The Operational Impact of Virtualization in the Datacenter

A Research Study of VMware Customers

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Executive Summary

In today's competitive marketplace, business agility depends on IT agility. Yet according to Forrester Research, companies still invest 65 to 70 percent of IT budgets on maintenance and support, leaving just 30 to 35 percent for new investments. Virtualization addresses this challenge by helping organizations shift IT resources from mundane tasks to more strategic projects that create value for the business. With a proven track record for reducing capital expenses (CapEx) by up to 60 percent, VMware business infrastructure virtualization solutions also enable organizations to significantly reduce IT operating expenditures (OpEx).

To quantify the operational impact of virtualization on IT operations, VMware recently completed a research study of the IT management practices of 30 customers in a variety of industries. Respondents completed an online survey and participated in a series of roundtable discussions with peers. The research compared time spent performing one-time and day-to-day tasks in physical and virtual environments.

The study's findings revealed:

• 94 percent of respondents realized operational savings with virtual infrastructure for both one-time tasks and day-to-day tasks. A third of surveyed organizations improved operating efficiency by 50 percent or more.

• For one-time server management tasks, half of respondents reported virtual machines take 50 to 90 percent less time than traditional physical servers. Nearly two-thirds of respondents reported the specific, one-time tasks of provisioning servers, decommissioning servers and migrating servers from one datacenter to another each took at least 75 percent less time with virtualization.

• For day-to-day tasks, more than a quarter of respondents said virtual machines saved at least 50 percent of their time when compared to physical servers. Half of all respondents stated performing the specific, day-to-day tasks of hardware maintenance, rolling back from unsuccessful patches and rolling back from unsuccessful configuration changes each took at least 75 percent less time with virtualization.

By simplifying and automating less valuable IT activities, VMware virtualization solutions dramatically reduce routine management and maintenance tasks and their associated labor hours, saving organizations energy that can be reapplied to new business efforts. VMware solutions enable companies to improve productivity and service availability, while reducing operating costs.

The lessons learned from VMware customers in this research provide valuable insight for other companies seeking to achieve operating cost savings as they deploy virtualization solutions. Those beginning their virtualization journey will benefit from the insights and best practices that participating organizations outlined around visibility and measurement, process alignment, policies and automation.

Introduction

Manufacturers historically have struggled to maximize value while simultaneously minimizing the inputs of labor, material and time. To achieve goals, they embraced lean manufacturing and quality management methodologies such as Six Sigma and ISO 9000 standards to optimize the management of capital-intensive plants. Today, physical factories consistently operate at 80 to 100 percent of capacity.

Unfortunately, IT "factories"—today's data centers—typically run at 10 percent or less of total capacity and require significant manual labor to operate. Their inefficiencies are the result of rigid infrastructure and overwhelming complexity, which constrain productivity and business agility. While ensuring a highly available infrastructure, many of today's data centers are built-in technology silos that require highly skilled personnel to perform mundane maintenance and narrowly focused tasks instead of concentrating on critical projects that move the business forward.

Virtualization technology enables the application of "just-in-time" manufacturing principles in IT, creating a more dynamic, efficient IT organization with lower costs. With virtualization, experienced IT staff is now available to collaborate more with business stakeholders, respond more quickly to their needs, and deliver innovative solutions.

Gartner analysts identified virtualization as one of the top 10 strategic technologies for 2009[1]. Companies of all sizes have adopted and rapidly continue to adopt virtualization solutions because server consolidation has proven to significantly reduce capital expenses. Now, these same companies are also seeing virtualization as a way to improve operations and productivity.

Yet over the past several years, some have claimed that virtualization adds complexity to IT operations. So what is the productivity impact of virtualization? With virtualization, can companies gain not only capital savings, but also operational savings? If so, how do companies leverage the savings to improve business agility and fund innovation? These are the questions that VMware sought to answer when it embarked on a quantitative and qualitative study of customers in January 2009.

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1 "Gartner Identifies the Top 10 Strategic Technologies for 2009." Gartner, Inc. press release dated October 14, 2008.

Study Methodology

To gain perspective into the operational impact of virtualization on IT organizations and staff, VMware conducted a formal study of 30 unique customers in its Technical Account Manager (TAM) program. The following criteria were used to select the participants:

- **Experience:**
  Organizations with more than two years of enterprise virtual infrastructure deployment experience with staff investment.

- **Scale:**
  Organizations running more than 50 virtual machines, where the deployed virtual machines represent more than 20 percent of their IT x86 compute infrastructure.

