

The background of the slide is a scenic photograph of a long, multi-span concrete bridge crossing a calm lake. In the distance, there are large, forested mountains with patches of snow under a clear blue sky with a few wispy clouds. Pine branches are visible in the foreground on the left side.

Efficient Storage for Ultimate Performance

Gartner's recommendations for
implementing storage tiering
to maximize system efficiency

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Gartner Research :

How Much and What Type of Disk Storage
Do IT Departments Need?

Fujitsu Case Studies :

- TomTom Business Solutions
- Z.I.E.L GmbH

Efficient Storage for Ultimate Performance

With options for storage constantly increasing and becoming more complex, it is vital businesses have sufficient information to create an efficient storage environment that can optimize performance and reduce costs. Identifying the right tiering structure for your storage system is fundamental in realizing the most from your investment.

Within this document, we investigate key findings from research conducted by Gartner, and incorporate proven success with the Fujitsu Storage ETERNUS solutions.

How Much and What Type of Disk Storage Do IT Departments Need?

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Taking a results-oriented approach to designing a tiered storage infrastructure creates a cost-effective agile solution. This research identifies the decisions that dictate the number and relative size of each tier within a storage array that an organization requires.

Overview

Within the last three years, increasing numbers and types of solid-state drive (SSD) and hard-disk drive (HDD) storage formats have become available. Consequently, the increased choices proportionately increase decision-making complexity in purchasing storage systems. This research helps users quantify the ratios of the different HDD and SSD formats an organization should deploy within a storage array.

Key Findings

- Multiple storage tiers within an array, together with automated and transparent tiering, improve performance and can reduce storage costs when different workloads are sharing the same storage array.
- Automated disk tiering can add cost to a user's storage infrastructure by hiding the consequences of wrong-sized storage tiers.
- Incorrect sizing decisions can increase costs and decrease performance by limiting the usable scalability of a storage system, which can result in the purchase of superfluous SSDs, high-performance HDDs or the deployment of additional systems to reliably meet performance SLAs.
- Data center tape is a suitable long-term storage medium, and should be used within data centers to store deep archives and very large quantities of inactive data.
- No single storage format, be it SSD, HDD or tape, can meet all storage requirements within a storage infrastructure.

Recommendations

- Storage arrays must have automated and transparent tiering software within the storage array so that performance and capacity can dynamically adapt to changes in application performance and service demands.
- An enterprise information archiving (EIA) tool is required to archive data from applications whose data resides on primary disk storage to secondary disk or tape archive storage.
- Perform storage array consolidation to increase the value of automated tiering software, simplify disaster recovery and provide economies of scale that increase the amount of data managed per storage administrator (full-time equivalent [FTE]/terabyte [TB]).
- Disk-based deduplication should be used to reduce capacity and storage costs for active data; for large environments that have over one petabyte (PB) of inactive uncompressible data, data center tape and other storage technologies such as public cloud storage should be exploited.

Analysis

Overview

The problem of too much choice has started to appear in the disk storage market, especially when customers need to purchase primary storage arrays. In comparison, the market for secondary enterprise storage is much simpler, as it consists of the tape market, within which there are only three tape formats: IBM TS11x0, LTO-5 series and Oracle StorageTek T10000x series. For brevity, this research describes the issues confronting customers purchasing storage arrays that can have many different types of disk drives or disk tiers within them. The increasing numbers of disk formats – from the perspective of physical size (2.5-inch or 3.5-inch), performance (15,000, 10,000, 7,200 and 5,400 revolutions per minute [rpm]), capacity (600GB to 3TB), cost and connection protocol (Fibre Channel [FC], Serial Attached SCSI [SAS] and Serial Advanced Technology Attachment [SATA]) – cause confusion for many customers. This confusion frequently results in unfavorable outcomes, such as stalled or delayed purchasing decisions, vendors driving customer purchase decisions or customers staying within their comfort zones. This can lead to stagnation within an organization when an IT department “decides not to decide” and stays with familiar storage array solutions that withhold the cost, performance and ease-of-use benefits new technologies provide.

Avoiding these problems begins with developing an intimate understanding of user and application requirements, and an adequate understanding of new storage technologies to develop confidence in the ability to negotiate needs with end users and knowledgeably discuss alternative solutions with vendors.

The ability to understand how storage resources are used and the ability to forecast future requirements are paramount to making intelligent purchasing decisions. Ideally, an organization should have storage capacity performance tools to validate any growth assumptions and storage resource management (SRM) tools to determine how storage is used by applications (see “Why, When and When Not to Purchase Storage Resource Management”). Some information may be determined from the storage array and some of the fully featured and broader storage array device management tools that have detailed performance and capacity planning features built into them. This information, together with an understanding of storage usage and access patterns, can be used to determine the most suitable storage array configuration to purchase.

