

**Total Cost Comparison:
IT Decision-Maker Perspectives on EMC and Network Appliance
Storage Solutions in Enterprise Database Environments**

Prepared for Network Appliance, November 2004



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■ Executive Summary

Mercer Management Consulting, a global strategy consultancy, was engaged by Network Appliance™ in September 2004 to conduct primary research on the total cost of acquiring, deploying, operating, and managing storage environments for database applications. The principal focus of the study was a comparison of the total cost of enterprise-level Network Appliance and EMC™ storage products in Oracle, DB2, and other database environments. The findings presented here are Mercer's, based exclusively on specific data provided by the database storage administrators and IT managers who participated in this study.

Key findings from this primary research include:

- **Total Cost of NetApp vs. CLARiiON.** Based on typical configurations and storage management policies, a Network Appliance solution is 32% less expensive than a typical CLARiiON™ solution for the same size database in a Fibre Channel SAN environment. The NetApp advantage is driven mainly by the significantly lower cost of implementing, operating, and managing a NetApp solution compared to the typical EMC CLARiiON deployment. For instance, respondents indicated that NetApp database storage solutions require considerably fewer resources to perform capacity changes, LUN provisioning, backup and restore, and other common management activities.
- **Total Cost of NetApp vs. Symmetrix.** Again assuming typical configurations and storage management policies, a NetApp solution is 63% less expensive than a typical Symmetrix™ solution for the same size database in a Fibre Channel SAN environment.
- **NFS, iSCSI increase NetApp total cost advantage.** NetApp Ethernet/IP-based solutions offer an even greater cost advantage. NetApp NFS is 39% less expensive than a typical CLARiiON solution and 67% less expensive than a typical Symmetrix solution. In addition, a NetApp iSCSI solution is 34% less expensive than a typical CLARiiON solution and 65% less expensive than a typical Symmetrix solution.

The data reported above include all directly quantifiable costs. This study also identifies how those total cost numbers can be divided into individual cost components so that more discrete comparisons can be made across specific cost elements.

Key findings from this more discrete view include:

- **Beyond "Out of Pocket" Acquisition Costs.** For organizations that consider only the up-front and vendor costs (ignoring other such costs as ongoing management), NetApp's advantage over a typically-priced and configured CLARiiON solution for the same size database drops to 7%. We would highlight, however, two issues that respondents point out as critical considerations:
 - Respondents suggested that truly matching NetApp Snapshot™ functionality using a CLARiiON device would require either large amounts of additional storage capacity or the acceptance of reduced performance. If one were to try to replicate the Snapshot functionality of NetApp in a CLARiiON solution (which is *not* the methodology used in this analysis), NetApp product acquisition costs would be 29% less expensive than CLARiiON, given the additional capacity required on a CLARiiON device.
 - More sophisticated respondents are focusing increasing attention on the ongoing costs of managing database storage solutions. As one customer stated, "*To me the ongoing management costs are the ones that really add up. I will rely on my vendors to arm me with these arguments for my CFO.*" As noted above, when ongoing costs are factored in, NetApp's total cost advantage grows considerably.
- **The Role of Downtime and Other Quantifiable Business Impact Costs.** Respondents noted that NetApp solutions require less scheduled downtime and less time to recover from equipment failures and data corruptions than CLARiiON or Symmetrix. However, many respondents suggested that quantifying the cost of these business impact issues is difficult, given the fact that costs are probabilistic and dispersed rather than direct out-of-pocket expenses. Even if one excludes these costs, the overall message of this study does not change. Factoring in only the product acquisition/vendor costs and direct internal costs, the typical NetApp Fibre Channel SAN solution is 30% less expensive than the typical CLARiiON solution and 60% less expensive than the typical Symmetrix solution for the same size database.

We explore each point in more detail on the pages which follow.

Approach and Methodology

A. Research Approach

Network Appliance engaged Mercer Management Consulting to conduct primary research with IT managers and database storage administrators to determine the total cost of acquiring, deploying, operating, and managing storage environments for database applications. Network Appliance commissioned this research with the belief that its storage solutions provided a total cost advantage over key competitors. However, Mercer had complete autonomy over the research, data analysis and results.

Participants in this study were recruited by Mercer for 60-90 minute structured interviews from two sources: NetApp customer lists and third-party lists of IT managers, who were screened to secure EMC CLARiiON and Symmetrix respondents. Participants were targeted to provide diversity on a number of dimensions, including:

- Geography
- Industry
- Company size
- Primary database vendor
- Primary vendor for database storage
- Storage protocol used for database storage
- Attitude towards total cost analysis.

B. Definition of Total Cost

In the respondent interviews, Mercer captured total cost data across three categories: product acquisition/vendor costs, direct internal costs, and the quantifiable aspects of broader business impact. We did not include business impacts that interviewees could not quantify. Where participants had more than one storage vendor for database applications, data was collected for each environment separately. In some cases, this required interviews with more than one participant from a company in order to provide a complete view of total costs.

