



# An investigation into role of Server Virtualization as a tool for sustaining competitive advantage and facilitating organization effectiveness:

## A conceptual analysis with reference to IT industry

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### ABSTRACT

This paper examines how VMware virtualization software reduces total cost of ownership (TCO) in server environments and provides almost immediate return on investment (ROI). It also demonstrates how Virtualization technology is a leading solution and why IT Industries are adopting it.

Following Paper depicts a conceptual study towards the Server Virtualization technology and its advantages for any organization using the same. Various researches show that the Organization using Virtualization to optimize their server's performance and efficiency results reduced overall cost and downtime.

Thus this paper will help organizations in identifying the basic benefits server virtualization technology has over other and how economy, cost benefit and effectiveness can be generated.

### INDEXING TERMS/KEYWORDS

Competitive advantage, organization effectiveness Virtualization,

### ACADEMIC DISCIPLINE AND SUB-DISCIPLINES

IT –Mainframe applications

### SUBJECT CLASSIFICATION

IT

### TYPE (METHOD/APPROACH)

Conceptual study-Based on secondary data

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## 1. INTRODUCTION

The term "virtualization" traces its roots to 1960s mainframes, during which it was a method of logically dividing the mainframes' resources for different applications. Since then, the meaning of the term has evolved to the aforementioned.

**Table-1 Major Developments in virtualization**

Duration	Major Developments
1964-1970	<ul style="list-style-type: none"> <li>• IBM Cambridge Scientific Center begins development of CP-40.</li> <li>• IBM announces the IBM System/360-67, a 32-bit CPU with virtual memory hardware (August 1965).</li> <li>• IBM System/370 announced (June) – without virtual memory.</li> </ul>
1970-1980	First shipment of announced virtual memory S/370 models
1980-1990	Announcement of the Intel 80286-based AT&T 6300+ with Simultask, a virtual machine monitor developed by Locus Computing Corporation in collaboration with AT&T,
1990-2000	<ul style="list-style-type: none"> <li>• First version of Virtual PC for Macintosh platform was released in June 1997 by Connectix</li> <li>• October 26, 1998, VMware filed for a patent on their techniques, which is granted as U.S. Patent 6,397,242</li> <li>• February 8, 1999, VMware introduced VMware Virtual Platform for the Intel IA-32 architecture.</li> </ul>
2000-Till Date	<ul style="list-style-type: none"> <li>• In 2001, VMware released two new products as they branched into the enterprise market, ESX Server and GSX Server. GSX Server allowed users to run virtual machines on top of an existing operating system, such as Microsoft Windows, this is known as a Type-2 Hypervisor. ESX Server is known as a Type-1 Hypervisor, and does not require a host operating system to run Virtual Machines.</li> <li>• Citrix Inc, entered the Virtualization market in 2007 when they acquired XenSource, an open source virtualization platform which started in 2003. Citrix soon thereafter renamed the product to XenServer.</li> <li>• On April 12, 2011, they released an open source platform-as-a-service system called Cloud Foundry, and a hosted version of the service. This supports application deployment for Java, Ruby on Rails, Sinatra, Node.js, Scala and support for MySQL, MongoDB, Redis, Postgres, RabbitMQ.</li> <li>• In April 2013, VMware and EMC formally created a joint venture with GE called Pivotal. All of VMware's application- and developer-oriented products, including Spring, tc Server, Cloud Foundry, RabbitMQ, GemFire and SQLFire were transferred to this organization. The Hyperic monitoring tool, acquired through the SpringSource acquisition, remains a VMware product. In September 2012, Microsoft released Windows Server 2012, which includes the latest version of the company's virtualization platform, Hyper-V.</li> </ul>

Above time frames clearly shows how virtualization has grown over the years with various researches being done.

Today's business climate is more challenging than ever and businesses are under constant pressure to lower costs while improving overall operational efficiency. In short, businesses are being asked to "do more, for less". Virtual Machine technology is one of the most exciting and transformative technologies to change the cost of IT infrastructure since the arrival of enterprise ready X86 hardware.

The concept of virtualization is generally believed to have its origins in the mainframe days in the late 1960s and early 1970s, when IBM invested a lot of time and effort in developing robust time-sharing solutions. Time-sharing refers to the shared usage of computer resources among a large group of users, aiming to increase the efficiency of both the users and the expensive computer resources they share. This model represented a major breakthrough in computer technology: the cost of providing computing capability dropped considerably and it became possible for organizations, and even individuals, to use a computer without actually owning one. Similar reasons are driving virtualization for industry standard computing today: the capacity in a single server is so large that it is almost impossible for most workloads to effectively use it. The best way to improve resource utilization, and at the same time simplify data center management, is through virtualization.

