



Hitachi TagmaStore USP Report Card And Updated TCO Analysis

Executive Summary

Hitachi's TagmaStore USP is very different in concept and implementation than other storage products. By separating the storage controller from disk arrays, allowing the attachment of competitive storage and virtualizing attached storage, Hitachi has delivered unique value to the marketplace. Hitachi's novel approach enables efficient storage management and the use of common software for all attached capacity. For example, application data on an EMC box can be remotely or locally replicated to low-cost SATA storage.

After eighteen months in the marketplace, Hitachi has shipped over 3,000 USP controllers and currently holds about 40% of the high-end market. ITCentrix recently surveyed customers to determine if Hitachi has delivered on its original promises. On balance, we found Hitachi has scored well. Notably, Hitachi's virtualization, performance, openness and architectural vision have solidified the company's leadership position.

While credible, we found Hitachi has room for improvement in the areas of business continuance delivery and overall market presence. The only two disappointments we found are: 1) slower adoption of partitioning, a feature ITCentrix feels has more potential and 2) service breadth, which we believe has significant upside. Hitachi is focused on improving the market acceptance of its unique logical partitioning technology and is expanding its service consultants.

The latest announcements from Hitachi demonstrate consistent follow through with a significant increase in USP performance that will benefit heavy enterprise application users and improve the performance of virtualized tiered storage environments.

As part of this effort, ITCentrix performed a case study analyzing the total cost of 1,000 Terabytes of storage comparing Hitachi's approach with best of breed competition. We found Hitachi continues to dominate in tiered environments where low cost attached storage and a unified software management approach yield a 50% cost advantage over a three-year period.

ITCentrix believes the TagmaStore USP has the best combination of architecture, performance, and functionality in the marketplace. IT executives who want to further leverage installed assets and improve efficiency through a common storage management approach should evaluate Hitachi TagmaStore USP virtual storage controller

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Delivery of Function & Performance on TagmaStore

Initial Announcement

When Hitachi announced the functionality of the TagmaStore Universal Storage Platform (USP) in September 2004, it was different from any other offering from storage vendors. It was a more powerful controller than had been built before, touted a completely different architecture, and was feature-rich

Eighteen months later, Hitachi has introduced additional power and functionality into its USP Platform. It is time to take stock of Hitachi's Storage strategy. This research report looks at the promises that were made, how users evaluate delivery against promises, and how it compares with other approaches in the marketplace.

Hitachi originally promised its Customers:

- Large Scale Virtualization of up to 32 Petabytes of Storage utilizing both internal and external resources
- Logical Partitioning of Disk, Cache, & Ports for the creation of Private Virtual Storage Machines (LPARS) in both internal and externally attached storage
- Over 30,000 Virtual Ports
- Support for Hitachi and competitive storage attached to the USP, including SATA drives
- Common Replication and Storage Management tools for all storage
- Advanced Asynchronous and Synchronous Remote Replication Capabilities
- Very high Performance of up to 2.0 (now 2.5) million IOPS

Customer Evaluation of Hitachi's Original Promises:

- Customers found USP Virtualization works, and exceeds expectations by significantly reducing the complexity of storage management, saving headcount and increasing flexibility
- Partitioning, while very useful in some niche situations, is not universally applicable
- Virtual Ports allow very large numbers of small servers and other devices to be attached at significantly reduced cost
- Hitachi has systematically introduced USP support for a large number of Hitachi and competitive devices from IBM, HP, EMC, and Sun. Customers have found that these devices work well attached to the USP to provide a Tiered Storage approach
- Customers have found the promises of virtualization and a common software stack for all storage attached to the USP have been kept, and exceed expectations.
- The Hitachi Universal Replication software (HUR) was late to market. However, the "pull" architecture of Asynchronous HUR is advanced, and has shown significant reduction in line costs.
- Customers universally position the USP as the most powerful Storage Controller available

Initially, the acceptance of the USP was slow, as customers evaluated the functionality, and kicked the tires before putting the USP controllers into production. Since then Hitachi's growth in the high-end has been very strong with quarterly growth rates approaching 35%, and nearly 50% of the installations currently licensing the Universal Virtualization Manager software. Tiered storage is being used by the majority of USP customers. Business Continuance is being

Customers found USP

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slowly brought to market, and initial installations have been successful. Hitachi's three data center approach is innovative, and is significantly enhanced by this announcement. However, it needs close evaluation over time.

