ENSAextended and Storage Virtualization

A White Paper Prepared by
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IT 2003 and Beyond

IT managers have greeted 2003 with alarm. As the complexities of their environments have grown, so has the need to provide higher levels of service to their internal and external customers. Nowhere is this of greater concern than with storage.

The storage issues confronting managers of medium-sized and larger sites today—all well known, most well documented—include responsibilities for managing heterogeneous storage assets that support multiple operating systems and are often dispersed geographically over a wide area. All of this is taking place amid a revolution in corporate expectations: increasingly, IT operations are expected to contribute to corporate profitability rather than just being a cost center, and accountabilities are formally measured by service level agreements (SLAs) to assure compliance with specified levels of availability and performance. In many cases, strict penalties are assessed for non-compliance.

A further concern is that IT finds itself in a constant state of flux due to the need to support shifting business requirements. A consequence of the new business orientation is that IT must adapt to change quickly and economically in order to provide a competitive edge to the business it supports.

Many vendors offer products to address these problems. In some cases, their solutions address individual problems within the overall storage environment, while others take a system-wide approach. This white paper examines the strategic direction HP has taken.

Adaptive Infrastructure

HP terms its strategy for providing automated, intelligent management tools and hardware "adaptive infrastructure," to indicate that the new managed infrastructure is capable of adapting to whatever changes shifting demands require. The strategic goal is to provide non-disruptive maintenance that ensures that the infrastructure has become adaptable at every level; that is, it is able to accommodate sudden shifts in both business needs and in unexpected events that affect system performance. The intent of this is that IT senior managers should expect to see a growing set of tools and hardware that enables them to maximize the efficiencies in hardware, software, and support staff.

HP's approach is based on the idea that storage's role (and the role of IT in general) is to support corporate business processes, and that when a company's business demands change, so will the requirements and expectations for IT. In a business environment where demands are in a constant state of flux, this calls for management capability that can adjust to continuously changing conditions. Furthermore, because of the opportunity to gain competitive advantage by adjusting rapidly to such shifts, an IT operation must continuously tune any adjustments it makes in order to maintain an optimized operating environment.

This continuous optimization to accommodate business processes means that management tools and intelligent hardware must find a way to allocate and control storage resources in a way that is secure, resilient when it comes to both planned change and unforeseen events, and extensible so that resources can be brought on- and off-line without disruption to business processes. This requires constant monitoring of resources, analysis of those resources' operations, and pervasive management, all done on-the-fly and completed within specified maintenance windows.

The only efficient way to do this, in terms of both response time and personnel drain, is to automate the process to the degree that existing technology permits. The only efficient route to such automation *while at the same time protecting an IT shop's investment in its existing assets* is to ensure interoperability through strict adherence to industry standards.

The Storage Utility Model

With storage these efficiencies are created through use of a "storage utility" model, which seeks to make storage into a utility in much the same way as electrical power or water are utilities – they can be accessed with no thought on the part of the user, and the user is "assessed" only for the storage that is used. Because of their performance and scalability characteristics, SANs are a particularly practical way of implementing this.

This model does not view disk and tape devices as a series of discrete and relatively independent entities. Rather, the model asserts that storage is an aggregate of all its parts, requires centralized management, and supports all provisioning, availability, performance and other management issues in a way that is both non-intrusive and completely transparent to the user. This means that both fundamental data management services (devices being brought on- and off-line, hotspot management, backups and recoveries, array reconfiguration, etc.) and advanced capabilities (system failover, snapshoting and data replication, for example) take place without impacting running processes or end users and, ideally, place only minimal demands on the IT staff itself.

A consequence of this is that any process addressing stored data has no need to know about traditional data paths and the like. The software that manages the utility handles this, along with all other management issues. A series of policy-based tools provides this management capability. These policies can address all the concerns of a shop's SLAs, managing provisioning, throughput, etc., to ensure compliance.

The purpose of the storage utility model is to make the use and management of storage assets efficient by every definition appropriate to the business. Therefore, the model is ideally suited to exploit the diversity of storage assets connected to a SAN. It allows IT management to assign data to physical devices based on their importance to the business as defined by storage policies: mission-critical data is assigned to high availability, high performance devices and receives an appropriate level of backup and recovery services, while data of lesser significance is deployed to cheaper devices.

HP implements the utility model with consistent tools such as HP OpenView Storage Area Manager (HP SAM) for managing an enterprise's data services, with its networked storage, and with the virtualized storage that is spread across the SAN.

This virtualized storage provides many of the advanced capabilities of the storage utility model.

Storage Virtualization

Virtualized storage places a level of abstraction between the user and the physical storage device. The various storage devices are still in use, but are pooled together into a single, virtual "disk" according to predetermined policies that optimize utilization of the storage pool. The storage user only sees this single virtual device, with access to the SAN's pooled resources managed by policies (see Figure 1).