Storage Usage and Access Patterns

Because of the different performance and cost characteristics of each disk drive format, it is important to understand the access profile of how the storage is used. The four high-level performance criteria that most storage departments are concerned with are:

- **Random access:** These applications randomly read and write data. Similar to accessing products in a refrigerator, some are used more than others, but access is random and depends on the user. The chances are that some areas are accessed more often than others, and this often depends on the time of day.
- **Sequential access:** These applications sequentially read and write data. This is similar to the way humans read a book sequentially, line by line, page by page, most of the time.
- **Latency:** This is defined as the delay in a system. From a storage-centric perspective, this usually refers to the time required to write or read a block of data, and is normally measured in milliseconds (ms) per storage request or input/output [I/O] operations per second (IOPS). Read or write and response time is determined by disk format, storage array controller efficiency and transport protocol (see Note 1).
- **Bandwidth:** The amount of data that can be transmitted in a fixed period of time. From a storage perspective, this is the ability to transfer large amounts of data, rather than small amounts fast, and is normally measured in megabytes per second (MB/sec) or gigabytes per second as GB/sec.

It is very important when purchasing, configuring, fine-tuning or solving storage problems to understand what type of I/O an application requires. For example, does the application require fast (low-latency) random I/Os that are predominantly reads, or large sequential writes, as used in backup systems? Without knowing this information, you cannot accurately decide what type and how much of each storage format you require (see “Application Requirements Must Drive Storage Purchasing Decisions”).

Recommended Storage Array Capacity and Performance Configurations

Gartner client inquiries show that the majority of storage array purchases or orders fall into three categories or configurations:

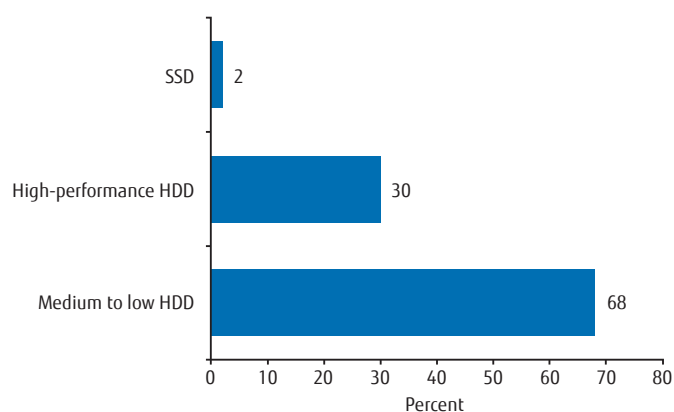
- Performance
- General-purpose
- Bulk or high-capacity storage array

An analysis of the type of storage purchased within these segments gives the ratios of disk formats by capacity as described below. The different disk formats or tiers are described in detail in Note 2. These ratios for a specific category remain the same for modular and monolithic storage arrays as the capacity of the system purchased increases or decreases. These capacity ratios vary for high-performance HDD tiers and medium/low HDD performance tiers by 5% to 10%, but the SSD values may only change by 1% to 2% and are reasonably static. In very large systems (500TB to 1PB and more), the proportion of SSD storage may reduce by 1% or 2%. For simplicity, the examples below describe a 100TB system. However, Gartner research has shown that the ratio between the tiers remains approximately the same in smaller and larger storage arrays. Thus, if you were planning to buy a 25TB general-purpose storage array, you could divide the ratios by a factor of four to determine what size each disk tier should be. In all these configurations, we assume the storage array will have and use an automated disk tiering feature that transparently and automatically moves data among the tiers. In some systems, this is achieved via caching software. In both of these situations, the final result is the same; data is moved to the appropriate tier, depending on its performance requirements.

General-Purpose or Most Common Storage Array Configurations

Most customers purchase storage arrays that consolidate and store data from many different servers and applications. These arrays need to provide varied storage performance and availability requirements. In this situation, customers make compromises to have a more balanced system that meets most of their requirements, but is not fine-tuned to a specific workload. The relative percentages represent how much capacity of each disk format is used in the type of configuration. For example, in a typical 100TB general-purpose array, this would equate to 2TB of SSD, 30TB of 15,000 rpm low-capacity HDD, and 68TB of 7,200 rpm high-capacity HDD (see Figure 1).

