Hitachi Enterprise Storage for Radical Improvements in Storage Efficiency

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OVERVIEW: Hitachi enterprise storage features the Universal Volume Manager function that can apply virtualization techniques to actual disk arrays, the world's first. With this function, Hitachi enterprise storage can consolidate multiple storage resources under uniform management while maintaining high levels of performance and reliability resulting in radical jumps in storage management and operation efficiency. The Universal Volume Manager can arrange data optimally on external storage devices that differ in scale and performance to enable cost-effective use of existing assets, and it can provide a platform for DLCM (data life cycle management) to raise the usage efficiency of all storage. It enables safe and easy migration between storage systems including those of other manufacturers, and can perform migrations during system operation without the need of intermediate servers. Hitachi enterprise storage supports Virtual Partition Manager function that provides dedicated storage areas for each server and the Universal Replicator function that provides enhanced replication power for disaster recovery.

INTRODUCTION

GIVEN a data life cycle that extends from creation to usage and storage and eventually disposal, Hitachi proposes "DLCM (data life cycle management) solution" as a means of achieving efficient management and usage of data whose value changes over time. To provide a platform for DLCM solution, Hitachi has provided a variety of disk arrays as multi-tiered storage, and in September 2004, it expanded this lineup with the introduction of enterprise storage products that can provide core storage for a DLCM solution platform (see Fig. 1).

This article reports on Hitachi enterprise storage.

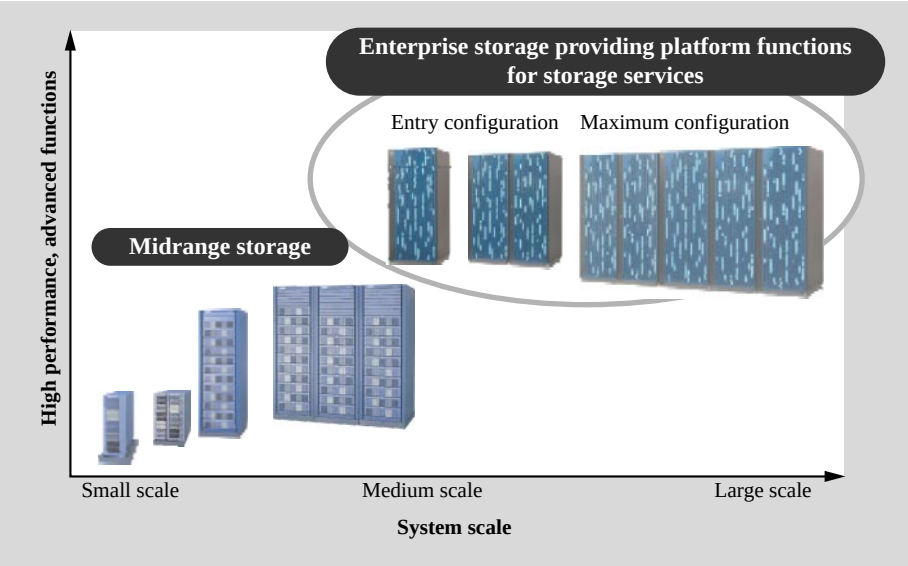


Fig. 1—Hitachi's Storage Lineup. Hitachi's storage lineup includes enterprise storage that provides platform functions for storage services and midrange storage that can be used as nearline storage.

