SnapManager for Oracle has probably reduced his workload by about 4 hours per week...which translates into a 20% time savings.*”

The following sections explore all these points in detail.

## ■ Approach and Methodology

### A. Oliver Wyman's Research Approach

NetApp engaged Oliver Wyman to conduct primary research with IT managers and database storage administrators in order to determine the total cost of acquiring, deploying, operating, and managing storage environments for database applications. NetApp commissioned this research as an update to Oliver Wyman's previous Database Total Cost Comparison study, published in March 2006, to include current comparisons on product acquisition and ongoing vendor costs, internal operational costs, and downtime and recovery costs. Oliver Wyman had complete autonomy over the research, data analysis and results.

This study is based on cost data acquired from primary research with IT managers responsible for their enterprise database storage solution. Participants in this study were recruited by Oliver Wyman for 60 minute structured interviews from two sources: NetApp customer and prospect lists and third-party lists of IT managers. Participants were targeted to provide diversity on a number of dimensions, including:

- Geographic region
- Industry
- Company size
- Environment size
- Primary database vendor
- Primary vendor for database storage
- Storage protocol used for database storage

This report differs from the previously published Database Total Cost Comparison study completed by Oliver Wyman for NetApp in March, 2006. The approach and methodology of the two studies are the same, with the following primary modifications based on participant feedback:

- The comparable storage systems observed in this study are NetApp FAS3070C, EMC CLARiiON CX3-80, EMC DMX-3 950, and HP EVA8100, updated from previously compared systems in 2006.
- The average usable production database storage size across participant environments is larger than that captured in the previous study (4 TB production database environment vs. 2 TB used in the prior study) to reflect increases in storage size in typical environments over the last two years.
- The growth rate of the production environment is also greater than that of the 2006 study (25% annual production database storage growth rate vs. 20% year-over-year used in the prior study) to reflect increases in storage size.
- The storage architecture differs slightly from that of the previous study. Instead of allocating a secondary storage system for snapshot copies or full copies used for local data protection, customers suggested they are able to keep these backup copies on the same primary system as the production database environment. The updated architecture view is used in this study.
- Current street prices from customer interviews are used in this study, leading to lower hardware costs than those observed in the 2006 study.
- The 2006 study included industry-standard benchmarks published by third parties for power and facilities costs. Oliver Wyman has since developed a more precise benchmark for identifying the

effect of power, cooling, and space differences among data storage systems based on actual customer deployments in enterprise data centers.<sup>1</sup> These new benchmarks are used in this report.

- This study highlights the impact of NetApp SnapManager for Oracle in new NetApp deployments, illustrating additional internal operational benefits that are not included as part of the total cost analysis.

When compared to the results from the March 2006 database study, the new data reaffirms NetApp's advantage in total costs and provides customer perspectives on additional benefits from SnapManager for Oracle.

## B. Defining Total Cost

Oliver Wyman analyzed cost data from interviews with storage decision makers across three categories: Product Acquisition & Ongoing Vendor Costs, Internal Operational Costs, and Downtime and Recovery Costs. Where participants had more than one database storage system in place, data was collected for each environment separately. In some cases, this required interviews with more than one participant from a particular company in order to provide a more complete view of total cost.

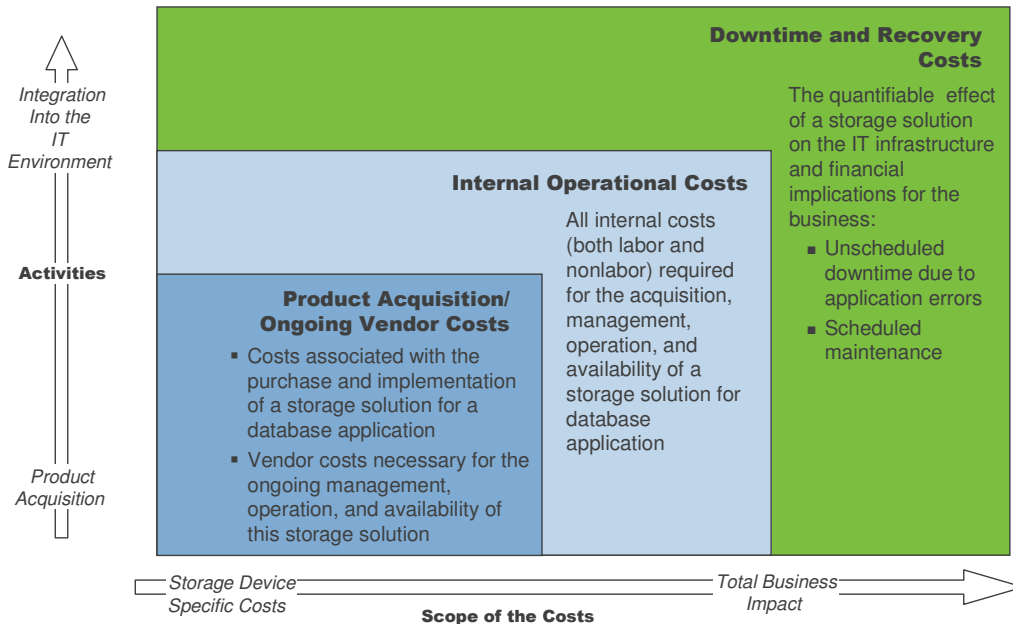
Figure 2 provides more detail on the total cost framework used with participants.

- *Product Acquisition & Ongoing Vendor Costs* include all the up-front hardware, software, implementation, and training costs associated with purchasing and implementing the database storage solution, as well as hardware and software support and maintenance agreements.
- *Internal Operational Costs* include all labor costs associated with the ongoing management and operation of the database storage solution as well as all ongoing nonlabor costs (e.g., power, cooling, and facilities costs).
- *Downtime and Recovery Costs* include only the downtime costs that study participants measure; specifically, scheduled downtime and unscheduled downtime caused by application errors. Although direct losses resulting from unscheduled downtime were included in this study, estimates of indirect business impact costs were not.

