

# White Paper

---

## **The Context and Value of a Fully Virtualized Storage Infrastructure**

**HP's Approach**

*By Mark Peters*

**November, 2009**

---

## Contents

Introduction: A Changing IT World .....	3
The Conundrum: Efficiency versus Effectiveness .....	3
From ‘Just-in-Case’ to ‘Just-in-Time’ .....	3
Market Shifts: IT Eras, Growth, Sprawl, and the Resulting Users Needs .....	4
IT and Data Eras .....	4
HP’s Approach: Introducing the Converged Infrastructure .....	5
Growth and Sprawl: Users’ Challenges and Needs .....	5
Industry Responses: Storage Virtualization and Efficiency .....	7
Storage Virtualization and Operational Value .....	7
Storage Virtualization and Economic Value .....	8
Efficiency: Virtualization as Optimization .....	9
Examining HP’s Approach .....	10
HP StorageWorks Virtualized Storage Infrastructure .....	11
Real World Applicability .....	11
The Bigger Truth .....	13

All trademark names are property of their respective companies. Information contained in this publication has been obtained by sources The Enterprise Strategy Group (ESG) considers to be reliable but is not warranted by ESG. This publication may contain opinions of ESG, which are subject to change from time to time. This publication is copyrighted by The Enterprise Strategy Group, Inc. Any reproduction or redistribution of this publication, in whole or in part, whether in hard-copy format, electronically, or otherwise to persons not authorized to receive it, without the express consent of the Enterprise Strategy Group, Inc., is in violation of U.S. copyright law and will be subject to an action for civil damages and, if applicable, criminal prosecution. Should you have any questions, please contact ESG Client Relations at (508) 482-0188. This ESG White Paper was developed with the assistance and funding of HP.

## Introduction: A Changing IT World

### The Conundrum: Efficiency versus Effectiveness

The fact that IT has always been massively complex and considerably inefficient is not a comfortable realization; and yet that is the reality. No one planned it that way, of course; there was no conspiracy, it just happened. But therein lies the point: when things ‘just happen,’ they often are not designed for ease or efficiency. Instead, they are typically designed to be effective—in other words, to get the job done. That has been the focus of IT for decades. *Optimized efficiency comes second to operational effectiveness.*

Progress on individual components in the jumbled overall IT infrastructure has typically moved in fits and starts; an ever-expanding army of specialists then works to pull everything together. It’s as if you wanted a car, but were forced to buy all the components separately—an engine from here, axle from there, seats from somewhere else—and hope you could combine them. You may waste some power, have unreliable brakes, or end up with spare seats, but applying sufficient expertise and brute force will probably eventually provide some means of automotive transport. Gradually, of course, auto manufacturers streamlined the car, combining purpose-built integrated components. The same happened in IT; gradually, the necessary parts to do useful data processing were combined and we ended up with (almost!) ready-to-use PCs, self-contained application-specific server ‘appliances,’ and so on. Some vendors even provide a complete data center in a box. Integration and interoperability make enormous sense.

Although this type of progress remains effective and goes a long way to address, and even preclude, much of the complexity in IT, it is only superficially efficient. Many IT components—from humble desktops all the way to mega-servers and the massive racks of storage that support them—are still poorly utilized. Effectiveness still wins over efficiency. To return to the car analogy, sure, we’ve improved the manufacture, reduced the cost and price, even driven up the MPG (all of which seems to be about efficiency), but most four seat cars typically only carry one person or sit in a garage or parking lot most of the day and then multiple cars from the same cul-de-sac make simultaneous trips to and from the grocery store, work, or school. Their potential to carry multiple people and luggage for many years and hundreds of thousands of miles is squandered. In reality, no one is going to give up the flexibility, so we all have our own vehicles.

IT has been very much the same: specific systems for this and applications for that, with each user wanting the flexibility individual ownership confers. So ‘IT sprawl’ happens, which adds the equivalent of personal car ownership onto the massive existing generic growth in IT and data: an increase in distributed processing and storage reserved (allocated) for prescribed uses. It may work, but it is inefficient. As the costs of IT have risen—fuelled by massive demand-side increases that have exceeded the supply side cost reductions—so it has become desirable to add *optimized efficiency* without impacting existing *operational effectiveness*; furthermore, what was merely desirable has become an urgent imperative in the face of the recent and continuing global economic recession.

### From ‘Just-in-Case’ to ‘Just-in-Time’

Is there a way to share resources, to optimize their use, and yet simultaneously to attain an on-demand (to specific applications or users) IT pool? *After decades of IT being run on a ‘just-in-case’ basis, can it move to something akin to ‘just-in-time’ and ‘just enough?’* The answer is almost certainly yes, but it requires three key elements in order to work:

1. **Management determination:** although outside the scope of this paper, most organizations will find success in this endeavor frustratingly elusive without an executive mandate (whether from IT itself or the business will depend on the specific organization). Human nature and years of conditioning make departments and users reticent to—as they typically see it—relinquish an entitlement to IT services that they ‘own’ and can effectively see and touch.
2. **Overall architecture:** an infrastructure vision and integrated approach is crucial; with HP, this umbrella concept is called ‘Converged Infrastructure,’ which this paper will touch on at a high level as it is the context within which a fully virtualized storage infrastructure delivers value.

3. **Virtualized resources:** the single ‘tool’ that enables resources to be optimized for efficiency is virtualization. It breaks the 1:1 relationships of the physical ‘bricks’ and the system view and creates ‘pools’ of IT components that can be dynamically allocated and used as needed.