In a two-step research process, participants completed an online survey to collect quantitative data about their virtualization deployment, staffing, policies, system management tasks and barriers to adoption. Respondents were then segmented according to role and industry, and invited to participate in a series of roundtable discussions with their peers. The roundtable discussions were designed to gather more contextual and qualitative information about survey responses, as well as uncover best practices in deploying virtualization solutions.

For the purposes of this study, OpEx is defined as the labor required to operate and deliver IT services. It excludes power, cooling and other operational energy costs. The reported time values are provided in terms of elapsed time and/or actual labor time.

The research focused on the effect of virtualization on specific tasks associated with server management. Administrative tasks were divided into two categories to determine the overall impact of virtualization on operational activities:

(1) One-time tasks that are discrete and happen very few times in a server's lifecycle (e.g. provisioning and decommissioning), primarily to get a new service online.

(2) Day-to-day tasks that occur on a regularly scheduled or an ad hoc basis (e.g. scheduled activities, such as backups, patching and disaster recovery (DR) testing, as well as unscheduled activities, such as outages, bugs and capacity issues). Given that scheduled activities occur in different cycles—twice a year, once a quarter, daily and weekly—calendared activities were considered day-to-day tasks.

The Organizations and Their Structures

The firms surveyed included small-to-medium-sized businesses and large enterprises across a variety of industries. Of the respondents, 73 percent had more than 500 server virtual machines under management with quantities ranging between 55 and 5,500, and a median of 1,000 virtual machines.

Organizationally, the findings revealed that most IT organizations begin with a vertically integrated model—where engineers manage everything from the physical box to guest operating system (OS).

Since respondents' organizational models and interpretations of server/administrator (admin) ratios differed, the survey results that follow focus on the actual tasks performed as part of a normal system admin role, and the impact that virtualization had on those tasks as measured by task-based time savings. While organizations varied by services delivered, technology portfolio and operating model, significant commonalities were observed on specific operational tasks.

The Survey Results: Virtualization's Effect on Operational Efficiency

Server virtualization inserts an abstraction layer between server hardware and operating system software. The abstraction layer enables considerable flexibility around how availability, business continuity, provisioning and other system management tasks are accomplished, but there is a specific skill set associated with managing the virtual layer.

While organizations have absorbed this skill set in different ways, the results of this survey show that despite adding an additional layer of software, virtualization improves productivity. In fact, 94 percent of respondents said their IT organization experienced improved productivity as a result of virtualization.

Accelerating One-Time Activities for Immediate Value Capture

More than three-quarters of IT professionals surveyed experienced significant efficiency gains for one-time tasks in a virtual environment over a physical environment. One-time tasks resulted in the greatest savings of time—both elapsed time and actual person-hours spent on task. Overall, 83 percent of respondents reported one-time server management tasks were improved by factors of at least 25 percent (see Figure 1).

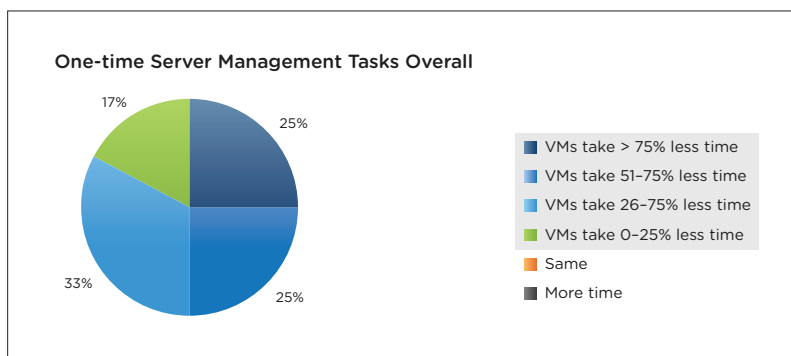
One-time Server Management Tasks Overall

- 17%
- 25%
- 25%
- 33%

- VMs take > 75% less time
- VMs take 51–75% less time
- VMs take 26–75% less time
- VMs take 0–25% less time
- Same
- More time