Figure 1. General-Purpose Storage Array Disk Proportions



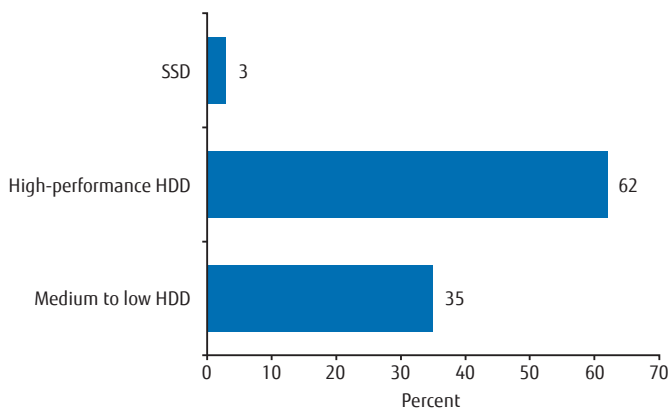
Source: Gartner (September 2011)

Caveats: See Note 2 on disk formats; vendors use different terms and HDDs for medium to low HDD.

Performance-Oriented Storage Array Configurations

Customers that require higher performance in terms of response time, IOPS or lower latency will use a far greater ratio of high-performance HDD than in general or capacity-based array configuration as described in this research. This is because the high-performance HDD costs one-tenth of what SSDs cost. Customers would prefer to use more SSDs, but even when the proportion of SSDs is 3% of total system capacity, they can frequently service 80% of total system IOPS, yet in many cases the costs are prohibitive. In the configuration in Figure 2, SSD costs can account for more than 20% of the total system hardware cost.

Figure 2. Performance-Oriented Storage Array Disk Proportions



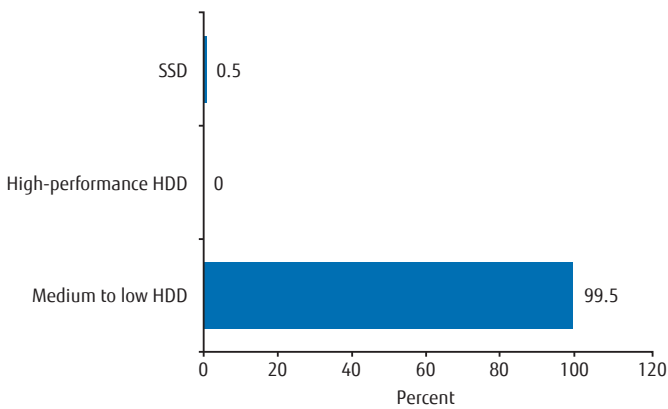
Source: Gartner (September 2011)

Caveats: In some cases, such as high-performance computing (HPC) storage for grids and low-latency trading systems, there may not be a medium to low HDD component for these specific niche applications. However, these pure SSD and high-performance systems are relatively niche in the market, as they are comparatively expensive to purchase. Even in these high-performance configurations, not all of the disks can be exploited due to controller performance limitations, and a high-speed interconnect such as InfiniBand or a proprietary software driver may be required to reduce latency so that high IOPS can be sustained. Some storage architectures such as Pillar Data Systems Axiom storage arrays can use general-purpose configurations and obtain higher IOPS than expected, because they place and group high-performance data on specific HDD cylinders and tracks. By doing such low-level block monitoring, more performance can be specifically fine-tuned for each application requirement.

Capacity-Based Storage Array Configurations

Many applications and data management products such as backup and archival systems require large amounts of low-cost storage, and IOPS performance is not critical as the highly active data is stored in small databases that can be cached and contain the highly accessed metadata. In these situations, customers often seek to purchase specific storage array configurations that are high-capacity and low-cost. However, as storage arrays scale, it is possible to use a pool or tier of HDDs in a general-purpose storage array to provide bulk storage, and separate array configurations for each application are not required. These configurations have no or a minimum amount of SSDs because some systems mandate SSD usage for caching, but the majority of the capacity is provided by the medium to low tier of HDDs (see Figure 3).

Figure 3. Capacity-Based Storage Array Disk Proportions



Source: Gartner (September 2011)

Caveats: There are some high-performance capacity-based systems that use new scale-out designs, such as the XIV, which have a large number of medium- to low-performance disks, but manage to obtain higher-performance numbers due to the scale-out distributed redundant array of independent disks (RAID) architecture. Similarly, the Oracle 7000 uses medium- to low-performance disks and no high-performance disks, but also uses slightly more SSDs than the capacity-based configuration to obtain higher performance than expected. Both of these systems break the accepted view due to their innovative RAID implementations. Nexsan SATABeast XI is another example of a bulk or capacity-oriented storage system that has a minimum number of SSDs.

What Should You Expect to Pay For?

We can compare the relative cost and performance of the different arrays if we normalize the values by taking the general-purpose storage array configuration and use it as a base value, e.g., one for cost, performance and number of disks. Comparing the configurations for the same capacity of storage gives us the following relative differences in cost, performance and number of disks (see Table 1).