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<sup>1</sup> "Making Green IT a Reality: Customer Perspectives on the Impact of Storage Vendor Decisions on Power, Cooling & Space in Enterprise Data Centers," December 2007.

**Figure 2: Oliver Wyman’s Approach to Total Cost**



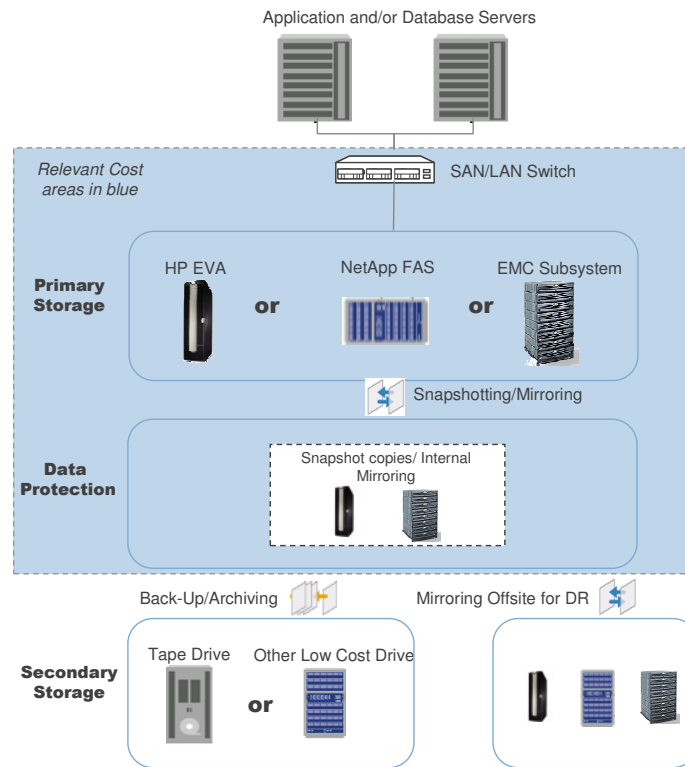
### C. Establishing a Standard Database Environment

In order to ensure a consistent and accurate total cost comparison, participants were shown a database storage architecture diagram, Figure 3, and asked to limit the scope of their answers to the storage elements described as “relevant cost areas” in the diagram (shaded in blue). The baseline environment for this study included a Fibre Channel storage area network (FC SAN), although study participants with Internet Protocol based storage networking solutions (e.g., iSCSI, NFS) were asked to provide data on those environments as well. Based on respondents’ configurations, the baseline architecture for this study has changed slightly since the previous findings in March 2006. The architecture no longer includes a secondary storage system to save full copies, local mirrors, or snapshots; most customers explained that they save these on the same system as the primary storage environment. Finally, the costs of servers, database applications, and secondary storage for backups, archiving, and disaster recovery are excluded from this analysis.

Participants gathered data for the interviews in advance, based on this common architecture view. Where participants’ database storage environments differed from the standardized architecture, Oliver Wyman identified the impact of these differences. The findings presented here constitute a consolidated view of all participants’ data over a five-year period,<sup>2</sup> which includes normalized costs for each cost category.

<sup>2</sup> Although vendors tend to suggest three-year product lifecycles, Oliver Wyman found that many IT organizations plan for longer cycles. Differences between the five-year view, which is the baseline for this report, and a three-year view are minor and are noted throughout the report.

**Figure 3: A Typical Database Storage Architecture View**




#### D. Typical Customer Database Environments

Table 1 shows the standard configurations used in this study. One key insight from the interviews was that NetApp, EMC, and HP customers typically use different amounts of storage for the same-size database. Specifically, the different approaches to Snapshot equivalent functionality led to NetApp environments requiring less disk space than HP EVA, EMC CLARiiON, or EMC Symmetrix for the same-size database. Therefore, for a database requiring 4 TB of usable storage capacity, NetApp requires approximately 15.0 TB of disk capacity in primary storage, while EMC and HP require approximately 30.7 TB each.<sup>3</sup> Note that 4 TB was a typical deployment among study respondents; however, this study captured data from a diverse set of customers, which included both small and large environments, and in each case the NetApp storage overhead advantage remained consistent.

<sup>3</sup> This is based on 1.4x overhead capacity required in NetApp environments with Snapshot functionality and RAID-DP™ vs. 2.3x overhead capacity required by equivalent solutions from EMC and HP running RAID 5. The NetApp FlexVol® feature also allows lower storage acquired in the primary environment for NetApp customers. The typical total storage acquired is based on 25% growth for production data. This study did not use the “copy on write” or the “demand-allocated snapshot” approach to Snapshot equivalent functionality that is possible in EMC and HP EVA environments, because customers indicate that those approaches degrade database performance and choose not to deploy them as part of their best practices.