Figure 1. Time savings for one-time tasks

For the specific, one-time task of provisioning a server or virtual machine, more than 60 percent of all respondents cited at least 75 percent improvement. For that one-time service provisioning task, four out of five IT professionals surveyed said they spent up to 25 percent less time than business as usual (see Figure 2).
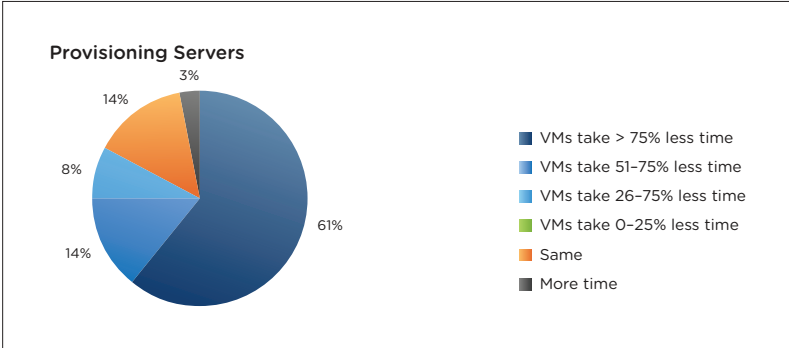
Provisioning Servers

- VMs take > 75% less time
- VMs take 51–75% less time
- VMs take 26–75% less time
- VMs take 0–25% less time
- Same
- More time

3%
14%
8%
14%
61%

Figure 2: For these one-time tasks, what is your best guess at the amount of time spent on virtual machines vs. traditional physical servers (lower=better)?

For the one-time tasks of migrating servers between data centers and decommissioning servers, more than two-thirds of all respondents cited greater than 75 percent improvements. For server migration tasks, 92 percent of respondents spent at least 25 percent less time with virtualization (see Figure 3).
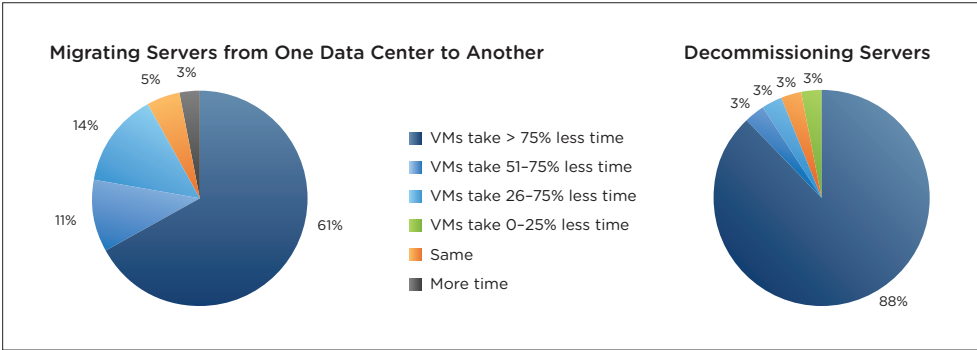
Migrating Servers from One Data Center to Another

- VMs take > 75% less time
- VMs take 51–75% less time
- VMs take 26–75% less time
- VMs take 0–25% less time
- Same
- More time

5% 3%
14%
11%
61%

Decommissioning Servers

3%
3% 3% 3%
88%

Figure 3: For these one-time tasks, what is your best guess at the amount of time spent on virtual machines vs. traditional physical servers (lower=better)?

More than half of those surveyed estimated virtual machines take at least 75 percent less time for deploying a new OS instance when compared to traditional physical servers, while more than half found configuring a new OS instance took at least 50 percent less time. No respondents cited either of these tasks taking more time with virtualization (see Figure 4).
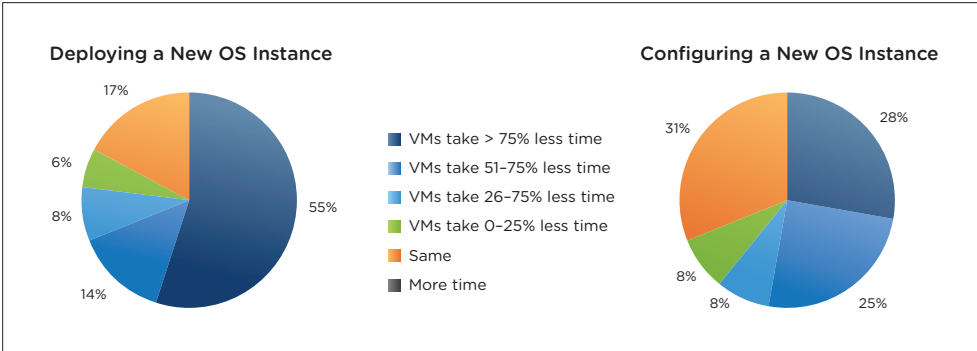
Deploying a New OS Instance

- VMs take > 75% less time
- VMs take 51–75% less time
- VMs take 26–75% less time
- VMs take 0–25% less time
- Same
- More time

17%
6%
8%
14%
55%

Configuring a New OS Instance

31%
28%
8%
8%
25%

Figure 4: For these one-time tasks, what is your best guess at the amount of time spent on virtual machines vs. traditional physical servers (lower=better)?