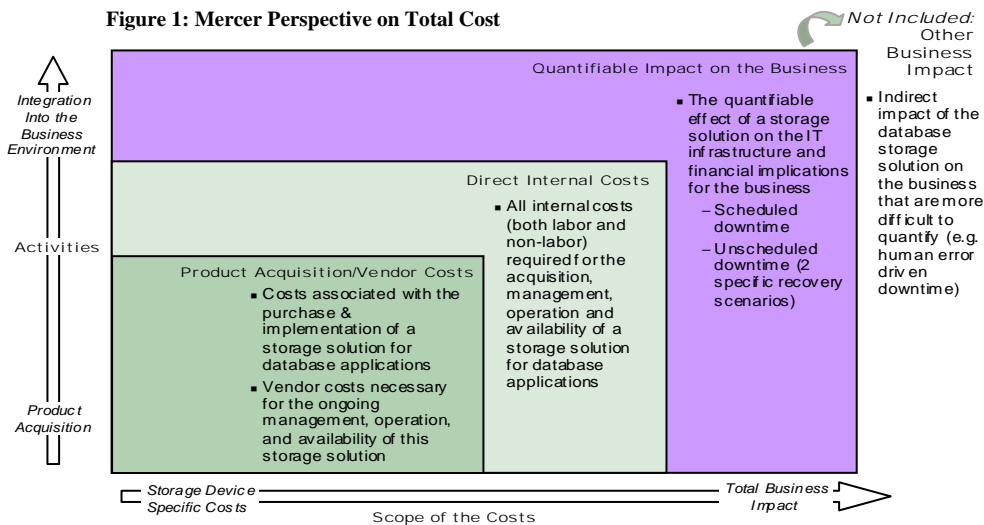


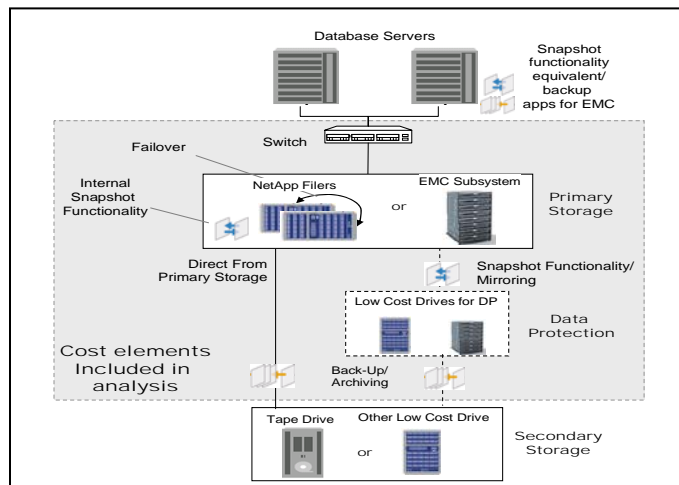
Figure 1 provides more detail on the total cost framework used with participants. Product acquisition/vendor costs include all up-front acquisition, implementation and training costs, as well as ongoing vendor support costs for the database storage solution. Direct internal costs include all labor costs

associated with the ongoing management and operation of the database storage solution as well as all ongoing non-labor costs (e.g. facilities, environmental). Quantifiable impact on the business¹ addresses scheduled and unscheduled downtime and includes costs only where respondents were able to credibly measure impact. Estimates of indirect business impact costs were not included in this study.

C. Common Database Architecture

In order to ensure a consistent and accurate total cost comparison, participants were shown a database storage architecture diagram, Figure 2, and asked to limit the scope of their answers to the elements of this diagram. Participants gathered data for the interviews in advance based on this common architecture view. Where participants' database storage environment differed from the standardized architecture, Mercer identified the impact of these differences. The findings provided here constitute a consolidated view of all participants' data over a 5 year period,² including both normalized costs for each cost category and typical variations based on company-specific factors.

Figure 2: A Common Database Storage Architecture View



D. Typical Customer Environments

One key insight from the interviews was that NetApp and EMC customers typically use different amounts of storage for the same sized database requirements. Specifically, the different approaches to Snapshot-equivalent functionality mean that NetApp environments require less disk space than EMC for the same size database. In addition, respondents indicated that they do not add data protection in Symmetrix environments because the cost would be prohibitive, requiring the purchase of another Symmetrix subsystem.

Table 1 shows the baseline configurations used in this study. For three instances of a database requiring 2 TB of storage capacity, NetApp requires approximately 2.9 TB of disk capacity in primary storage,³ while EMC requires approximately 4.7 TB.⁴ For data protection, NetApp solutions require 2 TB to mirror the original database. Since respondents reported that fewer Snapshot equivalent copies are kept in primary

¹ The only aspects of "impact on the business" included in this study are scheduled downtime, and unscheduled downtime (based on two specific recovery scenarios). Data for both are based on respondent-provided, not third-party, data adjusted for the probability of those events occurring, as reported by respondents.

² While vendors tend to suggest three-year product lifecycles, Mercer found that many IT organizations plan for longer cycles. Differences between the 5-year view which is the baseline for this report and a 3-year view, which are minor, are noted throughout the report.

³ The typical configuration assumes a clustered pair of FAS960 filers for NetApp solutions for the purposes of failover.

⁴ This is based on 1.4x overhead capacity required in traditional NetApp NFS environments and in the NetApp SAN environments using 7G software vs. 2.33x overhead capacity required by EMC's BCV solution. We did not use the "Copy on Write" approach to Snapshot equivalent functionality that is possible in CLARiON environments because the degradation in database performance that this approach creates would create a non-comparable view.

storage in CLARiiON environments,⁵ CLARiiON solutions typically include archives of the transaction logs, requiring 2.2 TB for data protection. The typical Symmetrix environment does not include data protection because the costs would be prohibitive.