**Table 1: Typical Configurations for NetApp, EMC, and HP for a 4 TB Database**

	<u>NetApp FAS</u>	<u>EMC</u>	<u>HP</u>
<b>Storage Hardware</b>	<ul style="list-style-type: none"> <li>▪ 1 cluster of FAS3070s with FC disks</li> <li>▪ RAID-DP</li> <li>▪ Snapshot</li> </ul>	<ul style="list-style-type: none"> <li>▪ 1 CX3-80 with FC disks or 1 DMX 3-950 with FC disks</li> <li>▪ RAID5</li> <li>▪ Full copy (BCV) on primary</li> </ul>	<ul style="list-style-type: none"> <li>▪ 1 EVA8100 with FC disks</li> <li>▪ RAID5</li> <li>▪ Full copy (BCV) on primary</li> </ul>
<b>Minimum Storage Required<sup>1</sup></b>	<ul style="list-style-type: none"> <li>▪ 6.2 TB Primary data (1.4x for Snapshot overhead and RAID-DP, 10% for DB log files)</li> </ul>	<ul style="list-style-type: none"> <li>▪ 10.1 TB Primary data (2.3.x for BCV and RAID5, 10% for DB log files)</li> </ul>	<ul style="list-style-type: none"> <li>▪ 10.1 TB Primary data (2.3x for BCV and RAID5, 10% for DB log files)</li> </ul>
<b>Typical Storage Acquired<sup>2</sup></b>	<ul style="list-style-type: none"> <li>▪ Primary – 15.0 TB</li> </ul>	<ul style="list-style-type: none"> <li>▪ Primary – 30.7 TB</li> </ul>	<ul style="list-style-type: none"> <li>▪ Primary – 30.7 TB</li> </ul>
<b>Software</b>	<ul style="list-style-type: none"> <li>▪ Software Suite that enables management, snapshots, mirroring</li> </ul> 		

1. Minimum storage required includes a copy of files protected by either snapshots or snapshot equivalents (BCV) and RAID. The baseline effective storage is 4 TB for production data.  
 2. Based on 25% growth for production data and FlexVol in primary environment for NetApp.

Approaches to data protection varied by respondent. Interviewees using EMC and HP noted that the most common form of data protection was to create a full copy of the primary environment, leading to 100% storage overhead. NetApp customers, however, create multiple Snapshot copies per day and require significantly less overhead. Customers noted that having additional full copies or mirrors at the primary location for data protection was not the norm. However, most customers interviewed did have backup implementations to either low-cost disk or tape, and a good portion additionally had disaster recovery sites with asynchronous or synchronous replication. Finally, differences in provisioning storage led to an observed difference in utilization rates. Respondents noted that with NetApp FlexVol, they are able to shrink and grow volumes and to provision more accurately, leading to higher storage utilization.

In addition, each of the systems was configured with standard storage networking equipment and storage management software. For NetApp, this included Data ONTAP® and licenses for software relating to Snapshot copies; for EMC CLARiiON, this included Navisphere and software related to creating full backup copies; for EMC Symmetrix, this also included management and TimeFinder software. HP EVA software included Command View and standard backup-related licenses. Standard software used for mirroring to the disaster recovery site was also used for all storage systems.

It is important to note that these configurations are not truly equivalent because EMC and HP solutions would require additional data protection storage capacity to replicate the number of Snapshot equivalent copies performed in the typical NetApp environment. However, this study was designed to provide a total cost comparison based on how enterprises actually deploy the different systems and the actual (not list) prices they pay for each element. The conclusions presented in this document are based on this more realistic view of a “typical deployment” for each vendor’s solution.

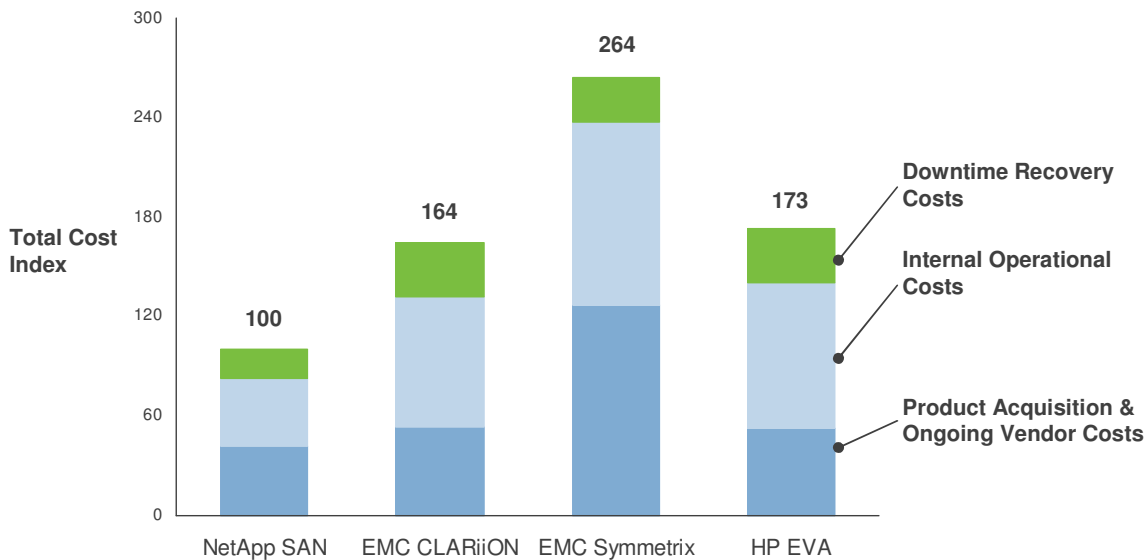
## Overall Findings

### A. Total Cost Comparison

Based on respondents' data, Oliver Wyman research suggests that a NetApp Fibre Channel SAN database storage solution is 39% less expensive than a typical EMC CLARiiON solution, 42% less expensive than HP EVA, and 62% less expensive than EMC Symmetrix for the same size database, assuming typical deployment and data protection policies.<sup>4</sup>

Put another way, our respondents suggest that owning and managing CLARiiON is 64% more expensive, EVA is 73% more expensive, and Symmetrix is over 1.6 times more expensive than owning and managing an equivalent NetApp solution.<sup>5</sup> This data is represented in Figure 4.<sup>6</sup>

**Figure 4: Total Cost Comparison: Typical Database Environments**  
Indexed Total Cost for NetApp FC SAN = 100



Total cost considerations are becoming increasingly important when choosing vendors. As one respondent explained, up-front costs are far from the only consideration when calculating the cost of a system. *“When looking at total cost, we look at acquisition, maintenance, support, performance, throughput, durability, administrative costs (which are a function of ease of use), high availability, and downtime costs.”*

<sup>4</sup> As noted earlier, this is based on a five-year total cost view. Under a three-year view, NetApp is 36% less expensive than CLARiiON, 38% less expensive than HP EVA, and 63% less expensive than Symmetrix.