In addition to compressing elapsed provisioning time from months to days, roundtable participants stated that the ease of virtual machine service decommissioning and re-provisioning enables rapid asset reuse. For example, two international banking firms estimated they repurpose 60 to 250+ virtual machines per year. By VMware internal cost calculation and customer concurrence, that allows quick provisioning, decommissioning and reuse of compute resources to result in sustained hardware savings of $300K to $1.25M annually.

A global information and media company participating in the survey deployed more than 3,000 virtual machines over the last three years. The original motivation for deploying virtualization was to extend the life of its existing data centers. The IT organization has successfully deferred its planned 2006 datacenter expansion project by two years and counting by migrating existing servers and storage to existing facilities in other locations.

Virtualization saved the company significant operational costs and time. The IT staff avoided needless tasks, including reviewing application dependencies across hundreds of servers, scheduling a physical outage for the migration and conducting post-move user acceptance testing. Based on past experience, an average of 15 percent of the company's hardware and software assets would not survive a physical move unscathed. Therefore, the IT department also avoided spending time troubleshooting problems and creating and executing contingency plans.

Operationally, virtualization enabled the company's IT organization to:

• Cut server build and provisioning time from eight weeks to two weeks (a savings of 75 percent).

• Reduce application downtime from several days to a few hours during site migrations for various consolidation efforts, since migrating a virtual machine is much simpler than physically moving a server to a new facility.

In addition to its operational savings, the company reduced its CapEx, saving more than $20 million in hardware and the associated costs (power, cooling, insurance and personnel) to operate a new datacenter, plus the savings associated with not building and maintaining a new datacenter.

Reducing Time Spent on Low-Value, Day-to-Day Operational Activities

Survey respondents also reported productivity gains in day-to-day tasks accomplished in a virtual environment. The vast majority (97 percent) of IT professionals surveyed found virtualization to be equal to or better than physical environments in terms of productivity gains (see Figure 5). Only three percent of those surveyed noted any decrease in day-to-day productivity overall.
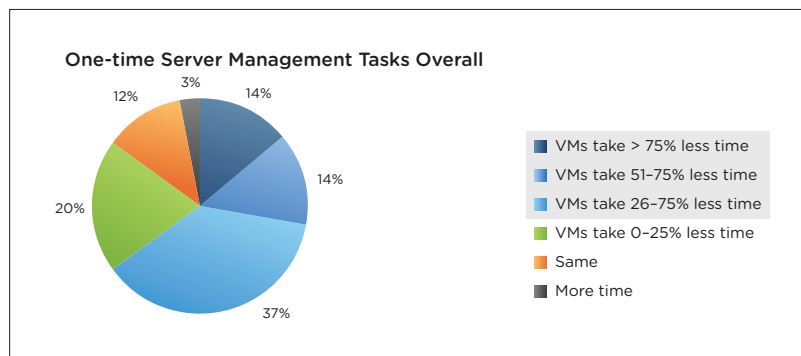

One-time Server Management Tasks Overall

3%
12%
14%
14%
20%
37%

- VMs take > 75% less time
- VMs take 51–75% less time
- VMs take 26–75% less time
- VMs take 0–25% less time
- Same
- More time

**Figure 5.** Time savings for day-to-day tasks

The day-to-day tasks of performing hardware maintenance and reverting back to a previous configuration when a problem is experienced upon patch rollout can be time consuming and difficult. In a virtualized environment, both tasks resulted in a time savings of at least 75 percent by roughly half of all respondents (see Figure 6).
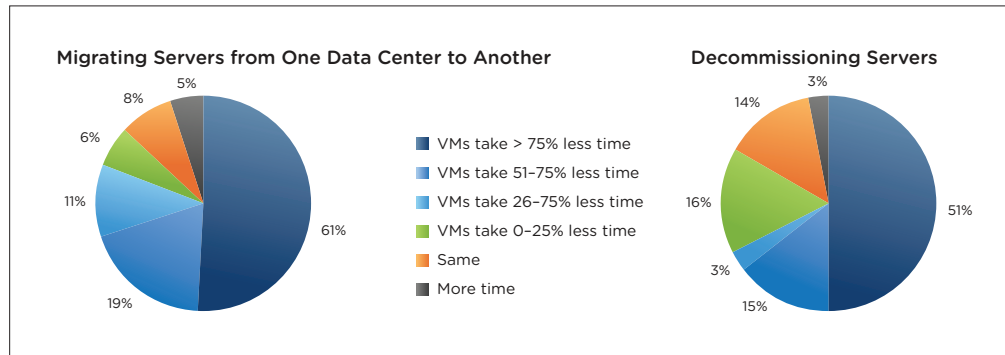
Figure 6: For these day-to-day tasks, what is your best guess at the amount of time spent on virtual machines vs. traditional physical servers (lower=better)?

