

WHITE PAPER

Reducing Server Total Cost of Ownership with VMware Virtualization Software



Table of Contents

Executive Summary 3

 Why is TCO important?..... 3

 Results of this study 3

Understanding Total Cost of Ownership and Return on Investment 5

 TCO Analysis..... 5

 Methodology 5

 Calculating ROI 5

How VMware Virtual Infrastructure Reduces Server TCO 6

 Reducing Hardware Costs with VMware Software..... 6

 Reducing Operational Costs with VMware Software..... 6

 Reducing Downtime Costs with VMware Software..... 7

 Reducing Business Administration Costs with VMware Software..... 7

Reducing Server TCO with VMware Virtual Infrastructure: Three Case Studies..... 8

 Applying TCO Analysis to Customer Case Studies..... 8

 Case #1: Regional healthcare organization reduces TCO by 74%..... 9

 Case #2: U.S. insurance company reduces TCO by 65% 11

 Case #3: National transportation business reduces TCO by 82% 12

Applying TCO Analysis to Your Environment..... 15

 Seven Steps for Estimating TCO Savings 15

Conclusion..... 16

Reducing Server Total Cost of Ownership with VMware Virtualization Software

Executive Summary

VMware has been providing world-class virtualization solutions since 1998. This paper examines how VMware virtualization software reduces total cost of ownership (TCO) in server environments and provides almost immediate return on investment (ROI).

Why is TCO important?

For many technology purchases, hardware and software costs are the easiest part of an investment to quantify. However, studies find that hardware and software costs are only one part of the costs associated with technology purchases. TCO analyses take a larger holistic view of all soft and hard costs that go into a purchase including the costs of supporting and maintaining the purchase over time. Organizations that take this broader view of their technology purchases benefit by understanding the more complete picture as well as uncovering other areas where new efficiencies or improvements can be made.

This paper describes commonly used TCO models and looks at several case studies that apply TCO models to virtualization projects. VMware customers across the board have experienced significant TCO savings as a result of their VMware virtualization investments. The customers profiled in this paper offer just a few examples of how virtualization software can reduce the costs of operating a server environment.

Results of this study:

The customers profiled in this study reduced their server TCO by 74% on average and realized an ROI of over 300% within the first six months of deploying VMware virtualization software. Although the sample size in this study is too small to make significant generalizations of TCO savings by industry or across types of businesses, the findings from the three customers studied in this paper are consistent with VMware experiences with other customers.

The customers examined in this paper all experienced substantial server consolidation—each started with over 50 machines and ended up with fewer than 10 servers following their virtualization deployment. But that's not all: customers found that they reduced data center costs and avoided costly investments in data center expansions. The savings they realized in operational costs continue even after the completion of the virtualization project. The three customers profiled in this paper achieved on average 67% TCO reductions in IT operations costs after virtualization.

Virtualization also provided these customers additional benefits that were not quantified in their TCO analyses. These benefits included:

- Reducing costs by consolidating idle resources and redeploying those resources on new projects.
- Increasing efficiencies in IT operations.
- Improving time to implementation of new services.
- Increasing disaster recovery capabilities, including decreasing recovery time on existing non-high availability services.
- Building cost-effective and consistent development and test environments.
- Reducing costs in technical support, training and maintenance.

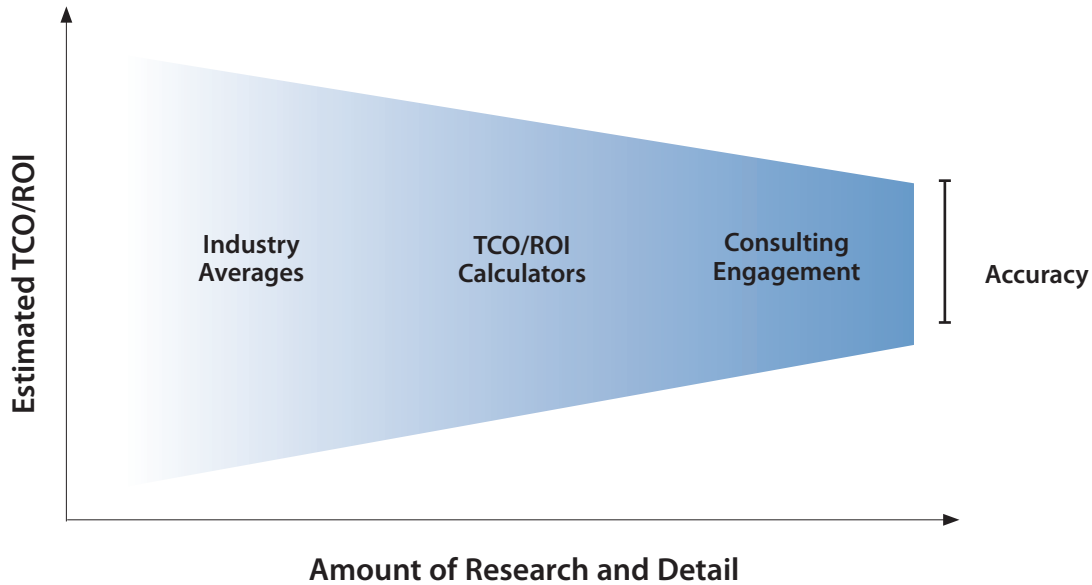
Exhibit 1 lists some of the other benefits realized by the three customers profiled in this paper:

Without Virtualization
 With Virtualization

Exhibit 1:

	Healthcare		Insurance		Transportation	
Other Benefits						
Number of Physical Servers Required	62	6	92	8	58	8
Server Development Time (hrs)	960	120	450	300	240	7
Recovery Time (hrs)	12	1	N/A	N/A	6	.17
Server Consolidation Ratio	10	1	12	1	7	1
Average CPU Utilization	5%	80%	<10%	60-70%	<10%	60-65%

Exhibit 2: TCO Models



Predictably, as conveyed in Exhibit 2, the more research and detail that can be tracked for a virtualization project, the more accurate the TCO and ROI analysis. After reading this paper, VMware believes businesses will be better equipped to track information on their virtualization investment and thus build an effective TCO and ROI analysis.

Understanding Total Cost of Ownership and Return on Investment

TCO Analysis

Organizations have found that TCO models are a valuable tool in understanding costs and optimizing IT investments. Although the purchase price of a server is the most easily quantifiable cost, industry research indicates that the purchase price typically represents less than 15% of the TCO. Accurate TCO models for servers should account for not only the purchase cost but also the cost to install, configure and manage servers.

Methodology

The TCO methodology discussed in this paper is based on industry-recognized approaches to TCO analysis. This methodology considers four categories of costs that contribute to the TCO of servers: hardware and software, IT operations, downtime and business administration. This TCO methodology considers both hard costs—costs that represent direct expenditures, and soft costs—costs such as labor costs and administrative costs that are not direct expenditures and may be more difficult to quantify. Exhibit 3 provides more information about these four categories.

Exhibit 3: TCO Cost Categories

Cost Category	Definition
Hardware and Software	Costs of necessary hardware, software and associated services. Includes hardware and software purchases, maintenance and support contracts, training and professional services, upgrades and other software such as virus protection and backup software.
IT Operations	Ongoing costs associated with operating data center servers. Components include the costs associated with server deployment, server configuration, network and storage infrastructure, data center power and cooling and other system administration tasks.
Downtime	Costs associated with both planned and unplanned server downtime. Includes costs of restoring services, lost employee productivity and lost revenue.
Business Administration	Costs associated with business processes. These include the labor cost associated with creating orders, obtaining purchase approvals, negotiating vendor contracts and tracking the procurement process.

Calculating ROI

ROI is a measure used to compare the cost of a project with the benefits of that project. The formula for calculating ROI is the benefits realized over a period of time divided by the amount of investment over that same period of time:

$$\text{ROI} = \text{Quantifiable Benefits} / \text{Quantifiable Costs}$$

To evaluate a project, organizations typically look at both the size of the project's ROI and the time required for benefits from a project to surpass the project's costs. For a virtual infrastructure project of the type discussed in this paper, TCO analysis is a prerequisite for any ROI study since customers cannot determine their savings without understanding their costs. ROI for a virtualization project is then calculated by comparing the cost of the project with the cost reduction and cost avoidance resulting from the project.

How VMware Virtual Infrastructure Reduces Server TCO

As proven by thousands of VMware customers, VMware virtual infrastructure software can dramatically reduce the TCO of x86 servers, providing a rapid ROI in virtual infrastructure. The VMware customers profiled in this paper report being able to reduce their server TCO by over 60%, providing a positive ROI within the first six months or less. VMware virtual infrastructure software makes this possible by providing savings in each of the server TCO categories mentioned earlier.

