WHITE PAPER

Virtualized Storage from HP

Focus on HP StorageWorks EVA4400

By Mark Bowker and Mark Peters

February, 2008

Table of Contents

Introduction

This paper is designed to help users who would like to understand virtualization better in order to evaluate the operational benefits it could provide. While the term 'virtualization' is far from new, it can mean different things to different people—and indeed often goes undefined. This paper, while focused on the HP StorageWorks EVA4400 as an example, aims to lay out the basics in a straightforward and not overly-technical manner. It will concentrate more on the value virtualization brings to data centers and businesses than on the intricacies of how it is achieved. To do this, it will introduce virtualization generically, and then examine its implementation and value at both the server and storage levels (also covering how those are linked). Of course, the paper will specifically examine where, how and for whom the EVA4400 from HP can best fit.

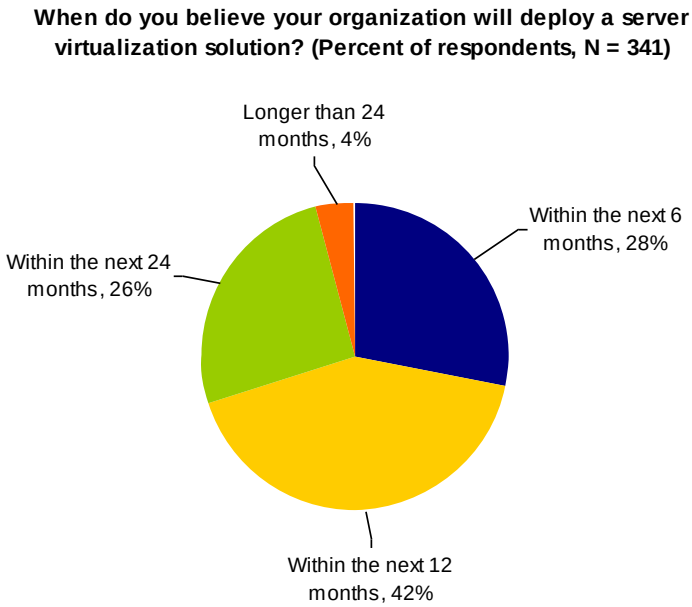
One of the key motivations behind the extended use of virtualization within many areas of IT is simply that IT is lately as much focused on *efficiency* as effectiveness; doing more with less is no longer just a mantra, but an absolute necessity driven by massive and continuing growth, by having relatively fewer skilled IT people to manage the growing complexity and by widespread 'green' concerns.

Let's start by clearly defining the meaning of virtualization to avoid any further confusion. Virtualization provides a *logical view into, and control of, physical infrastructure* in order to provide greater optimization, better utilization and simplified management of those physical assets. That's it. It can be applied to many aspects within a data center.

The State of Virtualization

ESG believes that server virtualization is acting as a catalyst for virtualization at all layers within the data center. In speaking with end-users, ESG has witnessed the pervasive nature of server virtualization and the vast adoption that is occurring across all industries—and the rate of implementation is showing no signs of slowing. In a recent ESG survey of current and planned virtualization users, 28% of companies that are planning to implement server virtualization plan to do so in the next six months and 42 % plan to deploy within the next year (see Figure 1).[1] Server virtualization is not simply the latest IT trend; it is becoming a foundational technology.

