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Flash Research Assignment 2
Virtualization and Cloud Computing

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Flash Research Assignment: Virtualization and Cloud Computing

Recent technological developments have given the firm the opportunity to save over \$9.5 million in the next three years. By running 80% of the firm's servers as VMware virtual machines, the firm can increase server utilization, which reduces down time costs, in addition to lower maintenance costs.

Virtualization allows a user to run multiple operating systems simultaneously on a single server. There are many technological benefits to consolidating server workloads that would save the firm money. According to Gartner, the average physical server utilization is less than 15%. By virtualizing servers, the firm can not only increase server utilization fourfold, but also decrease the necessary infrastructure costs to keep inefficient servers running. As the firm is rapidly growing, virtualizing servers will allow the firm to increase technological capabilities without increasing the size of the data center, which would incur even more costs to the firm. Virtual servers also ease the maintenance and management process, which incur both maintenance and downtime costs to the firm. According to TechSoup, hardware upgrades can be performed using a management console application, rather than physically maintenance the server. This allows for improved business continuity by preventing an entire server from being shutdown while one part of the server is being modified. Additionally, cloud computing with VMware increases the productivity of our business. According to VMware, if a server were to fail, the virtual machine automatically restarts on another machine, protecting against downtime and data loss. As stated above, VMware servers also enable multiple operating systems to run on a single server. In a period of rapid growth, the firm must run the most efficient applications possible to maintain high performance. With multiple operating systems, the firm would be able to select from a much larger platform of applications, ensuring the most efficient program for a given task.

As stated above, the firm has the opportunity to reduce server maintenance costs by \$1.36 million a year, and ultimately save over \$9.6 million in the next 3 years. If the firm would replace all 1,000 physical servers (Scenario 1), according to Figure 1 the firm would pay \$10 million in the first year, and \$14 million over three years. However, virtualizing 80% of servers (Scenario 2) would only cost the firm \$3.12 million, creating both a benefit of \$6.88 million in the first year, and a net benefit of \$9.6 million over 3 years. These numbers do not include any downtime and or data loss costs the firm would incur with an exclusively physical server fleet.

Scenario 1 - Replace with Traditional		
Purchase		
# Servers		1000
Purchase Price	\$	8,000.00
Total Acquisition Cost	\$	8,000,000.00
Maintenance		
# Servers		1000
Yearly Maintenance Cost	\$	2,000.00
Total Yearly Maintenance Cost	\$	2,000,000.00
Total Costs		
Year 1	\$	10,000,000.00
Year 2	\$	2,000,000.00
Year 3	\$	2,000,000.00

Scenario 2 - Server Decrease by Virtualization		
Total Servers to Purchase		
Virtualized Servers (80%) and 10-1 capacity		80
Physical Servers		200
Virtual Server Purchase		
Number Virtual Servers		80
Purchase Price	\$	16,000.00
Total Virtual Acquisition Cost	\$	1,280,000.00
Physical Server Purchase		
Number Physical Servers		200
Purchase Price	\$	8,000.00
Total Physical Acquisition Cost	\$	1,600,000.00
Virtual Server Maintenance		
Number Virtual Servers		80
Yearly Maintenance Cost	\$	3,000.00
Total Yearly Virtual Maintenance Cost	\$	240,000.00
Physical Server Maintenance		
Number Physical Servers		200
Yearly Maintenance Cost	\$	2,000.00
Total Yearly Physical Maintenance Cost	\$	400,000.00
Total Yearly Maintenance Costs		
Total Yearly Virtual Maintenance Cost	\$	240,000.00
Total Yearly Physical Maintenance Cost	\$	400,000.00
Total Yearly Maintenance Costs	\$	640,000.00
Total Costs		
Year 1	\$	3,120,000.00
Year 2	\$	640,000.00
Year 3	\$	640,000.00

	Cost / Benefit			Total
	Year 1	Year 2	Year 3	
Benefit	\$ 10,000,000.00	\$ 2,000,000.00	\$	2,000,000.00 \$ 14,000,000.00
Costs	\$ 3,120,000.00	\$ 640,000.00	\$	640,000.00 \$ 4,400,000.00
Net Benefit				\$ 9,600,000.00

Works Cited

- "Gartner Identifies 10 Key Actions to Reduce IT Infrastructure and Operations Costs by as Much as 25 Percent." *Gartner Identifies 10 Key Actions to Reduce IT Infrastructure and Operations Costs by as Much as 25 Percent*. Gartner Inc., 28 Sept. 2011. Web. 24 Sept. 2014. <<http://www.gartner.com/newsroom/id/1807615>>.
- Lo, Kevin. "Virtualization 101: Turn One Computer into Several Using Virtualization Software." *Techsoup.org*. Techsoup Global, 19 Jan. 2011. Web. 24 Sept. 2014. <<http://www.techsoup.org/support/articles-and-how-tos/virtualization-101>>.
- "Virtualization Basics." *Benefits of Virtualization with VMware*. VMware Inc. Web. 23 Sept. 2014. <<http://www.vmware.com/virtualization/virtualization-basics/virtualization-benefits>>.