Reducing Hardware Costs with VMware Software

The customers highlighted in the case studies in this paper saved on average over 70% on hardware and software costs by implementing VMware software. Virtual infrastructure makes these cost savings possible by partitioning server resources so that multiple virtual machines—holding an operating system, applications and configurations—can run simultaneously on a single server. By putting workloads into virtual machines, multiple workloads can run on a single system in isolation and independence from each other. This capability enables organizations to realize significant cost savings in many ways including the following:

- **Reducing the number of servers required to support computing needs.** Traditionally, IT organizations have been compelled to dedicate an entire server to each workload to ensure stability and reliability. As a result, most servers in data centers today are less than 10% utilized. Organizations have also been required to maintain a large number of servers for development, testing and staging. VMware software provides a safe path to consolidate servers and improve utilization without the complexity and disruption associated with other consolidation approaches. As a result, VMware customers have been able to dramatically reduce the number of servers they require and get more out of each server, helping them cut their spending on server hardware.
- **Reducing hardware support costs.** By reducing the number of servers, organizations reduce spending on hardware support contracts that some purchase for higher support levels. Organizations can also eliminate costly extended support contracts and per-incident support contracts for older legacy hardware by moving legacy applications running on legacy hardware to newer “virtualized” servers running VMware software.

- **Reducing hardware costs for disaster recovery.** Most disaster recovery plans require building an exact duplicate of production data centers, requiring the purchase and maintenance of a large number of servers that are mostly idle. VMware virtual machines are hardware independent and can be consolidated onto fewer physical servers. As a result, companies using VMware software can implement disaster recovery plans for critical applications with significantly fewer servers and without being forced to exactly duplicate production server hardware.

Reducing Operational Costs with VMware Software

VMware virtual infrastructure software also makes it possible to realize significant reductions in IT operations costs. In many cases these savings can be equal to or even greater than the savings in hardware costs—VMware customers report reducing operational costs by up to 70%. Among the ways that VMware software makes this possible are the following:

- **Reducing data center power and cooling costs.** Reducing the number of servers in data centers leads to dramatic savings on power and cooling costs. It can also make it possible to avoid costly data center upgrades and expansions needed to meet the growing power and cooling requirements for today’s data centers.
- **Reducing costs of network and storage infrastructure.** Because virtual machines running on the same physical server can share network and storage connections, consolidating servers with virtual infrastructure reduces the number of network and storage ports required. This brings down the costs of SAN and network switches, cables and administration.
- **Increasing administration efficiency.** VMware virtual infrastructure software makes it possible to centralize, streamline and automate common tasks such as provisioning, configuration, reconfiguration and migration. For example, time spent to provision a new server can be reduced from days or weeks to minutes. Likewise, reconfiguring virtual machine hardware and migrating virtualized workloads to different hardware can be done from an administrator’s desk in minutes. The increased efficiency resulting from capabilities like these makes it possible to manage a growing number of servers without requiring equally rapid growth in staffing budgets.

Reducing Downtime Costs with VMware Software

Downtime, whether planned or unplanned, has real cost and revenue consequences for organizations. Lost sales, lost employee productivity, violated service level agreements and IT time spent restoring service all translate into significant costs. VMware virtual infrastructure helps organizations avoid and reduce these costs by enabling them to do the following:

- **Reduce planned downtime:** According to several studies, planned downtime can represent up to 70% of total downtime. VMware can help customers significantly reduce unplanned downtime and the costs associated with it. With VMware vMotion™ technology, administrators can move live, running virtual machines from one host to another while maintaining near continuous service availability. This capability makes it possible to eliminate significant amounts of planned downtime for applications and users: running virtual machines can simply be moved to other physical servers when planned hardware maintenance is required and moved back when maintenance is complete. Planned downtime for hardware reconfiguration is also significantly lower in a virtualized environment because virtual hardware can be reconfigured in a few minutes from the VMware vCenter console without touching the physical hardware.
- **Reducing unplanned downtime:** vMotion allows customers to reduce unplanned downtime by making it possible to migrate running applications away from servers that show indications that they are likely to fail. With vMotion, customers can move applications that are running on servers with failed fans, disk errors or other problems. When unplanned downtime does occur, the amount of downtime and the costs associated with it are dramatically reduced because hardware-independent virtual machines can be rapidly recovered and restarted on any hardware.

