

Reduction in Infrastructure and operating costs using Server Virtualization

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Abstract

This paper presents a brief look at virtualization, and its benefits in today's IT world. Server Virtualization results in overall reduction in infrastructure and operating costs, manpower requirements, space.

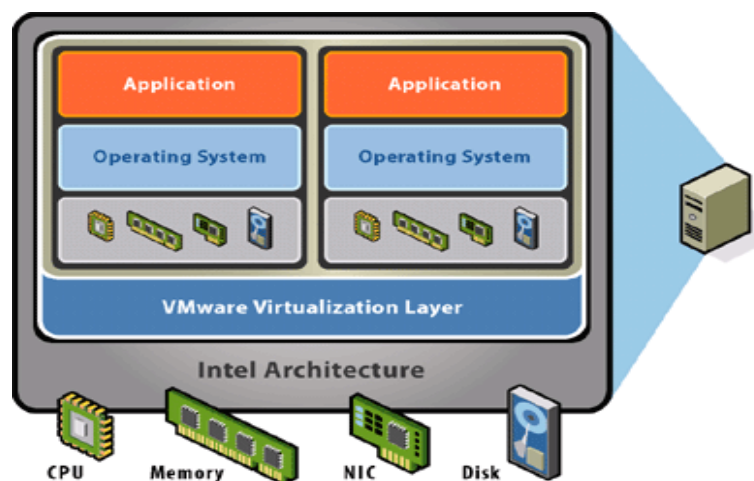
Virtualization provides benefits such as greater efficiency in CPU utilization, better management through central environment control, reduced project timelines, improved disaster recovery capability, more central control of the desktop, and also improved outsourcing services.

Keywords:- Server Virtualization, Citrix, VMware

1.Introduction

Server Virtualization is the technology which enables one single physical server to host multiple servers in the form of virtual machines and every virtual machine is running independent of each other. Each virtual machine can host different operating system like Windows, Linux etc and shares key resources like CPU, HDD, RAM and Network(Hagen, 2008).

Diagram below shows the server virtualization concept by VMware(VMware, n.d).



Server virtualization has disruptive effect on the traditional servers and has lot of benefits for organizations as discussed below.

- 1. Reduction in total cost of ownership:** Virtualization is a blessing for datacenters because running multiple virtual machines on a single server reduces the total cost of ownership. Earlier single server was used to host single application. Number of machines was proportional to number of applications. With the use of server virtualization; the same server is used to host multiple virtual machines with different resource requirements (CPU, memory etc), Operating System and applications. This reduces

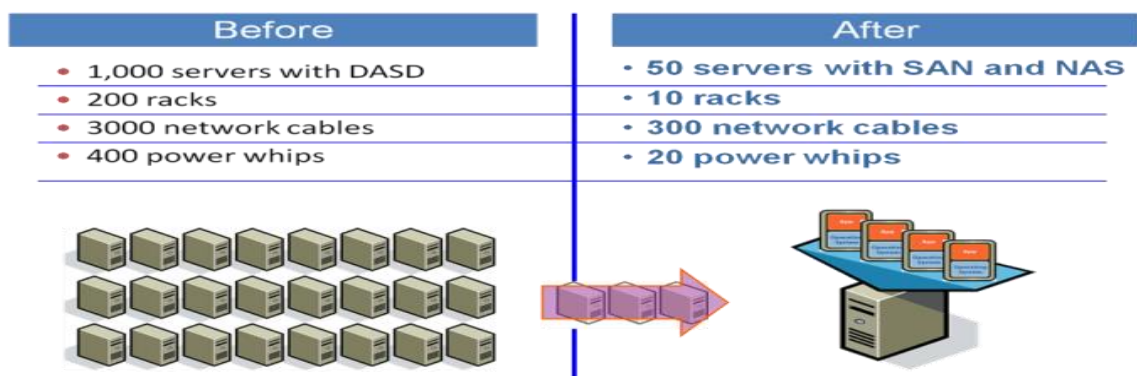
the cost of maintaining multiple servers in terms of man power, hardware and data center space(Hagen, 2008).The Forrester Consulting study on Citrix XenServer(Speyer, 2010)shows the cost benefit comparison in below diagram.