Table 1: Typical Configurations for NetApp & EMC Environments

	<u>NetApp FC SAN</u>	<u>NetApp NFS</u>	<u>CLARiiON SAN</u>	<u>Symmetrix SAN</u>
<i>Storage Hardware</i>	<ul style="list-style-type: none"> ■ 1 cluster of FAS960s ■ 1 R200 for data protection 	<ul style="list-style-type: none"> ■ 1 cluster FAS960s ■ 1 R200 for data protection 	<ul style="list-style-type: none"> ■ 1 CX700 ■ 1 CX700 with ATA for data protection 	<ul style="list-style-type: none"> ■ 1 DMX 2000 ■ No data protection
<i>Storage Capacity</i>	<ul style="list-style-type: none"> ■ 2.9 TB (1.43x for Snapshot functionality) ■ Data Protection- 2 TB 	<ul style="list-style-type: none"> ■ 2.9 TB (1.43x: Snapshot functionality) ■ Data Protection- 2 TB 	<ul style="list-style-type: none"> ■ 4.7 TB (2.33x: Snapshot functionality equivalent) ■ Data Protection- 2.2 TB 	<ul style="list-style-type: none"> ■ 4.7 TB (2.33x: Snapshot functionality equivalent) ■ Data Protection- 0 TB
<i>Networking Hardware</i>	<ul style="list-style-type: none"> ■ 1 FC switch with corresponding HBAs 	<ul style="list-style-type: none"> ■ No additional networking equipment purchased 	<ul style="list-style-type: none"> ■ 1 FC switch with corresponding HBAs 	<ul style="list-style-type: none"> ■ 1 FC switch (higher end) with corresponding HBAs
<i>Software</i>	<ul style="list-style-type: none"> ■ Software suite that enables management, Snapshot copies (or equivalent) and mirroring 			

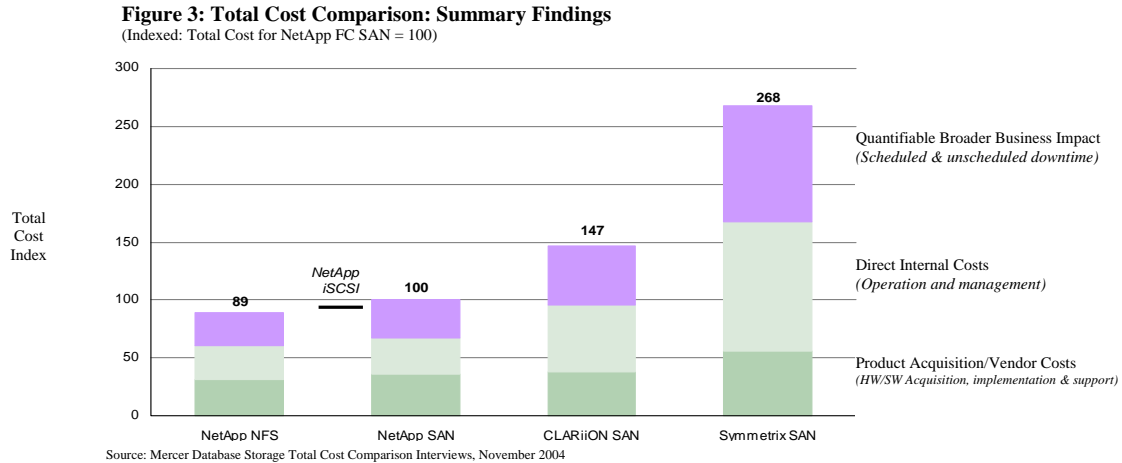
It is important to note that these configurations are not truly equivalent because EMC solutions would require even more storage capacity to replicate the number of Snapshot equivalent copies performed in the typical NetApp environment. However, this study was designed to provide a total cost comparison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

⁵ Participant data showed that NetApp environments typically conduct several times more Snapshot copies than EMC environments because of the more efficient approach that NetApp allows. For the purposes of this analysis, we used an assumption of seven Snapshot copies in NetApp for every one Snapshot equivalent copy performed in EMC environments.

Detailed Findings

A. Total Cost

For a typical deployment using typical data protection policies, a NetApp database storage solution is 32% less expensive than a typical CLARiiON solution and 63% less expensive than a typical Symmetrix solution for the same size database in a Fibre Channel SAN environment.⁶ Put another way, CLARiiON is 50% more expensive and Symmetrix over 2.5 times more expensive than a NetApp solution. Furthermore, the total cost of a NetApp NFS or NetApp iSCSI database storage solution is less than a NetApp Fibre Channel solution.⁷ This data is represented in Figure 3.⁸



If one excludes the cost category most subject to company-specific factors (quantifiable business impact such as downtime) the results are similar. For the first two cost categories (product acquisition/vendor costs and direct internal costs) a typical NetApp database storage solution is 30% less expensive than a typical CLARiiON solution and 60% less expensive than a typical Symmetrix solution for the same size database in a Fibre Channel SAN environment.

Some respondents indicated that they place more emphasis on product acquisition/vendor costs in their total cost comparisons since these costs are documented on an invoice and easiest to calculate. However, this study shows that these costs make up a relatively small portion of total costs. This is particularly the case in EMC environments, where quantifiable operational and management costs comprise 75% of total costs for CLARiiON environments and 79% of the total costs for Symmetrix environments.

Several important drivers of differences in total cost emerge when comparing each cost category across NetApp, CLARiiON and Symmetrix including:

- Actual street prices often vary from list prices, particularly for EMC
- CLARiiON and Symmetrix solutions require more initial storage capacity for the same size database
- NetApp database storage solutions require a fewer number of resources to administer, monitor and manage than either CLARiiON or Symmetrix
- Downtime costs are lower in less mission critical CLARiiON environments than they are in either NetApp environments or Symmetrix environments

⁶ As noted above, this is based on a five-year total cost view. Using a three-year view, NetApp is 29% less expensive than CLARiiON and 59% less expensive than Symmetrix.

