

White Paper

Advancing Business Value through Virtualization

Quantitative and Qualitative Insights

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Executive Summary

This paper summarizes and evaluates the prevalence and efficacy of data center virtualization deployments, as well as the hardware that supports them. The conclusions drawn from this report are based on analysis of both quantitative market research and two qualitative interviews with a CIO and CTO in healthcare and finance, respectively. Each customer, referred to ESG by [Hewlett-Packard \(HP\)](#), had extensive experience deploying both server and desktop virtualization. The goal of the study was to determine the IT and business drivers to adoption of virtualization technologies, the expected and realized benefits, ensuing infrastructure decisions, future outlook of the data center, and best practices for deployment. The findings indicate:

- A move beyond basic consolidation and cost containment for server virtualization.
- Improved economics through OPEX and deferred CAPEX.
- Better reliability, availability, and agility.
- A more consistent end-user experience with desktop virtualization.
- Network architectures influenced by virtualization and cloud computing.
- Potential for movement of workloads into the public cloud.

In all cases involving virtualization, organizations must make any necessary investments in data center infrastructure to support the initiative. Failing to do so will diminish return on investment, could lead to performance-related challenges, and even pose career risk in some cases.

Customer Quotes:

*"The directive from the leadership team is to be as efficient as possible. **If we show an ROI, we go forward with the initiative.**"*

*"Today I see more and more vendors embracing virtualization. **I would not be surprised if we were 80-90% virtualized in the future.**"*

*"**Mobile enablement itself is worth its weight in gold alone**, notwithstanding the other benefits that come along with virtualization, such as increased ROI."*

*"My hardware decision was ultimately performance driven: who could best serve data and do so reliably? At the end of the day, **3PAR boxes were the cream of the crop.**"*

Business Drivers of IT Initiatives

Businesses are constantly seeking ways to improve the quality and efficiency of IT services. Although technological advancements over the past five years have enabled IT to introduce numerous efficiencies into the business, age-old and newfound IT challenges have hampered organizations from realizing the potential of their IT environments. These challenges range from traditional economic, regulatory, and staffing constraints that continue to handcuff IT, to the relatively new idea of "shadow IT," wherein employees utilize cloud applications like Dropbox without corporate approval, which conflicts with standards in compliance. Irrespective of the organization's industry or market segmentation, IT is faced with the task of efficiently and cost-effectively providing reliable, easy-to-use services.

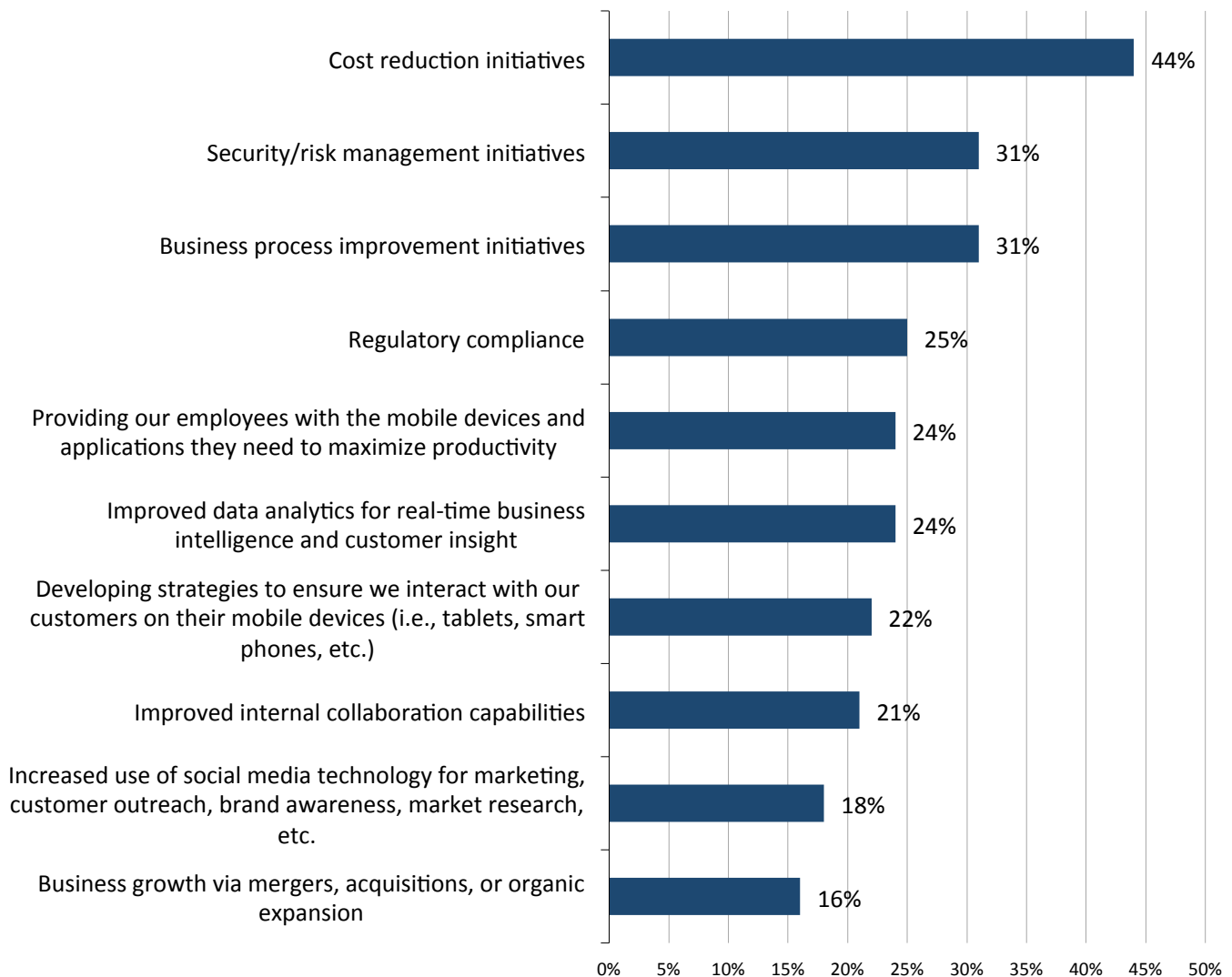
In recent years, the majority of IT initiatives have been rooted in economics. Specifically, cost reduction has ranked as the top business initiative impacting IT spending, as reported annually by the greatest percentage of ESG