FIGURE 1. SERVER VIRTUALIZATION FUTURE ADOPTERS' DEPLOYMENT TIMELINES



Source: Enterprise Strategy Group,, 2007

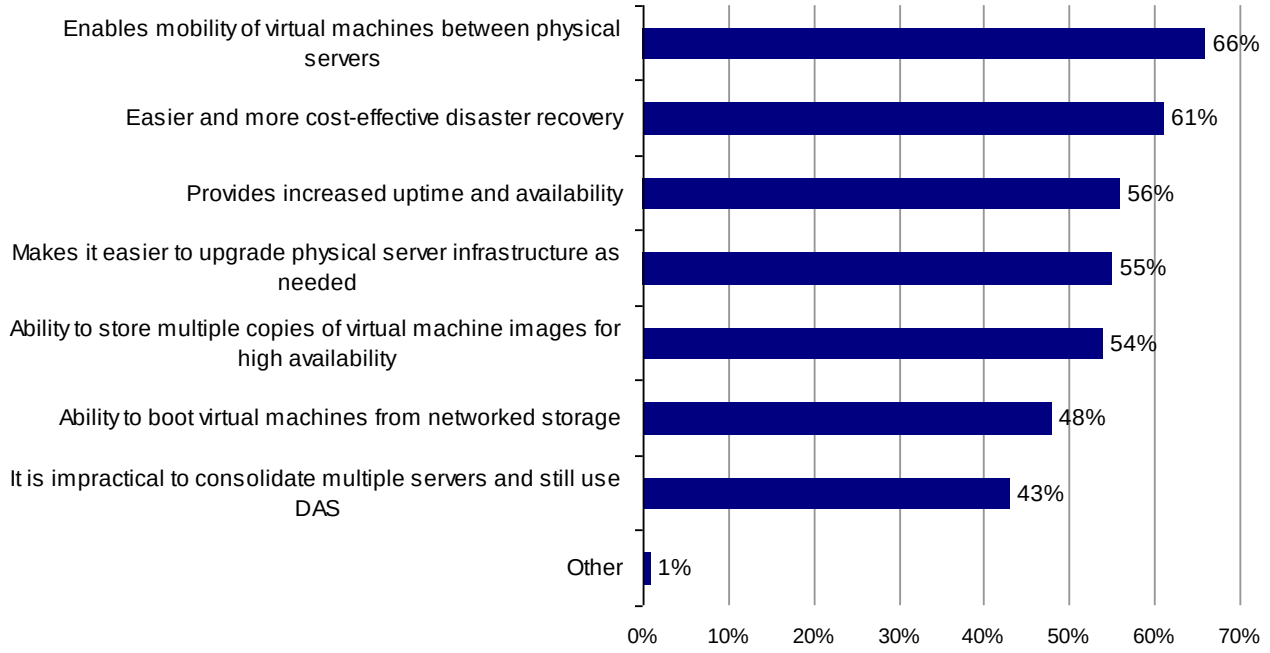
[1] ESG Research, *The Impact of Server Virtualization on Storage,* December 2007

Today, IT organizations are making major infrastructure changes in an effort to refresh their data centers. These organizations are using server virtualization as the primary catalyst to create the "always-on data center." This is a data center that self heals, dynamically scales in real time and is based on commodity components—while remaining easy to manage and maintain. This new development is turning historical server operating economics upside down.

Server virtualization is having a significant impact on the storage infrastructure as IT organizations look for ways to leverage investments for both physical servers and virtual machines. Deploying networked storage with server virtualization is essential if organizations are going to unlock the full potential of server virtualization solutions. This includes the ability to move virtual machines between physical servers for utilization, availability and data protection purposes (see Figure 2).

FIGURE 2. WHY USERS WILL INCREASE NETWORKED STORAGE FOR SERVER VIRTUALIZATION

Why do you expect that you will increase your usage of networked storage for storing virtual machines and associated data? (Percent of respondents, N = 181, multiple responses accepted)



Source: Enterprise Strategy Group, 2008

In order to continue to recognize the benefits of server virtualization throughout the IT organization, it is important to consider other methods of virtualization that can continue to add to the chain of efficiency. One such example is applying the benefits of virtualization to the networked storage infrastructure. Here again, this calls for a few definitions to fully comprehend the different approaches and how they can compliment one another.

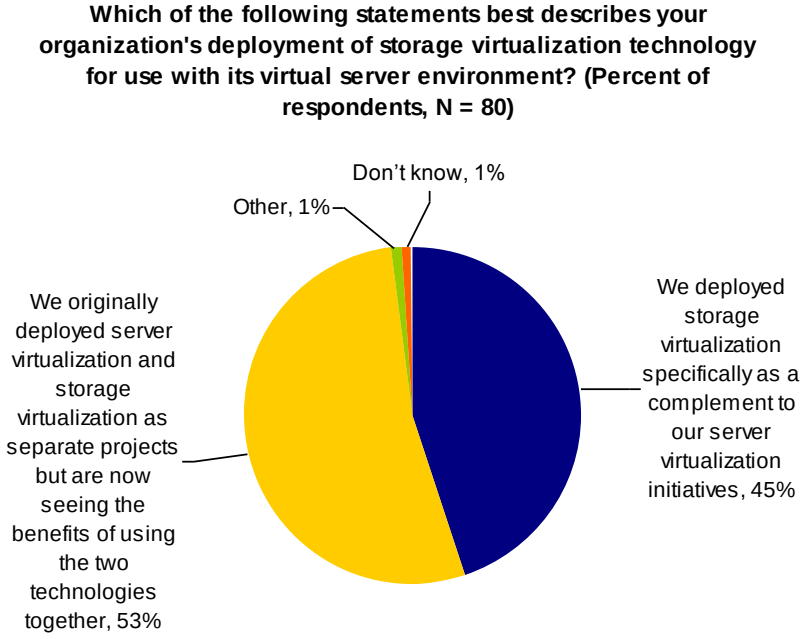
- **External 'storage virtualization'** is software functionality that, across complete storage systems—possibly including devices from different vendors and/or classes of devices from the same vendor—provides the ability to treat those systems as a single, centrally-managed pool of storage.