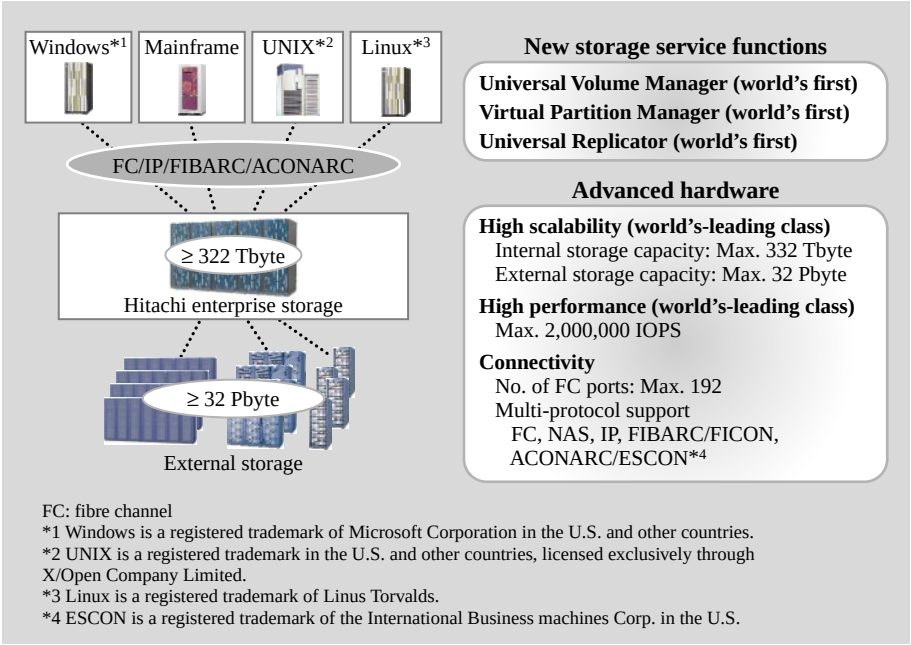


Fig. 2—Hitachi Enterprise Storage. Hitachi enterprise storage represents the world's first application of virtualization techniques to disk-array equipment.

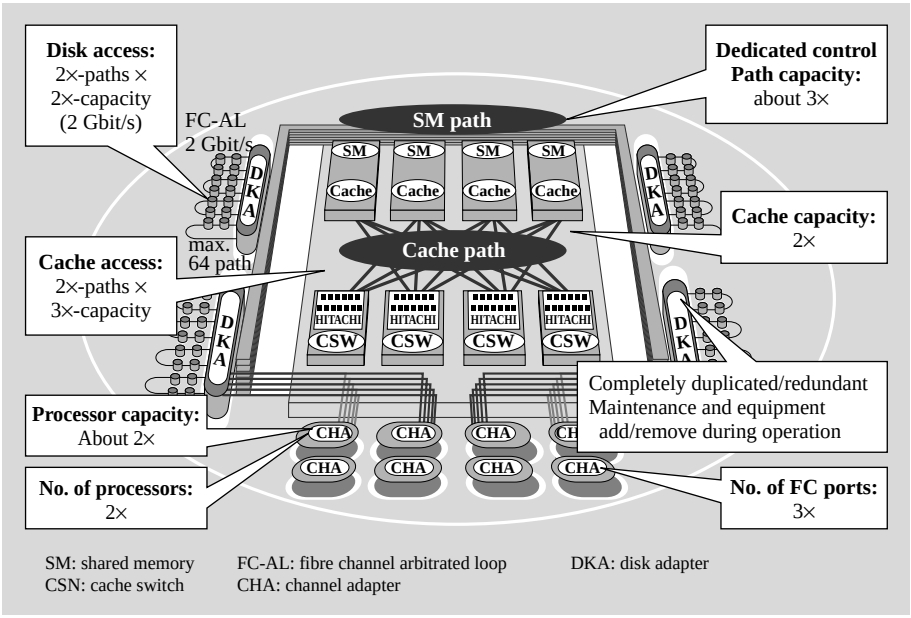


Fig. 3—Universal Star Network Architecture. As the next step in the evolution of proven Hitachi architecture, Universal Star Network architecture enables a significant increase in internal data-transfer capacity.

OVERVIEW OF HITACHI ENTERPRISE STORAGE

New Advanced Functions

Hitachi enterprise storage provides new functions above and beyond those provided by past enterprise storage products. These are Universal Volume Manager function that applies virtualization technology to disk arrays themselves, the world's first; Virtual Partition Manager function that provides dedicated storage areas for each application; and Universal Replicator function that provides enhanced replication power in the event of a disaster (see Fig. 2).