research respondents. This can largely be attributed to macroeconomic conditions in the wake of the 2008 global financial crisis. While subsequent recovery has resulted in a consistent annual decrease in the number of respondent organizations identifying cost reduction as a top IT spending driver, economic uncertainty stemming from the potential ramifications of the “fiscal cliff” has reversed this trend slightly in 2013.¹

Accordingly, purchasing new technologies with improved return on investment (ROI) has been increasingly cited by ESG research respondents as a top cost mitigation strategy, as well as the top justification for IT investment.² Those technologies that have been validated to generate a positive ROI have been, and will continue to be, those that get deployed within the data center. As stated by one of the respondents to the qualitative interview, **“The directive from the leadership team is to be as efficient as possible. If we show an ROI, we go forward with the initiative.”** Other top drivers to IT investments include business process improvement programs, security and risk management initiatives, regulatory compliance, and mobile-device related initiatives (see Figure 1).

Figure 1. Top-ten Business Initiatives with Greatest Impact on IT Spending Decisions

**Which of the following business initiatives do you believe will have the greatest impact on your organization’s technology spending decisions over the next 12 months?
(Percent of respondents, N=540, five responses accepted) (Top 10 shown)**



Source: Enterprise Strategy Group, 2013.

¹ Source: ESG Research Report, [2013 IT Spending Intentions Survey](#), January 2013. All ESG research references and charts in this white paper

Virtualization and Cloud Technologies Align with Business Initiatives

The initial success of server virtualization was born out of necessity for data center consolidation and cost containment. By fundamentally parsing hardware and software, which eliminated the one-application, one-server requirement, organizations were able to dynamically pool resources and allocate them throughout the environment. Since virtual machines (VMs) have no additional footprint and cost a great deal less than physical servers, optimizing server utilization allowed organizations to decommission or reallocate capacity based on need, creating massive savings on unnecessary floor space, power, and cooling. When VMware and Microsoft supplemented their hypervisors with features such as live VM migration and high availability, organizations with pervasive deployments were able to achieve higher level management capabilities, tier-1 application virtualization, and business process improvement.

Desktop virtualization and network virtualization are a direct result of the success of server virtualization. While growing costs associated with supporting consumerization and mobility as well as those linked to data center consolidation initiatives are economic drivers for desktop, network virtualization, calculating true cost metrics, and evaluating return on investment are challenging. This is primarily due to the initial infrastructure outlay they require. Accordingly, these technologies are just beginning to gain traction.

Storage virtualization is a slightly different case as it actually predates server virtualization (although the descriptor wasn't always the same, and—frankly—some users didn't even realize they were enjoying the benefits of storage virtualization as it was seen as a functional element of their storage rather than a “thing” in-and-of itself). *However*, storage virtualization has only really achieved prominence as the need to simultaneously manage costs down and service levels up—itsself, ironically, often driven by server virtualization!—has prompted both an operational and financial imperative for change in the way storage “gets done.” The need for integration across and between virtualized platforms also becomes abundantly clear once IT becomes provisioned dynamically from a range of pooled (i.e., virtualized) compute, network, and storage resources.