- **Internal 'virtualized storage'** is the ability within a storage system to create pools of storage capacity for easier management and performance (typically striping data across a large number of disk drives for greater performance while reducing or eliminating performance tuning).

Simply stated, external storage virtualization is applied *to* one or more storage systems (which can even be heterogeneous), while internal storage virtualization is applied *within* a storage system. ESG finds that current server virtualization users have a keen interest in the benefits of storage virtualization. Storage and server

virtualization have initially been applied independently (in over half [53%] of the respondents), but now organizations are seeing the benefit of using the two technologies together (see Figure 3).

FIGURE 3. STORAGE VIRTUALIZATION DEPLOYED TO COMPLEMENT SERVER VIRTUALIZATION



Source: Enterprise Strategy Group, 2008

Challenges and Inhibitors

While server virtualization is producing consistent benefits, it is also important to point out the vulnerabilities of server virtualization. In the "physical world," if a server fails, the operating system and the installed application(s) go offline. The same holds true in the "virtual world," but the significant difference is that the consolidation ratio of multiple virtual machines running on a single physical server has the potential to greatly impact the operating environment. In a virtual environment, all your eggs are in one basket. If a physical server fails, it will affect all of the virtual machines and application interdependencies running on that particular piece of hardware. The complexity of this scenario can quickly grow as more virtual machines are deployed and the organization standardizes on server virtualization. The balance, however, is that a growing number of users are deciding that the benefits far outweigh the challenges.

The HP Value Proposition: an Ecosystem of Solutions and Products

Of course, it's worth repeating that virtualization is not new; it is a method that aggregates, automates and often shares resources (for better utilization) in order to reduces management 'hassle.' It is found in many aspects of our lives—thus, we don't all have our own dedicated roads (one per destination!) and consider, for example, the difference between a physical telephone answering machine and the (virtual) answering system that you might use from your local telephone provider.

Virtualization is already found in many aspects of IT—RAID volumes, virtual memory, files systems, etc.—and that usage has been growing. ESG believes this growth is crucial to IT's long term success. To that extent, HP has the advantage of being an overall supplier that has been involved in all sorts of virtualization for many years. This does not just translate to experience and knowledge, but also to having a range of offerings to suit customer needs. Thus, although this paper focuses on the EVA4400,[2] HP also offers storage virtualization as well as virtualized storage—anticipating and serving a wide range of user needs.

In terms of HP as a provider of virtualized storage, it is hard to argue with HP's existing experience in this area—there are over 40,000 EVAs sold. The HP StorageWorks EVA4400 benefits from all that experience, common management software toolboxes (Insight Manager/Storage Essentials, which limits the range of education that is needed), and the same basic architecture that was already designed to provide 5 X 9s availability. Additionally, most users are risk averse (whether or not they admit it) and HP represents a well respected and trusted source of IT solutions.

HP does more than just declare to be an overall systems provider with the assumption that users magically 'get' it. Instead, HP has developed specific 'Solution Blocks' that combine storage with popular applications and HP BladeSystems, providing, in essence, everything in a 'box.' IT managers can, for example, configure a solution designed for a certain database with a certain number of users. This is akin to how a consumer might buy a PC—everything needed is included and a user can start to be productive almost immediately. It's a simple concept, but not one that you typically find from anyone other than a true systems provider. These HP StorageWorks solutions are available for the big-hitter applications such as Exchange, Oracle, SAP, SQL and VMware.