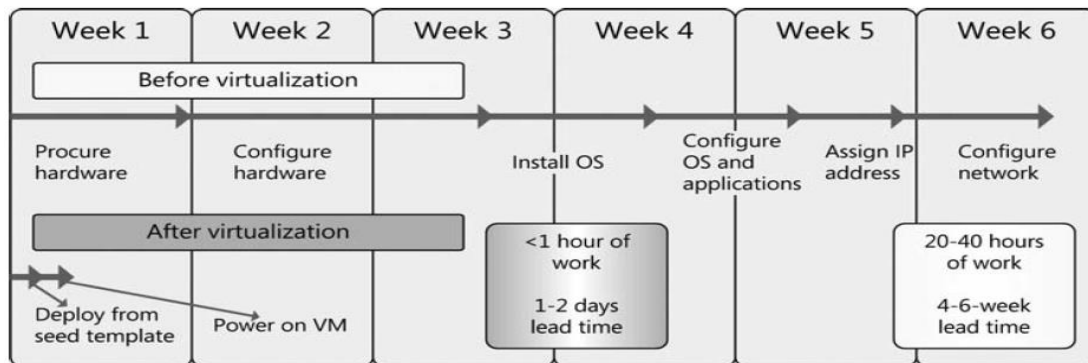
2. **Optimal utilization of resources:** Earlier companies used to purchase hardware keeping future requirements in mind such as projected increase in server load or memory required say in 5 or 10 years.This caused lot of resources to be wasted knowingly. Sometimes this wastage of resources would be at the expense of some other important project because upfront huge investment was done on high end hardware.Dynamic allocation of resources because of server virtualization helps in optimal utilization of hardware. Additional CPU or memory can be allocated when required thus saving the wastage and reducing the upfront investment. Not only this, additional applications can also be supported on the same hardware(Hagen, 2008).

3. **Reduction in IT Infrastructure costs:** Each physical machine consumes a lot of power, cooling & space. Virtualization enables you to add more virtual servers without incurring additional costs on these parameters. In addition to this, it also reduces cost by requiring few Keyboard-Video-Mouse systems, backup tapes, power cables and network cables to connect devices(Hagen, 2008).Positive side effect of this is Green IT. Company can showcase their efforts to reduce dependency on power in terms of lesser Carbon Dioxide emissions. Below diagram shows the reduction in number of racks and cables in a datacenter after virtualization(Netdirect Systems, n.d).

Server, Storage and Network Virtualization
Customer Example - TXU



4. **Faster Time-to-Market:** Earlier a lot of time was wasted to purchase server and to build them. This lengthy process involved a separate manpower to install server in racks, install applications and configure them as per requirements. Say in an IT company while the development servers are being provisioned; development teams would have little to do but wait. In a virtualized data center, the procurement and installation of applications can all be done in a single place/software in few hours. This reduces the overall development time by up to 2-3 weeks and helping companies to achieve faster results as shown in below diagram (Ruest & Ruest, 2009).



(Ruest & Ruest, 2009)

5. **Maximum Uptime & high availability:** In the situation of disasters or downtime, virtual machines can be easily migrated to another machine or created from backup of virtual server disks. Virtualization system providers' also support this by providing online disaster recovery testing without affecting the production environment and automatic disaster recovery (VMware, 2012).

2. Virtual Desktop Infrastructure

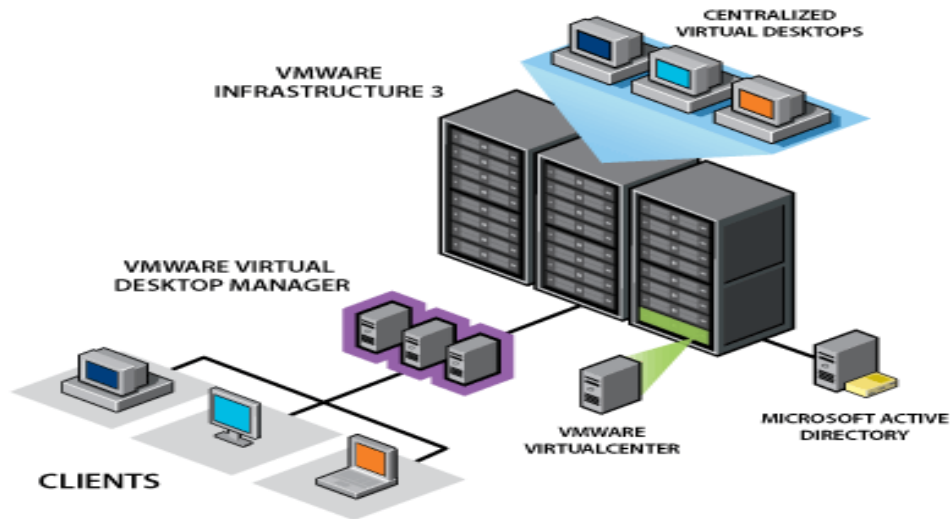
2.1. Overview

Virtual Desktop Infrastructure is a technology which enables host operating system like Windows XP, Windows Vista, Windows 7 or Linux to exist on a virtual server in a centralized data centre instead of physical machine. User accesses their virtual desktops by connecting to virtual server via remote display protocol (RDP), Citrix ICA/HDX, VNC or VMware "PC-over-IP" (VMware, n.d).