As organizations continue to seek IT initiatives that improve efficiency and drive down costs, virtualization and cloud technologies will remain viable options. These initiatives will require a well thought out strategy and execution plan that includes:

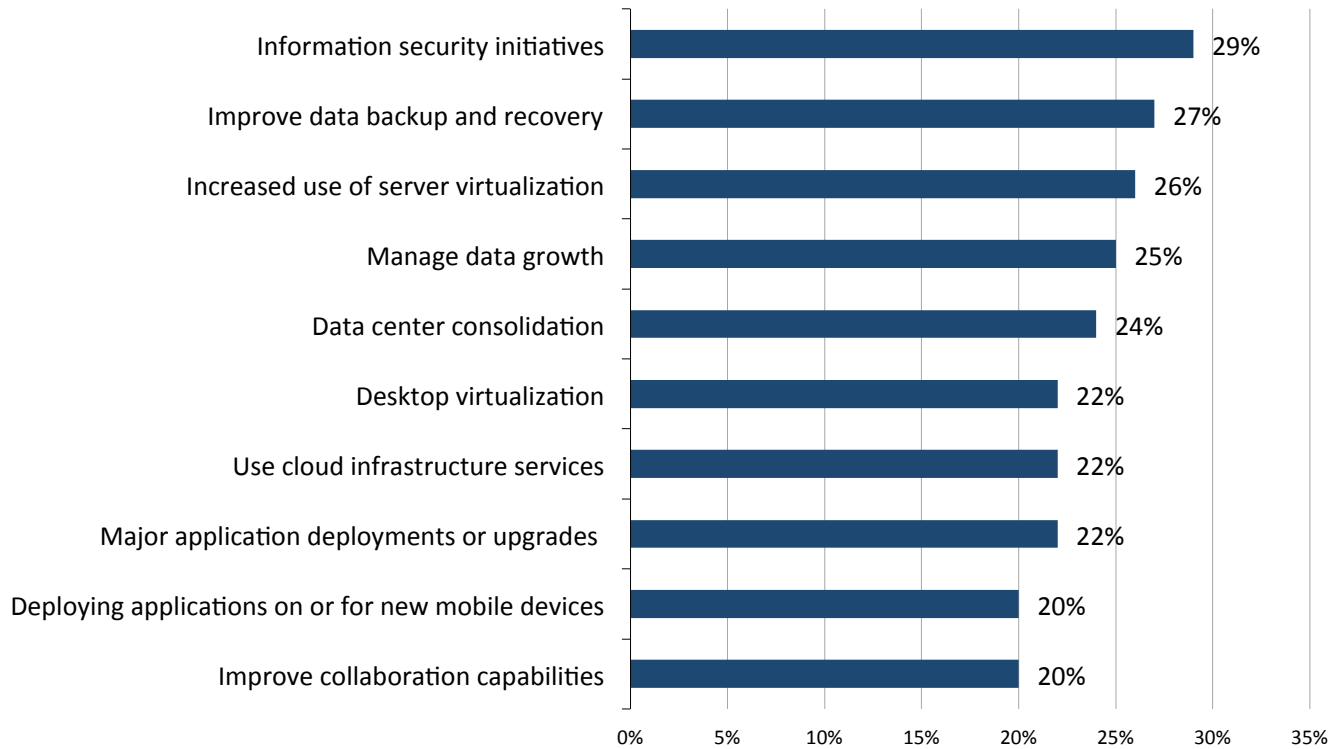
- Long-term vision.
- Infrastructure upgrades.
- Partnership with trusted vendors and channel partners.
- Technical and professional services.
- A potential change and prioritization of IT skill sets.

Virtualization Deployments and Customer Use Cases

As part of ESG's annual IT spending intentions survey, respondents were asked to identify their organizations' most important IT initiatives over the next 12 months (see Figure 2). As they have been since 2010, increased use of server virtualization, improved backup and recovery, data growth management, and information security initiatives are all top 2013 IT priorities. In addition, for the first time, desktop virtualization has cracked the top ten. Based on the fact that the adoption of server virtualization is nearly ubiquitous among enterprise and midmarket organizations, it makes sense that desktop virtualization and cloud infrastructure services—which offer many of the same benefits as server virtualization, including the rapid provisioning of resources—have gained increased attention recently.

Figure 2. Top Ten Most Important IT Priorities for 2013

Which of the following would you consider to be your organization’s most important IT priorities over the next 12 months? (Percent of respondents, N=540, ten responses accepted) (Top 10 shown)



Source: Enterprise Strategy Group, 2013.

Server Virtualization

The success of server virtualization is well documented. Though the primary use cases for deployment remain consolidation and cost containment, leading-edge IT organizations have been able to:

- Target the next tier of applications.
- Automate manual IT tasks through high-level management and orchestration capabilities.
- Maximize IT infrastructure efficiency.
- Streamline access to IT resources.

The two customers with which ESG spoke reported virtualization ratios of 67% and 100% of physical servers in their primary data centers—numbers that exceed the market average yet are not altogether uncommon in today’s IT environments. The primary drivers for their initial deployments ranged from “*economics*” to “*managerial advantages associated with VMware vMotion and high availability.*” In terms of economics, the ROI derives from hard savings and soft savings. Hard savings, in this case, include reduced operational (OPEX) costs associated with power and cooling and deferred capital expenditures (CAPEX) on hardware. Soft savings encompass simplified management, reduced downtime, improved performance, increased agility, and hardware choice (“*because you’re not reliant on a specific platform*”).

The primary challenges with server virtualization remain around governance and compliance. Either internal regulations or vendor requirements can preclude customers from virtualizing certain workloads. This is particularly the case in healthcare, where virtualizing certain critical patient systems is off limits.