Similarly, half of all respondents reported they spent at least 75 percent less time reversing configuration changes. 69 percent of respondents achieved at least 25 percent improvement (see Figure 7).
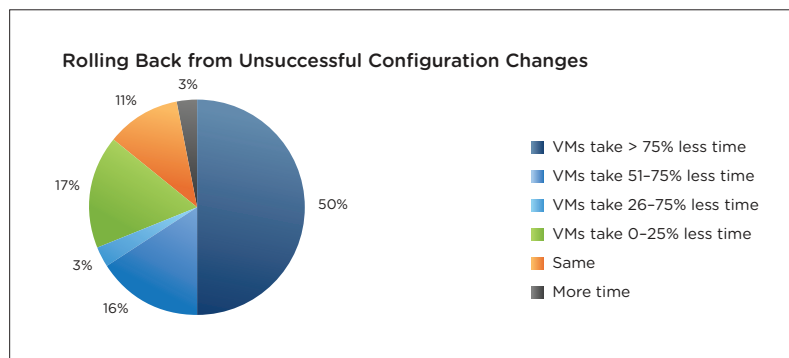
Figure 7: For these day-to-day tasks, what is your best guess at the amount of time spent on virtual machines vs. traditional physical servers (lower=better)?

Survey respondents also reported material improvements in the time it now takes to perform the day-to-day tasks of troubleshooting and fixing hardware problems, as well as managing and testing DR plans with half and 41 percent of respondents, respectively, reporting these tasks were now taking at least 50 percent less time. For testing upgrades, patches, and configuration changes and maintaining documentation (run books and DR plans), roughly half of those surveyed said virtual machines saved them time.

For the specific, day-to-day activities of:

• System restores, 57 percent of respondents spent at least 25 percent less time.

• Patch deployment, 30 percent saw improvement, spending between 25 and 90 percent less time.

• Troubleshooting and fixing software problems, 21 percent spent at least 50 percent less time.

• Backups, 30 percent reported improvement, spending between 25 and 95 percent less time.

• File-level restores, 29 percent of respondents spent at least 25 percent less time.

A full two-thirds of respondents stated their virtual infrastructure administration staff was at least 25 percent more efficient overall operating virtual machines. This increase in operational efficiency equates to 1.25 days saved per week, per administrator, which monetized annually is an approximately $40,000 efficiency gain[2] per administrator, or a reduction in low-value IT activity time spent by 65 days per year, per administrator. In

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2 According to VMware internal cost calculations where fully burdened (vacation, benefits, training, insurance, etc.) system administrators earn $150,000 per year, or $75 per hour.

terms of lost productivity, "business as usual" for a team of 10 administrators operating physical infrastructure accounts for approximately $400,000 per year in lost productivity. For businesses, these savings are typically realized by deferring hiring. For administrators, increased efficiencies translate to more interesting work that impacts the business and more personal time on weekends.

Financial services firm and roundtable participant, Natixis Capital Markets has leveraged virtualization to realize significant time and cost savings. Since IT maintenance and failover testing can now be done during working hours, Natixis has reduced overtime staff expenses, particularly for hourly staff and consultants. In addition, the company has eliminated downtime for hardware maintenance and further reduced operational expenses by no longer requiring non-IT staff to work weekends on user acceptance testing. The company has also experienced productivity gains from faster provisioning for development assets, which has increased its developer productivity.

Another study participant, responsible for server systems operations in a large enterprise stated: "We are asked to do more and more, many times with less. VMware's virtualization capabilities optimize our time and effort by putting large portions of our environment under a single pane of glass, allowing us to quickly and successfully meet customer commitments. In addition, we are able to migrate running Virtual machines from server to server with no downtime, so we are able to schedule maintenance of the hosts during regular business hours, which saves us countless hours of late night and weekend work on top of our regular duty shifts."