Table 1. Ratios of Comparative Cost, Performance and Size

Item	General Storage Array	Performance-Oriented Storage Array	Bulk-Storage, High-Capacity Storage Array
Relative purchase price	1	1.5	0.4
Relative performance (IOPS)	1	1.5	0.3
Relative size based on number of physical disk units (HDD and SSD)	1	1.4	0.6

Source: Gartner (September 2011)

A performance-oriented system costs 50% more, can perform 50% more IOPS and physically contains 40% more HDDs than a general-purpose system. Conversely, a bulk storage system costs 60% less, can deliver 70% less IOPS and uses 40% fewer HDDs than a general-purpose storage array configuration. All configurations have the equivalent storage capacity, but different performance characteristics. For detailed pricing per GB, see "Modular Block-Access Disk Array Storage Price Forecast: 1H10 Through 1H11." The proportions of fast HDDs and low HDDs are transposed between general-purpose and high-performance storage arrays.

Caveats: Please note that SSDs have more efficient environmental characteristics than HDDs. The above ratios do not include the cost for the automated disk tiering software due to large variations among vendor storage array software licensing models. Many vendors no longer charge for this software in their low and modular segments, but this can be a significant cost when purchasing enterprise storage arrays. The relative physical size of the storage system is based on the number of physical disks required to configure each system; this directly influences environmental factors such as physical size, power and cooling requirements.

Problems to Avoid

Delaying Purchases

Clients that decide not to decide are actually making a conscious decision that can have financial, service and technological implications. Customers that stay with their old storage arrays longer than expected will find that this can reduce availability and lower staff productivity as the capacity under management increases, leading to more complex and time-consuming operational tasks. Expensive extensions to support and maintenance contracts are often required and power, cooling and floor space savings are not achieved, as older arrays often use more resources.

Upgrade Recommendations

We offer these recommendations:

- Start the vendor selection process early, because delays are not uncommon.
- Retire your old storage arrays on schedule to avoid expensive extensions to support contracts.
- Take the risk of making decisions with incomplete knowledge, because the consequences of delaying a project or losing budget are frequently worse than the consequences of a less than perfect acquisition.

Conservatism

When confronted by a new situation or complex choices or technologies, it is often a safe and sure bet to use what is known and understood, and to continue as before. Many customers, especially storage managers, are risk-averse, because once data is lost it may never be recovered. However, by not exploiting new storage technologies, organizations will not be able to cope with the growth of data and the cost of the storage that is required to store it. Costs will increase, and storage and data will become unmanageable. Staying where you are is not an option, especially when older products and storage media quickly become obsolete, and spares and support cannot be acquired.

End-User Recommendations

We offer these recommendations:

- Exploit new cost-saving technologies such as thin provisioning, automated tiering and SSD.
- Show technological leadership and the ability to exploit technology to reduce costs and improve organizational agility, rather than let technology exploit your organization.
- Embrace new storage technology as long as it has a quantifiable business or organizational benefit.
- Do not purchase older disk formats such as internal FC disks (see Note 3), as these will no longer be available in two to three years.

Vendors Deciding What Is Best for the Customer

Vendors unconstrained by their prospects will often bid high-cost solutions that exceed customer requirements or low-cost solutions that enable them to win against aggressive competitors, but lead to early and costly upgrades to correct performance or functional deficiencies. Acknowledging that many vendor sales teams will put their interests ahead of their customers' should not be a cause of anger or frustration, but a reminder to users that they must effectively manage acquisition cycles and their infrastructures.

Purchasing Recommendations

We offer these recommendations:

- Use, respect and exploit vendor advice, but take advice from at least three separate vendors.
- Vendor total cost of ownership (TCO) and ROI tools can be useful when model variables are well-understood, and costs characterize your costs and not industry "norms."
- Ask for references where you can talk to the reference without the vendor being present. Request open questions, such as, "How did the vendor support you when you had problems?" and "Which other storage vendors did you consider and determined your decision?"

Expectations Versus Reality

Database administrators (DBAs) and application programmers are always complaining about storage performance and storage departments. Conversely, storage managers are constantly explaining that business units can only pick two attributes from these three: price, performance or reliability. But they cannot have all three; one attribute must be sacrificed. Therefore, to avoid constant complaints, storage managers often purchase storage systems that are overspecified and faster than they need to be; everyone gets a sports car whether he or she needs it or not. However, this results in excessive expenditures and increased storage costs due to the organization paying too much for storage, as every application gets the most expensive disk format, whether it needs it or not. This is more of an indicator of the inability to document, measure and agree on service levels for each application and service than of any storage performance issues (see "Innovations in Storage Technologies Are Not Enough to Reduce Storage Costs").