Advanced Hardware for Storage-integration Support

Even on its own, Hitachi enterprise storage achieves capacity extendibility and processing performance of an industry-leading class. For Hitachi enterprise storage in its maximum configuration, internal storage capacity can be extended up to 332 Tbyte (when mounting 300-Gbyte disk drives). Hitachi enterprise storage now employs the 3rd-generation of Hitachi's Universal Star Network architecture that significantly raises internal data-transfer capacity (see Fig. 3). Transaction-processing power has been increased to a

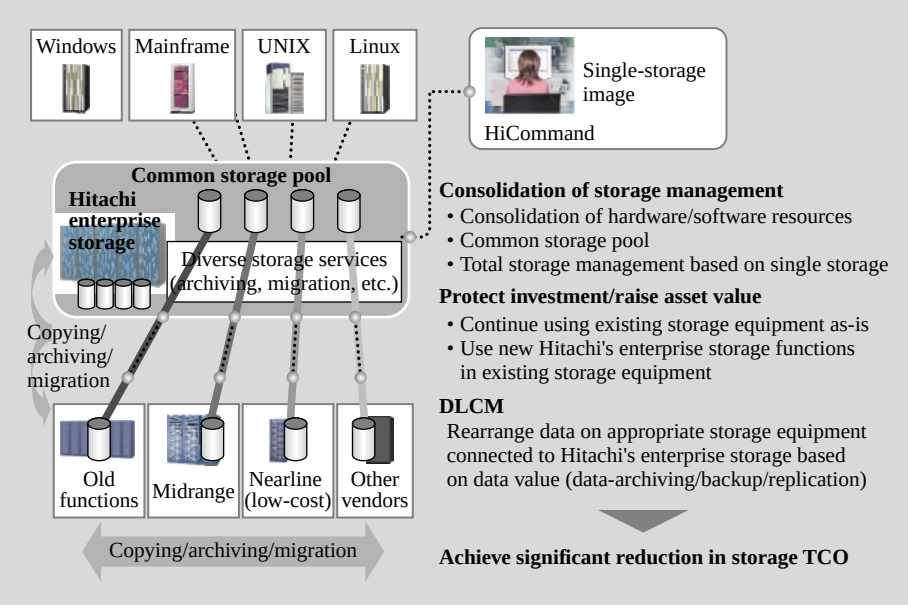


Fig. 4—Universal Volume Manager. The Universal Volume Manager enables uniform management of multiple storage groups resulting in a radical jump in storage management and operation efficiency.

maximum of 2-million IOPS (input/output operations per second), which is 3.5 times the database transaction performance of past systems.

NEW ADVANCED FUNCTIONS PROVIDED BY HITACHI ENTERPRISE STORAGE

Universal Volume Manager

The Universal Volume Manager function enables other storage resources (external storage) to be managed and used as if they were part of Hitachi enterprise storage (see Fig. 4). With this virtualization technique, Hitachi enterprise storage can provide uniform management of up to 32 Pbyte of storage including built-in storage resources.

Universal Volume Manager makes use of an FC interface between Hitachi enterprise storage and external storage to provide multiple connection paths, which can be used to raise processing efficiency by load balancing and to perform path-fail-over processing.

This function can be provided in conjunction with other functions provided by Hitachi enterprise storage, and new functions provided by Hitachi enterprise storage can be applied to existing storage devices. In addition, data migration from storage devices of other manufacturers that is normally accompanied by complicated processing can be executed during system operation.

Virtual Partition Manager

The Virtual Partition Manager function performs virtual allocation of Hitachi enterprise storage resources (disk drives, cache memory, host connection ports) for each application and work project. This prevents load concentrations caused by certain work from affecting storage resources allocated to other work, and enables work to continue under usual performance levels (see Fig. 5).