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STAMFORD, Conn., September 28, 2011

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Gartner Identifies 10 Key Actions to Reduce IT Infrastructure and Operations Costs by as Much as 25 Percent

Infrastructure and Operations Strategies to Be Examined at Gartner Data Center & Operations Summit, November 28-29 in London, and at the Gartner Data Center Conference, December 5-8 in Las Vegas

As many IT organizations are under intense pressure to continue to implement cost-cutting initiatives, Gartner Inc., has identified 10 actions that can reduce IT infrastructure and operations (I&O) expenses by 10 percent in 12 months, and as much as 25 percent in three years.

"I&O represents approximately 60 percent of total IT spending worldwide, so with IT budgets remaining tight, it's no wonder that I&O cost-cutting pressure continues to be intense," said Jay Pultz, vice president and distinguished analyst at Gartner. "When it comes to I&O cost reduction, there is no 'magic bullet,' but best results can be achieved by implementing as fully as possible the 10 key cost reductions we have identified."

Gartner analysts said that due to priority conflicts and resource constraints, few I&O leaders said they have implemented 50 percent or more of the total cost reduction opportunities these 10 key actions offer. However, depending on where an organization is now, fully implementing these 10 cost-cutting suggestions can provide significant savings.

The 10 key actions to implement to reduce IT I&O costs include:

Action 1: Defer Noncritical Key Initiatives

I&O leaders need to re-examine their key initiatives to determine which ones to focus on as near-term priorities. In doing so, there are three major questions to ask: Does the I&O key initiative strongly support a high-priority business initiative that needs to be completed in the near term? Does the I&O key initiative lower the I&O cost structure in the time frame required? Does the I&O key initiative lower risk by upgrading I&O to prevent major outages or severe performance deterioration?

Action 2: Re-examine Networking Costs

When it comes to I&O spending, the data center and the network claim the lion's share of costs. Because nearly half of the network expenses go to telecom service providers (TSPs), network managers need to continue to renegotiate contracts with these vendors to ensure that their contracted rates are market-based. Substantial steps can also be taken to optimize network costs by refining the design and sourcing of their networks.

Action 3: Consolidate I&O

I&O consolidation is closely related to standardization, integration and virtualization. In the past, the rise of distributed computing and other trends drove the decline of large data processing sites. Now, however, data centers are rising in importance, and Gartner expects this trend to continue throughout this decade, as server rationalization, hardware growth and cost containment drive the consolidation of enterprise data processing sites into larger data centers.

Action 4: Virtualize I&O

Servers run at very low average utilization levels (less than 15 percent). Virtualization software increases utilization typically by fourfold or more, which means for a given workload that can be virtualized, a company can typically reduce the number of physical servers by fourfold. Conservatively, this means hardware and energy costs are each reduced by more than 50 percent. As with consolidation, virtualization can be applied to many I&O platforms: Unix servers, storage, networking and client computing.

Action 5: Reduce Power and Cooling Needs

In the past, newly built data centers often opened with huge areas of pristine white floor space, fully powered and backed up by an uninterruptible power supply (UPS), water- and air-cooled, and mostly empty. With the cost of mechanical and electrical equipment, as well as the price of power, this model no longer works. New design approaches can result in data centers that utilize significantly less power, take up less space and cost much less.

Action 6: Contain Storage Growth

Compute, networking and storage capacity are all growing at annual double-digit rates, with storage growing the fastest by far. Gartner predicts that, by 2016, enterprises will install 850 percent more terabytes than they have installed in 2011. Throwing terabytes at the problem is no longer a viable solution. With capacity growth far outstripping cost declines, tighter control is required. Multiple approaches need to be adopted — including the use of storage virtualization, automated tiering and storage resource management (SRM) tools.

Action 7: Push Down IT Support

Support for end users and the enterprise typically is about 8 percent of total IT spending, and most I&O organizations have at least four tiers of support, each with a different cost point and level of expertise. To reduce costs, organizations need to drive those support calls down to the lowest tier that can satisfactorily resolve users' issues.