Data centers today use virtualization techniques to make abstraction of the physical hardware, create large aggregated pools of logical resources consisting of CPUs, memory, disks, file storage, applications, networking, and offer those resources to users or customers in the form of agile, scalable, consolidated virtual machines. Even though the technology and use cases have evolved, the core meaning of virtualization remains the same: to enable a computing environment to run multiple independent systems at the same time.

The architecture of physical servers allows them to run only one operating system at a time. Server virtualization unlocks the traditional one-to-one architecture of servers by abstracting the operating system and applications from the physical hardware, enabling a more cost-efficient, agile and simplified server environment. Using server



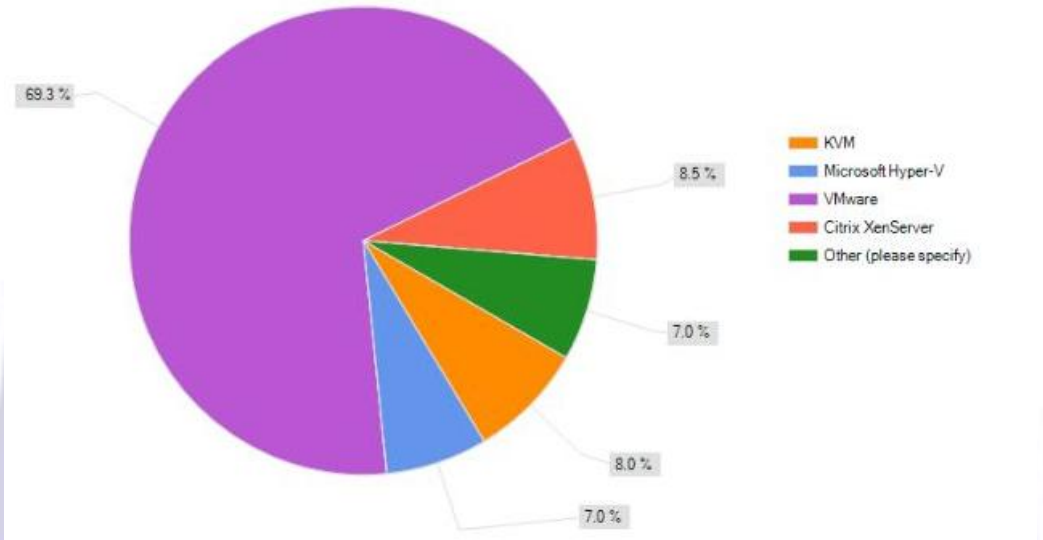
virtualization, multiple operating systems can run on a single physical server as virtual machines, each with access to the underlying server's computing resources. According to IDC Server workloads to go '70% virtual' by 2014.

## 2. CURRENT TRENDS

Following are some leader Companies offering Server Virtualization:-

- VMware(ESX Server)
- Citrix(Xen Server)
- Microsoft(Hyper V)
- KVM

**Figure 1**Nexenta Server Hypervisor Market Share Survey indicates vSphere remains dominant hypervisor



Since VMware is the leading Company, this research will primarily focus on solutions that VMware offers for Virtualization.

For a basic understanding following is a table that shows an illustration about other Companies and their products:-