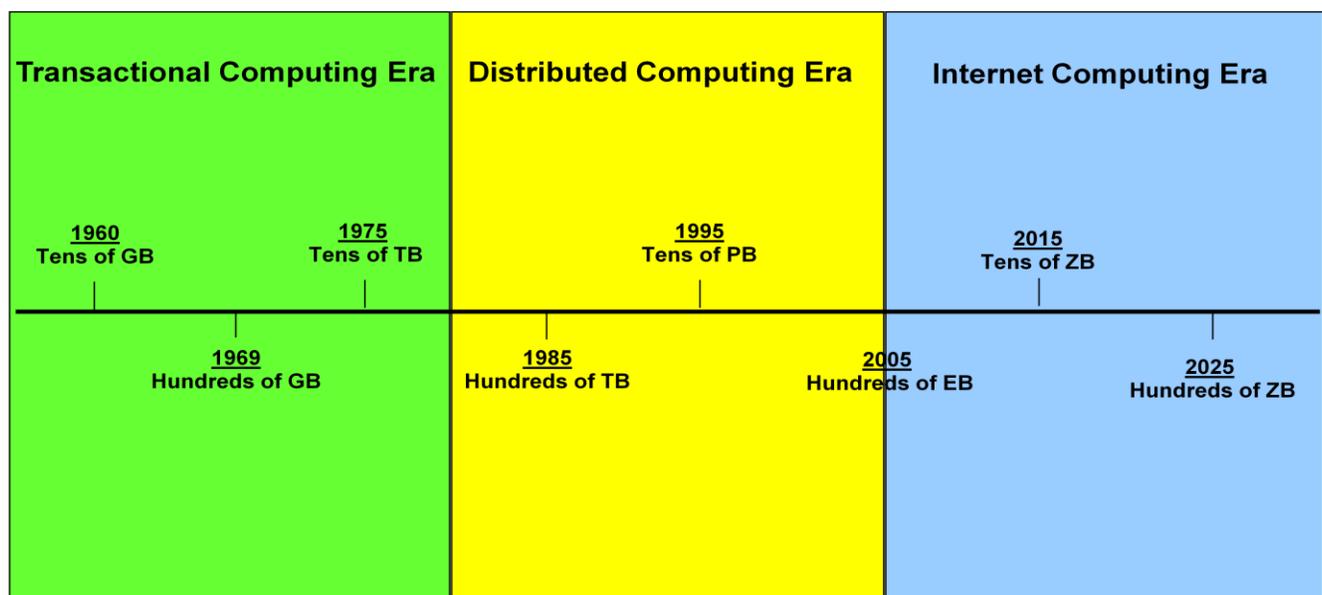
This paper is focused on the power of virtualization in general and the value of HP’s Virtualized Storage Infrastructure in particular. In order to put HP’s approach into balanced context, it is necessary to review the changes that have occurred in the IT world in a little more depth; this includes data growth and IT sprawl as well as the broader economic impacts, which have together produced a specific set of user needs. While these needs have been addressed with a degree of commonality across the industry—certainly in terms of virtualization as a general tool—the response and vision from HP are far more comprehensive and hold the potential for a step-change in the provisioning of corporate IT resources.

## Market Shifts: IT Eras, Growth, Sprawl, and the Resulting Users Needs

### IT and Data Eras

The major determining—and constant—factor behind all developments in IT is data growth. Over the years, there have been distinct and definable eras of commercial computing with equally distinct and definable infrastructure attributes for the data that they generated, especially in terms of scale but also in terms of the type and ownership of the data. Yet throughout, data growth has never ceased. Figure 1 shows the eras simply—first came a purely transactional computing era: the time of ‘big iron’ with centralized, expensive, rigid systems, and limited applications all from a handful of incumbent suppliers. Next came the distributed computing era, which was exemplified by new standards and a dramatic increase in applications and departmental data, but essentially utilized smaller versions of models from the previous era and was thus still hampered by rigidity and high costs. The latest ‘Internet’ era of computing is all about massive content, collaboration, and sharing; processing demands and unstructured data are growing exponentially and—unlike the prior eras—it cannot all be centrally managed or accurately predicted because data is constantly generated everywhere in a *two-way process that did not exist before* (in prior eras content generation was all done by businesses for review and then download; now, it can be uploaded by anyone).

Figure 1. Computing Eras & Exponential Data Growth



Source: Enterprise Strategy Group, 2009.

This new, and still emerging, IT paradigm is thus very different from the old world order. The new era is all about unknown scale requirements, unknown data values, and the unpredictable nature of pretty much everything. This is not only about IT; it’s specifically a new *data/storage*-era where the information explosion is a major contributor to

IT ‘sprawl.’ Two huge drivers of growth are the increasing use of rich digital media and the increasing retention of data to meet regulatory requirements. All this in turn means users must focus on thinking about new data, and thus new infrastructure, differently since the traditional silos of IT from the distributed model are no longer a viable, scalable approach. This is the essence of a ‘burning platform’ because artificially forcing these new requirements onto old processes and infrastructures will sometimes be impossible, can often be extremely inefficient, and will always be a mistake. It’s clear that businesses and vendors must rethink their approaches to IT infrastructure in general and information storage in particular.

### HP’s Approach: Introducing the Converged Infrastructure

HP has been a leader in both the first two eras and is addressing the challenges of the new era with its recently announced HP Converged Infrastructure. The essence of this is to provide an overall architecture and delivery model that is akin to ‘*liquid IT*’—an overall IT resource pool where processing power, bits and bytes, applications, and physical requirements (power, cooling, etc.) can all be provisioned and integrated, both seamlessly and dynamically, in the moment and at the point of need. Resource consumption is thus matched to actual need, hence optimizing the business of IT. Done properly, this holds the potential to address the overall conundrum outlined in this paper’s introduction, which is to add *optimized efficiency* to the existing *operational effectiveness*. Doing this is designed—using an HP phrase—to make IT about innovation and delivering business value again, rather than about having most of its dollars tied up in operations and systems maintenance.

One of the foundations of the Converged Infrastructure is the concept of ‘Virtual Resource Pools’ (which are explained later in the paper). More specific to storage—and the focus for this paper—is the delivery of a ‘Virtualized Storage Infrastructure’ from HP StorageWorks, with which HP wants to ‘transform the economics of information.’ HP’s Virtualized Storage Infrastructure is comprised of four focus areas.