2.2. Types of Virtual Desktop Infrastructure:

Server-hosted: Virtual desktop images exist on the server and client access their desktop using remote access. It is suitable for task workers who are mostly connected to LAN and use same applications and settings. Microsoft Remote Desktop Virtualization Host/RDVH, Citrix Xen Desktop, VMware View are some examples of Server-hosted VDI (VMware, n.d) (Spruijt, 2012).

Client-Side: Virtual machines exist locally on a local computer. It is suitable for road warriors (Sales representatives etc) or Laptop users who need ability to work from remote offices or work offline or have requirement to customize their desktops. Citrix XenClient, Microsoft Virtual PC, Oracle Virtual box, VMware Fusion are some examples of Client-side VDI (VMware, n.d) (Spruijt, 2012).



(VMware, n.d)


2.3. Advantages of Virtual Desktop Infrastructure

- **Security:** All the virtual desktops exist on servers in data centre enhances the security of user files and documents. This also reduces the chances of data theft and other virus vulnerabilities associated with use of USBs and help companies (such as Banks) to comply with Regulatory requirements regarding data security. Regular backups of virtual images keep the data safe in case of loss or corruption(Educause, 2011)(Spruijt, 2012).
- **Flexibility & mobility:** Virtual Desktop Infrastructure enables users to logon to any machine and access their personal desktop from anywhere. All you need is the internet access. VDI is very beneficial to remote users who often work from home or from offshore(Educause, 2011)(Spruijt, 2012).
- **Easy Administration:** The images of virtual desktop can be deployed and managed from single location instead of installing software from computer to computer. Deploying new images is much faster process than installing operating system. IT staff don't have to spend lot of time installing operating system and installing softwares/applications (VMware, n.d)(Spruijt, 2012).

3. Research And Development

3.1 Citrix over Windows Server 2003 Terminal Services

Application Performance: According to me, Citrix provides better application performance for Graphic applications. As per my experience with US based Oceaneering International Company, where Citrix ICA Client Ver8 is used and users working from home login to citrix server to work on office applications like Solid Works, Solid Works edrawings, AutoCAD. I have seen them working on these graphic applications and drawings with high resolutions without any display distortion or screen does not garble, it seems as if you are working locally sitting in office. However, in remote desktop connection the screen got distorted and movement of solidworks/autoCAD drawings is considerably slow. To support my opinion I have given the reference of YouTube video where working of citrix and RDP session on solid works edrawings has been shown in 1ms and 10ms latency by blasterFX1(YouTube, 2008).

Session Reconnection: According to my experience, during the citrix session between server and client if my session got interrupted due to network failure, it tries to reconnect with server in the background or in taskbar showing red  symbol reconnecting. Furthermore, it reconnects with the same session which

saved time to login again to server. However, Microsoft Server 2003 Terminal Server does provide this feature but with Enterprise edition only and in previous versions it creates new connection rather than saved connection. So I can say that session disconnection/reconnection is more reliable with citrix than Microsoft Windows Server 2003 Terminal Services.

Drag and Drop: As per my experience, drag and drop feature make citrix superior than Microsoft windows 2003 terminal server. During citrix session, I can make the shortcut of published application by dragging and dropping on my desktop without giving any path of the server however windows server 2003 terminal services does not allow to drag and drop between sessions. It allows me to create a Remote Desktop shortcut and if I want to open the particular application then I have to give the path of the application (residing on server) in programs tab.

Application Deployment: Citrix make the application deployment much easier than Windows 2003 Terminal Services. The remote connection is also secure and reliable. According to my experience in Oceanering International, ACET (Asset Condition Evaluation Tool) database server exist in UK's Oceanering office and all users sitting worldwide access the ACET database via Citrix server. ACET application is deployed on Citrix XenApp server from where users connect to ACET database via web browser using username and password. No application is used to install on local pc except citrix ICA client which automatically download itself while connecting to ACET. Citrix ICA client make the connection and data more secure and encrypted because users connect to citrix server via Citrix ICA client. Moreover, all their work also saved on the citrix server instead of local pc. So, I can say that application deployment using web browser is much easy via citrix however deploying applications/software is not offered by Windows Server 2003 terminal services.

Single Sign On: Single Sign On enable user to enter login information once and then it automatically login user in all applications. On my personal experience in Oceanering International Ltd, where Novell Secure login is used as SSO application. I can say that citrix support Single Sign On application where it automatically put username and password when user logs in the applications on a remote session. This feature makes it more superior over Microsoft Server 2003 Terminal Services which support it only with Service Pack 2.