⁷ A NetApp NFS solution is 11% less expensive overall than a NetApp Fibre Channel SAN solution. A NetApp iSCSI solution is 2% less expensive overall than a NetApp Fibre Channel SAN solution.

⁸ 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 enables us to present clear variations in costs, where they exist, between the different solutions. The approach to indexing has no impact on relative results.

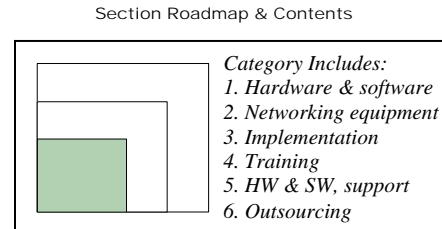
- NetApp database storage equipment is able to recover from unscheduled downtime much more quickly than either CLARiiON or Symmetrix equipment

Each of these factors will be discussed in greater detail in the sections that follow.

B. Product Acquisition/Vendor Costs

1. Overview

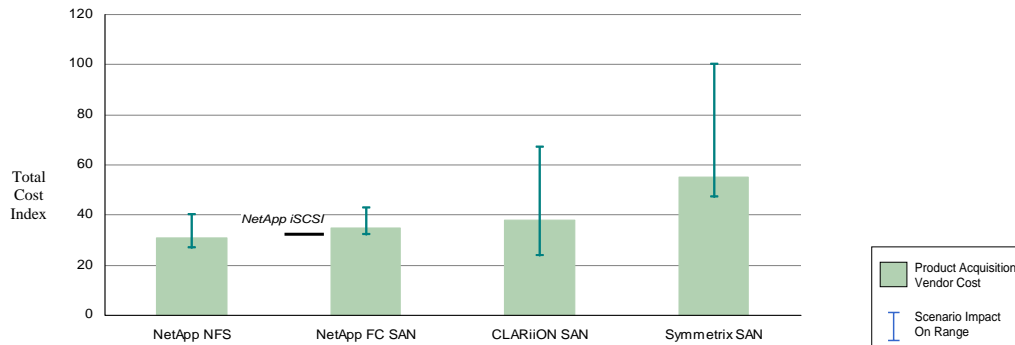
The first and most straightforward element of our total cost analysis is product acquisition/vendor costs. This category includes all upfront costs (both internal and external) associated with acquiring and implementing a storage solution for a database application environment. This category also includes all costs paid to third-party vendors for hardware or software maintenance and support and for any required outsourcing or training. These costs are often bundled as part of an initial invoice.



Product acquisition/vendor costs are the most tangible and easily quantifiable input into a total cost comparison. However, these costs represent only 35% of the total cost of a Network Appliance database solution and only 25% of the total cost a CLARiiON solution and 21% of the total cost of a Symmetrix solution. Put another way, companies typically spend 2-4 times more on other cost elements than on the initial “invoice” price. While important, product acquisition/vendor costs are only a part of the story.

As described above, the methodology used in this study is based on a respondent-defined typical deployment of NetApp and EMC storage solutions for a given database environment. Under this approach, a NetApp Fibre Channel SAN solution is 7% less expensive for product acquisitions/vendor costs than a typical CLARiiON solution for the same size database. A NetApp NFS solution is 18% less expensive than a CLARiiON solution. Symmetrix is considerably more expensive, even before layering on the complexity that drives considerable management costs later. On product acquisition/vendor costs alone, NetApp is 36% less expensive than Symmetrix for the same size database. Figure 4 displays the product acquisition/vendor cost data.⁹

Figure 4: Product Acquisition/Vendor Costs
(Indexed: Total Cost for NetApp FC SAN = 100)



2. Drivers of Differences Between EMC and NetApp Solutions

There are several factors that drive differences in product acquisition/vendor costs among these environments:

⁹ As described above, the data presented here and in subsequent charts is indexed such that 100 equals the total cost of a NetApp Fibre Channel SAN solution. The bars represent variation based on company-specific factors.

- Because of the different approaches to Snapshot functionality and the cost of deploying disk-based data protection solutions, respondents reported significant differences between typical NetApp and typical EMC deployments for the same database application
- Respondents reported that actual street prices, particularly for EMC, often vary significantly from list prices
- NetApp customers reported that implementation costs that are 3-5 times lower than implementation costs reported by EMC customers
- Symmetrix customers are more likely to run additional vendor or third-party software to manage database storage solutions given the typical complexity of a Symmetrix solution
- Respondents claimed that NetApp environments, unlike EMC environments, typically do not require any training
- CLARiiON customers are more likely to outsource some portion of the monitoring and/or management of their database storage resources to an external vendor

The biggest difference in product acquisition costs across respondents is driven by overhead capacity requirements. Typical EMC environments use more disk space than NetApp to handle the same size database.

Another key driver of variance in product acquisition costs is the level of discounting that EMC customers reported for CLARiiON and Symmetrix database storage equipment. This study uses customer reported “street” prices as its inputs for both NetApp and EMC database storage solutions.

Implementation costs for Network Appliance and EMC solutions also differ. NetApp solutions are implemented using internal resources and generally require 1 to 1.5 days of FTE time. Respondents said that EMC implementations are more complex than NetApp, and take more FTE time to complete – up to 3x as much time for CLARiiON and up to 5-6x as much time for Symmetrix. In particular, EMC customers point to the difficulty in executing activities such as capacity planning and LUN provisioning. As one storage administrator told us, *“With [EMC] you have to be very cognizant of where your disks are, particularly when adding new storage. It is just not as straightforward.”*

Respondents also reported that CLARiiON and Symmetrix solutions are more likely to require the hiring of a third-party services company, either EMC or a systems integrator, during implementation – further inflating costs.