Table-2 Companies offering Virtualization

Name	Creator	Host CPU	Guest CPU	Host OS	Guest OS	License
Hyper-VServer 2008 R2	Microsoft	x86-64 + hardware-assisted virtualization (Intel VT-x orAMD-V)	x86-64, x86 (up to 8 physical CPUs)	Windows 2008 w/Hyper-V Role, Windows Hyper-V Server	supported drivers for Windows 2000, Windows 2003, Windows 2008, Windows XP, Windows Vista, Linux (SUSE 10 released, more announced)	Proprietary
Hyper-VServer 2012	Microsoft	x86-64 + hardware-assisted virtualization (Intel VT-x orAMD-V only for	x86-64, (up to 64 physical CPUs)	Windows 2012 w/Hyper-V Role,	supported drivers for Windows NT, Linux (SUSE10, RH	Proprietary
KVM	Qumranet, now Red Hat	x86, x86-64, IA-64, with x86 virtualization, s390, PowerPC <sup>[4]</sup>	Same as host	FreeBSD, Linux, illumos	FreeBSD, Linux, Solaris, Windows, Plan 9	GPL version 2
VMware ESX Server	VMware	x86, x86-64	x86, x86-64	No host OS	Windows, Linux, Solaris, FreeBSD, OSx86 (as FreeBSD), virtual appliances, Netware, OS/2, SCO,	Proprietary
VMware ESXi	VMware	x86, x86-64	x86, x86-64	No host OS	Same as VMware ESX	Proprietary
Xen	XenSource	x86, x86-64, ARM, IA-64 (inactive, PowerPC (inactive)	Same as host	NetBSD, Linux, Solaris, MiniOS	FreeBSD, NetBSD, Linux, MiniOS, Solaris, Windows XP & 2003 Server (needs vers. 3.0 and an Intel VT-x (Vanderpool) or AMD-	GPL



### 3. DIFFERENCES FROM TRADITIONAL METHODS AND ADDED BENEFITS OF SERVER VIRTUALIZATION

Following are some Important features/Advantages which VMware Virtualization offers:-

#### **Reduce number of servers**

It enables simple and safe server consolidation.

Through consolidating, the number of physical servers can be greatly reduced. This alone brings benefits such as reduced floor space, power consumption and air conditioning costs. However, it is essential to note that even though the number of physical servers is greatly reduced, the number of virtual servers to be managed does not change.

#### **Reduce TCO**

Server consolidation with virtualization reduces costs of hardware, maintenance, power, and air conditioning. In addition, it lowers the Total Cost of Ownership (TCO) by increasing the efficiency of server resources and operational changes, as well as virtualization-specific features. As a result of today's improved server CPU performance, a few servers have high resource-usage rates but most are often underutilized. Virtualization can eliminate such ineffective use of CPU resources, plus optimize resources throughout the server environment. Furthermore, because servers managed by each business division's staff can be centrally managed by a single administrator, operation management costs can be greatly reduced.

#### **Improve availability and business continuity**

One beneficial feature of virtualized servers not available in physical server environments is live migration. With live migration, virtual servers can be migrated to another physical server for tasks such as performing maintenance on the physical servers without shutting them down. Thus there is no impact on the end user. Another great advantage of virtualization technology is that its encapsulation and hardware-independence features enhance availability and business continuity.

#### **Increase efficiency for development and test environments**

At system development sites, servers are often used inefficiently. When different physical servers are used by each business division's development team, the number of servers can easily increase. Conversely, when physical servers are shared by teams, reconfiguring development and test environments can be time and labor consuming. Such issues can be resolved by using server virtualization to simultaneously run various operating system environments on one physical server, thereby enabling concurrent development and test of multiple environments. In addition, because development and test environments can be encapsulated and saved, reconfiguration is extremely simple.

#### **How Virtualization Software reduces Total Cost of Ownership**

The key point why Virtualization is capturing maximum attention is the Cost effectiveness it offers. Following are the major points supporting the Statement:-

#### **Reducing Number of Servers**

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.

#### **Less Manpower/ Employee Cost to Company (CTC)**

With the number of servers reducing less would be the employee number thus reducing the Manpower and in turn Cost to company.

#### **Less Rack space in Data center/Air Conditioning**

With less number of servers, the space occupied in datacenter would also reduce thus reducing Rack cost. And since the number of servers is less various other factors would also reduce cost.

#### **Reduced time in managing Environment**



Since Virtualization comes with a Management client which can help in managing the entire virtual server remotely on one screen itself and various activities on the server can be done remotely thus the time required for managing the server environment reduces.

**Maintenance Cost**

Less the number of servers, less is the maintenance cost. Moreover features like SRM, Disaster recovery and High availability further increases the reliability and up time.