<sup>5</sup> The 2006 study found that, based on typical configurations and storage management policies, owning and managing CLARiiON is 55% more expensive, EVA 71% more expensive, and Symmetrix over 2.5 times more expensive than owning and managing an equivalent NetApp solution.

<sup>6</sup> Throughout this report, results are presented in an indexed format to better illustrate variations between the individual data storage solutions. The total cost associated with a NetApp Fibre Channel SAN solution has been set to 100, and total costs for other solutions are indexed to this. The index shows clear variations in costs, where they exist, between the different solutions, but the approach to indexing has no impact on relative results.

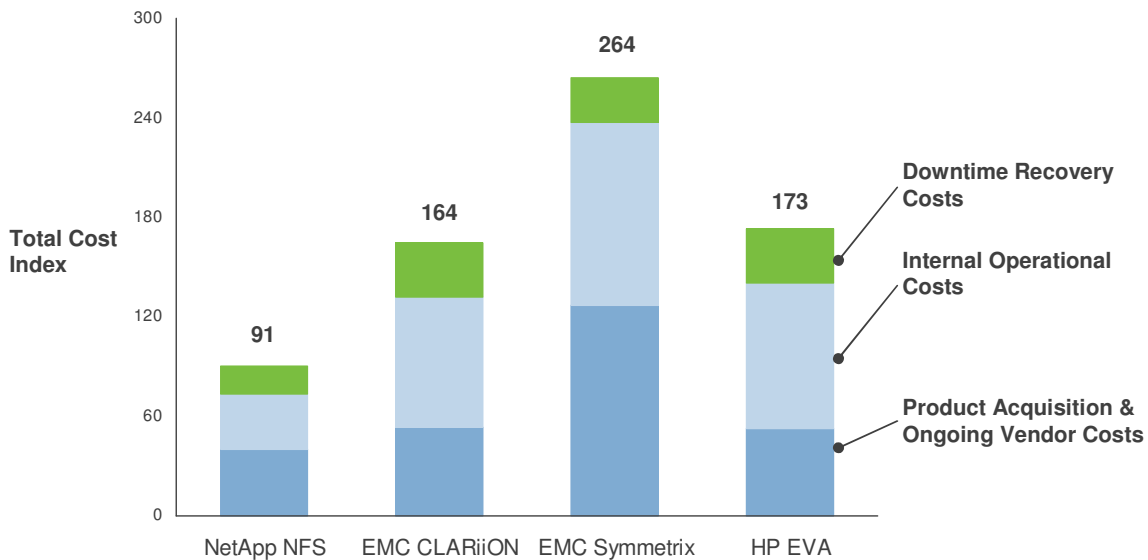
## **Total Cost Comparison for NFS Storage Protocol**

As described earlier, Fibre Channel was the baseline protocol used in the IT environments analyzed in this report. However, some of the participants in the study also reported using IP-based solutions. In these environments, the total NetApp cost advantage over competitor solutions is even more pronounced. As Figure 5 shows, a NetApp solution deployed using network file system (NFS) instead of Fibre Channel amplifies the cost advantage of NetApp against competitors. Customers who have deployed a NetApp NFS solution reported total costs 45% lower than those with EMC CLARiiON solutions, 48% lower than those with HP EVA solutions, and 66% lower than those with Symmetrix solutions.

A NetApp NFS system has a greater cost advantage for two primary reasons:

- *A NetApp NFS system eliminates the need for Fibre Channel SAN switches.* Rather than purchase expensive switches based on the number of systems, NetApp NFS users purchased enterprise-wide software licenses, which cut down on hardware costs.
- *A NetApp NFS system was observed to be easier to use and less complex than Fibre Channel SAN.* As one IT decision maker explained, with NFS, “It is easy to use and easier to decouple from the server and map elsewhere.”

**Figure 5: Total Cost Comparison: NetApp NFS vs. EMC and HP**  
Indexed Total Cost for NetApp FC SAN = 100



### **B. Drivers of Observed Cost Differences**

The total cost advantage that NetApp holds against EMC and HP consists of three elements:

1. NetApp achieves a 21% - 67% cost advantage over competitor solutions in Product Acquisition & Ongoing Vendor Costs in a SAN environment.

- Customers suggested that NetApp provides better storage utilization than competitors because of its Snapshot capability and FlexVol feature. Competitor systems, on the other hand, require additional storage capacity because customers typically create a local full copy, which requires 100% overhead. As one EMC customer explained, in order to protect his systems, he was *“running two full mirrored copies on top of RAID 5. Since standard devices have two mirrored copies, and that’s just the way it is, we are burning storage there.”*
- According to study participants, NetApp deployments tend to have much lower up-front training and installation costs compared to EMC and HP environments.
- NetApp solutions are even less expensive because they avoid SAN-related implementation and Fibre Channel switch costs.

The NetApp advantage in Product Acquisition & Ongoing Vendor Costs differs from the March 2006 study for two primary reasons:

- Base product costs have dropped for all three vendors, lowering product acquisition costs as a percentage of the total costs.
  - In the 2008 study, the comparable models observed were NetApp FAS3070C, EMC CLARiiON CX3-80, EMC DMX-3 950, and HP EVA8100. The NetApp FAS3070C has lower dollar per TB costs than the NetApp model used in the earlier study.
2. NetApp has a 48% - 63% cost advantage over competitor solutions in Internal Operational Costs.
- NetApp database storage solutions require less than half as many resources to administer, monitor, and manage as comparable EMC or HP environments. As one customer, whose NetApp administrators averaged 150 TB per FTE, explained, *“My storage administrators don’t need to do anything but create new volumes and take Snapshot copies. There is no maintenance or anything else they need to do on NetApp. Whatever work needs to be done is extremely easy with NetApp.”*
  - NetApp systems have lower power, cooling, and space requirements than competitor systems.
  - NetApp customers who have deployed SnapManager for Oracle experienced even greater efficiencies in managing the storage environment because most tasks are already automated.