In 2005, Hitachi introduced the NSC 55 mid-range version of the USP controller... The NSC was an immediate commercial success, allowing a much wider portion of the market to be reached by Hitachi, but maintaining a common set of storage management solutions.

NSC 55 Mid-range Version

In 2005, Hitachi introduced the NSC 55 mid-range version of the USP controller, which allowed Hitachi to offer the same capabilities in smaller configurations, but using the same microcode and software. In addition Hitachi announced a controller only version of the NSC55, mainly designed to free customers from buying unneeded disk capacity and enabling them to maximize existing storage assets, while obtaining the latest enterprise functionality. It is also designed for third parties to construct storage solutions to support specific environments.

The NSC was an immediate commercial success, allowing a much wider portion of the market to be reached by Hitachi, but maintaining a common set of storage management solutions.

May 2006 announcement

In this announcement, Hitachi improved the performance of the TagmaStore USP for both new and existing USP installations. The following points are noteworthy:

- The introduction of New 4Gb/s Fibre Channel Blades
- Overall 25% Performance Improvement to a maximum of 2.5 Million IOPS. This is up to 2 or 3 times greater than competitive offerings in most environments.
- Shadow Image internal replication increase of up to 1.0 Gigabyte/sec by increasing the number of concurrent operations (threads) from 32 to 128, a 300% increase
- The USP's ability to consolidate very large numbers of multi-protocol devices with Virtual Ports is expanded with a new embedded iSCSI Blade
- An increase in the number of Logical Devices (LDEVs) in a USP from 16K to 64K. This helps very large mainframe customer configurations who may be constrained by the previous 16k limit.
- New Security enhancements include detailed and consolidated multi-system audit log facility. This allows all user access and operations made to the storage configuration (e.g., LUNs deleted) to be recorded.
- 3 Data Center replication configurations have synchronous replication between the production site and the local standby site, and asynchronous replication between the production site and a remote recovery site. In the event of a disaster at the production site, a new Delta resynchronization function within HUR allows just the changes between the local standby site and the remote recovery site to be transferred. This speeds recovery, and increases the probability of zero data loss as a result of the disaster.

In summary, this announcement increases the overall performance of the USP significantly, and greatly improves the performance of virtualized tiered storage environments.

The advantage was achieved primarily by improved microcode, and allowing better scheduling of tasks across all available processors in the storage controller in combination with the new 4 Gb/s FC Blades that balance controller power and bandwidth.

Overall, the TagmaStore USP has been improved significantly over the life of the product. The massively parallel crossbar switch architecture in the control unit has made it easy to add additional functionality, and to provide that function across all internal and external storage resources. This approach completely separates the storage controller from the storage, and allows the two to be upgraded and changed independent of each other.

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This is very different than monolithic architectures, which encapsulate all the drives together with the controller. This requires additional storage to be purchased when controllers need to be upgraded to the latest functionality. The flexibility of being able to buy the right storage when required is a major contributor to reducing the cost of storage in the Case study below.

Case Study

Case Study - Manufacturing Organization

A large manufacturing organization has \$2 billion in revenues. It has 10,000 staff, with an average salary of \$45,000. The main applications running in the primary data center vary, with SAP being the ERP system.

The current Data Center environment includes a large number of UNIX and Windows servers used for a range of applications, including SAP, Distribution, Data Warehouses and Data Marts, and other manufacturing support systems. The center supports 5,000 internal users, who are using the systems for about 30% of the time.

There are 200 Terabytes of Operational Tier 1 & 2 Usable storage, and 800 Terabytes of additional usable installed data center storage (external storage) with minimal controller function and little storage management software.

There is a business requirement to replicate 7% of core systems (68 terabytes) at a remote site.