In addition, given the complexity of Symmetrix environments, respondents suggested that they are more likely to need to acquire additional storage resource management software, either from EMC or a third-party vendor. NetApp customers indicated that all the software they will need is included in the upfront cost of the equipment.

On an ongoing basis, respondents indicated that the level of training they chose to complete is different for EMC solutions than it is for NetApp solutions. EMC customers indicated that typically they must send at least one storage administrator to become EMC Certified for the operation of CLARiiON and Symmetrix database storage solutions. Similar training is not required in the NetApp storage environments represented in this study.

Finally, respondents described their CLARiiON environments as harder to manage than those of NetApp and of lower mission criticality than Symmetrix environments. The combination of these factors creates a greater willingness and desire to outsource some portion of the monitoring and/or management of CLARiiON database storage solutions. This outsourcing is in addition to internal FTEs dedicated to the CLARiiON equipment. In NetApp environments, ease of management limits the need for outsourcing. In the Symmetrix environments included in the study, mission-criticality was perceived to be too high for outsourcing.

3. Drivers of Variation from Expected Values

It is important to note that the product acquisition/vendor costs cited above are expected values in a range of data points gathered from respondents. The bars in Figure 4 reflect the expected range of product acquisition/vendor costs based on respondent feedback. Several factors cause specific environments to differ from the expected value, including:

- The specific Fibre Channel networking equipment deployed
- Additional vendor or third-party software for functions like back-up or storage resource management
- Organization policies that affect implementation timing and up-front training
- Differing levels of outsourcing in CLARiiON environments
- Variation in the amount paid to storage vendors for hardware and software support
- Differing levels of ongoing training in EMC environments

The upfront cost associated with Fibre Channel switching and HBAs for each environment varies based on the number of ports used and the number of servers connected to storage. This study assumes relatively similar networking equipment costs across environments with any significant variations accounted for in the range bars on Figure 4.

The range bars also account for participants who use additional software for their database storage solution. For instance, EMC storage solutions sometimes require additional licenses for storage resource management software like Control Center.

Variation also exists in the amount of time required to implement NetApp, CLARiiON and Symmetrix solutions. In general, implementation times used in this study represent the lower end of the spectrum for all vendors. Any significant differences are accounted for in the high end of the range. This range also accounts for upfront training in some EMC environments. NetApp respondents all reported no upfront training costs.

On an ongoing basis, respondents differed in the levels of outsourcing that they required to manage their CLARiiON environments. While respondents are more likely to outsource a portion of their CLARiiON resources, some do choose to manage these resources internally. If a CLARiiON customer outsources to a third-party, the tasks outsourced can also vary from basic monitoring to much more intensive levels of management, driving substantial differences in ongoing external costs.

The range also accounts for differences in the amount respondents paid for annual hardware and software maintenance and support. This study assumes an average value for each database storage solution. However, ongoing support costs are often specific to a particular enterprise or sales situation. Variance in the size of the annual fee exists in both NetApp and EMC environments.

Finally, the amount of ongoing training differs as well. In some large-scale CLARiiON environments, respondents suggested no additional EMC Certification is required. However, in certain Symmetrix environments, more than one resource needs to become EMC Certified.

4. Required Adjustments to Show Truly Comparable Results

This study found that typical CLARiiON and Symmetrix environments do far fewer Snapshot copies than NetApp environments.¹⁰ Also, because the costs of deploying a separate data protection environment would be prohibitive, many typical Symmetrix environments use Symmetrix disk space only for primary storage and internal RAID/data protection configurations.¹¹ As Table 2 shows, substantial adjustments to

¹⁰ Participant data showed that NetApp environments typically conduct several times more Snapshot copies than EMC environments because of the more efficient approach that NetApp allows. For the purpose of this analysis, we used an assumption of seven Snapshot copies in NetApp environments for every one Snapshot equivalent performed in EMC environments.

¹¹ This would require purchasing an additional DMX2000, which few customers are able to justify, except for instances in which SRDF and real time mirroring are used across disparate data centers. These special situations were not included in this study.

a typical CLARiiON or Symmetrix environment are required to provide functionality comparable to a typical Network Appliance deployment.¹²

Table 2: Storage Requirements Adjusted to Provide Comparable Performance
(Typical vs. “Comparable Performance Environments”)

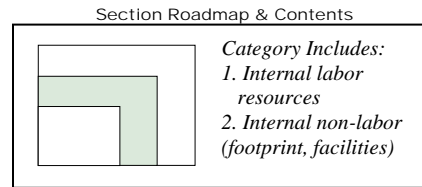
	Typical Environment			Comparable Performance Environment		
	NetApp	CLARiiON	Symmetrix	NetApp	CLARiiON	Symmetrix
Primary Storage (2 TB Storage Capacity)	2.9 TB	4.7 TB	4.7 TB	2.9 TB	4.7 TB	4.7 TB
Data Protection (Mirrors Primary)	2 TB	2.2 TB	0 TB	2 TB	15.4 TB	15.4 TB

Under the view adjusted to ensure comparable performance (which is, again, *not* the methodology used for the summary numbers provided throughout this report),¹³ product acquisition/vendor support costs are 29% less with NetApp than CLARiiON solutions and 72% less than Symmetrix solutions for the same size database.

C. Direct Internal Costs

1. Overview

Direct internal costs include all labor costs related to the ongoing management, operation and administration of database storage solutions as well as all ongoing non-labor costs (e.g. facilities, environmental).