Storage Management Recommendations

We offer these recommendations:

- Use the storage array monitoring tool provided with the storage array, and reconcile with the server or application monitoring tool to determine actual performance usage and purchasing requirements.
- Ideally, obtain an SRM solution that can combine and present this information in a diagrammatic or tabular format with the ability to extrapolate future requirements and growth patterns.
- Storage requirements cannot be viewed in isolation; application performance requirements and service levels need to be considered. A system view is required.
- Expected versus actual performance must be monitored or tracked via the storage array monitoring tool, or via an external performance management or SRM reporting product.

Summary

The key to determining what proportions of the various HDD formats you need to purchase is to understand the application service levels. Alternatively, if this has not been documented and will take too long to determine and performance is a moving target, then the purchase of a general-purpose storage array configuration will meet most requirements. A mixture of disk formats must be used in data centers, together with automated disk tiering or caching software to meet the wide variety of application and service performance requirements.

The proportion of SSDs used in storage arrays is rarely more than 2% to 3% of total capacity. However, they often account for the ability of an array to achieve a disproportionately high level of performance as measured in IOPS, and can account for up to 80% of an array's IOPS. It is also an accepted rule of thumb in performance management that only 5% of data in a data center is actively used at any point in time, and, therefore, the relatively low proportion of high-performance SSDs within an array, compared with HDDs, validates this assumption.

Recommended Reading

Some documents may not be available as part of your current Gartner subscription.

- ["Choosing Between Monolithic Versus Modular Storage: Robustness, Scalability and Price Are the Tiebreakers"](#)
- ["Why, When and When Not to Purchase Storage Resource Management"](#)
- ["Vertically Integrated Computing Systems Will Change Storage Purchasing Choices and Decisions"](#)
- ["Storage Infrastructure Considerations in a Virtual Server Environment"](#)
- ["Application Requirements Must Drive Storage Purchasing Decisions"](#)
- ["Why a Small Minority of Servers Increases Storage Costs"](#)
- ["Recommendations for SAN Fabric Dashboards"](#)
- ["Recommendations for a Storage Array Dashboard"](#)
- ["IT Market Clock for Storage, 2011"](#)
- ["Best Practices for Data Duplication on Primary Storage"](#)

Evidence

Gartner analysts take thousands of inquiries every year concerning storage sizing and relative performance and costs comparisons. These configurations plus market statistics are the basis for the data and conclusions in this research.

Automated disk storage tiering software, which transparently and automatically moves data among tiers, was a relatively immature and adolescent technology in 2009, but has matured and is available on most leading storage arrays in 2011.

Example applications: Online transaction processing (OLTP) is a random access, latency-critical application. Video streaming is a sequential and predominantly bandwidth-oriented workload. With all applications, latency is important, but each application and usage pattern has different tolerances; e.g., automated financial trading systems are very sensitive to changes in latency and do not require large amounts of bandwidth. Conversely, streaming systems are more bandwidth-oriented and less sensitive to latency, as they use bandwidth buffering techniques.

Note 1**FC as an Internal HDD Protocol Will Disappear, Not as an External SAN Protocol**

Over the next two to three years, HDD manufacturers will phase out the production of FC HDDs for use internally in storage arrays, and will replace them with serial-attached Small Computer System Interface (SCSI) internal HDDs. This transition will be transparent to customers as the hardware attributes of HDD are virtualized within storage arrays, and no reduction in performance or availability will occur. However, FC as an external storage protocol as used within storage array networks to connect servers, SAN switches and storage arrays will continue to develop, and will still be used for the next decade (see "IT Market Clock for Storage, 2011").

Note 2**Disk Format Characteristics**

The disk formats or tiers generally fall into the following categories:

- Tier 1 or Tier 0: SSDs that have capacities of approximately 100GB per disk
- Tier 1: 15,000 rpm 4GB/sec FC or 4GB/sec to 6GB/sec SAS 600GB to 800GB HDD
- Tier 2: 10,000 rpm 4GB/sec to 6GB/sec SAS 600TB to 1TB HDD
- Tier 3: 7,200 rpm SATA or SAS 1TB to 3TB HDD

SSD, in our diagrams, is classified as Tier 1 SSD, high-performance HDD is Tier 1 HDD and medium to low performance is Tier 2 or 3. There can be wide variations in this, as some vendors will have different definitions for Tier 2 or 3 because they may only sell one type of low-performance high-capacity disk, e.g., 10,000 or 72,000 rpm, but call either of them Tier 2 or 3 as required.