1. **Storage virtualization:** is aimed at driving utilization up by a factor of three and simultaneously halving management costs by ‘abstracting the physical.’ Both heterogeneous and scale-out systems become less costly to manage.
2. **Application integration:** enables considerably faster deployment times by enabling application-specific management and tuning along with ‘solution blocks’ (something HP has done for a while), as well as a move toward template driven management.
3. **Capacity and power optimization:** this offers the potential for huge reductions in consumption, which would lower the impact and cost of data growth. It would employ a range of technologies, from smart provisioning and deduplication through to capacity optimization/tiering, spin down, and smart cooling.
4. **Storage and server convergence:** the better usage of less equipment equates to a significant lowering of capital costs and benefits users through the removal of traditional proprietary storage infrastructures with the functions moved to integrated and industry-standard combined server/storage platforms.

Operating against the described background of enormous data growth and IT sprawl, this Virtualized Storage Infrastructure is intended to bring both operational and economic value via granularity, accuracy, and control so that both what is needed and what is used can be minimized and balanced.

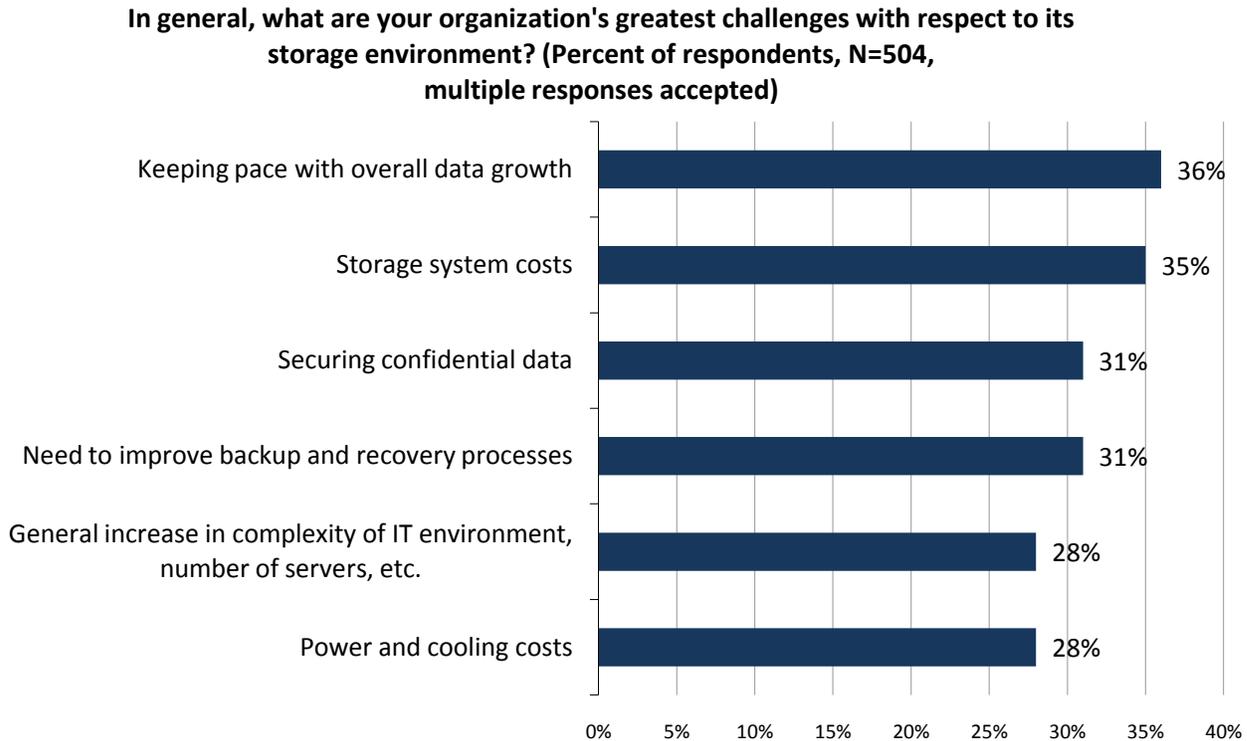
### Growth and Sprawl: Users’ Challenges and Needs

Due to a lack of alternatives, dealing with explosive data growth tended toward the inevitable, but erroneous, application of current approaches. Rather than solving the problem, this has become a major contributor to ‘IT sprawl.’ As a sub-optimum approach, the business and IT impacts of this IT sprawl are unsurprisingly negative:

- Underutilization of all resources
- Inability to respond quickly to new opportunities
- Highly disruptive change processes
- Resources weighted towards maintenance, not innovation

The rate of data growth is forecast to be on a continued exponential curve into the foreseeable future; though in prior eras, the rate of growth in capacity demand was roughly matched by the rate of capacity price decline, no such balance exists in this current era—a fact that is reflected starkly in the major storage challenges to which users attest. As shown in Figure 2, ESG research<sup>1</sup> has consistently found that—despite all the perceived advances in terms of technology and price—the greatest challenges that enterprise users still see with respect to their storage environments are led by keeping pace with data growth and managing storage system costs.