[2] *For a full description see ESG White Paper "Business Continuance and Availability – Focus on HP STORAGEWORKS EVA4400", November 2007*

The Impact of Server Virtualization and Virtualized Storage with HP

Businesses are beginning to see the benefits of combined server and storage virtualization initiatives. Storage virtualization is providing an additional opportunity to reduce IT costs and optimize efficiency as server virtualization use proliferates. The combined use of server and storage virtualization makes sense to ESG. The primary benefits of server virtualization in the eyes of most users include lower costs, improved resource utilization, non-disruptive upgrades and increased availability—all of which are fundamentally enabled by de-coupling servers, applications and data from physical assets. Storage virtualization takes those very same concepts and extends them from servers to the underlying storage domain, bringing IT organizations one step closer to a completely virtualized IT infrastructure.

Simply put, when implemented well, virtualization helps make IT our servant rather than the other way around! While virtualization itself is deeply complex, its benefits are not at all hard to understand. For example, most of us don't build cars, we just drive them—that's where we see the value and benefit. Yet for decades, IT has been too much about putting the right components together and constantly tweaking them. Frankly, except in the most skilled of hands (of which there are too few), automation is invariably better—just as with cars, the vast majority of people will get better results driving an automatic transmission rather than a stick shift—and will certainly be able to better concentrate on the important stuff (a.k.a., business results) rather than operational details.

Overview of HP's Virtualized Storage Implementation

The EVA product range provides virtualization at the controller level. By now, the value of virtualizing is pretty clear (optimization, utilization, flexibility, ease of management). The EVA4400 extends HP's virtualized storage range and reach into mid-sized operations—be they a complete company, a regional or subsidiary location or a specific application or line of business. Of course, the irony is that there's no reason smaller operations need any less IT abilities—indeed, just a few years ago, terabytes were viewed as big.

Although this paper focuses on the new EVA4400, it's only fair to point out that the entire HP StorageWorks line of EVA products offers the same advanced virtualization capabilities. The EVA4400 differs in terms of its 'entry level positioning and some additional ease of install/setup/configuration, but the main user benefits explained throughout this paper are consistent across all the EVA products.

Basics: The EVA4400 is the latest extension to the EVA product family, a leading SAN storage architecture offering from HP with tens of thousands of implementations worldwide. It is a highly virtualized storage system that treats all disk drives as one or more logical pools of storage, which makes management—whether provisioning or performance, and everything in between—much easier than with traditional systems.

Controllers: The HP StorageWorks EVA4400 has two physical controllers that work as an 'active-active cluster' in one logical system, combining processors and cache memory. The obvious advantage is that with two controllers working as one, there are more resources to serve read and write requests. Additionally, ESG prefers this 2-way active method because it provides greater ease of management, more transparent failover and resource pooling to manage data and system management.

Disks: Behind the controllers are up to 96 drives, which can be of a variety of types (both Fibre Channel and high density FATA) and can be mixed within the device. With the latter drives now at 1 TB, this means a single EVA4400 can scale up to 96 TB. The disks are arranged as 'VRAID' 1 or 5.

Features: Being a virtualized system, as well as an extension to a well-established enterprise product offering, the range of 'bells and whistles' is impressive:

- SmartStart EVA software – self installing
- Simple management (HP is justifiably proud of the low number of 'clicks' required)
- Hot-pluggable components
- iSCSI connectivity option
- Improved capacity utilization via virtualization
- Improved utilization via 'adaptive provisioning'
- Uses all disk drives (this is achieved because 'spares' are also virtualized)
- Extensive redundancy, high availability and failover capabilities
- Easy integration to common applications (extended through the 'Solution Blocks')
- Snapshots (varying types – see main paper)
- Local and remote mirroring/replication, both synchronous and asynchronous

Across the entire EVA range, the drivers are fairly uniform: consolidation, centralized information management, ease of use and a focus on power and cooling. The 'net net,' is that this virtualized storage can make a significant contribution to making IT simple—meaning less visible (which is good) and more able to say 'yes' to the business (which is better)—and so help IT to be seen as strategic (which is best) and not just viewed as a cost center. Since 'green' is such a large topic right now, it's important to expand briefly on how the EVA can play a part. ESG believes that the 'green card' gets overplayed (see Sidebar – "ESG's position on 'Green'"), but that certain processes and technologies can play a key role in increasing efficiencies in terms of PCSE (power, cooling and space efficiency). The biggest PCSE waste comes from 1) buying more than you need and 2) not utilizing what you have. An ESG report in 2006 found that most end-users' storage capacity was underutilized by 30-50%. This is both a huge waste and a huge cost to run. The EVA can affect improvements on both aspects via its high capacity utilization, via only using space when data is actually written and via attributes such as snapshot capabilities and internal tiering of data onto varying disk drive types. Wide striping of data and the virtualizing of spares (as capacity rather than as physical drives) only adds to the benefit.