The ongoing internal costs of operating and managing a database storage solution are sometimes overlooked or underestimated by some IT professionals in total cost comparison analyses. However, we have found that more sophisticated environments quantify these costs regularly, and all participants were able to quantify these costs when provided with targeted questions for data collection.

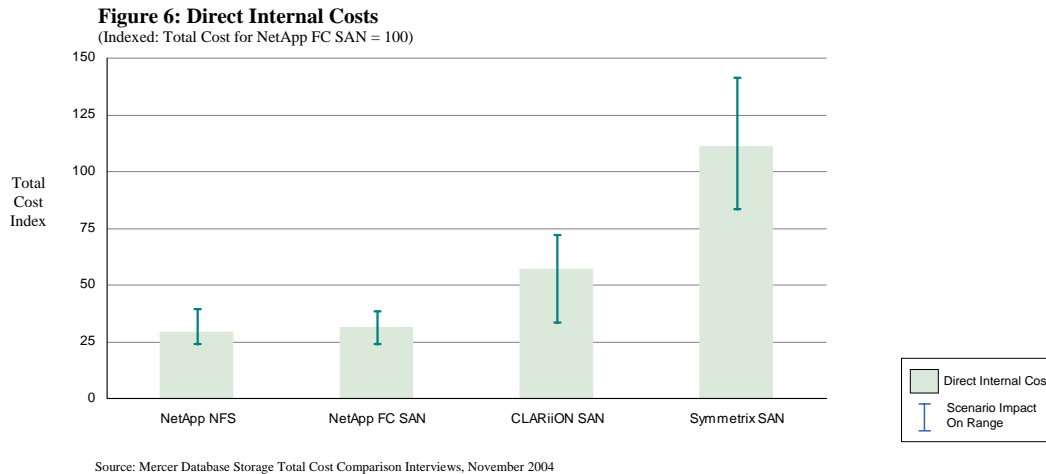
Direct internal costs represent approximately 33% of the total cost of a NetApp database storage solution, 38% of a CLARiiON solution and 42% of a Symmetrix solution. For EMC environments, these costs represent a larger portion of total costs than product acquisition/vendor costs.

NetApp has a cost advantage versus EMC in the internal cost of managing storage solutions for database applications. As Figure 6 indicates, for a typical NetApp solution, direct internal costs are 45% less than for CLARiiON and 72% less than for Symmetrix in a Fibre Channel SAN environment. Again, that a NetApp NFS solution improves the advantage further.¹⁴

¹² EMC data protection capacity requirements in the “Comparable Performance Environment” column reflect seven full Snapshot copy equivalents.

¹³ Instead, this report relies on the data in the “Typical Environment” column.

¹⁴ NFS solutions are 6% less than they are for NetApp Fibre Channel SAN solutions.



2. Drivers of Differences Between EMC and NetApp Solutions

Two key factors drive differences in direct internal costs among these environments:

- NetApp database storage solutions require a fewer number of resources to administer, monitor and manage than either CLARiiON or Symmetrix – typically 3-5 times fewer resources for a NetApp solution
- NetApp database storage solutions have lower non-labor costs associated with their ongoing management than either CLARiiON or Symmetrix

Participants indicated that the ongoing administration, monitoring and management of CLARiiON environments require approximately three times the number of IT resources that a typical NetApp Fibre Channel SAN solution requires. A typical Symmetrix solution requires approximately five times the number of IT resources as a NetApp solution.

Participants indicated several reasons for this difference. First, capacity planning and LUN provisioning on EMC database storage equipment are more time-consuming for storage administrators and database administrators. As one respondent with both EMC and NetApp database storage stated, “*EMC takes a lot more management when activating new capacity, whereas adding capacity with NetApp is a lot easier.*” When probed about the amount of time required for a specific capacity addition scenario, respondents indicated that to scale up EMC storage requires approximately 12 times as many FTE hours as in NetApp environments.¹⁵

Participants also indicated that performing backups takes approximately twice as long in EMC environments as it does in NetApp environments. One participant noted that the file system check time in CLARiiON environments is especially time-consuming. In addition, respondents pointed out that Snapshot equivalent functionality in EMC environments is usually based on the archiving of database transaction logs, which requires a greater number of storage administrator and DBA hours to manage on an ongoing basis. For NetApp, respondents said that this Snapshot functionality is largely automated and managing Snapshot copies represents a very small percentage of a storage administrator’s time.¹⁶

The non-labor costs of NetApp and EMC solutions also differ substantially. Respondents indicated that for CLARiiON solutions, non-labor costs are approximately 25% higher than for NetApp. This difference is primarily driven by higher power requirements in CLARiiON environments. With

¹⁵ Customers reported approximately 1 hour to add 200GB of storage to both NetApp NFS & Fibre Channel SAN equipment and approximately 12 hours for either CLARiiON or Symmetrix

¹⁶ Respondents indicated that less than 10% of a storage administrator’s time is focused on Snapshot functionality.

Symmetrix solutions, non-labor costs are three times as high as those of NetApp. This difference is driven by space, environmental and power requirements of Symmetrix solutions.

3. Drivers of Variation from Expected Values

These direct internal costs are expected values in a range of potential data points. Several environment-specific factors create variance from expected values, including:

- Differences in the number of IT resources dedicated to managing the database storage solution
- Variance in the ongoing non-labor costs of operating the database storage solution

Differences exist across NetApp environments in the number of IT resources required for the management of database storage solutions. This study uses a resource allocation in the middle of the range for NetApp environments. However, the number of locations at which database storage equipment is being run can raise the number of people required to manage that equipment. The range in Figure 6 accounts for variance in the number of IT resources managing NetApp database storage solutions.