“In this case, we have two options: go ahead, virtualize, and be out of compliance with the vendor, or work with the vendor to try and make him understand that the application can run in that type of environment. Today I see more and more vendors embracing virtualization. I would not be surprised if we were 80-90% virtualized in the future.”

The overall success of server virtualization has allowed organizations to operate more efficiently and at a reduced footprint. This is merely the initial step in leveraging server virtualization to consolidate data center hardware and contain costs. As organizations move forward with their deployments and look ahead to next-generation data centers, virtualization will be the underpinning technology that enables organizations to achieve operational efficiency, mobility, and execution on cloud computing strategies (see *More Work to Be Done*).

Desktop Virtualization

ESG has observed an increased trend that firmly seats interest in desktop virtualization in the current top-ten most important IT priorities list reported by respondents to ESG’s latest IT spending intentions survey. Born out of the success of server virtualization, desktop virtualization has been driven largely by mobility and consumerization, which have challenged IT with the task of manually securing, updating, and patching the growing number of endpoints—often consumer devices—that are accessing the corporate network.

Traditional, decentralized desktop and application delivery can no longer effectively and economically scale with mass device proliferation and an increasingly mobile workforce. Respondents to an ESG study identified both OPEX and CAPEX as top PC challenges.³ Desktop virtualization offers a solution by centralizing management of endpoints within the data center and restoring control to IT administration, which improves business processes and mitigates costs.

From an operational standpoint, those who have deployed desktop virtualization have cited desktop provisioning (43%), patch management (38%), and centralized backup of devices (37%) as the top benefits realized as a result of implementation. Ninety-nine percent of respondents indicated that they have derived some level of benefit from deploying desktop virtualization.⁴

These results echo customer feedback. Both customers had deployed desktop virtualization extensively, citing ROI, improved performance, and consistent desktop experience as the primary drivers for adoption.

“Consistency of end-user experience is the predominant benefit of desktop virtualization in healthcare. Clinicians require mobile access to patient information and want a consistent desktop image every time with no variation. Mobile enablement itself is worth its weight in gold alone, notwithstanding the other benefits that come along with virtualization, such as increased ROI.”

Consistent with ESG findings, both customers reported that the biggest challenge deploying desktop virtualization is latency. Desktop virtualization places added workloads on the infrastructure. Accordingly, maintaining performance and reliability requires strategic planning and investment on the part of IT. Although the benefits of desktop virtualization are becoming better understood, the realization of its potential is contingent upon an initial outlay on data center infrastructure. In any event, *“the end result is worth any challenges that we’ve withstood.”*

Network Virtualization

ESG research shows that, to this point, network virtualization technologies such as software-defined networking (SDN) are more in line with the needs of cloud and service providers, as well as academia, than with mainstream enterprise organizations.⁵ Although enterprises are faced with data center consolidation and virtualization initiatives that strain network infrastructure and administration, they are addressing these challenges with tactical approaches: hiring additional personnel, upgrading the hardware, and flattening the network. End-user

³ Source: ESG Research Report, [Desktop Virtualization Market Evolution](#), February 2013.

⁴ Source: Ibid.

⁵ Source: ESG Research Brief, [Software-Defined Networking: Enterprise View](#), September 2012.

organizations recognize the value in SDN, but until they surpass the threshold whereby their networks can no longer keep pace with scale, SDN is more of a technology to follow and roadmap than one that's on the horizon to be deployed imminently.

This research aligns with customer testimonials. While neither had deployed network virtualization up to this point, one customer stated that server virtualization, and private cloud environments in particular, could be the impetus that drastically changes the networking landscape.

“Networking is the last piece of the puzzle to truly evolve. If you took someone who worked on a network switch 20 years ago and put them in front of one today, there would not be much difference. Now, server virtualization has made it so VMs could reside on any given physical server at any moment, putting added import on networking. Driven primarily by SDN, I think things are going to change drastically over the next three to four years.”

Storage Virtualization

Unyielding data growth remains the primary driver of storage virtualization. In addition to natural application growth, social media, web 2.0 applications, smartphones, and tablets have enabled an onslaught of both content creation and consumption. Traditionally, organizations have addressed this challenge by simply adding storage capacity, which has generated tremendous inefficiencies in the storage domain characterized by underutilized resources and un-sharable storage capacity stranded behind specific uses. In some cases, upwards of 70% of storage capacity is sitting idle, locked behind a particular server or purpose, while another silo might be running out of capacity.

Storage inefficiencies have impeded other initiatives as well, namely expansion of server virtualization. The storage challenges associated with server virtualization cited by respondents included the capital cost of new storage infrastructure (36%), scalability problems (25%), operational costs of new storage infrastructure (24%), and the impact on overall volume of storage capacity (21%). When asked what would help them to expand their virtual server implementations, in addition to more training, better storage capabilities—faster provisioning, better scalability, increased use of virtualized storage, and better storage migration tools—were top of mind.⁶

Storage virtualization provides the necessary efficiencies by reclaiming stranded storage, consolidating storage management, providing advanced features, enabling non-disruptive migration, and lowering total cost of ownership (TCO). Storage virtualization enables organizations to improve performance and increase capacity without disrupting operations. Because storage is not dedicated to any specific server or application, it creates a much more flexible and responsive environment while also increasing utilization rates. Moreover, storage virtualization can simplify storage tiering, which enables users to get away from a default storage approach and move to a mix that better meets their application needs and financial budget.