Case Study – Assumptions:

- Compare the Hitachi solution against best of breed competitive solutions
- Assume that the disk storage under the controller is priced the same for both Hitachi and Competitive solutions, and storage management software is priced the same
- Use of 400 Terabytes of SATA drives for tiered storage where appropriate
- Hitachi Storage Software is as follows:
 - HUR is used (11% of storage)
 - Volume Migrator (100%)
 - Shadow Image (~13%)
 - No Partitioning

Case Study – TCO Comparison:

Figure 1 below shows the TCO comparison between a Hitachi USP Configuration and a competitive best of breed solution. The main savings come from:

- Reduced storage cost - More effective utilization of storage because of virtualization, and effective use of SATA storage where suitable
- Reduced cost of storage administration – Virtualization and common storage management give significant efficiency benefits
- Reduced cost of storage operation – because there are a large number of servers and other devices, Hitachi's Virtual Ports significantly reduce the loss of connection to the storage network.

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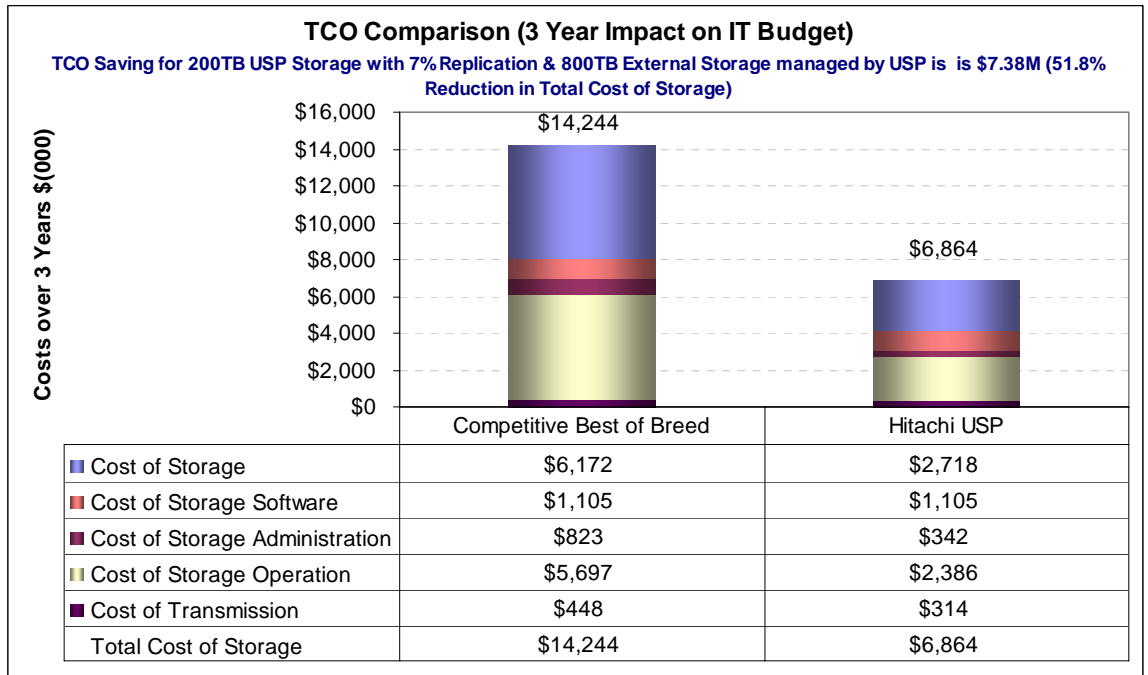


Figure 1 - TCO Comparison between Hitachi USP Configuration and Competitive Best of Breed solution

Case Study – Total Business Impact:

Figure 2 shows total business benefit of the Hitachi USP, which includes the Total cost of storage savings, as well as the business benefits from better service delivered to the end users. The major business savings come from improved flexibility. This means new applications and upgrades to existing applications are implemented faster in the data center. The primary driver for this is an improved management environment derived from the virtualized environment.