Now let's review the HP StorageWorks EVA4400, concentrating specifically on where it is positioned and for whom. The sad truth is that all too often, vendors talk about market segmentation and intricate technologies, which are very vendor-centric. HP—especially with this product—should be commended for trying to focus on the data needs and business benefits, which are user-centric. When a product claims to extend a range and make it available to/suitable for a wider user group, there can be two oft-taken routes, both of which raise concerns about suitability:

a) Sometimes the eventual product is really a low-end device that's had way too many 'turbo-chargers' added in order to attempt to make the grade and is simply trying to do too much.
b) At other times, the device is just a throttled down version of a mega-high-end device that is therefore still way too specialized and complex and/or has not had sufficient investment made since the vendor knows it's a lower margin product.

ESG's Position on 'Green' – Focus on 'PCSE'

There is a lot of messaging around 'green' these days. Indeed, with global-warming as a top item on public and private agendas everywhere, it is hard to avoid. Everything from aircraft to zoos claims some green aspect or endeavor. And, like everyone, we applaud these efforts—if things can be done with a reduced negative impact on our planet, then that's clearly a good thing. Every small step counts. 'Green is good.' And the IT infrastructure suppliers know it too.

Consequently, with electricity prices and consumption heading upwards, almost all storage vendors are chasing the 'green' mantle. However, while this may be right and good in general, the implied altruism is also somewhat misleading. There are no real green storage products; although certainly some are significantly less bad than others. And, as yet, there are few end-users making buying decisions purely on 'green-ness.' At ESG, we assert that most IT departments are realistically not currently highly focused on being 'green,' but rather *are*—and if not they should be—highly focused on reducing the consumption of power, cooling and floor-space that their operations require. While many IT vendors are enamored by this 'green' image, at ESG we concentrate on PCSE: Power, Cooling and Space Efficiency. This is where huge, immediate, practical improvements are possible in the data center. Driven by technology advances in collaboration with better processes, the power, cooling and space necessary to deliver a certain level of capacity, IO and service level can be dramatically reduced. PCSE focus and improvement is where the rubber (of 'green' expectations) meets the road (of IT and business deliverables). It's an area of massive potential.

This is <u>not</u> to say that there are no genuine initiatives by IT infrastructure vendors to directly minimize environmental impact (such as reducing their use of hazardous materials, improving manufacturing, or offering decommissioning and recycling programs). Where these exist and have merit we of course applaud and indeed highlight them too. They are an added bonus. But PCSE improvement is where the major opportunity lies today, offering significant operational advances and huge financial savings.

With the EVA4400, HP has actually built a solution—not just for the data needs of their users, but also for the needs of the users themselves:

- **Data needs** – you might ask, what's been stripped out of the preceding versions of the product to create the EVA4400? In reality, it turns out to be nothing, and indeed it's quite the opposite—the new product scales higher than the lower end of the existing range and is designed to offer better real world performance.

- **User needs** – given the likely user profile, HP has extended the already good ease of use existing in the rest of the EVA family. For the EVA4400, they have provided a self installation capability (although they can still do it for you if you prefer), added improved user troubleshooting, and made almost all the major components to be CRU's (customer replaceable units) for simple, local, user repair. Considerable effort has also gone into the practical ease of use, in order to reduce the number of screens and clicks to actually get operations done.

> "I took a colleague to test the new EVA – for sure he's a smart guy, an electrical engineer, but not someone who had ever dealt with any shared storage device, and to whom I only explained RAID levels and some basic concepts on the journey. He sat in front of the EVA4400 and I – with my decades of expertise – sat in front of a competitive system. He was done with set up in half my time."
>
> – An early EVA4400 user interviewed by ESG.