Products / Differences	Citrix XenDesktop	Microsoft's Remote Desktop Virtualization Host	VMware View
Remote Display Protocol	It uses High Definition Experience protocol (HDX/ICA) as its RDP protocol. It is TCP based protocol.(Schultz, 2011). It communicates only with Terminal Server with citrix installed.(Chiara, n.d)	It uses RDP as its default protocol. It supports TCP/IP only.(Schultz, 2011) RDP clients communicate with Microsoft Terminal Servers only.	It uses PCoverIP. PCoverIP is UDP based protocol.(Schultz, 2011)
Licensing Costs	It offers per user licenses.	Microsoft offers device based license. \$100/Year/Device	It offers license on the basis of per Virtual machine(VMware,

		(Microsoft, n.d).	n.d).
Client Device Support	Citrix support is much wider than other Microsoft and VMware because it support clients like Windows, Mac, Linux, Unix, IOS (IPad, iPhone), Android, WebOS, Blackberry(Spruijt, 2012).	It does not support Linux, Unix, Mac, IPad, Google Android(Spruijt, 2012).	Except Windows 2000 professional, Vista 64 Bit, Server 2003 R2 & Server 2008 R2 machine it support all windows operating system. It also support Linux and Google Android OS(Spruijt, 2012).
Virtual Infrastructure Support – Hypervisor	It supports XenServer, VMware Sphere and Microsoft Hyper V Windows Server 2008(Spruijt, 2012).	It supports Microsoft Hyper V Windows server 2008 R2 only (Spruijt, 2012).	It supports only VMware vSphere 4.0, 5.0 technologies(Spruijt, 2012).

4. Conclusion

Because of above mentioned benefits such as overall reduction in infrastructure and operating costs, manpower requirements, space and ease of use the virtualization technology is gaining popularity in today's IT world. To put some figures behind the benefits I am quoting statement of **Anthony O'Donnell, Insurance and Technology** about the savings by using Virtualization. He stated that

since the overall virtualization effort began in 2005, Nationwide [Insurance] has reduced physical server from more than 5,000 to about 3,500 [and] virtual server have increased from 75 to more than 1,450, with a related 50 percent reduction in monthly Web hosting costs, an 80 percent reduction in data center floorspace needs, a 20 percent to 50 percent reduction in hardware and operating system support costs, and an average increase of server utilization to about 65 percent from 10 percent. (Donnell, 2012)

References

1. P. Mell, T. Grance, —The NIST Definition of Cloud Computing, National Institute of Standards and Technology, Information Technology Laboratory, Technical Report Version 15, 2009. [2]
2. S. Perez, —Mobile cloud computing: \$9.5 billion by 2014, <http://exoplanet.eu/catalog.php>, 2010.
3. IBM, —IBM systems virtualization, version 2 release 1, <http://publib.boulder.ibm.com/infocenter/eserver/v1r2/topic/eicay/eicay.pdf> (2005).
4. Karen Scarfone, Murugiah Souppaya, and Paul Hoffman, —Guide to Security for Full Virtualization Technologies, Special Publication 800-125, National Institute of Standards and Technology (NIST), 2011.
5. Dawei Sun, Guiran Chang, Qiang Guo, Chuan Wang, Xingwei Wang., —A Dependability Model to Enhance Security of Cloud Environment Using System-Level Virtualization Techniques, First

International Conference on Pervasive Computing, Signal Processing and Applications (PCSPA); 2010, pp.305-310.

6. Joanna Rutkowska and Alexander Tereshkin, —Bluepillling the Xen Hypervisor, Xen Owing Trilogy part III, Black Hat USA, aug 2008. [7] P. Barham, B. Dragovic, K. Fraser, S. Hand, T. Harris, A. Ho, R. Neugebauer, I. Pratt, A. Warfield, —Xen and the art of virtualization, in: Proc. 19th ACM Symposium on Operating Systems Principles, SOSP 2003, Bolton Landing, USA, Oct. 2003.
7. Z. Pan, Q. He, W. Jiang, Y. Chen, and Y. Dong, —Nestcloud: Towards practical nested virtualization, in Proc. Int Cloud and Service Computing (CSC) Conf, 2011, pp. 321–329
8. Samuel T. King, Peter M. Chen, Yi min Wang, Chad Verbowski, Helen J. Wang, and Jacob R. Lorch, —Subvirt: Implementing Malware with Virtual Machines, In IEEE Symposium on Security and Privacy, 2006.
9. B. Siddhisena, Lakmal Wruasawithana, Mithila Mendis, —Next generation multi tenant virtualization cloud computing platform, In: Proceedings of 13th International conference on advanced communication technology(ICACTION), vol. 12, no.3; 2011. p.405–10
10. C. Almond, “A Practical Guide to Cloud Computing Security ,” 27 August 2009.