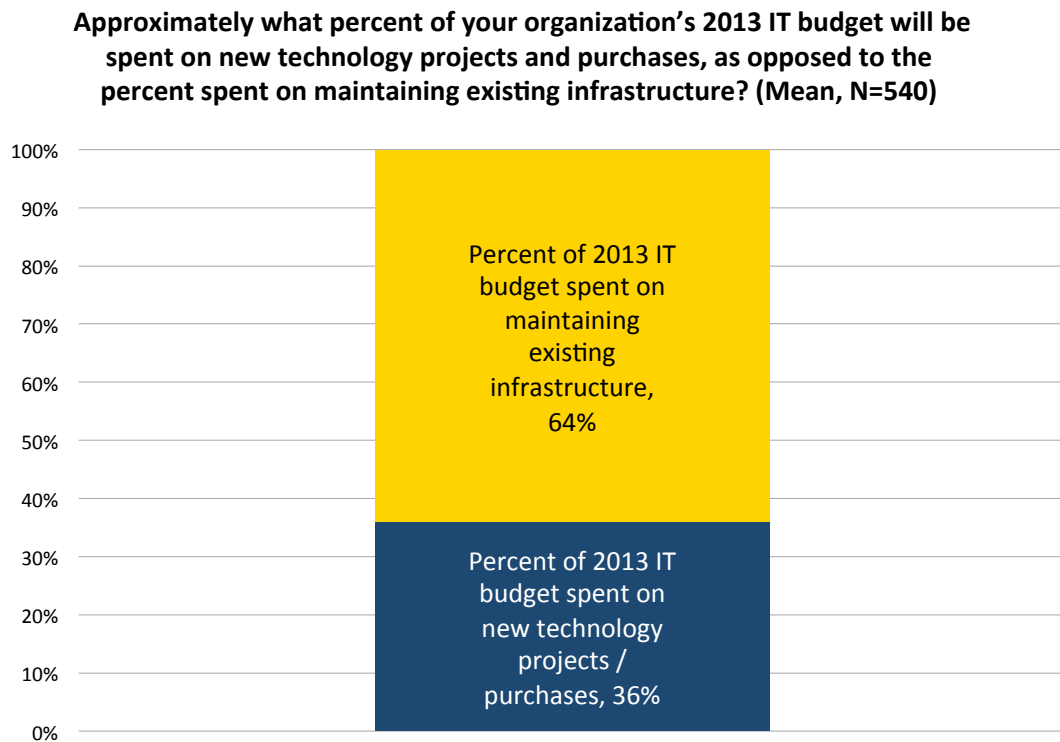
More Work to Be Done

Although IT priorities aim to produce measurable business benefits, IT organizations that fail to account for the change in data center demands tied to new technology implementations will struggle to realize the full potential of their initiatives. Even more so, those that neglect to upgrade their infrastructure to account for added workloads risk spending the majority of their time in break/fix mode rather than innovating.

ESG asked respondents to consider their 2013 IT budgets and assign a percentage breakdown of spending that would apply to *maintaining* existing infrastructure as opposed to spending on net-new technology projects (see Figure 3). Respondents indicated that nearly two-thirds (64%) of the typical 2013 IT budget would be earmarked for the upkeep of existing infrastructure.

⁶ Source: ESG Research Report, [The Evolution of Server Virtualization](#), November 2010. All ESG server virtualization references and charts in this white paper come from this research report.

Figure 3. Budget Allocation on New Technology versus Old Technology



Source: Enterprise Strategy Group, 2013.

While the cost of maintaining existing IT environments will always be a factor, in order for technology to become strategic—rather than tactical—when it comes to business agility and innovation, organizations must strive for a more balanced ratio. IT can achieve this by:

- Investing in infrastructure that is capable of serving multiple projects, architectures, and use cases.
- Aligning IT through certification, training, and education to get the team together and headed in the right direction.
- Partnering with a trusted advisor in the technology ecosystem that can help establish goals and accelerate their execution and achievement.
- Embracing innovation without increasing risk.
- Leveraging infrastructure and consumption models that fit business needs and help shift budget into new technology initiatives and innovative projects.