*Figure 2. Top Storage Challenges*



*Source: Enterprise Strategy Group, 2009.*

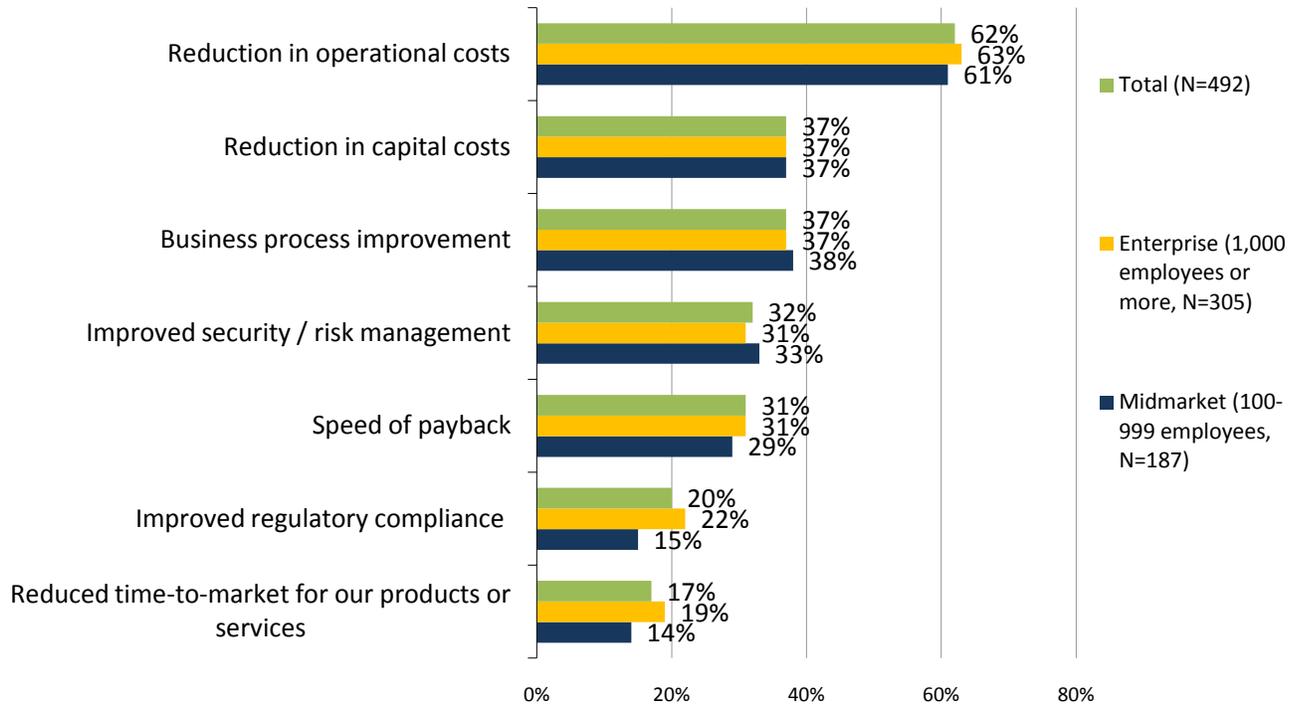
Since data growth is a given (and, it should be noted, can very often be a positive in an organization’s overall business), it is not surprising then that the overwhelming focus of users is on addressing costs in all areas. This is relevant to both HP’s overall Converged Infrastructure approach and to the Virtualized Storage Infrastructure within it. Traditional resourcing simply costs too much; ESG’s investigation<sup>2</sup> into what is most important when users are justifying IT expenditure over the next 12-24 months found an overwhelming emphasis (see Figure 3) on reducing operational and capital costs and on improving business processes.

<sup>1</sup>Source: ESG Research Brief, *Enterprise Storage Priorities Emphasize Information and Infrastructure Efficiency*, January 2009.

<sup>2</sup>Source: ESG Research Report, *2009 Data Center Spending Intentions Survey*, March 2009.

Figure 3. Most Important Considerations for Justifying IT Investments

Which of the following considerations do you believe will be most important in justifying IT investments to your organization’s business management team over the next 12-24 months? (Percent of respondents, multiple responses accepted)



Source: Enterprise Strategy Group, 2009.

## Industry Responses: Storage Virtualization and Efficiency

### Storage Virtualization and Operational Value

A large part of the industry response to these challenges and needs has been based upon virtualization. This is the disassociation of the physical from the logical and—although it still occasionally has an air of mystique—it is extremely common in many parts of daily life. Take phone lines, for example. No one connects bunches of direct, separate phone lines to all their friends, family, and business partners, yet that is what we all—virtually—construct when we make calls. To restate: virtualization provides a logical view into, and control of, physical infrastructure assets in order to provide greater optimization, better utilization, and simplified management of those physical assets. In simple terms, virtualization permits resources to be allocated flexibly from a ‘pool’ and thus enables improved utilization since each user and application does not need to be over-provisioned ‘just in case’ and for ‘personal ownership.’ Reverting to our previous automotive analogy, this can be viewed as more akin to carpooling and on-demand public transport. Management is obviously a crucial element—with policies, dynamism, and automation being key—yet the approach can significantly drive down the amount of resource consumed and hence directly address the two key storage challenges (growth and costs).