The Total Business Benefit is \$12.9M over 3 years,

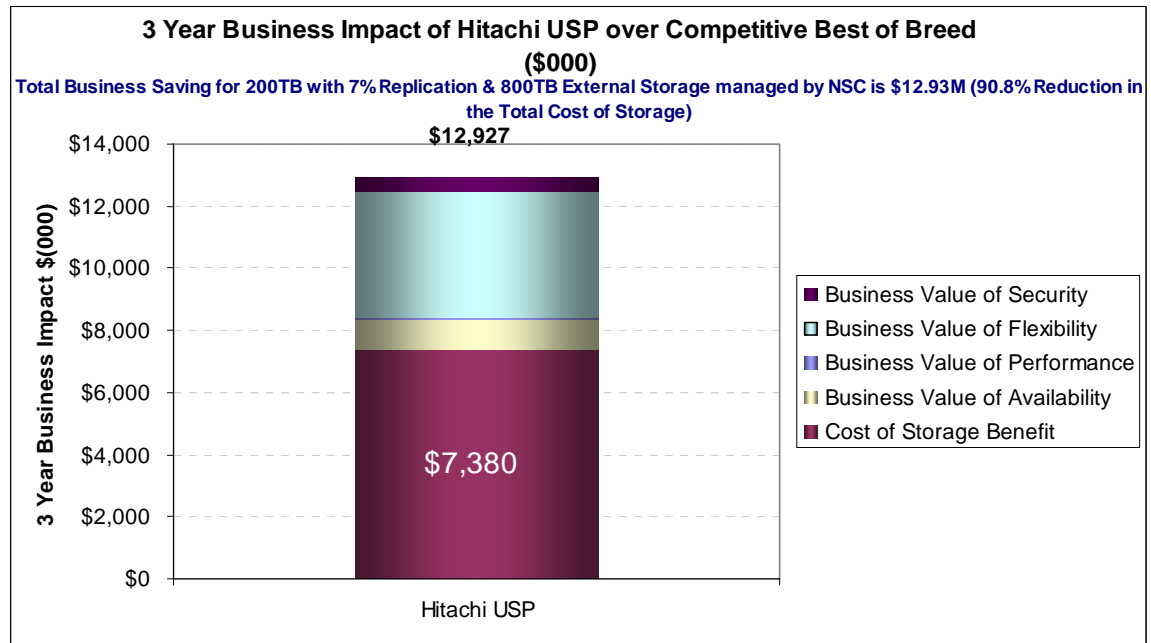


Figure 2 - Total Business Impact of Hitachi USP over Competitive Best of Breed

Competitive Positioning

The TagmaStore USP virtualization architecture is significantly more scalable and flexible than competitive virtualization offerings.

The TagmaStore USP virtualization architecture is significantly more scalable and flexible than competitive virtualization offerings. This advantage comes from the fact that other storage vendors are offering virtualization of just their own storage, or a PC or switch-based virtualization appliance that is separate from the storage controller.

Hitachi's virtualization solution is unique in that it works very well, and provides support for heterogeneous tiered storage from multiple vendors. This allows all storage to be managed from one integrated console. One set of common storage tools (e.g., snapshots, replication, etc) can be applied to all the storage. This reduces the cost of software and training, and improves the quality of storage processes and procedures.

The architecture allows the purchase of storage to be independent of the storage controller. This allows the right type of storage to be bought when required, reducing the cost of storage significantly. This is as close to avoiding storage lock-in as you can get.

Hitachi's remote replication products are now proven, and are very competitive against other vendors. The NSC 55 provides a low-cost entry into remote replication. Hitachi's asynchronous Universal Replication software provides a best of breed technology for long distance replication, and significantly reduces the cost of telecommunication links required because it can buffer data during peaks which reduces the need to over-configure to accommodate peak workloads.

Hitachi will need to improve its NAS offerings, particularly in the CIFS area, if it is going to attract significant NAS business onto the USP. Hitachi will need to improve the reach and range of its service offerings to become a trusted advisor for storage matters. Hitachi has significant plans in place to achieve these goals, and will need to execute them aggressively.

Conclusions and Recommendations

Hitachi is executing on a Storage Vision that can be summarized as follows:

- **The storage controller is a single point of control, which simplifies storage management & reduces costs**
- **Hitachi's approach reduces costs for five main areas:**
 - Virtualization
 - Data Management Software
 - Error Recovery
 - Business Continuity
 - Additional Future Function
- **Hitachi's open tiered storage approach:**
 - Eliminates Storage "Lock-in" at the array level
 - Significantly Lowers Costs of Storage
 - Makes SATA available for Mainframes
- **Hitachi's business continuity offers:**
 - A full range of solutions for large & small data centers
 - Near zero data loss with 3 data center solutions
 - An improved architecture that significantly reduces telecommunications costs

Hitachi's vision is based on a profoundly different architecture than its major competitors. ITCentrix believes Hitachi's architectural vision has a significant lead in the market.