**4. CONCLUSION**

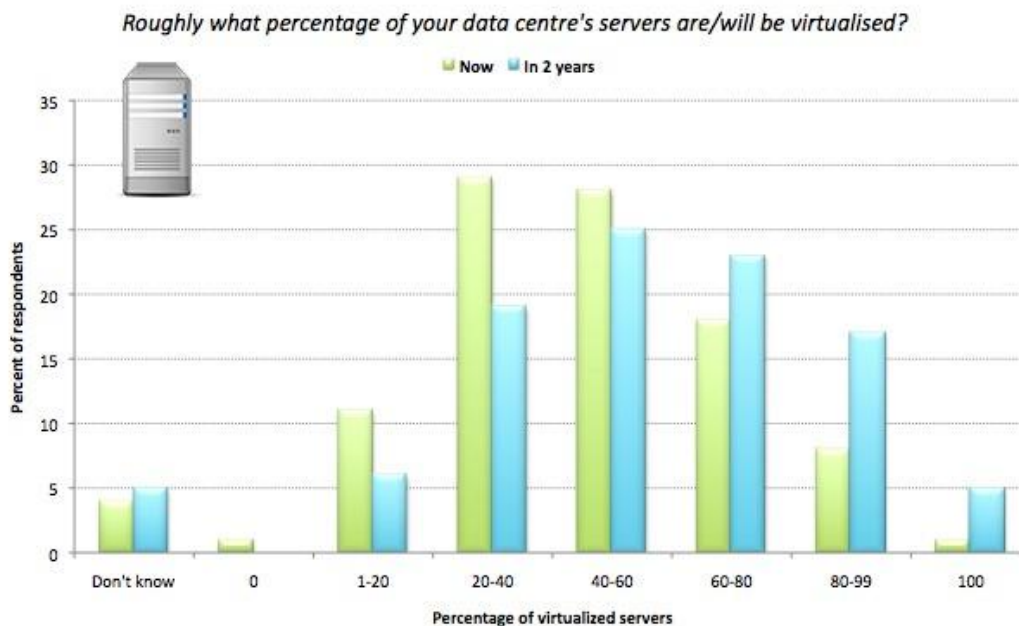
As described above the various Competitive/Organizational advantages Server Virtualization has to offer, it makes Virtualization a clear winner over the traditional methods. Since the start of this technology it has been always the leader in server management.

For any organisation the key points for using any technology are same as the advantages which server virtualization has to offer which not only makes it the favorite for now but for various years to come. Following are some of the best researches which support the conclusion. 'Top Executives are really bullish on Virtualization', that's one of the conclusions of a new survey of 150 managers and executives on virtualization trends, jointly sponsored by Cisco, FlexPod and NetApp. '51% Servers have been Virtualized across world' by 451 Research (leading survey company in IT Industry). A recent survey by market research company Vanson Bourne on behalf of networking vendor Brocade shows the level of penetration of server virtualization in company data centres. This study canvassed 1,750 IT decision-makers and office workers in companies ranging in size from 500 to over 3,000 employees in Europe (UK, France, Germany) and the USA:

**Table-3-Benefit and impact of Virtualization**

BENEFIT	IMPACT
Reduced hardware	Capital Expenses Reduced
Disaster recovery improvements	Agility & Operational Efficiency Improvements
Server provisioning time reductions	Agility and Operational Efficiency Improvements
Upgrade / maintenance reductions	Agility and Operational Efficiency Improvements
Faster capacity for unplanned requests	Agility and Operational Efficiency Improvements

**Figure-2 Percentage of Virtualized Servers**



Source:

Infrastructure and connectivity issues in organizations today (Brocade/Vanson Bourne, June 2013)



Brocade's survey found that, on average; companies currently virtualized 46 percent of their servers, with more than half virtualizing at least 40 percent of their servers. In two years' time, the respondents expect 59 percent of their servers to be virtualized, on average, with three quarters of companies virtualizing at least 40 percent of their servers. Although it's well established, server virtualization is clearly still on the rise.

Above statements support the fact that how Virtualization is growing and booming. Customers have reported significant cost reductions from implementing VMware virtual infrastructure solutions.

**IMPLICATIONS AND OUTCOME OF FINDINGS FOR IT INDUSTRY**

Implications of Virtualization to IT industry have been very fruitful. Gone are the days when a single server used to provide a single service and remained inefficient and underutilized. With the advent of Virtualization a single server is now able to serve at the best of its efficiency and using the features of virtualization remains available to the maximum.

Added advantage like reduced TCO, efficient and optimum server utilization, high availability and Disaster recovery options have made it possible for IT Industry to incorporate this solution and enjoy the benefits of the technology.