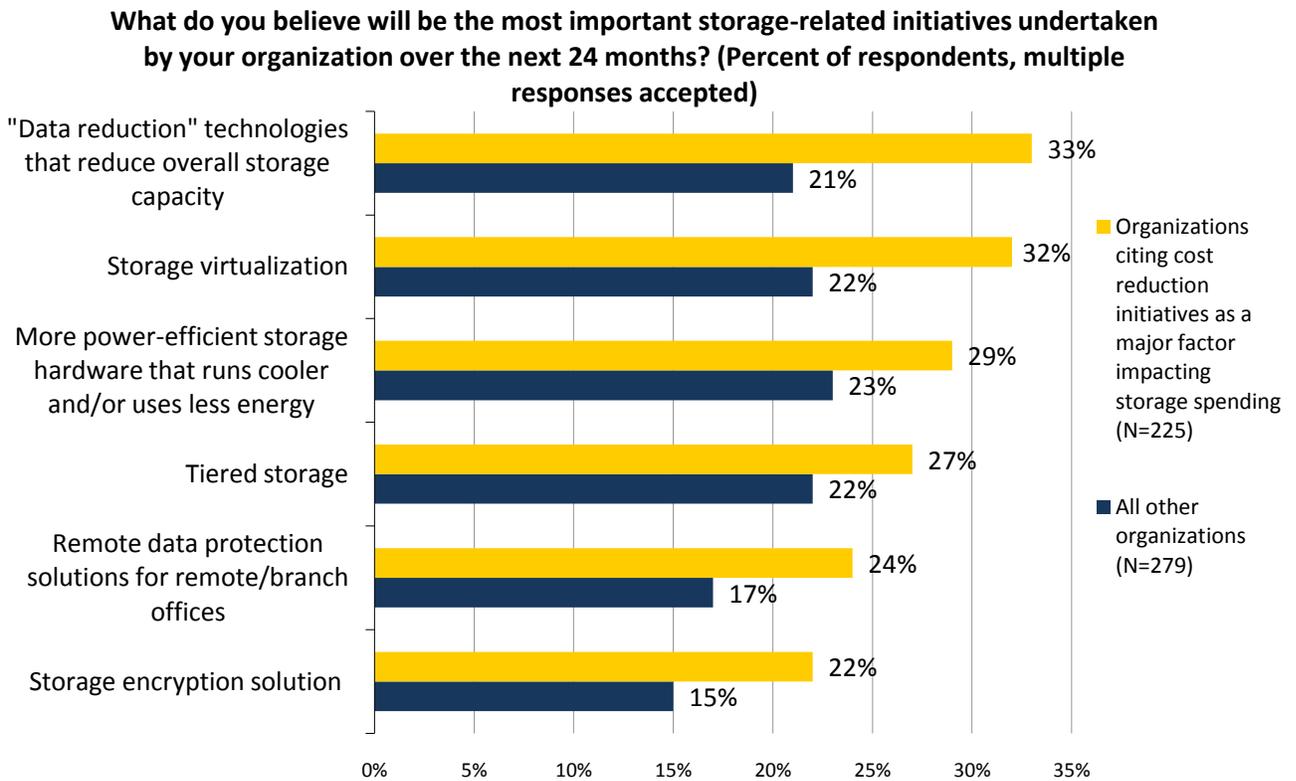
Some implementations—such as HP’s Converged Infrastructure—aim to address a lot more than just server, network, and storage virtualization and there is plenty of room for both cumulative and escalating value in doing so. Additional value is gained at each step so that the whole is greater than the sum of its parts. Although this paper focuses purely on the storage infrastructure, it is worth remembering that it can contribute to an escalating overall business value. Whereas once virtualized storage was a ‘cool’ IT luxury (“it’s clever, it’s whiz-bang technology, so use it”), all the new factors described to this point have construed to make it a business necessity (“it’s operationally and financially compelling”). Intriguingly, it has been the sweeping adoption of server virtualization

that has captured most recent headlines; however, that is also a catalyst for storage virtualization. This is because combining the two can yield added user value. ESG has found that users expect many improvements from virtual machine mobility and disaster recovery options, through to availability, upgradeability, and more. Furthermore, whether investigating enterprise users<sup>3</sup> or midrange users,<sup>4</sup> our research consistently finds ‘storage virtualization’ ranked as the most important storage-related activity currently being undertaken.

### Storage Virtualization and Economic Value

Knowing that financial improvement is paramount for most users these days—and frankly such advances aren’t going to be tossed out or ‘un-invented’ once the economic situation improves—if a virtualized storage infrastructure is to have major interest for users, then it had better be seen as capable of delivering cost savings compared to traditional storage infrastructures. As the information in Figure 4<sup>5</sup> shows, storage virtualization is number two on the list of storage initiatives planned to be undertaken by organizations citing cost reduction as a major factor impacting their storage spending. Interestingly, storage virtualization can also contribute to other initiatives on this user priority list: for instance, the reduction in overall storage capacity behind the need for ‘data reduction technologies’ could also be achieved or extended by the improved utilization that virtualization delivers. Efficient storage tiering invariably requires migration that relies upon virtualization, which can in turn place more data onto more power-efficient storage types.

Figure 4. Top Storage Initiatives When Cost Reduction is Key, 2009-2011



Source: Enterprise Strategy Group, 2008.

<sup>3</sup> Source: ESG Research Report, *ESG 2008 Enterprise Storage Systems Survey*, November 2008.

<sup>4</sup> Source: ESG Research Report, *Medium-Size Business Server and Storage Priorities*, June 2008.

<sup>5</sup> Source: ESG Research Brief, *Enterprise Storage Priorities Emphasize Information and Infrastructure Efficiency*, January 2009.

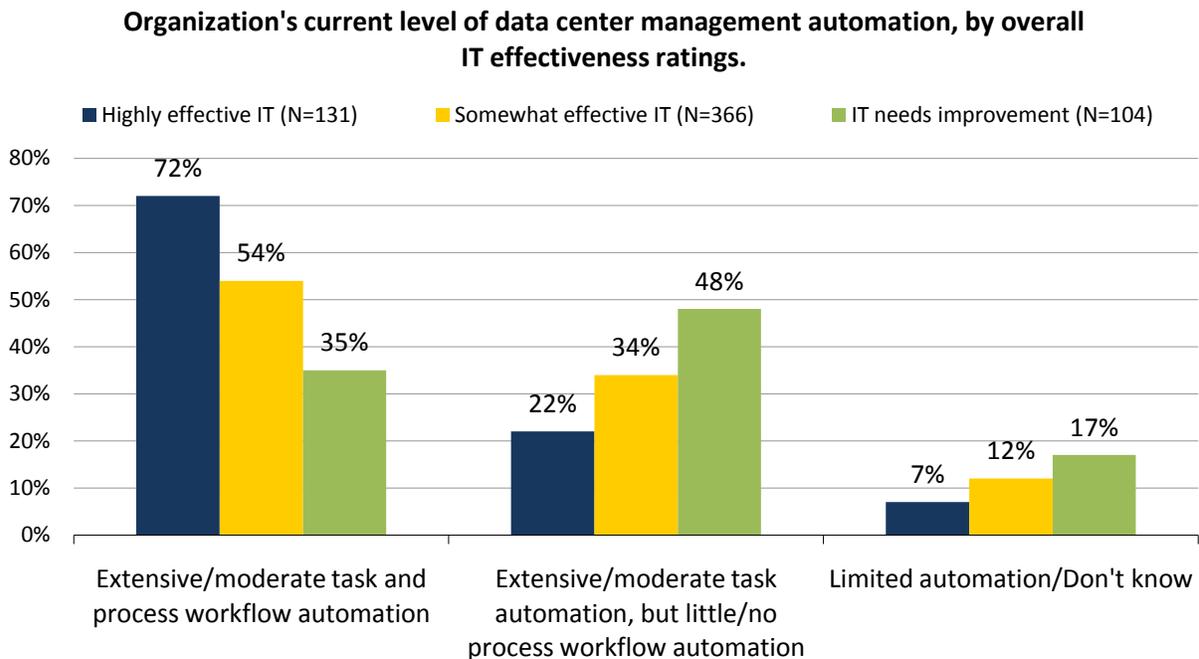
## Efficiency: Virtualization as Optimization