Reducing Business Administration Costs with VMware Software

Companies that implement VMware virtual infrastructure software also realize reductions in costs associated with business administration overhead. For example, by reducing the number of servers needed, organizations can reduce the frequency of server purchases and thus the frequency of time-consuming approval and procurement processes. Because virtual machines are hardware-independent, virtual infrastructure also makes it possible to standardize server purchases on a smaller set of hardware and thus simplify the purchasing process.

Reducing Server TCO with VMware Virtual Infrastructure: Three Case Studies

To illustrate how TCO analysis can be applied to real scenarios, VMware spoke with three customers who shared details about their VMware virtual infrastructure implementation and how it affected their costs. As indicated in the summary table below, this sample of VMware customers represent a range of industries, company sizes and implementation scenarios.

Applying TCO Analysis to Customer Case Studies

The TCO methodology described earlier in this paper provides the framework for the customer case study analysis that follows. For each customer example, a TCO model was built to quantify the TCO impact of VMware software over the first six months. The TCO models compare the cost of buying new physical servers to the cost of refreshing those servers while implementing VMware software. For simplicity, the models focused on only costs that differed between the two scenarios. Note that virtualization can be implemented without requiring a large investment in new servers—organizations can implement

virtualization incrementally as part of their normal server refresh cycle and can re-use existing server hardware for virtualization in many cases.

A key part of this TCO analysis was determining which cost components were important to the customer and could be quantified. The three customers profiled in this paper were able to quantify many of their hardware, software and operational costs. These customers did not have sufficient data available to quantify costs related to downtime and business administration, particularly for the first six months of their implementation; so, these costs were not included in the TCO models.

Exhibit 4: Customer Case Studies

Customer	Scenario
1. Regional healthcare organization	Significantly reduced hardware costs for servers supporting its physicians. Avoided a costly data center upgrade through server consolidation and improved server utilization.
2. U.S. insurance company	Virtualized servers supporting financial services for several business units. Stopped server sprawl. Enabled IT to provision servers more quickly.
3. National transportation business	Addressed problems with scalability and manageability of servers through virtualization. Eliminated old hardware, improved server utilization and made legacy applications easier to support.

Case #1: Regional healthcare organization reduces TCO by 74%

The IT department for this regional network of six hospitals, supporting 12,000 physicians and healthcare professionals maintains servers running a variety of operating systems including almost every instance of Windows. Before implementing VMware software, the company faced a number of critical challenges in its data center. For one, it was running out of space. The company was faced with the possibility of having to upgrade its data center facility to support increasing demand for its IT services. The company also had too many underutilized servers—with an average server utilization of only 5%. Additionally, IT spent too much time provisioning new servers and recovering systems when they failed.

By implementing VMware virtual infrastructure software, the IT department not only recovered their costs but experienced significant savings—all within the first six months of purchase. They reduced the number of servers they needed to buy, which in turn helped them avoid a data center upgrade that would have cost \$1–\$1.5 million. The IT department also realized savings by retiring old hardware that would have required renewed maintenance contracts and licenses for backups. They further decreased operations costs by reducing their data center power consumption and the amount of time they spent on server deployment.

In addition to these cost savings, the IT team also experienced other benefits from virtualization. They reported dramatically improved application availability with the ability to recover servers in an hour instead of 12 hours. They also experienced benefits from faster server deployment, improved disaster recovery capabilities and increased flexibility to react to the organization's needs.

For these reasons and more, VMware's virtualization solutions have become a staple for the company. Now, 80% of new systems go into virtual machines from the start. For any new hardware requested, the IT department's customers must justify why they need to purchase a new box instead of provisioning a virtual machine. The company is now evaluating all aspects of its IT infrastructure for additional opportunities to virtualize, including using virtualization to implement a disaster recovery project for its clinical systems and a project to virtualize the desktops for its training departments.

Bottom-line Results:

- ROI over first six months: 289%
- Savings from avoiding the need to upgrade data center: \$1 million–\$1.5 million
- Reduction in hardware and software costs: 79%
- Reduction in IT operations costs: 43%
- Reduction in procurement costs: 80%
- Time to provision a new server: 24 labor hours before virtualization, 2–3 hours after
- Average CPU utilization: 5% before virtualization, 80% after
- Server consolidation ratio achieved: 10:1

Exhibit 5: TCO Analysis Summary

Note: Numbers were compiled over the first six months of the investment.