#### Case Study: Achieving significant operational advantages with SnapManager for Oracle

One organization recently moved from an IBM system and an EMC CLARiiON Fibre Channel SAN solution to NetApp while implementing Oracle Database 10g™. As a part of this switch, the organization wanted to simplify and automate their data management and backups. For this particular organization’s industry, reductions in internal operating costs are especially important.

The customer deployed a NetApp solution with SnapManager for Oracle, and has since leveraged its capabilities to streamline backup procedures. *“What SnapManager for Oracle does is extract the commands such that we can manage the snapshots of Oracle databases at a level that does not require [multiple] storage administrators. If we didn’t have SnapManager for Oracle, the database backups would have required tight coordination between DBAs and storage administrators, which we have not had to do.”*

According to this customer, SnapManager for Oracle can be customized for different environments, which further reduced the burden on his storage administrators. *“We use SnapManager for Oracle for production system backups as well as for non production systems, ... [and] the retention and frequencies are different for each, but we are able to configure things [independently] for different environments. We can have a common template for all production instances and one for all non production instances. SnapManager for Oracle has a nice environment and toolset that allow us to do this easily.”*

Overall, he has seen improvements in both operational activities and lower downtime. *“The real winner is that it used to take 8 to 12 hours to do a backup, but now we’re doing it in minutes. Now, with our Snapshot methodologies, we can go back to any point in time in the last month, and we don’t have to go back to tape, a huge impact for us.”*

By taking advantage of this feature, the organization is able to manage 160 TB at the production and disaster recovery location by using less than 10% of the time of each of the three FTEs they have for storage-related activities, allowing them to focus on other issues and yielding a remarkable 600 TB/FTE ratio for the firm.

3. NetApp has a 35% - 46% cost advantage over competitor solutions in Downtime and Recovery Costs.
  - NetApp Snapshot functionality allows it to recover twice as quickly from application errors as EMC or HP solutions, and levels of magnitude faster than other solutions such as tape backup. One respondent explained that he has reduced his recovery time from several hours with a tape-based solution to 12 minutes with NetApp. The most time-consuming part of the recovery process, he elaborated, was discovering and identifying the issues.

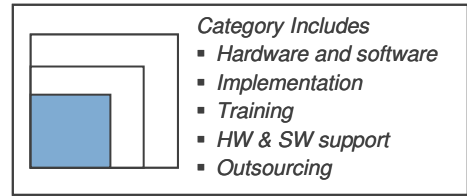
The rest of this report focuses on differences between NetApp, EMC, and HP deployed on Fibre Channel SAN environments.

## ■ Detailed Findings

### A. Product Acquisition & Ongoing Vendor Costs

#### Overview

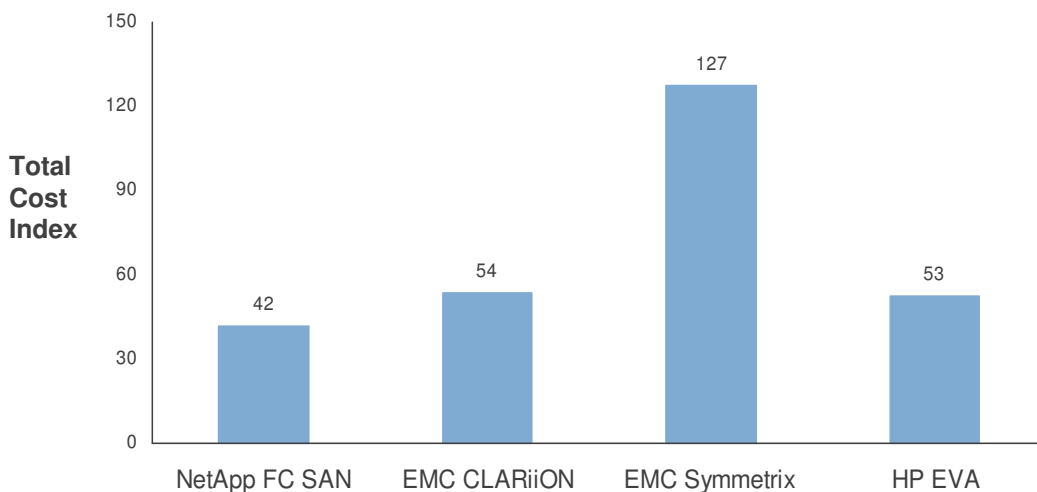
The first and most straightforward element of the total cost analysis covers Product Acquisition & Ongoing Vendor Costs. This category includes all up-front costs (using actual reported or “street” prices) associated with acquiring and implementing a storage solution, all costs paid to third-party vendors for hardware or software maintenance and support, and all costs for any required outsourcing or training.



Taking into account only these up-front costs, interviewees suggest that NetApp Fibre Channel SAN solutions are 21% less expensive than typical HP EVA solutions, 22% less than EMC CLARiiON, and 67% less than EMC Symmetrix for the same size database (see Figure 6).