Virtualization Increases Innovation Funding

While business agility depends on IT agility, most companies still spend significantly more of their IT budgets on maintenance and support, than invest in projects that would improve their business agility. Analysts at Forrester call this "MOOSE" spending: maintenance and ongoing operations of systems and equipment. On average, the cost of MOOSE consumes about 65 percent to 70 percent of firms' IT budgets, leaving just 30 percent to 35 percent for new investments.

VMware virtualization and management solutions significantly reduce ongoing operational costs, providing organizations with additional time and fiscal resources. Companies typically realize these operating cost savings through deferred hiring and managing more IT infrastructure with the same staff. They also reinvest some of the time savings into tackling strategic projects that are often neglected in order to "keep the lights on."

"Virtualization provided a reduction in the overall management effort, let us take on more projects and grow the environment with our existing staff," explained survey roundtable participant, Alton Ingram, Infrastructure Management Manager at Affiliated Computer Services (ACS), a leader in business process and information technology outsourcing.

In the study, more than one-third of those surveyed cited operational savings of 50 percent or greater for day-to-day activities. Using a simple equation, it is easy to show the conversion of real dollars from infrastructure maintenance to new business activities.

For example, a representative company similar to survey respondents' that is operating 5,000 servers with a server administrator ratio of 75:1, at a fully burdened cost of $75 per hour, per server administrator, would have a labor cost of approximately $10 million. By adopting virtual infrastructure, this representative company can more than double the efficiency of its staff on system management tasks. This translates into approximately 268 hours of staff efficiency gain daily, or 69,680 hours annually, over physical infrastructure management. This productivity gain enables the company to deploy new IT services without increasing staff and to focus skilled administrators on innovation, which makes IT a more strategic business partner (see Figure 8).
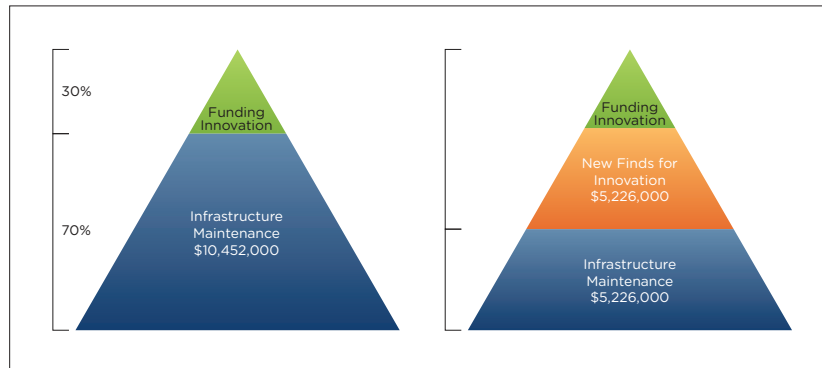
Figure 8: Funding for innovation profiles

Virtualization can also help to dramatically change the activities IT performs, enabling agility, while reducing risk and costs. For example, instead of routine maintenance tasks, IT staff members now have time to invest in on-demand capabilities or building a private cloud infrastructure. Conversely, virtualization allows IT staff to remove unproductive, repetitive maintenance tasks that monopolize time such as: frequent hardware installation and build outs, new and refresh application installs for server refresh, legacy application porting for older OSes, out of hours patching, installations of standard toolsets, hardware maintenance and monitoring, bios hardware updates and lengthy tape restores to roll back upgrades. It also eliminates the need to travel to geographically dispersed data centers.

Best Practices for Gaining Operational Savings from Virtualization

After completing the online survey, respondents were asked to participate in a series of roundtable discussions with peers. During these sessions, participants provided more insight into their virtualization infrastructure deployments and best practices for achieving operational savings, which included:

• Establishing and tracking quantifiable goals via a management dashboard

• Establishing a holistic view of IT requirements to streamline processes

• Implementing a consistent and fair cost recovery model

• Creating a "Virtualization First" policy

• Deploying automation

Establishing and Tracking Quantifiable Goals via a Management Dashboard

While virtualized assets in a datacenter will continue to deliver operational savings and higher availability, an ad hoc approach to server virtualization can result in lower ROI. An unplanned approach hinders an organization's ability to prioritize projects and cohesively build out its infrastructure to maximize efficiency. By establishing clear goals for increasing the utilization of the IT factory through virtualization, companies can reduce operating costs and labor.