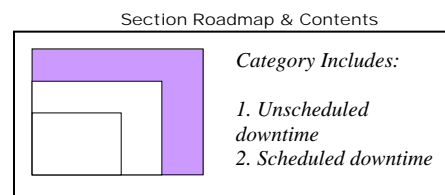
Labor and non-labor resource requirements also vary for CLARiiON and Symmetrix database environments. Some CLARiiON customer environments reported fewer people dedicated to database storage solutions (but these environments are often ones with correspondingly higher outsourcing costs). Symmetrix environments consistently reported higher resource requirements than CLARiiON. Respondents reported that they often underestimate the resources required to manage EMC database storage solutions, discounting less frequent tasks like capacity additions. In fact, many were surprised by their own costs to manage EMC products having engaged in our worksheets and analysis. The range bars of direct internal costs in Figure 6 reflect this variance in respondent-reported ongoing labor requirements.

Participants also expressed differences in the amount of non-labor costs for each database storage solution. In general, these costs, like facilities, footprint space, and environment, are more difficult for participants to quantify because they require allocations (often “in someone else’s budget”). As a result, the range in direct internal costs also accounts for some of the variance in reported non-labor costs.

D. Quantifiable Impact On The Business

1. Overview

Many participants struggled to articulate the broader business impact of selecting a specific database storage solution. For instance, while catastrophic system failure can be highly costly if it occurs at certain times of the work day or during particular tasks, it is often hard to generalize its frequency and impact across environments. As a result, many IT environments ignore or discount this element of total cost.



Moreover, participants noted that they perceive several common flaws in many published figures for this type of analysis: the figures are often based on worst-case scenarios (and therefore overstated), are not probability adjusted, and are not specific to their environment.

To account for both measurement difficulty and skepticism among some IT professionals, this study includes only two elements in the analysis of business impact, and only includes data where respondents were able to credibly measure impact:

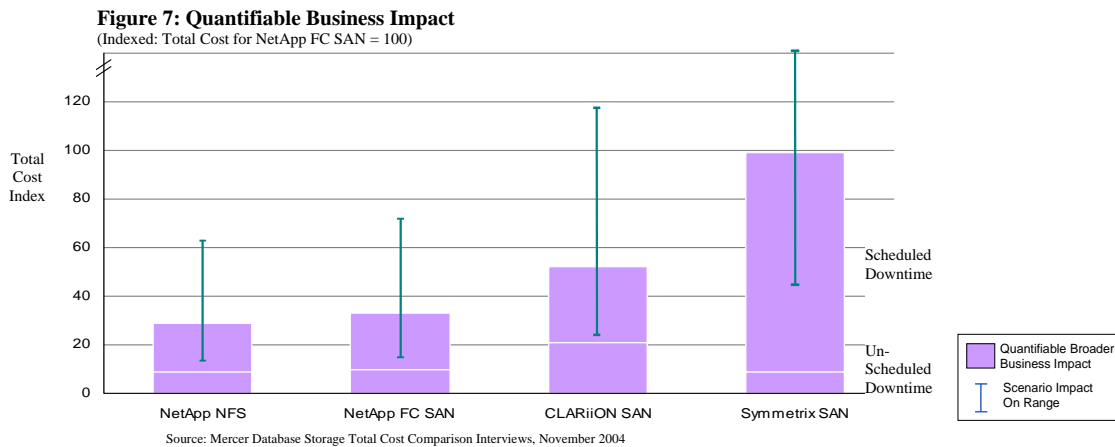
- Scheduled downtime
- Recovery scenarios to calculate the impact of unscheduled downtime

Where scenarios are used, probability factors were developed with participants to arrive at realistic values that respondents validated. Please note that this section, more than others, is highly dependent on the

specifics of a respondent’s storage environment. This study includes conservative assumptions throughout to assure applicability to the widest possible set of enterprises.

By focusing on specific tangible impacts, respondents were able to articulate the business impact of owning a database storage solution. Based on this approach, quantifiable broader business impact costs represent approximately 34% of the total cost of a NetApp database storage solution, 37% of a CLARiiON solution and 38% of a Symmetrix solution.

Once again, the costs associated with quantifiable business impacts (e.g. downtime) are considerably lower for NetApp than for EMC. For the same size database solution a NetApp solution is 36% less expensive than a CLARiiON solution and 67% less expensive than a Symmetrix solution in a Fibre Channel SAN environment. Once again, NFS improves the story for NetApp.¹⁷ Figure 7 displays this data.



2. Drivers of Differences Between EMC and NetApp Solutions

Several important factors drive differences in quantifiable business impact between these environments:

- Downtime costs are lower in less mission critical CLARiiON environments than they are in NetApp or Symmetrix environments
- Downtime costs are highest in Symmetrix environments, however unscheduled downtime occurs far less frequently than in NetApp or CLARiiON environments
- NetApp database storage equipment is able to recover from unscheduled downtime much more quickly than either CLARiiON or Symmetrix equipment

Downtime costs associated with a solution depend heavily on the type of application in which a storage device is deployed – the more critical and “online” a storage device, the higher the potential cost of downtime. Because participants in this study indicated that their CLARiiON environments were typically used in less mission critical applications like data warehousing (where downtime only impacts a smaller number of internal users) we assume downtime costs are lower for CLARiiON environments than either NetApp or Symmetrix environments.