Protecting Your Investment

Whether desired or incidental, many IT initiatives—particularly those centered on maximizing efficiency—impact data center infrastructure to some extent. This is true for virtualization technologies. Server virtualization maximizes the workload that can run on a given physical device, and automated VM mobility and load balancing require that the network is optimized to handle the additional processes. Similarly, desktop virtualization centralizes endpoint management within the data center, which again adds payload on top of traditional workloads. Storage virtualization is a crucial “cornerstone” of the overall foundation—all IT is about manipulating and gaining access to data. And without the ability for that data to be shareable and readily moved between applications and systems as well as to be economically viable, the whole edifice can come crumbling down. Storage may not always be sexy and beautiful in a cloudy, big data, mobile, application-centric world, but it can make everything look ugly quickly if it is not well implemented. In order to support the dynamic demands and financial

goals across IT—to *protect your investment in IT in general*—it is not too strong an assertion to proclaim storage virtualization as a foundational prerequisite.

Evaluating all of the relevant costs and benefits is imperative to the success of any virtualization project; economically viable strategies exist and can yield impressive returns with a comprehensive understanding of the impact a virtualization initiative will have on IT infrastructure and how to successfully plan and invest for it. This investment in infrastructure is critical for the successful deployment of virtualization. Companies whose infrastructure cannot keep pace with the added workloads will fail to see the operational and productivity gains that lead to a positive ROI. In order to protect their investments, organizations must align virtualization deployments with data center infrastructure solutions that scale. Those that do so often find that the initial outlay yields significant savings over time.

Investment decisions should consider factors such as the operational impact to IT and IT infrastructure investments as well as the potential benefits to areas such as employee productivity, data security, and regulatory compliance. They also require a thorough understanding of how the technology has advanced and the various considerations that will impact purchasing decisions. As a result, a holistic approach to a cost-benefit analysis can help demonstrate the actual costs and value of virtualization compared with those of traditional environments.

HP as Your Solution Provider

Both customers with whom ESG spoke were HP customers top to bottom, citing superior technology, support, innovation, and hardware longevity as the primary drivers for the partnership. In return, both customers provided a test bed for HP that has resulted in first-line innovations and reference architectures for industry-specific applications (the IT professional in health care generated innovations around Epic—a system for digital medical records—that HP was able to bring to its customers). It truly is an *“incredible partnership.”*

One customer indicated that HP’s 3PAR storage systems promulgated implementation. Working for a full-service investment bank with a small hedge fund, the organization required infrastructure that could process heavy performance-driven databases that occupied over 70% of I/O: market data feeds, trading feeds, algorithms, and monitoring.

“My hardware decision was ultimately performance driven: who could best serve data and do so reliably? As a storage and statistics nerd, I had calculated an IOP figure in my mind based on the organization’s requirements, and I weighed various solutions based on their ability to deliver that number at cost. At the end of the day, 3PAR boxes were the cream of the crop.”

For this midmarket organization, HP was able to deliver the most reliable, dependable, and durable solution. To that last point, the customer suggested the possibility of moving all or some of his workloads into the cloud once the legs on his systems run out. How the environment shakes out will depend on cloud evolution and whether cloud providers develop storage SLAs for latency sensitive data and stringent performance requirements. If not, the organization will run a hybrid environment with local infrastructure supplied by HP.

Another customer utilized an HP reference architecture as the infrastructure foundation for his desktop virtualization deployment. Reference architectures fall under the category of integrated computing platforms (ICPs), which are becoming increasingly popular. ESG data reveals that although 46% of surveyed organizations currently support a do-it-yourself (DIY) solution, just 28% indicate that that is their preferred method of infrastructure deployment.⁷ Accordingly, 64% of respondents indicated that reference architectures or fully integrated/pre-configured solutions—designed, built, and tested for integration—were their organizations’ preferred infrastructure model. The customer was able to deploy an HP “Pod” Infrastructure to support his desktop investment, a solution that he has *“deployed very successfully.”*