Note 3**Disk Performance Variability: All Reads and Writes Are Not the Same**

The IOPS of a mechanical HDD is determined by the rotational speed, measured in rpm and the time to move the read/write head/arm above the correct place (cylinder) on the HDD. These factors are called rotational delay and seek time. And the combination of these can vary the response time considerably, as it is determined by factors such as whether the head is already above the correct track, how far the disk needs to rotate before the required block passes under the read/write head. For example, performance is better if a head is already positioned above the correct cylinder, as no seek time is required. SSD performance also is not constant because read performance is approximately four times faster than write performance due to the requirement of NAND memory used within SSDs to erase a block of SSD flash before a write. All these factors create variability in performance, which storage arrays try to smooth out by using intelligent caching algorithms in the controller and the HDDs and SSDs themselves. There are many levels of caching in the I/O path from the server to the storage media, and this is what makes storage performance and reliability so complex, varied and relatively slow, compared with the CPU.



Proven Track Record of Performance, Reliability and Cost Reductions

Leveraging Automated Storage Tiering (AST) technology Fujitsu Storage ETERNUS offers customers a family of storage solutions that can flexibly adapt to support individual storage needs.

The efficient storage management software ETERNUS SF ensures that expensive SSD storage is only used for tasks where it is really required and that the greatest value is derived from the more economical HDD and tape storage.

Fujitsu has a wealth of global experience in the successful deployment of a wide range of storage solutions as indicated in the following case studies.

Case Study

TomTom Business Solutions securely navigates through rapid growth with ETERNUS DX

»During our extensive benchmark tests, we noticed vast differences in the levels of performance achieved with various vendors systems. Fujitsu delivers consistently impressive performance, and the best complete package with the ETERNUS DX8400.«

Michael Oehme, Director of IT, TomTom Business Solutions



The customer

TomTom Business Solutions is the division of TomTom NV dedicated to commercial vehicle fleets, founded in 2005 when we introduced an out-of-the-box fleet management solution. Today, we are one of the world leaders and recognized as Europe's fastest growing Telematics Service Provider. We serve more than 175,000* vehicles worldwide and have over 15,000 satisfied business clients. Website: : http://business.tomtom.com/en_gb/fleet-management/



The challenge

Cope with the growing flood of data from approximately 1.5 billion Incoming messages in real time, and more than 1 billion queries per month, through use of a storage system that is absolutely reliable, and offers a future-proof, scalable architecture.

The solution

The Implementation of the Fujitsu ETERNUS DX8400 storage system with a pure SSD configuration (Solid State Disk), which outperforms all competitor products in benchmark testing.

The Technology heart of TomTom beats strong in Leipzig

Why does the Dutch provider of navigation technology have two of its nearly 20 data centers in Leipzig? This is not the first time that Michael Oehme, Director of IT at TomTom Business Solutions is asked this question. The answer is simple: The roots of the fleet management solution from TomTom have their origin in the acquisition of the datafactory AG. Since being acquired by TomTom, the software development and system operations have been continually expanded. Thus the core technological competencies of TomTom fleet management have been settled in Leipzig.

More than 15,000 customers* rely on the fact that nothing is allowed to interfere with the around-the-clock, 365 days a year operation. A cornerstone of this trust since recently carries the name Fujitsu, since they delivered two ETERNUS DX8400 storage subsystems to TomTom business solutions. Two advantageous aspects of the storage subsystems were the continual top benchmark tests, and the expertise of the project implementation teams.

Mountains of data every minute from more than 175,000* »Connected Navigation Devices«

The volumes of data that TomTom Business Solutions processes on a daily basis is more than impressive, as more than 175,000* commercial vehicles transmit every minute, mountains of data from their »Connected Navigation Devices«. They transmit status information, position, data from digital tachographs, fuel consumption rates, order data and other information, while providing exact arrival schedules in real-time. More than 70 million messages every day are immediately processed in this manner, because customer dispatchers and fleet managers demand real-time information for managing their fleets.

Two data centers in Leipzig, which TomTom certifies as »World Class« in terms of performance, reliability and security, ensure these demands are met. A look behind the scenes of the server, storage and network infrastructure confirms this assessment, as both data centers meet the highest industry standards and work in an active-active operation, which is made possible by the networking of multiple redundant Gigabit connections.

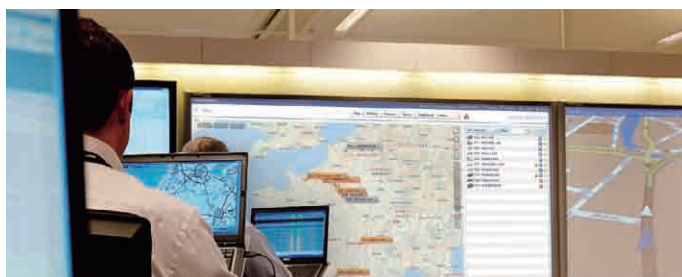
*) These and all other figures represent information available as of 12/2011.