Following are some of the best researches completed on the organizations using Server Virtualization:-

**Significant Operational Findings of Benchmark Study Research:-**

**Table-4 Operational Benefits of Virtualization**

OPERATIONAL BENEFITS OF VIRTUALIZATION	OVERALL
Number of new projects increased by	21%
Application time to market improved by	22%
Rework and testing improved by	26%
Server incidents reduced by	27%
System downtime reduced by	26%

**Table -5 Business Benefits of Virtualization**

BUSINESS BENEFITS OF VIRTUALIZATION	OVERALL	
	IMPORTANCE	VMWARE DELIVERS*
Operating expenses reduced	57%	4.1
Business continuity improved	54%	4.2
IT can better respond to customer requests	47%	4.0
IT can better deliver on SLAs to the business	31%	3.9
Customer service Improved	22%	3.7

Study Results for Virtualization Adoption Metrics:-

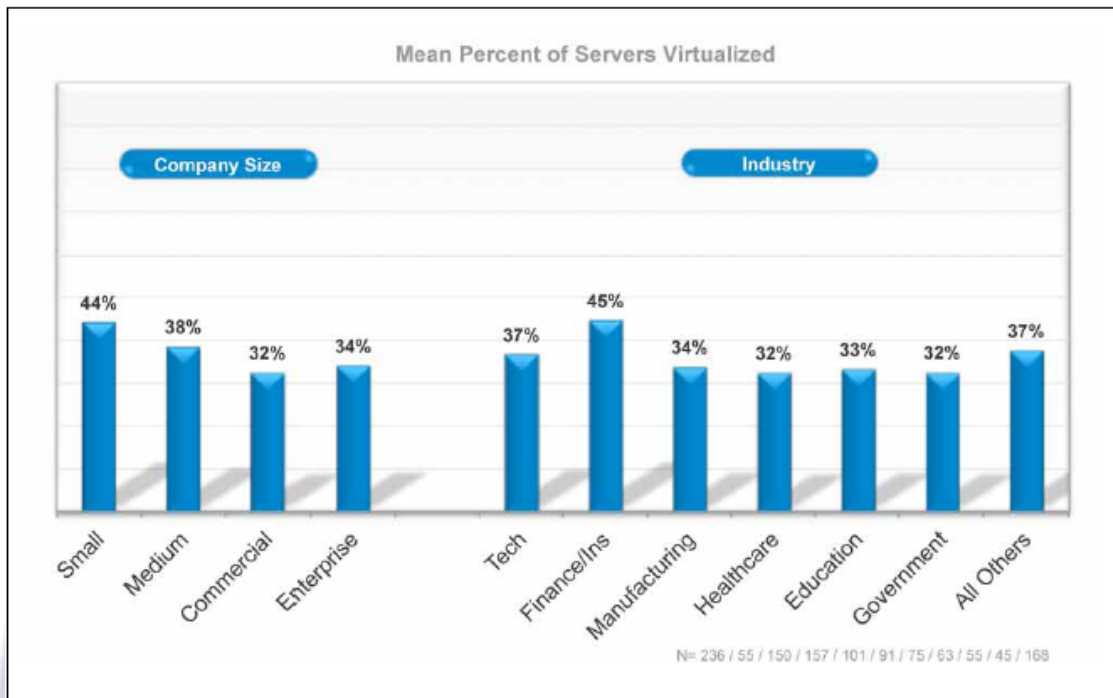
**Table-6 Virtualization Adoption Metrics**



VIRTUALIZATION ADOPTION METRICS	OVERALL
Current percent of x86 servers virtualized	36%
Target percent of production servers that will be virtualized in two years	66%
Percent of newly acquired servers that will be virtualized	76%

Adoption of Virtualization is Steadily Increasing

**Figure-2 Mean Percent of Servers Virtualized**



From above figures and tables it can be concluded that the world of Virtualization is increasing day by day. By consolidating your server hardware with vSphere with Operations Management, your organization can increase existing hardware utilization from as low as 5 percent to as much as 80 percent. You can also reduce energy consumption by decreasing the number of servers in your data center. VMware server virtualization can reduce hardware requirements by a 15:1 ratio, enabling you to lessen the environmental impact of your organization's IT without sacrificing reliability or service levels.

Server and desktop hardware consolidation can also help you achieve a 20 to 30 percent lower cost per application, as well as defer data center construction costs by \$1,000 per square foot. vSphere with Operations Management allows for a 50 to 70 percent higher virtual machine density per host than commodity offerings. To End with Virtualization is a destination for all IT Industries seeking better performance/Efficiency/Utilization and reduces Cost/Administration/Downtime for servers.

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### Author's Biography



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