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Action 8: Streamline IT Operations

I&O accounts for approximately 50 percent of the total enterprise IT head count, and most of the I&O staff is involved in operational processes of a day-to-day and tactical nature. To contain head count and associated costs, these processes need to be streamlined and as efficient as possible. This typically entails implementing ITIL, the de facto standard framework in IT operations. The principal goal is to improve service management and quality, but ITIL has been known to reduce operating expenses as well.

Action 9: Enhance IT Asset Management (ITAM)

ITAM by itself doesn't reduce I&O costs; however, it is a very effective tool to identify and assess cost reduction opportunities. ITAM can help determine the life of certain assets, defer upgrades and eliminate or combine software licenses, as well as replacing certain maintenance service contracts with a time-and-materials approach. IT asset repositories are generally the most effective tools to help in this endeavor. These tools can maintain dates, manage changes to assets and send out reminder emails to ensure that the life cycle process is proactively managed.

Action 10: Optimize Multisourcing

Sourcing is perhaps the most strategic decision facing I&O leaders today. The decision is not as simple as whether to outsource or insource all of I&O. IT leaders can make separate sourcing decisions for virtually any I&O component, system or function. The key decision criteria are controlling those aspects that are of strategic and critical importance to the business, playing to the strength of available staff, defining clear lines of demarcation, keeping the number of vendors involved to a small, manageable number and determining what makes solid financial sense.

Additional information is available in the Gartner report "Ten Key Actions to Reduce IT Infrastructure and Operations Costs" at <http://www.gartner.com/resId=1744215>.

Mr. Pultz will provide additional insight on I&O technologies and strategies at the Gartner Data Center & IT Operations Summit, November 28-29 in London and at the 30th Annual Gartner Data Center Conference, December 5-8 in Las Vegas. These events deliver a wealth of strategic guidance and tactical recommendations on the hottest issues, including next-stage virtualization, the impact of cloud computing, mobility, servers, storage, facilities, business continuity and disaster recovery.

Members of the media wishing to register for the Gartner Data Center & IT Operations Summit in London can register by contacting Laurence Goasduff, Gartner PR at laurence.goasduff@gartner.com. For further information on the Summit, please visit <http://www.gartner.com/technology/summits/emea/data-center/index.jsp>.

More information on the Data Center Conference in Las Vegas is available at www.gartner.com/us/datacenter. Members of the media can register for the event by contacting Christy Pettey at christy.pettey@gartner.com.

Additional information from the event will be shared on Twitter at http://twitter.com/Gartner_inc and using #GartnerDC.

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Virtualization Basics

[Overview](#)[How Virtualization Works](#)[Virtualization Benefits](#)[Use Cases](#)

Virtualization Benefits

All Virtualization Is Not Created Equal

The differences between vendor platforms are considerable, especially for smaller businesses. It's important to choose wisely to achieve maximum agility and efficiency, the highest ROI and the most substantial reductions in IT overhead and complexity.

Trust the Recognized Virtualization Leader

From the largest multinationals to the smallest start-ups, more than 500,000 businesses worldwide trust their mission-critical applications to VMware virtualization solutions that deliver:

The most mature and comprehensive technology

Built-in high availability for all your applications

Unmatched reliability and security

The fastest and easiest installation

World-Class Data Center Capabilities Right-Sized for Smaller Businesses

VMware is known as the standard for large enterprises, but we are also the No. 1 choice of small and midsize businesses worldwide. Our affordable small-business packages simplify your infrastructure, speed operations, and reduce your costs—with capabilities competitors can't match at any price.

[Learn more about small business virtualization](#)

VMware Advantages

The most mature, proven, and comprehensive platform. VMware vSphere is fifth-generation virtualization—many years ahead of any alternative. It delivers higher reliability, more advanced capabilities, and greater performance than competing solutions. VMware’s virtualization pre-eminence is recognized universally by analysts and overwhelmingly by the marketplace.

High application availability. Purchased separately, high-availability infrastructure remains complex and expensive. But VMware integrates robust availability and fault tolerance right into our platform to protect all your virtualized applications. Should a node or server ever fail, all its VMs are automatically restarted on another machine, with no downtime or data loss.

Wizard-based guides for ease of installation. VMware’s wizard-based guides take the complexity out of setup and configuration. You can be up and running in one-third the deployment time of other solutions.

Simple, streamlined management. VMware lets you administer both your virtual and physical environments from a “single pane of glass” console right on your web browser. Time-saving features such as auto-deploy, dynamic patching, and live VM migration reduce routine tasks from hours to minutes. Management becomes much faster and easier, boosting productivity without adding to your head count.