Storage virtualization (as with all virtualization) is all about efficiency and optimization. Despite the IT industry’s love of buzzwords, when you boil it down, virtualization of any sort is ‘just’ about the efficient use of resources. Viewed without mystique, the advantages and value can be more easily seen. In this light, the ‘Virtual Resource Pool’ element of HP’s Converged Infrastructure is—in reality—‘virtualized IT’ or a construct to deliver the most efficient use of all IT resources. It may not sound quite so grand and it probably can’t be trademarked, but it certainly is compelling.

As already mentioned, the key to successful virtualization—and hence to ‘optimizing the optimization’—comes from the management layer. Virtualization by itself is inert; its life and ability to deliver value comes from being able to apply the right resources at the right time and to do so automatically, dynamically, and flexibly. Its management should ideally be linked to not just storage (as some vendors do), but across data center and IT operations as a whole. As the world moves from a purely physical infrastructure to a virtual one, so does it highlight the intersections of computing, networking, storage, business applications, physical data centers, and even delivery elements; none of which, for optimal results, can be deployed or managed in a vacuum. Again, this is why HP StorageWorks Virtualized Storage Infrastructure is just one part of the larger HP Converged Infrastructure.

Furthermore, ESG research<sup>6</sup> shows that management automation has a direct correlation on effectiveness. Reviewing Figure 5 shows that where users have extensive or moderate task and process workflow automation, IT is viewed as ‘highly effective’ in 72% of cases, a number that drops to only 7% where there is limited automation.

Figure 5. Automation Drives Effectiveness



Source: Enterprise Strategy Group, 2008.

There are two other aspects of ‘virtualization as optimization’ that should be explained:

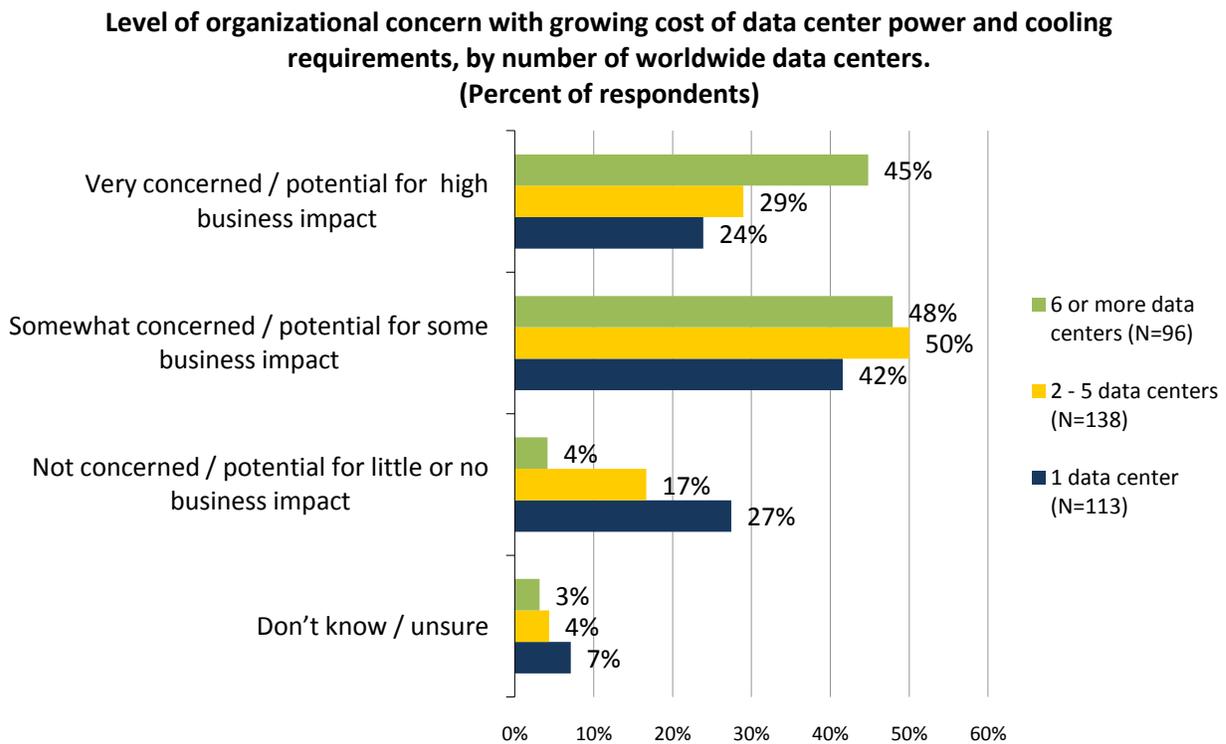
1. **Virtualized storage versus storage for virtualization:** The overall virtualized storage approach is a software-managed architectural design that can be an enabler of data center transformation. It should not be confused with either a) storage for virtual server environments per se (which need not itself be virtualized, although often is) or b) inherently virtualized storage devices (whether single arrays or a group).

<sup>6</sup> Source: ESG Research Report: *2008 IT Service and Infrastructure Management Survey: Uncovering the Business Value of IT Management Automation and Best Practices*, March 2008.

Both these types of storage may or may not become a part of an overall virtualized storage implementation, but are neither obstacles nor requirements.