Healthcare Example

TCO Comparisons	Without Virtualization	With Virtualization
Hardware and Software Costs		
Number of Physical Servers Required	62	6
Total Hardware Costs	\$434,000	\$38,757
Hardware Maintenance	\$43,500	\$16,757
VMware Software	\$0	\$21,000
VMware Software Support	\$0	\$5,250
VMware Training & Services	\$0	\$19,500
Total Hardware and Software Costs	\$477,500	\$101,263
Hardware and Software TCO Reduction		79%
IT Operations		
Affected Datacenter Costs: (SAN port and power costs)	\$8,637	\$31,526
Total Server Deployment Cost:	\$59,520	\$7,440
Server Development Time (hrs)	1488	186
Average Hourly Labor Cost	\$40	\$40
Server Support	N/A	N/A
Total Affected IT Operations Costs	\$68,157	\$38,966
IT Operations TCO Reduction		43%
Total Affected costs	\$545,657	\$140,230
Total TCO Reduction		74%
Six Month ROI		289%
Other Benefits		
Recovery Time (hrs)	12	1
Server Consolidation Ratio	10	1
Average CPU Utilization	5%	80%

Case #2: U.S. insurance company reduces TCO by 65%

This U.S. insurance company's centralized IT team supports all infrastructure and services for the company's tens of thousands of employees. The company was looking at virtual infrastructure to combat server sprawl and meet its CTO's objective of consolidating servers in order to save money and make better use of current resources. Further, the company wanted to speed time-to-market of new financial services. If the IT infrastructure to support new services could be implemented more quickly, the company could be more competitive.

The virtualization project far exceeded the company's goals, paying for itself in just six months. The department experienced significant reductions in hardware, software and operations costs. Virtualization helped make the company more agile and responsive to business unit needs. The business units experienced dramatic reductions in the time to procure a new server. One business unit remarked after the virtualization project that they received a new (virtual) machine in just three hours from signing off on the internal order. In addition to cost savings, the virtualization project improved the company's test and development environment and disaster recovery ability, while minimizing planned downtime.

The company is enthusiastic about virtualization and is considering how it can be incorporated into other aspects of its IT infrastructure. In its near-term projects, the company is looking to expand its virtual infrastructure as well as engage VMware Capacity Planning Services for its remote locations. The company plans to move legacy systems onto a virtual infrastructure, migrating these applications from local storage to fully networked SAN storage. Meanwhile, the company is also examining the rest of its infrastructure to see where additional servers can be targeted for consolidation.

Bottom-line Results:

- ROI over first six months: 189%
- Reduction in hardware and software costs: 63%
- Reduction in IT operations costs: 70%
- Reduction in procurement costs: 50%
- Average CPU utilization: 5–10% before virtualization, 60-70% after
- Server consolidation ratio achieved: 12:1

Exhibit 6: TCO Analysis Summary

Note: Numbers were compiled over the first six months of the investment.

Insurance Example

TCO Comparisons	Without Virtualization	With Virtualization
Hardware and Software Costs		
Number of Physical Servers Required	92	8
Total Hardware Costs	\$690,000	\$201,999
Hardware Maintenance	N/A	N/A
VMware Software	\$0	\$40,000
VMware Software Support	\$0	\$13,006
VMware Training & Services	\$0	\$3,000
Total Hardware and Software Costs	\$690,000	\$258,005
Hardware and Software TCO Reduction		63%
IT Operations		
Affected Datacenter Costs: (Network and other data center costs)	\$169,533	14,721
Total Server Deployment Cost:	\$41,400	\$27,600
Server Development Time (hrs)	552	368
Average Hourly Labor Cost	\$75	\$75
Server Support	\$221,697	\$87,650
Total Affected IT Operations Costs	\$432,630	\$129,971
IT Operations TCO Reduction		70%
Total Affected costs	\$1,122,630	\$387,976
Total TCO Reduction		65%
Six Month ROI		189%
Other Benefits		
Recovery Time (hrs)	N/A	N/A
Server Consolidation Ratio	12	1
Average CPU Utilization	<10%	60-70%

Case #3: National transportation business reduces TCO by 82%

The IT department was the backbone IT for a privately held Forbes 500 holding company that consisted of 50–60 companies and over 10,000 employees. The company was under pressure to add new projects, yet its server environment was not scalable or easy to manage. Many servers were underutilized: the imaging system in particular had very few users and was a drain on resources. Many of the systems were based on applications written by staff no longer with the company. It was difficult for an already overworked IT staff to take on new projects, let alone support existing systems.