Software is becoming the key differentiator between storage solutions, and evolving purchasing patterns reflect this trend. As previously detailed, each system included licensing fees for the management software and for backup and replication functionalities. Software costs, in fact, represent from 16% - 30% of Product Acquisition & Ongoing Vendor Costs, resulting in some customers suggesting that software purchase costs are getting “prohibitively high”; but for others, especially NetApp customers, the resulting savings in ongoing Internal Operational Costs more than made up for the investment: “The differentiating factor becomes what you offer from a features and functions perspective that can make life completely different for those that administer the databases and storage. This is where NetApp has the strongest story.”

**Figure 6: Database Product Acquisition & Ongoing Vendor Costs**  
Indexed: Total Cost for NetApp FC SAN = 100



It is important to note that even though Product Acquisition & Ongoing Vendor Costs are the most tangible and easily quantifiable cost elements (since they are often bundled as part of an initial invoice),

they should not be considered alone. Such up-front costs represent less than half of the total cost of EMC, HP, and NetApp solutions. Put another way, companies typically spend as much or more on other cost elements as they do on the initial “invoice” price. Although they are important, Product Acquisition & Ongoing Vendor Costs are only a part of the total cost story.

### **Drivers of Differences Observed between NetApp and Competitive Solutions**

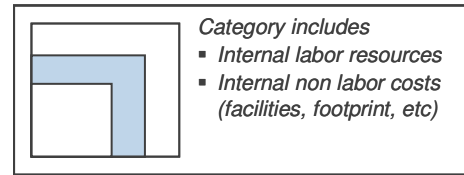
Several factors drive differences in Product Acquisition & Ongoing Vendor Costs among these vendors, the foremost of which are the following.

- *NetApp solutions require the purchase of significantly less disk capacity than EMC or HP solutions for the same-size database.* The use of low-overhead Snapshot copies with the latest version of Data ONTAP 7G enabled NetApp customers to recover their databases to a point-in-time instance with 20% additional storage overhead, instead of incurring the 100% overhead per copy that was typically the case for EMC and HP respondents. As one customer noted, “*The number of snapshots was a significant influencer in this round over EMC; we have several applications that are truly 24x7... so we create 16 snapshots daily. NetApp was the only one who could do that in a fast and efficient manner*”
- *The use of thin provisioning enables more efficient use of space and allows higher utilization rates.* NetApp FlexVol, a feature of the NetApp Data ONTAP 7G operating system, helps reduce the number of disks required for purchase because customers are able to grow and shrink volumes on demand by treating all volumes as aggregate. IT executives noted that this has increased utilization by about 25%. Respondents explained that allowing storage administrators to shrink and grow storage at will allows them to significantly reduce overprovisioning and thereby improve their storage efficiency.
- *Although there are significant differences in implementation requirements and complexity across vendors based on the experience and capabilities of the IT staff, implementation and training costs are typically lower for NetApp deployments.* Respondents’ data reflected that the simplicity inherent in NetApp solutions reduces the need for training on the new system. As one IT executive noted, “*The amount of training with NetApp is substantially less than on my EVA. One of our two guys came to us from HP. He had to take 4 weeks of [up-front] training on EVA to get familiar, whereas with NetApp he attended less than 2 weeks in total.*” Additionally, customers noted that they tended to have additional costs for external vendors to deploy an EMC or HP solution, whereas NetApp implementations were typically handled internally.
- *Actual hardware and software prices varied across customer environments, and were significantly lower than previously observed in March 2006 for all vendor systems.* Hardware system and disk prices continue to drop, making Product Acquisition & Ongoing Vendor Costs a smaller percentage of total cost. Therefore, depending on the date of the purchase of the storage equipment, customers varied in how much they paid. Additionally, customers indicated that all vendors offered major discounts. For this study, the hardware and software prices have been normalized, and current street prices have been used.

## B. Internal Operational Costs

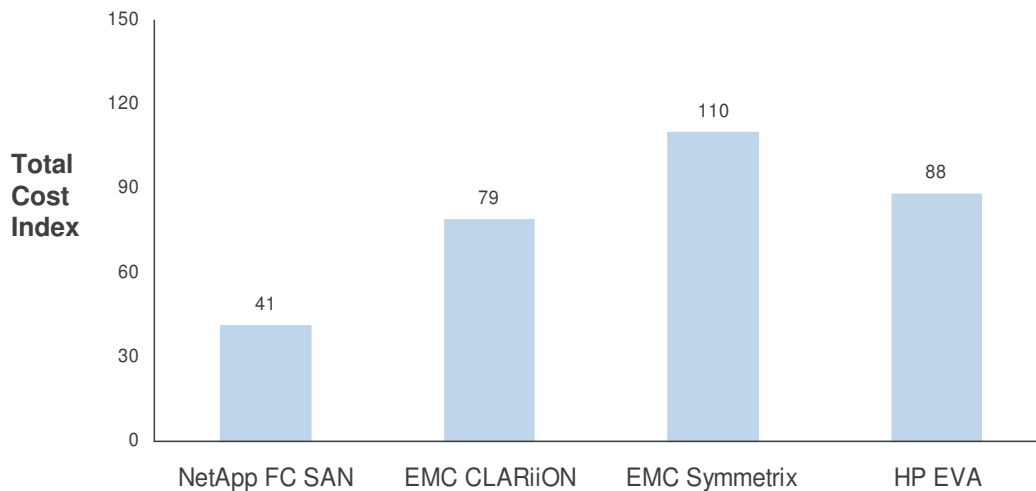
### Overview

Internal Operational Costs, which include all labor costs related to the ongoing management, operation, and administration of database storage solutions and nonlabor costs (e.g. power, cooling, and facilities costs), represent about 40% - 50% of the total costs of a typical solution, primarily because of a decrease in product acquisition costs, leading to Internal Operational Costs as a greater percentage of total costs.



As Figure 7 shows, study participants suggested that Internal Operational Costs for a NetApp solution are 48% lower than for CLARiiON, 54% lower than for EVA, and 63% lower than for Symmetrix.