Customer benefits

- Ensuring High availability for real-time processes
- Comprehensive data protection
- Robust and Reliable operations
- High reliability through redundancy and RAID protection
- Low power consumption and standardized storage management
- Flexible expansion options for increasing performance requirements

Products and services

- 2 x Fujitsu ETERNUS DX8400 each with 256 GB cache and 52 x 200 GB SSDs
- 4 x Cisco 9148 MDS switches
- 2 x AIS-Connect for remote maintenance
- Fujitsu ETERNUS SF Software for monitoring and management
- Utilization of Oracle with ASM in a Linux-based server farm



An intelligent Firewall architecture, with three Firewall layers from various providers, ensures optimal protection of customer data. Distributed monitoring continuously monitors approximately 5,000 different services, and creates transparency in order to discover potential problems as early as possible, and allow for immediate action.

Benchmarking the key player in the storage market

Where real-time business without interruptions is required, this is where storage systems gain their importance. In the summer of 2011, the time had come for improvements in this area to fulfill their continuous growth needs, therefore Michael Oehme and his team invited well known storage vendors to compete for the deal. Benchmarking under real conditions was demanded, and the key players on the market brought their storage strengths into position. They were additionally challenged as they had to overcome the task of handling up to 200,000 Input-output operations per second (IOPS) and response times of less than one millisecond. Two vendors were invited into the final round, to which there was one winner: Fujitsu with the ETERNUS DX8400.

Convincing results and competencies

»Absolutely convincing«, said Michael Oehme to the results delivered by Fujitsu. »The redundant design of all system components, as well as the four storage processors, will further minimize the already low risk of failure or downtime«, explained Michael Oehme.

What particularly stood out above the exceptional measurements, were the competence and commitment of the project team from Fujitsu. Whether at the benchmark location at Paderborn or at the ETERNUS development in Japan: »The Project implementation was extremely professional and exceeded my expectations. It was a very positive experience to work with partners who proved their expertise in terms of configuration insights, optimal tuning and technical consulting, and who were also good listeners who were not only interested in making a sell.« summarized the TomTom management in Leipzig that they were really impressed.

With their focus on the demanding real-time business of fleet management, TomTom feels on the safe side with the ETERNUS DX8400: »The systems fully satisfy our requirements«, said Michael Oehme as he looked back on six months of smooth and trouble-free operations.

»Fujitsu impressed us not only with high levels of technical expertise, but also with the ability to listen carefully, and the quick implementation of our requested changes.«

Michael Oehme, Director of IT, TomTom Business Solutions

Case Study

Z.I.E.L. GmbH

»Thanks to the highly-efficient architecture of the ETERNUS DX storage system, we improved performance by a factor of five and can flexibly fulfill customer requirements.«

Thomas Scherer, manager of the Z.I.E.L. GmbH data center



The customer

Since 1984 Z.I.E.L. GmbH has been developing software products which are specifically tailored to meet the needs of travel agencies. The company's motto is "Specialization without Compromises."
www.ziel.de



The challenge

Upgrading its data center to implement a high-performance environment with maximum flexibility to offer hosting for travel agencies.

The solution

Creating a dynamic IT infrastructure to further accelerate business development. The driving force is a PRIMERGY BX900 S2 blade server, which offers high power density in a very compact format and is equipped for this application with six PRIMERGY BX924 S3 server blades. The backbone of the new SAN in the high-performance data center is ETERNUS DX90 S2, the flexible data safe.

The trend is Web-based travel agency management

Z.I.E.L. products are known for their user-friendliness. With years of experience, the company's specialists are very familiar with the requirements of travel agencies and specific conditions in the travel industry. Z.I.E.L. has used its practical knowledge since 1984 to develop software products and services for travel agencies according to its motto "Specialization without Compromises." Its Web-based SYNCESS® travel agency software is increasingly popular. Some 800 travel agencies currently profit from hosting of their back office administrative systems by the Z.I.E.L. data center.

Data center to drive business development

More requirements must be fulfilled by the data center as Z.I.E.L. hosting services for travel agencies become a success story. However, this had become much more difficult with an ageing server and storage infrastructure. Z.I.E.L. has used virtualization for a long time, but the heterogeneous environment made administration cumbersome. At the same time, data growth and the increasing number of virtual servers slowed the storage system, increasing customer complaints about performance. That led to Z.I.E.L.'s decision to upgrade its data center infrastructure. Thomas Scherer, manager of the data center, describes the company's estimations for the new complete solution: "We wanted a homogeneous infrastructure with a lot of power that would also be energy efficient, compact, and easily expandable."