Higher reliability and performance. Our platform blends CPU and memory innovations with a compact, purpose-built hypervisor that eliminates the frequent patching, maintenance and I/O bottlenecks of other platforms. The net result is best-in-class reliability and consistently higher performance; for heavy workloads, VMware achieves 2-to-1 and 3-to-1 performance advantages over our nearest competitors.

Superior security. VMware’s hypervisor is far thinner than any rival, consuming just 144 MB compared with others’ 3-to-10 GB disk profile. Our small hypervisor footprint presents a tiny, well-guarded attack surface to external threats, for airtight security and much lower intrusion risk.

Greater savings. VMware trumps other virtualization solutions by providing 50 percent to 70 percent higher VM density per host—elevating per-server utilization rates from 15 percent to as high as 80 percent. You can run many more applications on much less hardware than with other platforms, for significantly greater savings in capital and operating costs.

Affordability. VMware is highest in capabilities, but not cost. Starting at \$165 per server, our small business packages consolidate more of your applications on fewer servers, with greater performance—delivering the industry’s lowest total cost of ownership (TCO).

To quickly determine and compare the cost of deploying VMware virtualization in your environment, use our [cost-per-application calculator](#).

VMware Virtualization Checklist

Greatest Cost Savings

Highest Server Utilization

Built-In High Availability

Zero Downtime Failover

Best Performance

- Unmatched Reliability
- Superior Security
- Lowest TCO
- Fastest, Easiest Management

Virtualization Pre-Eminence: Analysts and the Marketplace Align on VMware

are still has advanced capabilities that the others lack.

It's easy to see that VMware has the best, most feature-rich solution on the market. It's years ahead of the competition in many ways and will likely continue to lead the field for many years to come.

InfoWorld, April 2011

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Virtualization 101

Turn one computer into several using virtualization software



Kevin Lo - January 19, 2011

Virtualization software can essentially turn one computer into several. We'll show you how virtualization works, what it can be used for, and a few virtual software packages for your nonprofit or library.

Imagine only being able to run one software program at a time on your computer. What if, in order to check your email, you had to turn off your office application? What if you had to close your PDF reader in order to use the Internet?

While we take for granted that we can use more than one software application at a time, we seldom consider running more than one operating system at once. Virtualization software — programs that allow you to run multiple operating systems simultaneously on a single computer — allows you to do just that. Using virtualization software, you can run multiple operating systems on one physical machine. The technology is now mainstream enough that it is a built-in feature in Windows 7 Professional and in Windows Server 2008 R2.

Below, we'll show you how virtualization software works, what it can be used for, and a few virtual software packages your nonprofit or library may wish to consider. Virtualizing can allow you to turn one computer into many, saving time, money, energy, and space.

The Virtual Experience

Running multiple operating systems is not a new concept. Since the early days of desktop computing, software engineers have found ways to do this using boot managers or boot loaders. Mac OS X includes Boot Camp which allows for a Windows operating system to be installed on an Apple machine. What makes virtualization software different is that it's a much simpler and straightforward process, and you can run multiple operating systems simultaneously.

Virtualization software runs like any other application. To get started, you power up your computer, load the virtualization program, and install an operating system from its install CD, DVD, or .iso file. In virtualization parlance, the main operating system is called the "host" operating system, and the secondary operating systems the "guest" operating system. Once the virtualization software is running, each subsequent operating system you install on your PC will act like a new computer. For instance, one computer might run a Linux server, two Windows servers, and three other Linux servers — for a total of six servers (five guests and one host) you could access at once. On the network, each server would appear as a unique system. You could run programs, share files, and do anything on these guest systems that you could do with a real computer. But, you've got the convenience and cost-savings of running all of them from one machine.

The Benefits of Virtualization

Depending on your IT architecture, the nature of your work, and your IT budget, virtualization software can offer a variety of advantages to your nonprofit or library.

Consolidate Servers

One of the primary benefits of virtualization software is that it allows you to increase the scale of your server infrastructure without purchasing additional pieces of hardware. This reduces "server sprawl" and allows resources to be used more efficiently. (Keep in mind, however, that you may still need to purchase software licenses for the virtualization software, depending on the package you choose.)

Conserve Energy

In addition to savings in hardware costs, virtualization software may also save you money on your energy bill. It's widely believed that the energy costs of running a server in a datacenter is more than the costs of acquiring it, which is why enterprises — especially those that offer their services in the cloud — are keen on using virtualization to minimize their operating costs.