Auto Data Distribution Across Drives

The essence of virtualized storage is that the system internally and automatically distributes data across available drives. The system is self-managing and self-leveling—it may be something of a cliché, but it means that you are freer to manage the needs of your business and not the mechanics of your storage. Complexity is removed (at least from an operational standpoint) and you save people, time and money. The ease of a virtualized system is because you have less to manage, as shown in Figure 4.

FIGURE 4. FROM INTRICATE MANAGEMENT TO SIMPLIFIED AND AUTOMATED MANAGEMENT

Traditional Disk System Management View

Simplified Virtualized Storage Management View

Source: Enterprise Strategy Group, 2008

But what is the underlying reason for the distribution of data? Quite simply, on all disk systems, there are a certain number of disk surfaces that can store data, which are accessed by an equivalent number of 'heads'

mounted on things called actuators that move the heads into place so they can read or write data. Simple laws of physics apply—each head can only be in one place at one time in order to read/write a record. It is a serial thing—complete one full action before doing another. If, however, you can spread the individual read or write actions (this is called striping) across multiple actuators, heads and surfaces, then the overall operation is made parallel and is completed faster. To a user, this simply means better performance from their subsystem and basically eliminates the need for manual tuning to avoid 'hot spots' (certain physical disks receiving a disproportionate amount of activity). All HP's EVA products go one further—whereas some virtualized storage systems just stripe data across the exact number of drives to match the RAID group being used by the application, the HP StorageWorks EVA4400 extends the concept and stripes the data across ALL the disks in a disk group as part of its underlying virtualization and then provides data parity on top of that using RAID, 1 or 5 (or for those technically minded and seeking accuracy, RAID 1+0 or 5+0).

> "To me, one of the most appealing things – yet underplayed by HP I think – is the way they approach and overcome hot-spots and hot-sparing….they have no dedicated RAID group linkage and everything is spread over loads of spindles, which is both really clever and wonderful."
>
> – An early EVA4400 user interviewed by ESG.

In essence, this approach can be viewed as extended virtualization, and the key values to a user are improved speed and optimized utilization. Indeed, EVA also does away with the concept of having dedicated *physical* spare device(s) and instead *logically* uses virtualization by spreading spare capacity over all the drives. This removes the concern that a spare won't come up when needed and also speeds any necessary rebuilds because there is no 'rebuild bottleneck' given that there are more spindles from which, and on to which, to rebuild. Everything is designed to spread data efficiently and to enable using as much of the capacity as possible.

Large Common Pool of Storage

Because a virtualized storage system is one large common pool of storage, it is again very flexible, easy to provision and easy to adjust. By definition, the logical and physical aspects are separated, which means a user can create virtual disks as needed. And, of course, since you only use physical space when data is actually written (meaning you can provision—or indeed, 'over-allocate'—to your heart's content), capacity management can be seen as monitoring just one thing—how full is the overall system?

It bears repeating that the avoidance of pre-allocated space reduces both management complexity and a very wasteful practice.

Empty Seats

Imagine a large meeting room with hundreds of seats, but only a handful occupied. There are people at the door, but no one new is allowed to enter and use an unoccupied seat. There seems to be plenty of room. "Sorry, we're full" say the ushers. The crowd outside grows restless—they point out all the empty seats. Ah, yes, they're told, but those are reserved in case so-and-so turns up. And more are reserved in case that person brings a friend…or two…or many. Indeed some further extra seats are reserved in case so-and-so adds to their family…soon…or ever. And still others are reserved 'just because' and 'in case we guessed the approximate attendance number wrongly.' And so on. Lots of seats are either unused and/or wasted.

Sound crazy? Well, in the preceding sentences, replace 'seats' with 'storage capacity' and 'reserved' with 'allocated' and there you have traditional storage provisioning as practiced over the last few decades. If bus seating or parking lots were arranged and managed like this, there would be an outcry. Only now are storage systems and management becoming practical tools with effective methods to maximize usage and minimize deliberately purchased over-capacity. Storage utilization efficiency—while maintaining service and performance levels— is becoming the focus.

So, open those doors (which, in this context, means virtualize) and let the rest of the audience (data) in!

Having everything as one large common pool also enables a couple of other notable features:

1) Capacity can be seamlessly added. To a user, this means easy growth.