Respondent data showed that NetApp customers are more likely to run NetApp storage solutions in conjunction with more mission-critical database applications than CLARiiON customers, while Symmetrix environments, not surprisingly are deployed for applications with very high levels of mission-criticality. Respondents to this study typically utilize Symmetrix (and often use NetApp) in database applications where downtime has a palpable and immediate effect on company revenues. As one respondent commented, “[The applications run on] Symmetrix impact our customers. Symmetrix is

¹⁷ Costs associated with a NetApp NFS solution are 13% less than for a NetApp FC-SAN solution.

my golden goose.” As a result, in these environments, availability requirements are typically in the extremely high and customers select solutions to minimize unscheduled downtime does not occur with great frequency given the high resulting cost.

The NetApp cost advantage in this category is predominantly driven by faster recovery times from unplanned database and storage outages than either CLARiiON or Symmetrix. Respondents were asked how long it would take to recover in two scenarios:

- A database crash caused by a storage equipment failure
- A database corruption based on a storage equipment error.

Table 3: Hourly Impact of Downtime By Environment
(Based on Respondent Data)

		NetApp (NFS)	NetApp (FC SAN)	CLARiiON	Symmetrix
Un-scheduled Downtime	Cost Per Hour	\$26K	\$30K	\$20K	\$60K
	Hours over 5 Years- If It Occurs	7	7	22	28
	Probability of Occurrence	50%	50%	50%	5%
	Total Impact Per Year	\$18K	\$21K	\$44K	\$18K
Scheduled Downtime	Cost Per Hour	\$5K	\$6K	\$4K	\$12K
	Hours Per Year	8	8	16	16
	Total Impact Per Year	\$41K	\$48K	\$64K	\$192K

Respondents indicated that the frequency of Snapshot copying possible in NetApp environments makes recovery relatively easy. By contrast, respondents indicated that CLARiiON environments require three times longer than NetApp to recover in each of these scenarios. Symmetrix environments require four times longer than NetApp in each of these scenarios. It is important to note that since unscheduled downtime is so rare in Symmetrix environments, the probability factor applied to these scenarios reduces their impact overall.

Scheduled downtime also differs across NetApp and EMC environments. Respondents indicated that EMC equipment requires approximately twice as much scheduled downtime as that of NetApp. For example, respondents suggested that volume expansions and database refreshes both take considerably longer in EMC environments. However, because scheduled downtime is usually planned for times when its business impact is minimal, it does not affect the quantifiable business impact as heavily as unscheduled downtime. Table 3 outlines the assumptions used for scheduled and unscheduled downtime.

3. Drivers of Variation from Expected Values

These quantifiable business impact figures are expected values in a range of potential data points. Several factors create variance from expected values, including:

- Variance in the impact of unscheduled downtime
- Differences in either the recovery times from or probability of unscheduled downtime

It is difficult to assume a single value for downtime that is broadly applicable across a range of industry verticals and enterprise environments. Participants expressed a range of values for the net impact of an hour of downtime, from roughly \$25K-\$100K, and this study assumes representative values within this range.¹⁸ Where downtime varies, it is depicted on the graphic as a bar above or below the quantifiable business impact value.

¹⁸ The downtime estimates used in this report are consistent with conservative figures published by industry analysts, such as Gartner (2004) which estimated \$50K per hour, and contrasts with estimates of as high as \$1M-\$1.5M used in some vendor reports.

In addition, the range of quantifiable business impact reflects the fact that both the time to recover in an unscheduled downtime scenario and the probability of that scenario's occurrence vary across respondent environments. In NetApp environments, recovery times could be faster (1 hour) or slower (6 hours) and occur with greater or less frequency. In CLARiiON and Symmetrix environments, recovery times vary even more, ranging from 4-33 hours at the extremes. Probabilities of occurrence of each scenario also vary somewhat more in CLARiiON environments than in others.

4. Additional Impact of Protocol Flexibility

For many respondents, an additional important driver of total cost difference between NetApp and EMC is that NetApp solutions enable greater flexibility in migrating to new or different networking protocols. With NetApp, different ports can be configured for multiple protocols. With CLARiiON or Symmetrix, migrating to a different protocol requires the purchase of a new system.

Many respondents place value on having the flexibility to migrate relatively easily to iSCSI should their IT departments decide to do so. While those respondents were able to quantify the value of this flexibility, this factor was not included in the total cost analysis because the research found wide variation in the probability of an individual enterprise converting to iSCSI in the near future.

■ Concluding Thoughts

This study suggests that the cost of owning a NetApp storage solution for storage of enterprise-level database applications is lower than typical offerings from EMC. Much of this cost advantage, however, does not show up in the initial invoice but instead begins once the equipment arrives on site.

Obviously, a total cost comparison is just one of several considerations that go into a typical purchase decision. Participants noted that a number of elements outside of this study (including ongoing vendor relationships, level of desire for simplicity and manageability, availability requirements for mission critical applications, and specific hardware and software functionality) are inputs that also weigh heavily in any decision. As a result, the importance of the total NetApp cost advantage over CLARiiON and Symmetrix must be understood in the context of the broader set of decision criteria.

Interviews with IT managers identified another issue: as IT departments become more sophisticated in their management of lifecycle costs, more detailed cost comparison analysis is becoming the rule rather than the exception. In fact, approximately two-thirds of respondents indicated that some form of robust total cost analysis is factored into their database storage purchase process today. While some organizations focus primarily on the upfront vendor costs, most IT professionals expressed a desire for more sophisticated total cost comparisons that would include ongoing administration and management costs. Under that view, NetApp has a significant total cost advantage.



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