2. **Power efficiency:** The importance of electricity (both to power and cool equipment) is extremely high these days, whether in terms of availability and/or cost. Many organizations also have a ‘green’ mandate for either brand and/or moral reasons or to comply with regulations. Whatever the motivation, OPEX and TCO are watchwords in many data centers. By optimizing resource usage, a virtualized storage infrastructure can contribute significantly to efforts to control and curtail electrical consumption. As Figure 6 shows, while a majority of all sizes of IT operation are somewhat or very concerned about their power and cooling costs and believe this has the potential for some or high business impact, the bigger the overall operation (as measured by number of worldwide data centers), the greater the concern—with 93% of organizations that support six or more data centers falling into those categories.

Figure 6. *Concern with the Cost of Data Center Power and Cooling, by Number of Data Centers*



Source: Enterprise Strategy Group, 2009.

## Examining HP’s Approach

As already mentioned, HP’s overall IT architectural future is the Converged Infrastructure—the virtualization of all IT resources to drive integration, optimization, ease of use, and, ultimately (and most importantly), efficiency and economic value. The HP Converged Infrastructure is itself comprised of certain key elements:

1. The infrastructure is, as might be expected, composed of servers, storage, network, power/cooling, and management software. The control and architecture that adds the true value and delivers convergence is split into four areas: HP Infrastructure Operating Environment, HP Flex Fabric, HP Virtual Resource Pools, and the HP Data Center Smart Grid.
2. HP’s requirements for the Converged Infrastructure are encapsulated in a nifty acronym, ‘VROOM,’ which stands for Virtualized, Resilient, Orchestrated, Optimized, and Modular.
3. HP plans to combine its own intellectual property with open integration of partner offerings and an expertise to deliver as needed for in-house IT, outsourced operations, or via the cloud.

4. Architecturally, the physical storage capabilities are focused as a ‘double-click’ within the ‘Virtualized Resource Pool’ layer that orchestrates all the necessary resource components for given tasks.
5. The Resource Pool needs a Virtualized Storage Infrastructure to flexibly meet application needs in terms of scalable performance and capacity and to enable rapid deployment across converged platforms to control costs and simplify management.

## HP StorageWorks Virtualized Storage Infrastructure

The easiest way to imagine HP’s fully virtualized storage infrastructure is as one single pool of storage. Although at a physical level, there can still be arrays, SANs, NAS, and so on, such things are of no inherent value to users; thus, for all intents and purposes, users and applications are divorced from that reality and simply have ‘storage,’ which is provisioned as needed in terms of capacity, time, and attributes (such as protection levels, performance, etc.). This approach delivers value and efficiency as follows:

- Optimized use (a.k.a., minimized overall capacity)
- Optimized flexibility (a.k.a., right data, right place)
- Optimized cost (a.k.a., savings)

To deliver such value, the four main attributes of this virtualized storage infrastructure are:

- It is virtualized to enable efficient scalability
- Capacity and tiering are optimized to reduce the impact of data growth
- It is built on standardized platforms to improve cost efficiency
- Application integration speeds ‘time to business value’

Even for an organization of HP’s scale and resources, this fully Virtualized Storage Infrastructure (let alone the overall Converged Infrastructure) is an enormous undertaking. While it owns the overall constructs and direction, HP has not been attempting to build all the components itself; it has, however, been making a number of moves over the last couple of years that—however business-savvy they seemed at the time on an individual level—can now be seen to be a part of this larger initiative. Some key existing HP investment areas and product offerings are:

- **Enterprise Virtual Array:** (Internal) HP array-level virtualized storage product with ongoing innovation
- **P4000:** (Acquired) HP’s LeftHand Networks acquisition provides software-virtualized iSCSI networks for scalable block virtualization
- **SAN Virtualization Services Platform:** (Partnership) Heterogeneous network based virtualized storage management and migration
- **X9000:** (Acquired) HP’s IBRIX acquisition provides scale-out NAS file system virtualization

This list highlights that HP has been quietly focused on this development for a long time and has made significant steps over the last 12 months or so to set itself up for the future. And, as reassurance to its customers, HP also has enormously deep pockets should other investments be needed to achieve either the Virtualized Storage Infrastructure component and/or other parts of the overall Converged Infrastructure.