2) Tiering can be simply described as assigning data of different attributes and needs to suitable storage devices of different attributes. This can happen automatically *within* an EVA or across EVAs. This is beneficial as ESG has found that 60-80% of all data is persistent after 90 days. So it makes sense to move such data to less expensive storage—for example, from 146 GB 15 k drives to 1 TB FATA drives. But the reason many data centers don't do this also makes sense—it's hard! The HP StorageWorks EVA4400 makes it easy, supporting both FC and FATA disk drives in a single array, and side by side in the same drive enclosure, allowing for tiered storage within the system. Users can reduce costs (both via the high capacity of the drives themselves, and by the significantly lower power consumption per GB that such drives offer) creating different tiers of storage based on the performance and protection requirements of their application data.

Capacity Utilization – Snapshots, Capacity Management

Once you disassociate the physical from the control, you can do some very useful things very easily—and virtualized storage takes full advantage. When you add in the fact that space is not pre-allocated—and that it's only used when data is actually written—you can also make these 'useful things' very cost-effective.

Snapshots are point-in-time 'copies' of data. However, they are logical (or virtual, if you prefer) copies, since the system uses a new set of pointers in the controller to map to the existing data that is being copied (do not forget that pointers, maintained in the controller, are how all data is located and tracked in a virtualized storage system, so this is nothing out of the ordinary). Since every IO to the device is virtualized, these snapshots are as real to the users and applications as any other volume. What is out of the ordinary is what can be done with these snapshots, depending on the attributes they are given—and what that means to a user. The snapshot types offered within an EVA are:

1) **'Simple' Snapshot** – nothing more than a fully provisioned read-only copy of the original data, good for ensuring two full copies that you want to keep are available.

2) **Virtually Capacity Free Snapshots** – this protects data without consuming any significant system resources. It is still an immutable read-only copy, but only the pointers and any changed data (if there is any) are actually copied. It is far more physical-space-efficient than a full volume copy and is good for data headed to tape back up or to be available for a disk restore. This approach is both more efficient and much simpler than snapshots applied to traditional back-end (non-virtualized) disk systems, where some amount of actual space must be pre-allocated to the snapshot to allow for changed data. This 'side file' may or may not be used and may or may not be enough, which can— clearly—cause management headaches. Using a fully virtualized back-end is better and simpler because the actual capacity is only ever used as actually needed.

3) **Virtually Instantaneous SnapClones** – unlike a traditional clone (or copy) where you only have access to the clone after it's fully built, this variation allows you read-only access to both copies all-but-immediately, as the system tracks what has moved where via the pointers. This is a good tool to use for tiering and migration.

4) **Writable Snapshots** - a writable snapshot sounds like an oxymoron; however, it is an extremely useful tool. As before, it is another working copy of primary data, *but* it can be written to. Because data is not 'updated in place,' any updated or added data is written elsewhere. However, in addition, *only* such updated or added data actually consumes any extra real capacity, since all the unchanged data (common to both copies of the data) simply has two discrete sets of pointers pointing at the same unchanged blocks of data. This is extremely useful for application testing and data mining.

While the technical intricacies behind snapshots are interesting, it's the business value that matters. Snapshots are used:

- to change tiers.

- for point in time recovery, replication (remote or local).
- to permit applications to stay up even through back-up processing (snap a copy and then do a background operation to back up to another tier inside or outside the EVA).
- to enable extensive controlled application testing. Users can easily reset to test each new code revision against another copy of the original data. That could even be a snap of production data if you'd like—you won't impact the production system.

Except for full-copy clones (Basic Snapshot), users can basically take as many snaps as they want—every hour or two, or even more frequently for recovery purposes—and likely as many writeable snaps (for testing etc.) as most developers could imagine needing

And after all these copies are made, what about capacity management? While it's now clear that overall capacity management boils down to 'what percent full is the EVA?' there is one additional enabling feature that must be mentioned. As already covered, space is only allocated and used when data is actually written—so a virtualized storage system gives the user the main benefits of efficient utilization that are found in a standard 'Thin Provisioning' scheme. The EVA also adds 'DCM' (or "Dynamic Capacity Management"), which can be viewed as 'adaptive provisioning.' DCM is a tool that dynamically and automatically (or via alerts if the user prefers) expands *or* shrinks VRAID volumes and supported hosted file systems based on thresholds that the user sets. This is yet another way to improve flexibility and drive overall better utilization. To expand the chair analogy (see "Empty Seats" sidebar), this is akin to being able to automatically add or remove chairs to rows during the meeting (think of it as keeping the production system running). There is no stranded or unused capacity/chairs (which means that each row can seat the correct number of family/friends without odd spare spaces left) and the overall audience is maximized.