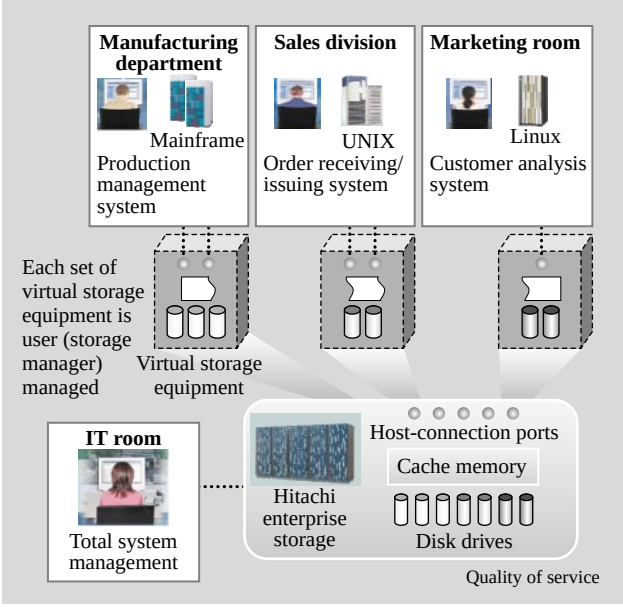


Fig. 5—Virtual Partition Manager. The Virtual Partition Manager function defines virtual storage equipment having dedicated disk drives, cache memory, and host-connection ports for each application and function.

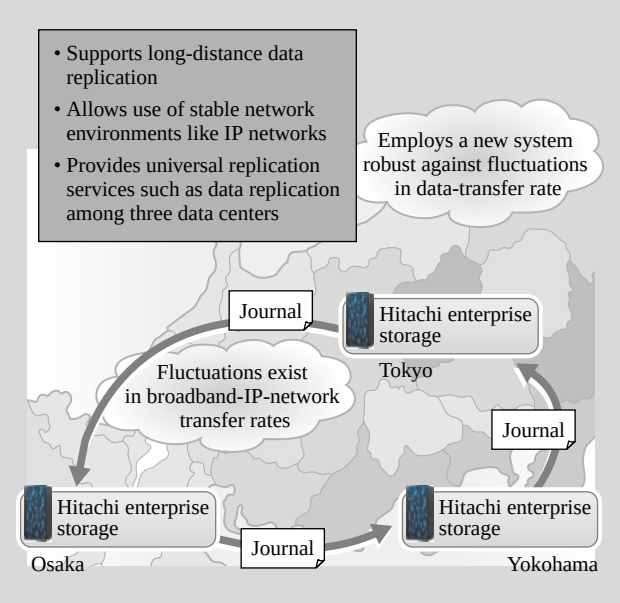


Fig. 6—Universal Replicator.
The Universal Replicator function enables stable remote copying even during sudden jumps in input/output load at servers and fluctuations in network bandwidth.

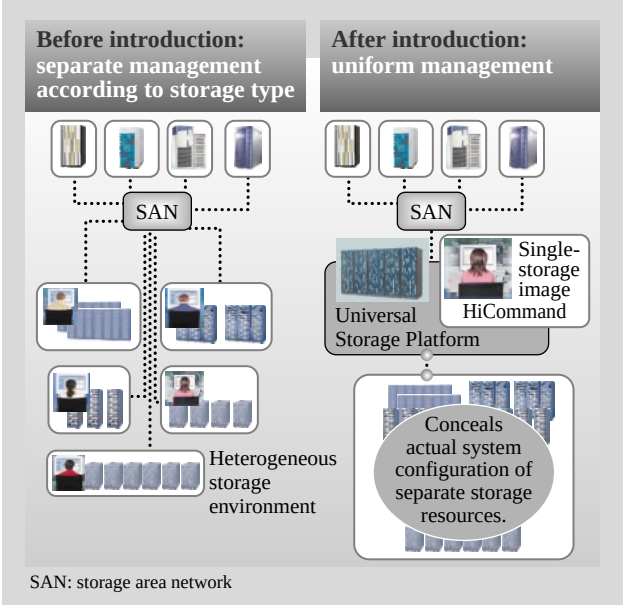


Fig.7—Example of System Construction Using Hitachi Enterprise Storage.
Hitachi enterprise storage enables the uniform management of multiple storage resources.

Universal Replicator

Universal Replicator is an asynchronous remote copy function featuring a new system based on Hitachi's proven replication technology.

By storing updated data as journal data on disk drives, this function can secure an updated-data storage area much larger than usual. It can perform stable and uninterrupted remote copying even during unexpected jumps in load and fluctuating bandwidth in the lines connecting storage enclosures. Although bandwidth is not as stable as that provided by dedicated lines, the Universal Replicator function can use the IP (Internet Protocol) network—which is cheaper than dedicated lines—as communication lines between storage enclosures.