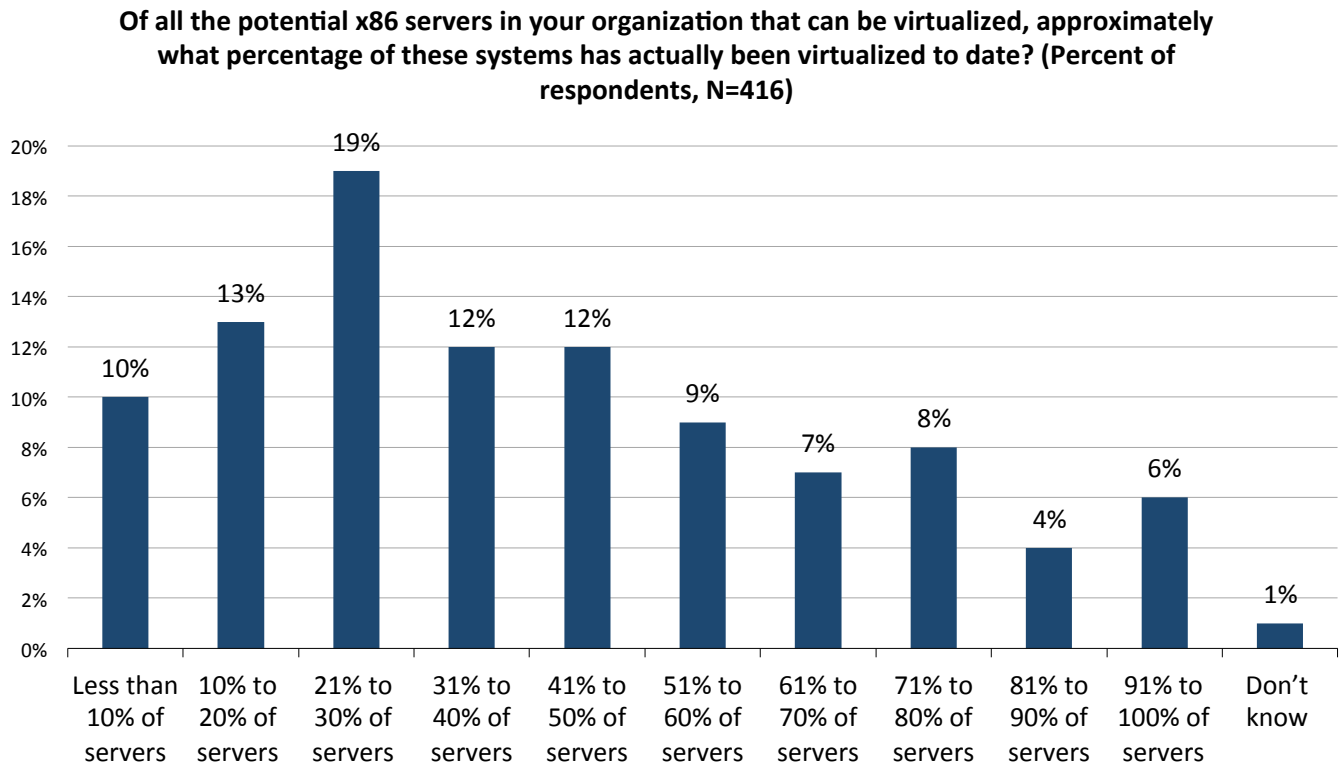
As a leader in virtualization and cloud strategy, HP optimizes the investment in infrastructure, delivers reliable solutions, and helps its customers achieve the next level of success.

⁷ Source: ESG Research Brief, [Virtualized Computing Infrastructure Preferences](#), April 2012.

Advancing the Current State of IT into Favorable Business Value

Virtualization is currently being leveraged to help prepare customers for what’s next. Cloud is one of the future places people will go if it makes good economic and business sense and can provide the SLAs that enable customers to stay in compliance with governance and regulations. However, while virtualization may be a proverbial stepping stone in the process towards the next-generation data center, significant value is still being left on the table. Despite customer testimonial, the majority of ESG research respondent organizations have virtualized less than 50% of all potential x86 servers that can be virtualized (see Figure 4).

Figure 4. Percent of x86 Servers Virtualized to Date



Source: Enterprise Strategy Group, 2013.

Though organizations can achieve basic consolidation and cost containment through initial deployments, higher level value is achievable only through increasingly pervasive implementations. This includes VM mobility, high availability, improved performance, and simplified management.

Figure 4 reveals an opportunity both for end-users seeking to optimize their data center environments and for IT solution providers looking to gain market share. For end-user organizations, the many benefits around server virtualization—and virtualization technologies in general—make (increased) deployment a near no-brainer. For IT solution providers like HP, the task is to communicate to their clients the value in these solutions and how, as a trusted partner, they can help enable successful deployment.

Customers continuing their investment of virtualization should start to hone in on:

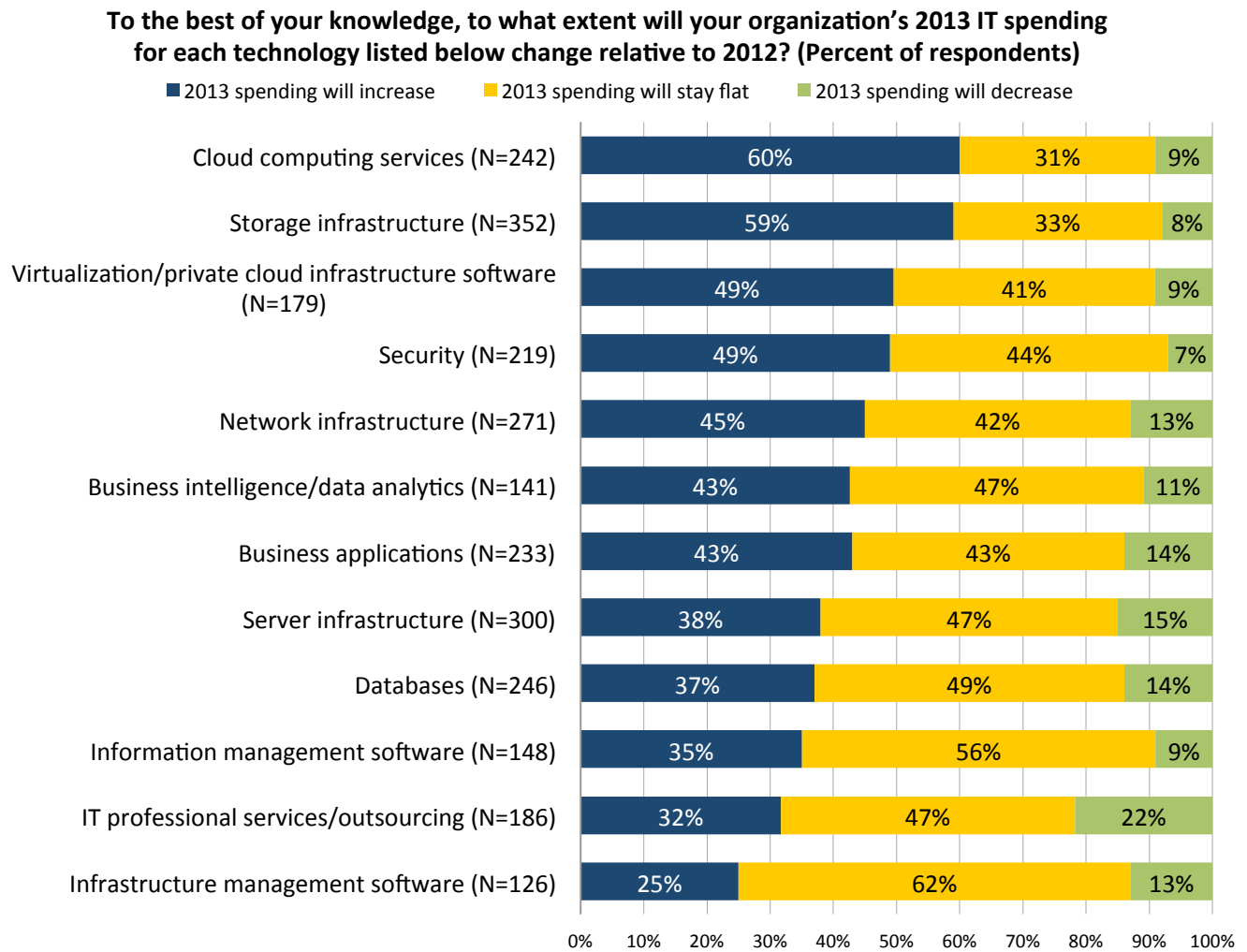
- New business-critical applications.
- Security.
- Network architecture and design.

As organizations make these moves, they want to maintain a level of investment protection as they build for the future. One such direction is to the cloud.

Cloud Computing

ESG asked survey respondents to share their 2013 spending plans for a number of specific technology segments. According to Figure 5, IT departments are most likely to increase 2013 spending in the area of public cloud computing which is in line with the increased adoption and use of these services that ESG has tracked over the last several years. It also suggests that organizations will look to cloud-like infrastructures to achieve top business priorities. With managing data growth, application deployments and upgrades, and even desktop virtualization being identified as top-ten IT priorities, it makes sense that more than half (59%) of respondent organizations expect to increase spending for storage infrastructure, while only 8% will spend below their 2012 levels. As has been the case since 2010, security remains the area where organizations are least likely to compromise, with only 7% of respondents indicating decreased spending and nearly half (49%) planning to increase spending in 2013.

Figure 5. 2012 to 2013 Spending Change in Specific Technology Areas



Source: Enterprise Strategy Group, 2013.

Virtualization and private cloud infrastructure software ranked third in terms of spending increase relative to 2012. This suggests that organizations will look to leverage their increasingly pervasive server virtualization environments as the foundation for private cloud computing infrastructures. In doing so, they hope to achieve many of the tenets of public cloud computing: rapid elasticity, resource pooling, broad network access, on-demand self-service, and usage-based billing and tracking.

Figure 5 reveals that virtualization technologies are an excellent means of protecting investment. Rather than wholly moving into the cloud, as some service providers would like customers to think is the norm, many

organizations will develop hybrid cloud platforms that deploy high degrees of virtualization in-house. As this occurs, it will be imperative to partner with IT solution providers, like HP, with expertise to help onboard clients into hybrid environments.

The Bigger Truth

As an offshoot of the global economic landscape, organizations seeking cost mitigation strategies are turning to innovative solutions that can deliver an ROI. Corporate directive to IT is clear: Become more efficient. In turn, organizations are looking to virtualization and cloud solutions to deliver economic benefit as well as business process improvement. To this point, companies across the spectrum of market segmentation are primarily virtualizing servers and desktops. SDN technologies are increasingly deployed in large service provider environments and in academia, but are still some time away from penetrating the enterprise market.

Despite the favorable economics and business benefits of virtualization, this study revealed that there is still work to be done, particularly when it comes to properly sizing new workloads and aligning technology deployments with data center infrastructure upgrades. To this point, customers categorically stated the value of a trusted partnership with an IT solution provider, such as HP, with relevant expertise in terms of strategy and consulting. Such vendors can help scope current need as well as project out for future demands, while helping to bolster deployment with infrastructure solutions that scale.

Virtualization technologies are proving to be the foundational platform for private cloud and, as organizations move more workloads into the public cloud, hybrid environments, too. Although they provide an opportunity for organizations to achieve high-value dividends, they must protect their investments with hardware upgrades and strategic partnerships with trusted vendors.

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