Enabler for New System Technologies, Values and Processes

As the world—and the IT demands within it—change, having virtualization allows the sort of flexibility and efficiency that will only become more crucial. Both at the server level and the storage level, it is going to be increasingly important to be responsive to changes and to be able to scale, while still claiming efficiency in both a production context and also in a 'green' context. Virtualization is thus a crucial technology to have employed in order to play well in the 'Infrastructure 2.0' era.

As IT moves into this new phase, the emphasis will not be on *how* IT does things, but on *what* IT can do for the business. It is simply less relevant to business metrics that virtualization is "the transparent abstraction of storage at the block level" or "the disassociation of capacity from its underlying physical disk restrictions to create large pools of storage capacity available to multi-vendor hosts" when what matters is that virtualization delivers efficiency, flexibility and ease of use wrapped in attractive economics that enables IT to fulfill on both halves of the famous phrase, 'doing more with less.' Referring back to the car analogy where we want to drive rather than build, IT is changing from operating the hand-crank, choke and adjusting manifolds and piston strokes, moving to the electric starter and engine management system. Virtualization is a key part of the change.

Infrastructure 2.0 is the catch-all for a tremendous change—not only in terms of the sophisticated automation and economics of IT, but also for IT's ability to become more of a strategic player in individual businesses. This can only happen when your eye is on the road ahead and not on the oil leak on the tarmac behind you.

Virtualization provides the tools and abilities to support new demands:
- Advanced, automated, local or remote replication;
- Integrated support for complex virtualized server environments. Dianne Green has called VMware a 'non-disruptive disruptive technology' (quoted in *The Economist* 19 Jan 2008), and virtualized storage is part of that game-changing phenomena;
- Utilizing snapshots for new purposes, such as mounting a production version of a database at a given point in time to run differential analyses;
- With no links to, or reliance on, particular systems, virtualized storage can be 'shunted' around;
- Virtualized storage makes conventional storage look inefficient and wasteful—both generally and in terms of the 'green' prescription.

ESG's View

The numerous challenges facing IT managers are well known: growth, complexity, lack of resources, performance and availability challenges, inefficiency and the need for flexibility. It's impossible to keep managing these things as individual knobs and dials—as IT grows up, these must all be automated with efficiency and economy. That is the essence of virtualization, which makes sense in terms of provisioning, management and utilization—and is a part of getting IT up and out of the 'weeds.' Our view is that virtualization will be increasingly pervasive throughout IT as the world moves into an era concentrated on what the tools can actually deliver rather than on knob-twiddling expertise.

The EVA4400 is a 'right sized' offering that extends the value of virtualized storage to a much wider range of uses. It is affordable and boasts an excellent pedigree. It may even be a good enough package for HP to increase sales outside its comfort-zone HP base. While HP wants users to 'trade up' from DAS (direct attached storage—basically, the capacity within the server) there are also going to be some current users of the MSA range who will be motivated to move. Of course, HP also knows that the EVA4400 will cannibalize its existing lower end (4100 and 6100) products to some degree since a) previously, if you were an HP user and wanted virtualized storage, you had to go 'higher' than you needed product-wise; and b) the EVA4400 is simply an excellent package—in many respects superior to the low end 4100/6100 products (except perhaps for committed existing users or those wanting more extensive upgrade options).

Still, that's the way of the world; far better for HP to replace its own products than have a competitor do it! The MSA product is also undergoing extension and improvement so HP have something of an embarrassment of riches in this segment of the market—the converse way of saying this is that there is clearly overlap within and between HP's ranges. While this is a far more preferable state than the gaps that existed previously, it does mean that HP's marketing departments will need to provide clear guidance on appropriate positioning and customer-suitability to prevent the choices becoming an annoyance rather than a blessing.

Overall, virtualization is clearly a good thing in most instances (both server and storage), and the HP StorageWorks EVA4400 is an option that users seeking to add ease of use and maximize utilization would do well to consider. That the product comes from the HP stable—with its full range of systems, Solution Blocks and support—can only make the option more worthy of investigation.

20 Asylum Street
Milford, MA 01757
Tel: 508-482-0188
Fax: 508-482-0218

www.enterprisestrategygroup.com

4AA1-8081ENW