Virtualization brought many pleasant surprises. The most sought after was server consolidation, but the company also realized improved CPU utilization and better capacity planning, thus avoiding an additional investment of \$216,500 in servers for new projects. The company also was able to end-of-life servers coming out of warranty and recover Ethernet ports within its Cisco network.

Aside from significant reductions in hardware and software as well as IT operations costs, virtualization also improved the IT team's processes. They were able to bring servers online more quickly, improve backups and even take on new projects more easily. After virtualization, they experienced yet another unexpected benefit in supporting legacy systems. The IT team converted their legacy systems into virtual machines, enabling them to run legacy applications on newer hardware and eliminate older hardware.

The company's virtualization project was such a success that they have set a goal of making 50-60% of its data center virtual within the next year.

Bottom-line Results:

- ROI over first six months: 449%
- Reduction in hardware and software costs: 81%
- Reduction in IT operations costs: 88%
- Time needed to recover a system: 6 hours before virtualization, 10 minutes after
- Average CPU utilization: less than 10% before virtualization, 60–65% after
- Server consolidation ratio achieved: 7:1

Exhibit 7: TCO Analysis Summary

Note: Numbers were compiled over the first six months of the investment.

Transportation Example

TCO Comparisons	Without Virtualization	With Virtualization
Hardware and Software Costs		
Number of Physical Servers Required	58	8
Total Hardware Costs	\$377,000	\$52,000
Hardware Maintenance	N/A	N/A
VMware Software	\$0	\$17,200
VMware Software Support	\$0	\$4,300
VMware Training & Services	\$0	\$0
Total Hardware and Software Costs	\$377,000	\$73,500
Hardware and Software TCO Reduction		81%
IT Operations		
Affected Datacenter Costs: (SAN port and power costs)	\$35,966	\$5,114
Total Server Deployment Cost:	\$13,920	\$387
Server Development Time (hrs)	348	10
Average Hourly Labor Cost	\$40	\$40
Server Support	\$27,840	\$3,840
Total Affected IT Operations Costs	\$77,726	\$9,341
IT Operations TCO Reduction		88%
Total Affected costs	\$454,726	\$82,841
Total TCO Reduction		82%
Six Month ROI		449%
Other Benefits		
Recovery Time (hrs)	6	.17
Server Consolidation Ratio	7	1
Average CPU Utilization	<10%	60-65%

Applying TCO Analysis to Your Environment

Seven Steps for Estimating TCO Savings

The following seven steps provide a roadmap for analyzing the cost impact of VMware virtual infrastructure software in the data center:

1. Understand the components of server TCO. This paper highlights some of the key components of server TCO by looking at four broad cost categories and at several individual costs in those categories. The individual costs listed represent only a subset of the costs that comprise server TCO. Additional examples of costs that should be considered include the following:

- Hardware and software costs: costs associated with storage and network infrastructure; costs associated with server migrations; and costs associated with hardware and software for high availability and disaster recovery
- IT operations costs: costs for data center cooling, server backups, security and post-deployment support
- Downtime costs: costs associated with troubleshooting failures, restoring IT services after failures, lost revenue and lost employee productivity due to outages; costs may also include the costs of third party charges to set up a disaster recovery site as well as the time and costs associated with ongoing updates to ensure that the disaster recovery site is up-to-date with the latest applications and software
- Business administration costs: costs associated with server procurement, asset management, vendor management and vendor negotiations

In addition to understanding these costs, it is important to understand how they apply to the data center. How these components apply to different data centers depends on many factors including whether server hardware is purchased or leased, which costs are directly incurred and which are internal charges, and the span of responsibility for IT.

2. Identify the “before” and “after” scenarios for the TCO comparison. In order to make it possible to compare the cost of implementing VMware software with the cost of other options, it is important to define the scenarios with and without virtualization as well as the time period for conducting the comparison. One of the simplest possibilities is to compare the cost of a one-for-one refresh of physical servers to the cost of replacing those servers with new servers using VMware virtualization to run virtual machine workloads. Other scenarios may consider virtualizing leased servers as they reach the end of their leasing contracts, virtualizing only new servers, or implementing a disaster recovery site with and without virtualization.