Hitachi has a clear vision to add value at the storage subsystem level, and provide functionality that can be easily incorporated into applications. It has aggressive plans to provide that base functionality, and to be a good partner to any software in the stacks above.

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Hitachi has been quiet, too quiet, on the marketing front. Hitachi's services also need upgrading to enable it to compete in some enterprise spaces.

The most significant constraint for Hitachi to winning additional market share is the large installed base of competitive storage boxes. Reliable and entrenched storage processes and procedures have been developed for these assets. However, ITCentrix expects Hitachi will continue to win an increasing percentage of business, where there is a possibility to introduce new systems, and when new applications or installations are being acquired. The fact that Hitachi has separated the USP controllers from the back-end arrays enables a non-disruptive entry point into established environments. This avoids a "rip and replace" approach, but instead provides the ability to install a USP controller to manage existing legacy storage assets.

The overall scorecard for the TagmaStore USP is as follows:

- **Virtualization** **A**
Heterogeneous Virtualization that works very well
- **Adoption of Partitioning** **C**
Slow adoption of an interesting feature
- **Performance** **A**
The latest improvements in microcode optimization bring this up

- **Follow through** **A-**
Good enhancements of the platform
- **BC Delivery** **B-**
Delivery of HUR delayed
- **Service reach & range** **C+**
Needs to improve from “what do you want” to “we recommend”
- **Market presence** **B-**
More noise required
- **Openness** **A-**
No lock-in of array storage
- **Architectural Vision** **A+**
Unmatched

Overall an excellent report card.

The Hitachi TagmaStore USP has matured significantly over the past 18 months into the platform of choice for most data centers. ITCentrix recommends IT executives who want to further leverage installed assets and improve efficiency through a common storage management approach evaluate TagmaStore USP storage controllers.

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ITCentrix uses a two dimensional methodology to assess the impact of different storage management strategies on organizations.

Methodology Used to Analyze Case Studies

ITCentrix uses a two dimensional methodology to assess the impact of different storage management strategies on organizations. The method includes a total cost of ownership (TCO) approach that captures a customer's current equipment, software, and staffing costs and projects potential change based on complexity of environment, staff skills, and technology deployed.

To evaluate availability and flexibility benefits (so-called "intangibles"), ITCentrix uses a Value Flow methodology that establishes the value of service levels and flexibility to the organization today, and projects potential improvement based on a consolidated infrastructure.

ITCentrix evaluates a business case by taking as a starting point the existing storage management environment and assessing its current costs and business value; and then projecting the case for using the new Hitachi Data Systems approach by forecasting the potential for benefit and the cost of achieving that benefit over a planning horizon (three years for this study). See Appendix A for a list of variables used as input for this analysis.

The process is automated by using a proprietary and patent-pending ITCentrix Storage Model independently developed by ITCentrix. Use of the model also ensures that inputs are used to create results in a consistent, objective, and repeatable manner. As a sanity check, ITCentrix uses its ValueBase industry database of cost and value metrics to compare results against industry averages. More information on the methodology can be obtained from the ITCentrix website (www.itcentrix.com).

The final step of the process was to validate the conclusions by interviewing the storage management professionals in three medium sized storage operations.

The quantifiable benefits from storage enhancement fall into three main categories:

- **Operational Costs Benefits** – Savings from factors such as increased staff efficiencies, as well as lower acquisition, maintenance, software, and space/power/cooling costs.
- **Service Level Improvements** – Additional user productivity from higher application availability and costs associated with planned and unplanned downtime and security enhancements.
- **Flexibility Enhancements** – Additional benefit from speeding the time to develop and introduce new applications or application function that customers, employees, and constituents can exploit.

About ITCentrix

ITCentrix, which serves the needs of IT audiences, is a division of Barometrix Software Corporation. Barometrix is a privately held software company founded in 1999 by leading business and technology professionals. The company develops enterprise decision management and collaboration software designed to increase company performance through improved resource allocation and management.

The company's software products are used at several hundred organizations in North America, Europe, the Asia/Pacific region and other emerging countries to focus investments on returning optimal business value.

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