**Figure 7: Database Internal Operational Costs**  
Indexed: Total Cost for NetApp FC SAN = 100



### Drivers of Differences Observed between NetApp and Competitive Solutions

Several key factors drive differences in Internal Operational Costs in these environments.

- *NetApp database storage solutions require less than half the number of FTEs to administer, monitor, and manage the environment than do solutions from EMC CLARiiON, HP EVA, or EMC Symmetrix. Customers suggest that one of the key differentiators for the NetApp environment is the reduction in the amount of time it takes to create database copies. As one customer explained, “It used to take 8 to 12 hours to do a backup, but we are now doing it in minutes. Now, with our Snapshot methodologies, we can go back to any point in time in the last month, and we don’t have to go back to tape.” Additionally, NetApp’s storage interface reduces the need for command-level management and facilitates easier storage monitoring. As a VP of IT explained, “The beauty of NetApp is that managing is done through a simple interface and it is very intuitive to understand.”*
- *NetApp Data ONTAP 7G functionality has resulted in substantial time savings relating to provisioning and reallocating storage. NetApp FlexVol enables users to treat separate volumes in aggregate so that they can grow and shrink the sizes as needed, which reduces time spent on capacity*

planning and provisioning. As one respondent explained, *“With NetApp, setting up [new storage space] takes seconds, whereas before you would have had to go to the storage administrator, leave a couple of hours to provision – and you had to take down the system. Now, you can provision instantaneously. It’s so fast and easy, we basically don’t bother managing the storage environment anymore.”*

- *NetApp has a 26% - 71% cost advantage over competitor systems in power, cooling, and space metrics.* According to data managers interviewed as part of a Green IT study conducted by Oliver Wyman in December 2007, the primary drivers of power, cooling, and space in enterprise storage systems used for database environments have little to do with disk drive technology differences and everything to do with product feature differences provided by storage vendors. Data from customer deployments shows that NetApp solutions require less storage per usable TB, reducing the number of hard disk drives and enclosures required. For a typical database environment used in this study, NetApp storage solutions achieve the following advantages:
  - NetApp systems require fewer rack units compared to EMC and HP deployments.
  - EMC CLARiiON and HP EVA power, cooling, and space costs are over 30% more than NetApp, and EMC Symmetrix facility costs are 3.4x compared to NetApp systems.

**Case Study: Significant Reduction in Administration Costs**

**A High Tech Firm's Perspective**

For many organizations, improving manageability of the storage environment is a growing concern, as companies are gearing up for continued fast-paced storage growth in the production database environment.

For one high technology firm, reducing internal operational costs was a major driver for choosing their NetApp solution. *“There was a strong belief that it would take fewer people to manage the NetApp environment than any other. Now deployed, that has been absolutely true. We have no dedicated storage people. We have one guy spending 20% of his time on storage, whereas it would require at least one dedicated person if on our old Hitachi system. [Similarly], we were working with EMC with my previous employer, and we had a team of storage engineers maintaining the equipment there, which is not the case here with NetApp.”*

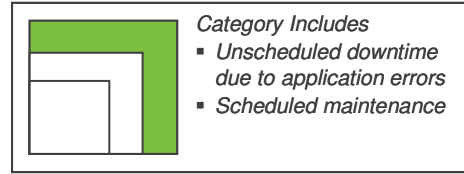
The NetApp ease of use has allowed this firm to manage all storage activities in house, requiring far fewer resources. *“Before, nobody would maintain volumes or create LUNs, and we had to call the vendor each time. NetApp is so much easier to administer.”*

- *Snap Manager for Oracle provides additional time savings for database and storage administrators.* By automating tasks and providing a user-friendly interface, operational constraints are reduced for SnapManager for Oracle customers. According to one customer, *“SnapManager for Oracle benefits, including ease of administration, backup, and restore abilities are impressive. Using SnapManager for Oracle, we have seen 10% - 20% savings in management time.”* Another customer said, *“We use SnapManager for Oracle for Oracle backups, and have used it to create a test environment, load the database, and create a clone. SnapManager for Oracle allows us to make clones automatically. Before, we had to physically copy all the database files and go through the procedure of creating a new database manually, which we could do on hot standby. The time it would take to copy was greater than 4 hours in our environment, but with SnapManager for Oracle and Snapshot copies, it is now a matter of minutes to create a copy, and cloning takes 10 to 15 minutes to have a new environment available. [Furthermore], the production database need not be shut down and there is no impact on performance.”*

### C. Downtime and Recovery Costs

#### Overview

To account for both measurement difficulty and skepticism among some IT professionals, this study includes only two elements in the analysis of Downtime and Recovery Costs, and includes data only where study participants were able to credibly measure impact:<sup>7</sup>

