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Buyer's Guide to Storage Virtualization

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1. **Where does the virtualization functionality reside?**

   Solutions from Hitachi Data Systems offer virtualization from the storage controller. These extend the mature controller-based storage services Hitachi developed to support both internal and external heterogeneous storage. Noted by industry analysts as one of the simplest yet most robust ways to implement virtualization, the Hitachi approach still has no direct competition since its introduction in 2004. Identifying it as the 1st example of a new evolution in storage architectures, IDC coined the term "network storage controller" to describe the Hitachi approach.

   Technical IT staffers and systems architects should explore whether the vendor's virtualization functionality resides on the host, on the switch or appliance, or in a storage controller, and consider the pros and cons.

2. **Can you logically partition storage capacity, cache and ports?**

   Hitachi virtualization technology provides the most extensive logical partitioning functionality on the market today. This includes the ability to partition storage resources into multiple resource groups, each with its own dedicated internal and external capacity, cache and ports. This functionality allows IT organizations to apply storage policies to specific applications, thereby matching business requirements for performance, capacity and availability to designated storage resources. Because each partition has its own serial number, IT teams can associate specific business applications with selected departments and business units, then charge back accordingly. These unique capabilities allow organizations to create a utility model to deliver "metered" storage resources to select business entities. Subsequent management of partitions can be addressed centrally or by local administrators. In this way, organizations can make sure that service level agreements successfully align the performance needs of an application with the commensurate cost required to achieve that quality of service.

   Some analysts maintain that logical partitioning is a critical component of a successful tiered storage architecture. This functionality allows other storage resources to be virtualized and reprovisioned as well, including capacity, cache and ports; therefore, specific applications have the guaranteed processing resources they need to maintain steady service levels and be able to charge back using a "utility" model to internal customers.

3. **How well does the solution support use of external, low-cost disk systems from other vendors?**

   Hitachi Data Systems has mastered the ability to integrate lower cost heterogeneous disk systems into existing enterprise storage infrastructures. In fact we support more than 100 models from other manufacturers in addition to our own storage systems. Hitachi Data Systems also offers the only virtualized solution to support use of low-cost storage for mainframe environments, via more economical FICON or ESCON connections.

4. **How do you ensure extra virtualization elements won't decrease system reliability or availability?**

Reliability and availability levels for Hitachi Virtual Storage Platform do not rely on clustering technology. Instead, these are based on the already mature and proven reliability of the underlying Hitachi storage controller, which has already been field proven for reliability in large enterprise storage environments. In fact, Hitachi Data Systems offers a 100% data availability warranty.

The physical separation of tiers also allows any rebuild efforts ultimately required on high-capacity disks to be more easily isolated, with no impact on the performance and availability of any surrounding application data. Since Hitachi virtualization technology allows data to be seamlessly migrated in the background during such rebuilds, access to the impacted tier's data is also assured even during this type of maintenance activity.

Some network-based solutions may require additional clustered servers or appliances to support their availability goals. While offering limited availability, performance of these virtualization solutions can still be dramatically reduced by as much as 50% in the event that half of the cluster goes down.

5. **How easy is it to migrate or replicate data between systems or back out once you begin the migration process?**

Any-to-any replication, seamless data migration and centralized data management are part of Hitachi virtualization functionality. Hitachi controller-based virtualization (in Hitachi Virtual Storage Platform) has been carefully integrated with Hitachi Universal Volume Manager and other Hitachi software. This results in a single set of management tools for performing snapshot, migration, archiving, backup and replication of data across heterogeneous storage systems, even from mainframe systems to lower cost open systems.

Virtualization technology in Virtual Storage Platform can be turned on or off, and rolled out in either big implementations or small pilot projects. Organizations also have the option to choose whether to use the system as just another storage system or fully activate its existing virtualization functionality. The system can also be deployed as just another storage system and then used to easily "discover" any externally attached heterogeneous storage volumes, which can be assigned as virtual volumes.

When evaluating storage virtualization, learn how much support virtualization solutions offer for data migration or replication across heterogeneous systems and different price and performance storage tiers. Watch for:

- Any added storage capacity required to "stage" interim volumes during migration to the virtual layer.
- Potential vendor lock-in after data is migrated into the virtual layer
- How easy it is for data to return to the native storage mode of the underlying physical controller
- Maturity of replication and data migration functions
- Virtualization solutions that place virtualization functionality farther away from the data and therefore have to redevelop and re-architect the use of common storage services like replication and data migration

6. **How much extra latency will the solution add to performance (such as ongoing disk read and write operations)?**

Hitachi Virtual Storage Platform systems do not introduce significant latency. Shortly after the release of the groundbreaking Hitachi Virtual Storage Platform, analyst firms like IDC acknowledged the enterprise levels of performance the solution provided. Since then, Hitachi enterprise storage solutions have continued to increase in performance and reliability.

Other virtualization solutions can introduce added I/O latency due to:

- Opening Fibre Channel packets so I/O must then be redirected with other systems
- Maintaining, updating and referencing a separate mapping table with the use of extents or added LUNs that maintain the ongoing relationship between the underlying physical and logical volumes
- Additional control path processing that may be required for servers or appliances to communicate with an intelligent switch
- The added impact of virtualized replication, migration or mirroring services on core directors or switches.