Organizations must use specific metrics related to productivity and cost to track progress toward their goals. These metrics may include: virtual machine and physical server count per time period, square feet of datacenter

reclaimed, quantity of virtual machines (compute resources) repurposed, ESX® host utilization rate(s) versus physical servers, virtual machine/admin ratios, provisioning time, quantity planned outages for virtual versus physical infrastructure, or another internally proven approach to track productivity and cost savings. When companies measure how administration in the virtual environment compares to a physical environment, they can more accurately establish a business case for expanding the virtualization deployment. Regardless of measurement method, what matters most is setting goals and choosing key metrics that help monitor progress in a consistent manner.

A management dashboard quickly presents executive sponsors with critical operational data to determine if existing processes are working efficiently. Many roundtable participants are deploying dashboards to enable IT and business management to maintain measurements and regularly evaluate deployments. With each item discretely identified, all business stakeholders can understand how IT is improving its service delivery and business responsiveness, while reducing operational costs. By improving visibility, management dashboards are helping participants' IT organizations to gain additional business sponsors who in turn support and help propel further virtual infrastructure deployment.

Establishing a Holistic View of IT Requirements to Streamline Processes

In most organizations, IT resources exist in silos. As a result, there is little visibility into IT processes that span multiple technology silos and serve the entire organization. By default, finance and procurement take leading roles as they submit bids (e.g. servers, storage, space and power) based on various requests by individual teams. Without a comprehensive view of requirements, the lengthy procurement process contributes to creating more widespread inefficiencies in the business.

With virtualization, businesses can take a more holistic approach to IT requests. They can identify, migrate and consolidate under-utilized server assets, which results in recapturing facilities and reducing asset administration requirements and maintenance costs. Among the roundtable participants, IT virtualization best practices include ensuring build-outs occur as workflows, with all requests going through a business review process, rather than directly to procurement. For these companies, the increased visibility provided by VMware virtualization infrastructure eliminates duplication of compute resources and reduces costs.

Implementing a consistent and fair cost recovery model

Virtualization's ability to increase utilization through consolidation requires a different approach to chargeback or costing methods. If virtual machine charges are the same as or more than physical server charges the move to virtualization will stall due to inadequate cost savings. If virtual machines are free or fully subsidized the demand will outstrip supply and raise aggregate spend. Organizations accustomed to predictable costs tied to physical infrastructure may not have the processes in place to manage the complexity of a shared environment and cost variability.

Several questions arise in allocating cost for virtual infrastructure. For example:

• Who should pay for a new physical server when existing server is at full capacity? Should a single cost center be charged for this shared resource when it will host the workloads of multiple cost centers?

• How should server refresh costs be allocated, especially if the virtualized environment will not be fully populated for a quarter or two?

• Should all virtual machines be priced the same regardless of the resource allocation (more CPU, memory and storage) or actual usage?

Shared infrastructure is often purchased in a central pool where the infrastructure and significant CapEx and OpEx savings can be shared by the entire organization. Consider renting the development or pre-production infrastructure at a significant discount to get the organization comfortable with the new operating model and technology.

Most traditional IT cost recovery or chargeback methods are not sophisticated. As difficult or tempting as it may seem to develop a new chargeback policy for virtual infrastructure, the best solution is often one that is easy to explain, easy to deploy and presents a fair approach consistent with organizational norms. Do not seek to over instrument and explain every CPU cycle, memory space consumed or I/O load in the virtual environment. Simpler is better. Possibly a small, medium or large virtual machines. Or a chargeback plan based on services delivered -- rapid recovery from backup, 24x7 availability based on the use of live migration and automated DR, dedicated vs. shared resource usage.   By deploying a fair and simple chargeback plan, organizations can avoid unintended consequences and realize savings.

Creating a "Virtualization First" Policy

Server virtualization usually happens through a compelling event, for example, lack of space or power in a datacenter, creation of a DR infrastructure, server refresh cycle, or storage end-of-lease/end-of-life migration. When assets for these events are purchased or replaced, there are several alternatives—one of which is the decision to use virtual servers instead of physical servers. The Virtualization First policy effectively means that a virtual machine is the default platform for any new or replaced x86 server, unless there is an approved exception.

The use of a Virtualization First policy has increased dramatically in recent years. A separate, independent study of VMware ESX customers commissioned by VMware revealed that customers using virtualization as a default policy for servers almost has doubled since 2007. The approach was also very popular for participants in this study with 86 percent of respondents having had such a policy (see Figure 9).