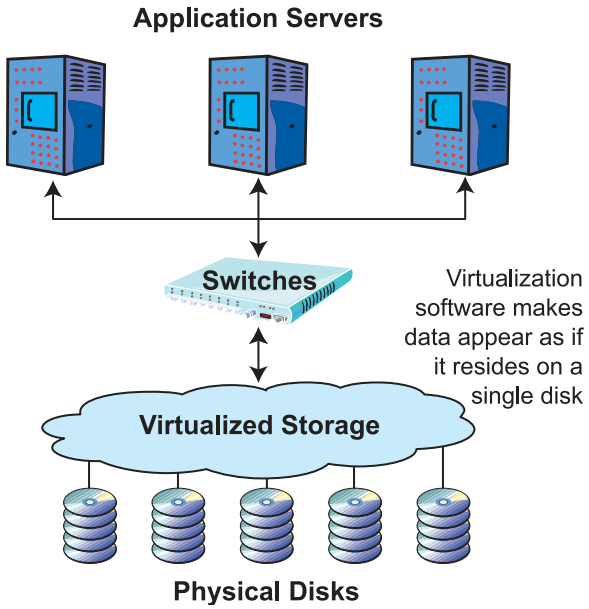

Figure 1. Pooled Storage Environment

Vendors typically implement storage virtualization in one of three ways. **Array-based** virtualization is located on a RAID controller, creating a single pool of storage across all disks within the array and making optimal use of all the device's capacity for all applications that see the array. **Host-based** virtualization occurs within individual host devices, supplying pooled storage to applications residing on each host (but not to applications running on other hosts) and offering best value when a single host uses data on a number of storage devices. **Network-based** virtualization resides on the SAN, allows pooling of all assets on the SAN, and provides access to the pooled environment for any process with rights to access the SAN.

HP offers all three approaches to virtualization, each appropriate to a specific set of user requirements. Array-based virtualization maximizes resource utilization any time multiple hosts access a single storage array. Host-based virtualization is useful when a single host accesses storage on multiple storage devices and can benefit from pooling those devices. Networked-based virtualization is recommended for larger environments where many hosts interoperate with many arrays and where IT managers have determined that their site's needs are best served by SANs.

Managers of enterprise IT shops, and particularly those that are already finding value in the any-to-any connectivity inherent in a storage area network, are likely to find that virtualizing the storage on their SANs (the networked approach) provides the greatest benefits in terms of efficient, flexible, readily-manageable and adaptable storage and storage services.

While IT managers can expect their storage will become easier and more efficient to manage—clearly of value to IT—much greater value will come from the benefits that pooling SAN storage will mean to their corporate stakeholders. Both assets within the virtual storage pool and services to users will be allocated according to policy-based priorities. Because of this, high value processes can be assigned to high performance assets and services, just-in-time provisioning is both practical and easy, quota allocation will be limited only by the size of the total storage pool (and irrespective of device or partition boundaries), data replication can be non-intrusive, and so forth.

Because of this, the virtualized storage environment provides optimal performance and asset utilization to whatever business process relies upon it. Data for revenue-producing systems will be more reliably available (consider the potential value to a business if its money-making systems can take advantage of a throughput enhancement of 10%, of 20%, and so forth), and asset utilization will be managed by policy and not by assigning whatever resource was available at the time it was requested.

ENSAextended and the Role of Virtualization

Virtualization is an enabling technology at HP, which implements it in a number of ways. Within the company's product portfolio are array-based solutions (the HP StorageWorks Enterprise Virtual Array, for example), host-based products (such as the HP OpenView Storage Virtual Replicator), and network-based virtualization through the HP OpenView Continuous Access Storage Appliance (CASA) and VersaStor technology.

Network-based virtualization lies at the heart of the storage utility. It is network-based storage virtualization, along with networked storage, data services and an increasingly automated set of management tools, that forms the foundation of HP's ENSAextended strategy.

Networked Virtualization – What is being delivered today

In its present state, HP's network-based virtualization solution delivers several key benefits to users. For example, on SANs, which are typically installed because of their performance, extensibility, and manageability characteristics, HP uses virtualization as an enabling technology to provide data replication (mirrored locally, remotely or both, depending on local requirements) to ensure high data availability. Its automated approach

makes on-the-fly adjustments that compensate for changing provisioning, quota and throughput demands, so that operator-induced errors are all but eliminated no matter how fast the response to changing conditions must be. The snapshoting capability cuts down on data traffic and media usage, and may make it possible for managers to implement both low-impact data protection (the snapshots) and timely restores while—perhaps for the first time—operating strictly within their service windows.

Today, HP delivers this capability through CASA. CASA sits on the SAN and uses network-based virtualization technology to provide LUN security, synchronous (or asynchronous) mirroring, snapshoting, replication and data migration services in a non-disruptive fashion. It provides such services to a heterogeneous mix of operating systems and high-end, mid-range, low-end and even legacy devices.

By way of example, one site needed to migrate a large amount of data off legacy storage to high–performance devices with significantly increased capacity. While other vendors offered to sell them iron, HP used CASA to migrate the 3 TB of data on the legacy systems to a new set of high performance SAN devices. Furthermore, *CASA's ability to support older devices on the SAN maintained the value of the existing IT investment.* The legacy machines are now used for snapshots, data base copies and other applications where performance is less of an issue than cost containment.