Z.I.E.L. starts with a dynamic IT infrastructure from Fujitsu

Following an analysis of the current server/SAN developments, Z.I.E.L. chose the PRIMERGY BX blade server and the ETERNUS DX online storage system. Fujitsu and Bytec proved their point by running a test with an ETERNUS DX. Major improvements in performance values utterly convinced Z.I.E.L. The proven data center components support hosting for a constantly growing number of customers, offering maximum power and superior scalability. They also work perfectly together, can be flexibly configured, and are extremely energy efficient. As a result top performance capability and economic efficiency go hand in hand. Z.I.E.L. reckons that performance has been improved by a factor of five and that energy savings total 60 percent.

Customer benefits

- Higher guaranteed service levels for travel agencies
- Enhanced customer-friendliness
- Sufficient power reserves for further growth of the customer base
- Energy consumption by the server and storage environment down by 60 percent
- Major decreases in running costs
- Comprehensive protection of investments thanks to simple, cost-effective scalability of the infrastructure

PRIMERGY BX blade server simplifies virtualization

Hosting by the SYNCCESS® back office system is increasingly popular with travel agencies and is of strategic importance for Z.I.E.L. It soon became clear that the system would be based on the PRIMERGY BX blade server, since the entire dynamic server infrastructure in a box with ten height units is extremely compact and offers top power density with up to 18 server blades in one chassis. This considerably reduces the complexity of the Z.I.E.L. data center while leaving plenty of room to expand the hosting business. Administration is now much simpler, too, thanks to I/O virtualization and simple management of the physical and virtual environment.

ETERNUS DX maximizes flexibility and data security

"When choosing the storage system, we were initially unsure which one was right," reveals Thomas Scherer, raising a problem that faces many IT decision-makers these days. Storage systems in modern data centers must fulfill many requirements, which can also change quickly. That makes planning far more difficult. For example, in addition to predicting data growth, Z.I.E.L. also had to include a sufficient power buffer for server virtualization in its calculation and find a solution that would allow it to fulfill different customer requests economically. But Z.I.E.L. was confident that its chosen solution was also the best, because "we knew that Fujitsu offers the most comprehensive portfolio on the market with SAN, NAS, and unified storage systems," says Scherer. After initially being tempted by another maker's system, Z.I.E.L. ultimately decided on an ETERNUS DX. "The final tipping point was a test run; the performance values of the ETERNUS DX convinced us," explains Scherer.

An ETERNUS DX90 S2 is the backbone of the new SAN in Z.I.E.L.'s high-power data center. The flexible data safe for dynamic infrastructures has an architecture with a large cache, a slim

Products and services

- PRIMERGY BX900 S2 with six PRIMERGY BX924 S3 server blades
- ETERNUS DX90 S2 with storage capacity scalable to 360 TB
- Operating system: Microsoft® Windows® 2008 R2 server
- Application: SYNCCESS® back office system for travel agencies

operating system, and optimized algorithms, guaranteeing brief response times even under full load "We can realistically say that we expect that performance to be improved by a factor of five," reports Scherer. Hard disk types such as SAS, Nearline SAS, and SSD can be used at the same time in one system, so Z.I.E.L. can now offer optimum performance for every customer requirement with no difficulty in reconciling power, capacity, and costs. For example, Z.I.E.L. plans to deploy extremely fast SSDs for certain customer groups and implement a RAID array of SSDs during a later expansion phase. Z.I.E.L. is now very flexible in the area of data growth as well: The storage capacity of the ETERNUS DX90 S2 can be scaled up to 360 TB, and thanks to the uniform design of the entire ETERNUS DX product family Z.I.E.L. can grow simply from one model to the next. Another important aspect is that thin provisioning keeps the initial investment to a minimum.

Substantial improvements in economic efficiency

Higher-quality service for travel agencies and increased flexibility are two main advantages of the new data center environment. A third is that running costs are much lower. One reason for this is integrated server and storage management along with functions such as automatic tiering. Another important factor is the energy efficiency of PRIMERGY and ETERNUS DX: "We are achieving energy savings of 60 percent," reports Scherer. The new equipment also gives off much less heat, so he is convinced that Z.I.E.L. will be able to install smaller, more energy-efficient air conditioners the next time they have to be replaced.

"Close cooperation with our partners Bytec and Fujitsu made it much simpler to plan the new data center environment."

Thomas Scherer, manager of the Z.I.E.L. GmbH data center

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