Improve Ease of Management

Managing virtual machines is a lot easier than managing "real" machines, since hardware upgrades, for example, can be done using a management console application, rather than having to power down the machine, install the hardware, verify the change, then power up

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again. Moreover, managing virtual machines can often be done via the same console, reducing the time needed to deploy them.

Reduce Backup and Recovery Time

Since virtual machines are essentially files, backing up and restoring them is a lot less time-consuming than doing it on several individual machines. And while the files can be huge, a directory of many files is still easier to restore than a real machine of the same specifications. Moreover, hardware failures — such as a failed hard drive — will not affect virtual machines in the same way they would a physical machine. In addition, virtualization packages tout their backup and recovery functionality as a way to improve business continuity and resilience.

Test Software Configurations

Another way you can use virtualization software is for testing software configurations before deploying them on a live system. If you needed to verify whether a program is compatible with your existing setup, for example, you may try testing in on a virtual machine first. This can be immensely useful for organizations that have legacy systems or applications and must test out systems before deploying them. Virtual machines can also interact with one another in virtual networks, allowing you to test server-client applications virtually.

Maintain Legacy Applications

If you do have old applications that have compatibility issues with newer software or that must run on a certain version of an operating system, you can dedicate a virtual machine just for those tasks. That way, your IT architecture and planning won't be constrained because of a few applications.

Support a Cross-Platform Office

It is not uncommon for offices that run mostly Macs to need to run one or two Windows-only programs; in this case, virtual software can be an affordable, easy way to do this. Note, however, that the reverse is not applicable; many virtualization applications for PCs allow you to run Linux, but not Mac operating systems.

Despite its many benefits, keep in mind that virtualization software is not for everyone. There is a learning curve in both conceptualizing how virtual machines will function in your network and organization, as well as managing them reliably and cost-effectively. If your staff has trouble with physical computers, you may need to consider making sure which machine is the guest and which is the host extremely transparent to your users, or explaining to them in simple terms how this will affect their day-to-day work, if at all.

Virtualization Software Options

Virtualization software is available for a variety of needs, ranging from free or no-cost software for desktop users to six-figure packages for datacenter operators.

The package you choose will depend on what you need to accomplish with the technology. Other factors to consider include how many computers you currently have, your level of technical expertise, and the kind of tech support available at your nonprofit.

If your organization is considering virtualization technology, here are some popular options you may wish to consider. For a broader comparison of the features of these and other packages, Wikipedia's [Comparison of Virtual Machines](#) may provide a general reference as well.

VMWare

VMWare, by far the most popular virtualization software vendor in terms of range of offerings, market share, and expertise, offers everything from enterprise-level product suites to help manage and virtualize data centers to a free [VMWare Player](#) that allows you to create and use virtual machines. VMWare also offers virtual appliances, virtual machines you can download for free. VMWare additionally provides [technical resources](#) for setting up and using its various products. VMWare products run on both Windows and Unix/Linux variants, as well as on Mac.

Microsoft

As mentioned earlier, Microsoft provides a lot of free virtualization resources and tools, such as [Microsoft Virtual Server](#) and [Virtual PC](#). If you are running only Windows desktops and servers, these products can be an affordable way to test whether virtualization should be part of your organization's IT strategy. Keep in mind, however, that Virtual Software and Virtual PC can only work with Windows guests and hosts, meaning they are not viable options for those who want to run Linux or Mac operating systems.

Citrix

[Citrix](#), after acquiring the company that created and licensed the open-source virtualization package [Xen](#), has become a major player in the field of virtualization. They offer packages for server consolidation, as well as more advanced desktop virtualization for enterprises.

Parallels

Best known for its [Desktop for Mac](#) — the first commercial virtualization product that could run on Mac OS hosts — [Parallels](#) also offers products that run on Windows and Linux hosts. They have a strong user base and their products garner positive reviews in terms of speed and user friendliness.

VirtualBox

As with many other software technologies, there are free and open-source alternatives to commercial virtualization software. Sun Microsystems' [VirtualBox](#) is the most popular package and supports a variety of guest and host systems. As it is supported commercially, its updates and bug fixes are addressed timely and frequently.

Virtualizing Forward

Even if your nonprofit or library doesn't currently have a need for virtualization software, knowing that the technology exists can help you plan for the future and may be a factor for future buying decisions. Virtualization has the potential to greatly streamline your organization's IT infrastructure and operational workflow, but it must be planned out with a clear understanding of its compatibility with your organization's present and future IT needs.

Image: [Virtualization, Shutterstock](#)

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