Next Steps in the ENSAextended Strategy

The HP virtualization roadmap is based to a large degree on how SANs are evolving. While it is clear that several technology trends are occurring simultaneously on the SAN, it is also clear that it is the new generation of intelligent SAN switches—which bring new capabilities, increased performance, and scalability benefits—that will have the greatest significance for the way SANs are managed.

Intelligent SAN switches are key to the next stage in the development of storage virtualization. Storage management applications and VersaStor communication protocols will be deployed into these devices, which will look across the entire virtualized storage environment and deploy storage capacity according to policies that maximize the effectiveness of IT resources to meet the demands of the business environment. The use of VersaStor in CASA and intelligent switches creates a distributed processing model to add enterprise-wide scalability to HP's extensive network-based virtualization capabilities (see Figure 2).

Fortunately, intelligent switches can be installed on existing SAN infrastructure. Today's CASA users will find the value of their present investment enhanced as CASA's capabilities extend over larger, higher-throughput SANs. In fact, because HP's approach to networked virtualization is standards-based, and because the company emphasizes a broad base of technology alliances with other vendors, any SAN site can take advantage of the scale and performance improvements offered by this combination of CASA, VersaStor, and intelligent switch technologies.

Conclusion

Maturing virtualization technology creates an optimized storage environment, enabling IT organizations to provide more and better services in an efficient manner. Users have the flexibility to acquire storage assets on an as-needed basis. Automated backups, replication and other such services offer the opportunity to remove most instances of human intervention in what traditionally have been expensive and labor-intensive tasks. The increased system up time (and consequent increased revenue flow) that results from this, plus the freeing up of IT workers to address other tasks, will often provide a quantifiable return on this technology investment that leads to very rapid payback.

Will it be useful for your site? If your current environment contains a mix of heterogeneous assets, and if managing those assets has become more and more challenging due to increased demands for flexibility and efficiency, storage virtualization is likely to be an extremely practical enabling technology. Vendor selection will of course be the key.

Smaller vendors provide one form or another of storage virtualization as independent point solutions. Some larger companies still speak of it only as a partially defined future offering. HP's approach differs: with HP, we see storage virtualization as a key part of the strategic direction of a major technology leader. Importantly, clients can implement this technology today.

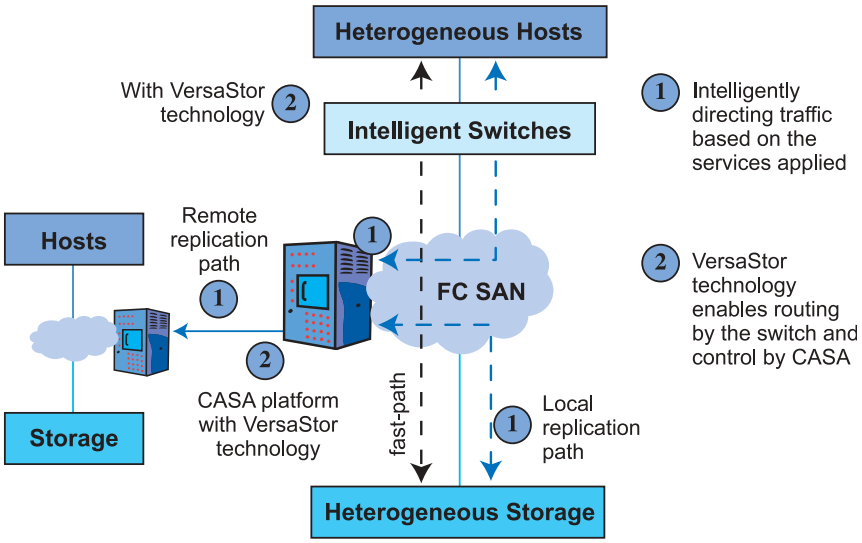

Figure 2. CASA and Switches with VersaStor Technology

HP's network-based implementation is standards-compliant, works with existing array-based and host-based virtualization, and has a clear, published growth path. HP SAM sites can manage CASA today through their current management console and, as additional VersaStor-enabled solutions become available in the future, will manage those as well. Designed-in interoperability means that shops not currently using HP SAM or HP storage products have the same opportunity to centrally manage their mixed environments no matter who their vendors may be.

Storage virtualization will be the enabling technology platform for efficient future asset management. Some of the benefits it will provide for your business are available today, others are in the pipeline, and still others—as yet un-thought of—will come online in the future. Whatever lines of business you support, storage virtualization is likely to be the underlying technology that makes it possible for you to address most of your company's data demands.

About Enterprise Management Associates, Inc.

Enterprise Management Associates, Inc. is the fastest growing analyst firm focused on the management software and services market. EMA brings strategic insights to both vendors and IT professionals seeking to leverage areas of growth across e-business, network, systems and application management. Enterprise Management's vision and insights draw from its ongoing research and the perspectives of an experienced team with diverse, real-world backgrounds in the IT, service provider, ISV and publishing communities.

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