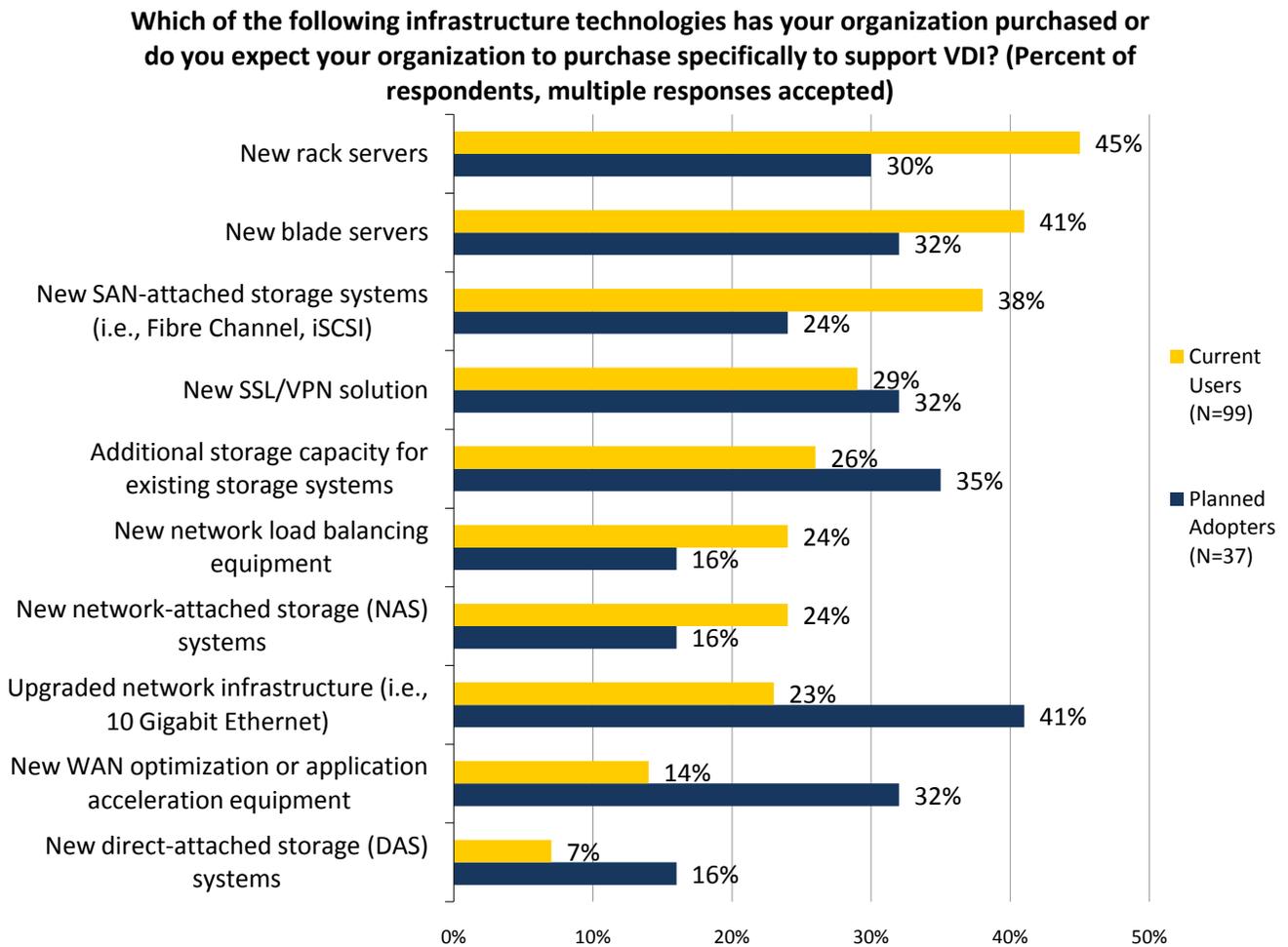
## Real World Applicability

The intent, the investments, and the possibilities of the Virtualized Storage Infrastructure all sound very beguiling. Clearly, HP is committed to this approach. But what can it mean in practice? First and foremost, referring back to the major market challenges of unabated data growth and the intense accompanying focus on cutting the costs of IT and storage, most organizations are probably already at the point where only a virtualized approach can make a sufficiently significant difference to their traditional infrastructure model. Other technical tweaks in individual subsystems are useful, but not sufficient. Indeed, it is not “if,” but “when” standard commercial computing buyers will be forced to handle ‘new era’ data—if they haven’t already—and thus require some sort of new approach, such

as this from HP. Although glib, a new world requires a new way. That said, pragmatically, some older truths remain true, even as the world changes. Thus, for example, while the recent economic conditions have clearly highlighted the ‘uncertain’ nature of business and shown virtualization technologies are key responses for the ‘new era’, those very same technologies also provide the most flexible approach to respond to the old adage that ‘we don’t know what we don’t know,’ and provide an improved, flexible foundation across the whole business of IT—whatever the future might reasonably be expected to hold.

Another good specific example in the ‘new era,’ and an area that is receiving a lot of attention right now, is that of VDI, or virtual desktop infrastructure. Yes, it’s more virtualization and it is, of course, based upon all the same tenets, drivers, and possibilities as other areas of virtualization. But while it has inherent value, it also can cost a lot, as the data in Figure 7 shows. Whether a user looks at all the areas of expense, or simply at the storage, it is clear that VDI has a big outlay as well as a payback. Combining a VDI implementation with HP’s Virtualized Storage Infrastructure could surely contain or even preclude some of the storage costs. HP’s Converged Infrastructure could garner efficiencies and optimization across even more of the technologies and expense associated with implementing VDI.

*Figure 7. Data Center Infrastructure Purchases Made Specifically to Support VDI*



Source: Enterprise Strategy Group, 2009.

## The Bigger Truth

HP is one of only a very few organizations today that could even attempt what is represented by the Virtualized Storage Infrastructure and its umbrella superstructure, the Converged Infrastructure. It is clearly an ambitious leap forward, but HP has historical proof points as a market leader *and* has the services, product portfolio, and financial wherewithal to prove that it is a horse worth betting on. As the leader in shipment numbers of servers and storage and with well over 11,000 patents, as well as massive integration experience with major applications providers (Microsoft, SAP, Oracle, etc.), the company is clearly both well positioned and in possession of the necessary clout to get things done. Even so, the mixed approach of invention, acquisition, and partnering in order to build out the vision is likely the only practical way and as such demonstrates a pleasing pragmatism. The company's credibility to deliver actually increases when looking at the broader full infrastructure virtualization where there is already a considerable set of virtualization assets in HP's portfolio such as BladeSystem, Insight Dynamics (to manage virtual and physical servers), Virtual Connect, and the ProCurve networking products.

Viewed against the background of the market challenges and needs of this new era of IT, only a significant new approach is likely to make any real difference. IT needs to move away from the Band-Aid or 'finger in the levee' approaches that have just about kept IT going to date, but which are unlikely to be able to keep pace as demands increase further and faster. In large, complex, and demanding data centers, the traditional static silos of IT equipment and applications must give way to *'liquid IT'*; 'just-in-case' provisioning must give way to 'just-in-time' and 'just enough' while *optimized efficiency* must be just as important as *operational effectiveness*. Few vendors have this figured out and even fewer have a viable design concept. HP actually has a credible approach and pedigree. Converging, virtualizing, and automating everything is clearly the way to a much better future. Although hesitant to use an over-used phrase, HP's initiatives genuinely could represent a paradigm shift, giving rise to a new era of IT delivery that is in synch with the new era of IT demand.



Enterprise Strategy Group | **Getting to the bigger truth.**

20 Asylum Street | Milford, MA 01757 | Tel:508.482.0188 Fax: 508.482.0218 | [www.enterprisestrategygroup.com](http://www.enterprisestrategygroup.com)

<b>Title:</b>	The Context and Value of a Fully Virtualized Storage Infrastructure: HP's Approach by Enterprise Strategy Group	
<b>Pub number:</b>	4AA0-2061ENW	(English (U.S.), Worldwide)