3. Determine which TCO components are relevant for the analysis. Some components of server TCO will not be affected by virtualization and thus can be excluded from a comparative TCO analysis. For example, the cost of application administration is generally not affected by virtualization. Other server TCO components may not apply to a given scenario, may not be deemed important in the scenario being considered, or may be impossible to quantify. These could include costs of procurement and vendor management. Likewise, organizations may have other costs such as various charges paid to internal or external service providers that are not included in the models discussed here but that are important to include in their analysis.

4. Gather data. Collect the data needed to calculate the TCO for the chosen scenario(s). This data may include the number of servers in the computing infrastructure; the software license costs; the cost and average number of hours of planned and unplanned downtime; and the amount spent on maintenance, management and monitoring of physical systems.

A VMware Capacity Planning assessment can help accurately gather this information and jumpstart a virtualization project. VMware’s Capacity Planner tool helps companies gather information about their existing hardware and its utilization, even helping companies find hardware they didn’t know they had.

5. Build a TCO model to compare existing environment with a virtualized environment. Build a TCO model that compares the TCO of the necessary scenarios. The model presented in this paper provides a framework that can be leveraged for this analysis

6. Use TCO model to compare scenarios. The TCO model built in the previous step will enable a comparison of the VMware software implementation with the costs of other options. This model can also be used to calculate the ROI of an investment in VMware software. These two metrics—TCO and ROI—are two of the most common metrics that organizations use to evaluate potential projects.

7. Implement a pilot project. VMware and its partners have helped many customers develop pilot projects that validate the benefits of VMware virtual infrastructure. These structured pilot projects are designed to help prove the effectiveness of VMware server software in the specific environment based on specific success criteria.

Conclusion

The small sample of VMware customers profiled in this paper describes how TCO and ROI can be measured for virtualization projects. These customers reported significant cost reductions from implementing VMware virtual infrastructure solutions. In all three customers profiled, the customers experienced a significant positive ROI within the first six months of their implementation.

Exhibit 8 compares these customers' TCO and ROI before and up to six months after implementing VMware virtualization software.

Virtualization projects are often justified from the start as a result of projected savings in hardware and software costs. The customers profiled in this paper achieved hardware and software savings above 60% in all cases.

What may surprise customers even more is the savings these customers experienced in IT operations. On average, these customers experienced TCO savings in IT operations of 67%. All customers profiled in this paper are expanding their virtualization infrastructures due to the success of their first virtualization project in delivering a rapid ROI. Clearly, there is much to be gained in conducting TCO analysis to get a more complete picture of cost savings of a technology investment.

Exhibit 8:

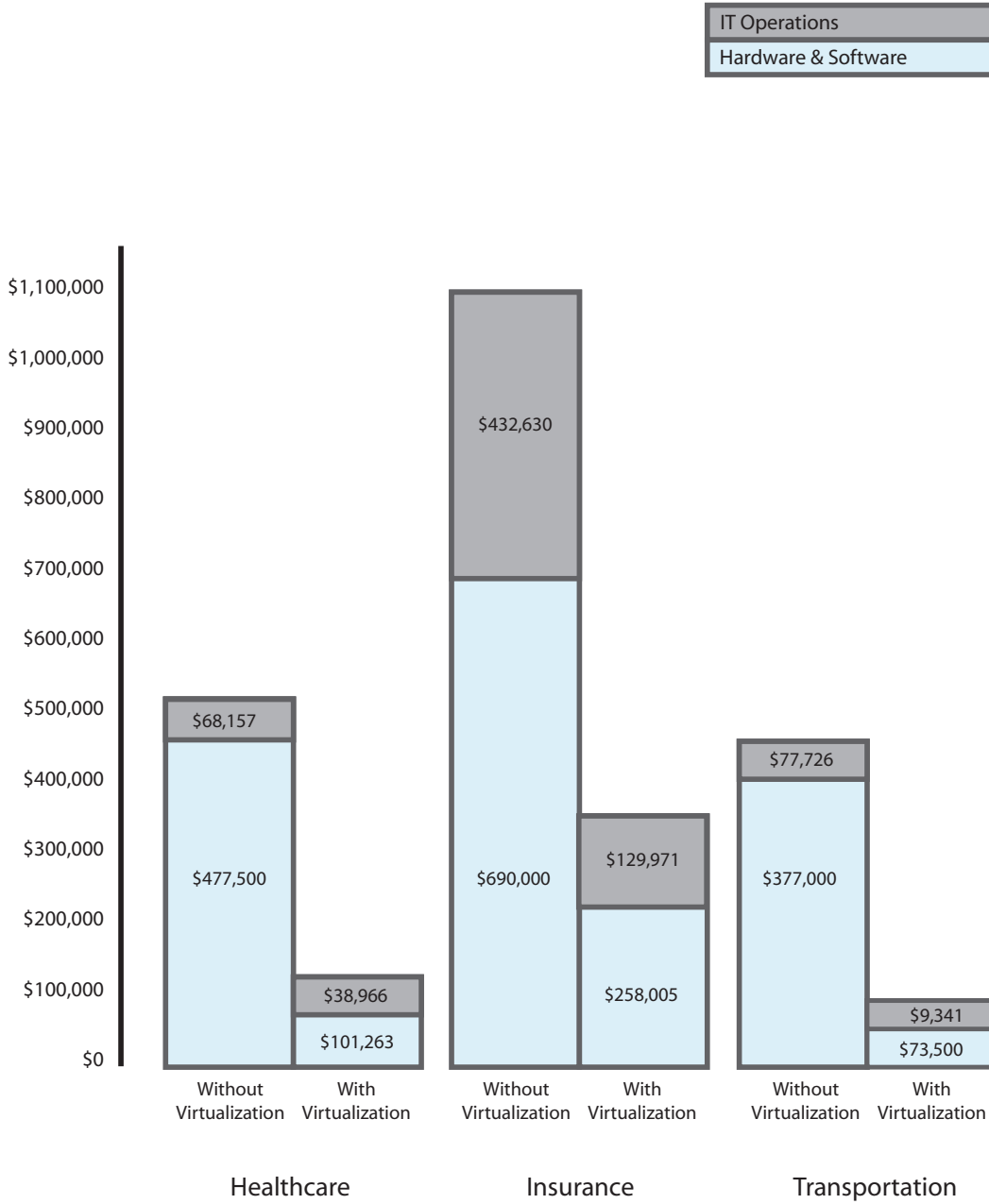
TCO Comparisons	Healthcare Example		Insurance Example		Transportation Example	
	Without Virtualization	With Virtualization	Without Virtualization	With Virtualization	Without Virtualization	With Virtualization
Total Hardware and Software Costs	\$477,500	\$101,263	\$690,000	\$258,005	\$377,000	\$73,500
Hardware and Software TCO Reduction		79%		63%		81%
Total Affected IT Operations Costs	\$68,157	\$38,966	\$432,630	\$129,971	\$77,726	\$9,341
IT Operations TCO Reduction		43%		70%		88%
Total Affected costs	\$545,657	\$140,230	\$1,122,630	\$387,976	\$454,726	\$82,841
Total TCO Reduction		74%		65%		82%
Six Month ROI		289%		189%		449%

The Bottom-line

Exhibit 9 shows the before and after TCO impact of a virtualization investment for the three companies profiled. They saved an average of \$371,000 in hardware and software costs and \$133,000 in IT operations costs.

Contact VMware to learn more about how virtual infrastructure software can lower server TCO. For more information, please contact VMware sales at sales@vmware.com or **1-877-4VMWARE**.

Exhibit 9:





VMware, Inc. 3145 Porter Drive Palo Alto CA 94304 USA Tel 650-475-5000 Fax 650-475-5001 www.vmware.com
© 2006 VMware, Inc. All rights reserved. Protected by one or more of U.S. Patent Nos. 6,397,242, 6,496,847, 6,704,925, 6,711,672, 6,725,289, 6,735,601, 6,785,886, 6,789,156 and 6,795,966; patents pending. VMware, the VMware "boxes" logo and design, Virtual SMP and VMotion are registered trademarks or trademarks of VMware, Inc. in the United States and/or other jurisdictions. Microsoft, Windows and Windows NT are registered trademarks of Microsoft Corporation. Linux is a registered trademark of Linus Torvalds. All other marks and names mentioned herein may be trademarks of their respective companies.