Universal Replicator can also be combined with existing replication technology to enable long-distance, loss-free data copying among three data centers and facilitate the construction of disaster recovery systems to meet the growing need for anti-disaster and fail-safe measures (see Fig. 6).

SYSTEM CONSTRUCTION USING HITACHI ENTERPRISE STORAGE

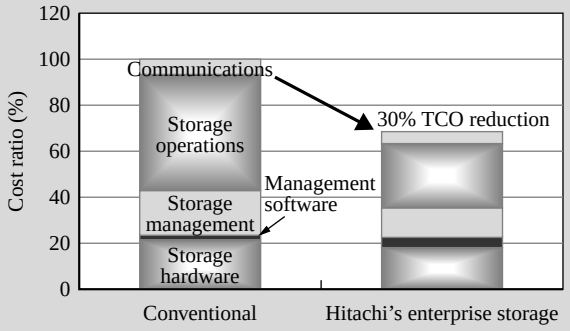
The following describes the results of introducing Hitachi enterprise storage using an example of system construction.

Example of System Construction

A system consisting of different storage equipment with different performance and capacity levels for each work project and/or department will require that each group of storage be managed accordingly. This may involve backup processing, capacity planning, fault monitoring, and performance tuning. In addition, future capacity increases and system extensions that result in additional storage may further complicate storage management.

Improvements in the above situation can be expected by introducing Hitachi enterprise storage. Even without external storage, storage capacity can be scaled up as far as 332 TB, which is sufficient enough for migrating data in multiple storage resources to Hitachi enterprise storage for consolidation purposes. And as described above, the Universal Volume Manager function can be used to consolidate and uniformly use and manage internal and external storage (see Fig. 7).

The following three benefits are also provided by Universal Volume Manager. First, by managing storage used by each work project or department as part of the resources of Hitachi enterprise storage, some of the data held in heavily accessed storage can be moved to lightly accessed storage. This operation for balancing the load among various storage resources can be



Enterprise storage: 100 Tbyte of newly purchased storage (conventional equipment or Hitachi enterprise storage with 50% used as a replication area)
Midrange storage: continuous use of 400 Tbyte of existing equipment (for Hitachi enterprise storage, connection and management of external storage)
Management software: Hitachi enterprise storage and all other necessary storage-management software (Volume Migration, ShadowImage, Virtual Partition Manager, Universal Replicator, etc.)
Storage operation and management: operation and management cost of all storage (500 Tbyte)

Fig. 8—Effect of Hitachi Enterprise Storage.
The uniform management of multiple storage resources has a beneficial effect.

performed during system operation without disturbing work flow. Second, new functions provided by Hitachi enterprise storage can be applied to existing storage assets thereby raising the value and extending the lifecycle of those assets. And third, in the event that storage needs to be replaced due to capacity increases or system extensions, data migration can be performed simultaneously with normal work processes.

In the above way, the introduction of Hitachi enterprise storage enables the multi-tiered storage needed for DLCM to be managed in a uniform manner and facilitates the construction of systems that can respond flexibly to storage replacement due to capacity increases and system extensions.

Effect of Introduction

An evaluation performed by ITCentrix, a U.S. firm providing cost-benefit analysis of IT investments, revealed that the introduction of Hitachi enterprise storage for a 500-Tbyte storage configuration* can reduce storage-related TCO (total cost of ownership) by about 30% (see Fig. 8).

* TCO reduction rate when using 100 Tbyte of Hitachi enterprise storage and 400 Tbyte of external storage for a 3-year period.

CONCLUSIONS

This article described the features and functions of Hitachi enterprise storage, a collection of core products for Hitachi storage solutions, and the effect of introducing it in a storage system.

Hitachi plans to improve storage hardware on an ongoing basis and to enhance functions for simplifying the operation and management of storage. It will propose "best solutions" that combine both hardware and software improvements to reduce the load on user systems as much as possible, and enable users to concentrate on their core businesses.

REFERENCES

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(2) Product introduction site: http://www.hitachi.co.jp/Prod/comp/storage/diskarray/index.html (in Japanese).

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