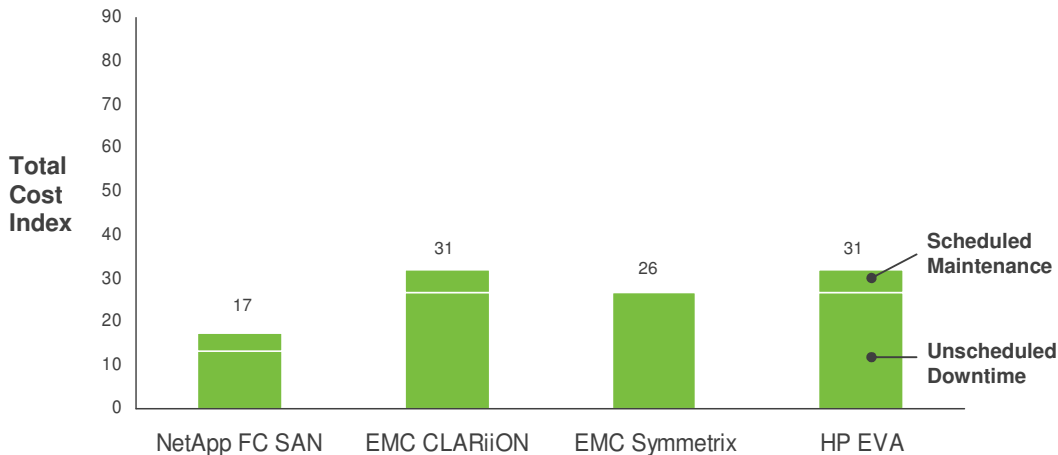


- Scheduled downtime
- Unscheduled downtime caused by application errors

In this study, participants were asked several questions aimed at understanding the scheduled and unscheduled downtime of their environments. Although these costs are smaller than Product Acquisition & Ongoing Vendor Costs and Internal Operational Costs, study participants found that Downtime and Recovery Costs are measurable and that there are real differences among different vendors’ solutions.

As Figure 8 shows, for a typical database solution, the Downtime and Recovery Costs are 46% lower for NetApp than for either EMC CLARiiON or HP EVA and 35% less for NetApp than for EMC Symmetrix.<sup>8</sup>

**Figure 8: Downtime and Recovery Costs**  
Indexed: Total Cost for NetApp FC SAN = 100



#### Drivers of Differences Observed between NetApp and Competitive Solutions

Two important factors drive differences in downtime and recovery in these environments.

<sup>7</sup> For example, based on interviews with IT managers, this study excludes any calculation of downtime as a result of a storage system hardware failure. Study participants indicated that most of their systems were deployed in clusters or in fault-tolerant configurations such that the likelihood of a hardware failure resulting in an outage was so close to zero as to not be relevant in a total cost calculation.

<sup>8</sup> The downtime estimates used in this study are based on published figures by various research experts. Study participants’ view of unscheduled downtime ranged from \$5,000 to over \$200,000 per hour. The estimated cost of unscheduled downtime used in this study is \$50,000 per hour, and the cost of scheduled downtime used in this study is \$5,000 per hour.

- NetApp environments are able to recover at least twice as quickly from application errors, due to NetApp Snapshot capability.* Customers suggest that on average, file corruptions or application errors occur once every 2 years, and the ability to quickly restore databases after a corruption is vital, because these errors can result in losing an entire instance. As one HP customer noted, “*if we had a corruption, we would need to rebuild the OS and database [and] bring them back from tape. Our database is [pretty large], so it would take about 18 hours.*” For customers who are creating snapshots of their data, the time to restore was typically based on how long it took to replay log files and to do any necessary reconfigurations. Study participants explained that the NetApp Snapshot functionality allowed them to restore a point-in-time backup much more quickly than by restoring from a mirror or manually through log files – at least twice as quickly for most participants. “*We can’t do a one-off backup of each production database individually. We have to be able to put the entire environment on standby and take a Snapshot copy in under a second. So Snapshot copies are one of [NetApp’s] key features I take advantage of every day.*” As a concrete example, one NetApp customer explained that “*we lost a volume last weekend and had it back up in under 30 minutes.*”
- NetApp has lower overall scheduled downtime costs compared to HP EVA and CLARiiON, whereas Symmetrix customers reported very little or no scheduled downtime.* NetApp customers suggested that they are able to do online volume expansion and automate a lot of tasks and therefore are able to reduce scheduled maintenance windows. Symmetrix customers suggested that due to the robustness and criticality of their systems, scheduled downtime was not a necessity. However, because scheduled downtime is usually planned for times when business impact is minimal, it is typically only 10% as costly as unplanned downtime.

**Case Study: Reducing Downtime for Mission-Critical Databases**

A Financial Services Firm’s Perspective

For dynamic organizations, maintaining a high level of availability is vital; multiple hours of unscheduled downtime can lead to substantial losses.

For a financial services firm, the need to immediately recover mission-critical systems meant that backing up to tape alone was insufficient. Two years ago, the group suffered an application failure. Although they had procedural safeguards and stand-ins, they brought in 25 IT staff in order to resolve the issue as quickly as possible. With over ten thousand transactions taking place per hour, reloading their tapes and logs took 18 hours to restore.

Recently, this customer has begun backing up their critical databases using NetApp Snapshot copies, and the results have paid off. When their system recently suffered a storage equipment failure, they were able to restore from a snapshot copy, validate the system, and load the log files in less than an hour after they realized the problem.

There was large variance between the impact of downtime and recovery costs for most customers. Standard 8-5 organizations for which costs were limited to labor scheduled more downtime than their 24/7 counterparts. Others, notably government organizations and educational institutions, said that the downtime had more of an effect on their reputation than on their finances. For data-driven manufacturing companies, where data is costly to amass and unscheduled downtime delays almost all productivity, its effects were as high as “\$56,000 per minute.” Users who had no downtime tolerance, most notably manufacturers and retailers, generally invested the most in data protection and disaster recovery measures.

## ■ Conclusion

Oliver Wyman's research with storage decision makers found that the total cost of a NetApp storage solution for enterprise-level database applications is 39% - 62% lower than typical and comparable deployments from EMC or HP. The new study found that a majority of the costs for each vendor environment do not show up in product acquisition costs, but rather in internal operational costs, where NetApp has the largest cost advantage.

As IT departments become more sophisticated in their management of IT costs, more detailed cost comparison analysis is becoming the rule rather than the exception. Under that view, as evidenced in this report, NetApp has a significant total cost advantage. However, a total cost comparison is just one of several considerations that go into a typical storage purchase decision. Participants noted that a number of elements outside of this study (including specific hardware and software functionality, ongoing vendor relationships, and familiarity with equipment) are inputs that also weigh heavily in any decision. Therefore the importance of the total NetApp cost advantage over competitor solutions must be understood in the context of the broader set of decision criteria.



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