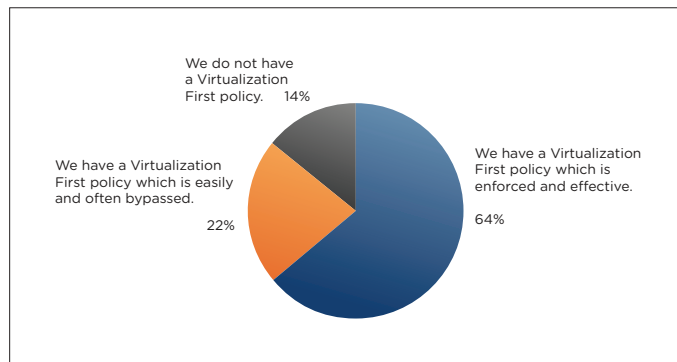Is virtualization the default policy for new servers?

Figure 9: "Virtualization First"policy adherence

However, a policy is only as good as its enforcement, and some of the IT professionals surveyed confessed that their policies could often be bypassed. So in addition to a policy, many of the organizations surveyed already have or are planning to establish a Virtualization "Center of Excellence" (CoE) staffed to arbitrate requests for new platforms.

A strong policy and CoE signal a top-down commitment from the business to a virtualization strategy. The policy and staff enforcing it often help companies standardize processes across multiple functional groups. This enables economies of scale and the integration of virtualization into daily routines, which can amplify cost savings across the organization. Virtualization First policies and CoEs yield greater productivity as IT specialists focus on service delivery enablement and efficiency improvements rather than politics.

Deploying Automation

Companies are rapidly moving beyond niche virtual machine deployments to develop private cloud and shared services infrastructure. To monitor larger deployments, IT organizations are turning to automation tools—

management tools, performance and availability monitoring, workload balancing, lab automation, template-based solution design/provisioning and more. The abstraction delivered via virtualization in and of itself facilitates new automation capabilities and techniques.

Roundtable participants revealed that the use of orchestration products improves the consistency and reliability of their operations. With them, IT staff can focus on establishing proper policy instead of specific tasks and procedures. The use of life cycle management tools automates many functions—from service provisioning to patching to decommissioning—further reducing time spent on mundane tasks and enabling staff to reclaim their weekends.

Virtualization Solutions from VMware Deliver Operational Cost Savings

With 89 percent of all virtualized applications in the world running on its technology[3], VMware enables companies to increase productivity, reduce costs and improve business agility. In addition to the operational savings those surveyed have already achieved using VMware Enterprise Infrastructure 3, respondents expect to increase efficiency as they deploy VMware vSphere™ 4 with its new automated tools.

Specifically, VMware vSphere enables IT organizations to create virtual security zones without managing additional dedicated firewalls or segregating server farms. VMware vSphere also simplifies host and switch configuration and management. Storage allocation and consumption visibility spans from the virtual machine to the resource pool. The migration to a resource-centric configuration and management model rather than a device-centric model increases automation, availability and performance, while reducing time spent on troubleshooting and repetitive administrative tasks.

As study participants go beyond the built-in virtualization platform automation features and leverage more advanced tools from VMware to manage their virtual infrastructures, they expect more productivity improvement. For example, participants expect recently released VMware vCenter™ management products in the areas of capacity management and application performance management to deliver additional savings opportunities.

Today, VMware customers are beginning to leverage ESXi™ and PXE booting for bare metal provisioning of commodity hardware, as well as high availability and fault tolerance for resiliency. This enables forward-thinking customers experiencing challenges that surpass troubleshooting time thresholds to consider deploying standby servers and migrating workloads to these devices or the existing resource pool. By resolving server issues off-line, IT is able to improve service level agreements (SLAs) and reduce downtime.

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3 Gartner, December 2008

Virtualization is Proven to Increase Operating Efficiency

Despite claims that virtualization adds complexity to IT operations, nearly all of the IT organizations surveyed experienced increased productivity and efficiency. 94 percent of respondents realized operational savings with virtualization infrastructure for both one-time tasks and day-to-day tasks. A third of surveyed organizations improved operating efficiency by 50 percent or more.

Virtualization is significantly changing the way companies think about their compute infrastructure and how they deploy resources in terms of provisioning, troubleshooting and management. As those surveyed attest, virtualization is also changing the skill set and responsibilities of the IT staff, which in turn has increased operational savings and overall IT productivity for both one-time and day-to-day tasks.

For organizations just beginning their virtualization journey, these results clearly demonstrate the positive impact of virtualization on IT operations. With informative virtualization best practices from VMware customers around process alignment, policies, automation and measurement, companies of all sizes can begin shifting their IT staff from serving hardware to serving the business.

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