

## **Virtualization Benefits and Which Software to Use**

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### **Abstract**

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Virtualization technology has allowed businesses to benefit from increased efficiency while reducing costs. This allows for information technology (IT) departments and organizations to increase server utilization, lowering environment footprint while able to accommodate increased scalability, availability and infrastructure consolidation. The authors in this paper discuss the benefits of virtualization as well as a comparison of the three most popular virtualization software packages used today and a recommendation for one as being the preferred product in most situations.

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Keywords: Virtualization, consolidated infrastructure, IT scalability

### **Introduction**

There have been few new technologies that have increased business productivity and infrastructure more so than virtualization. The term virtualization refers to the emulation of hardware within a software platform, which allows a single computer to take on the role of multiple computers (Bhardwaj and Kaushik, 2014). Virtualization has offers many benefits providing efficiencies and capabilities that are unrestricted by geography and limitations of the physical world. Therefore, IT departments within organizations see that through virtualization their computing infrastructure costs can be reduced drastically and in doing so would increase estimated server utilization from roughly 15% to as much as 80% (Malhotra, Agarwal & Jasiwal, 2014). This allows for many other benefits listed below:

- 1) Cost efficiency
- 2) Scalability
- 3) Higher availability
- 4) Consolidated Infrastructure

After the decision to use virtualization technology the next step would be how to implement it and what software packages to use. The latest versions of VMware player 12.0, VirtualBox 5.0 and Virtual PC 6.0 are three popular types of desktop virtualization software that are commonly used. The feature sets and capabilities of all three types will be reviewed and compared in this paper and a recommendation will be made by the authors (Ward, 2016).

### **Cost Efficiency**

One of the primary concerns of any business especially one that employs a lot of technology is the cost. There are costs in hardware, software and support personnel. Virtualization addresses all three areas and can offer reduced costs and efficiency. The cost of the physical computer hardware systems, software and training of personnel is usually a big part of an IT department's operating costs. When using virtualization less physical hardware is needed, less software licenses may be used and technical support personnel can be reduced to support the reduced number of systems even though they would obviously need to be trained in using the virtualization software. In organization that have hundreds of computers and servers the use of virtualization software could reduce the physical number of servers and computers resulting in lower power consumption, real-estate and footprint allowing for better overall utilization of the facility.

For example, a server room that runs 10 full physical servers may use 10 times the number of wattage required by each server whereas by using virtualization and running 3 physical servers and 7 virtual servers the power consumption can be reduced to approximately 4-5 times the required wattage (Camargos & Girard, 2008).

### **Scalability**

Scalability in IT is the ability for both expansion and contraction of infrastructure within the minimal amount of overhead. For example, if the organization expands by 100 employees the company would obviously need to spend money and time to accommodate the new workers. This capital cost is then typically spread out over a number of years to calculate return on investment (ROI) and placed into the hardware/software life cycle. If there is then a decrease in business requiring the removal of 50 employees how easily this can be done affects the company's ability to scale to size. Virtualization makes this process much more effective because in essence many of the systems that the new employees use can be virtual so only virtualization software configuration is needed. If the business requires removal of those "workstations" then that can be achieved with relatively minimal costs allowing for company increase or decrease with little notice and less operating and budgeting revenue.

### **Higher Availability**

Availability is concerned with the amount of time the computer network and infrastructure is up and running to support an organization's business. Virtualization allows for servers that are fully independent from each other and thus decreases downtime during scheduled maintenance periods. For example if the file server needs to be rebooted it can quickly be "cloned" and switched over so that the actual reboot the network infrastructure would be running off the backup cloned server. This allows for maintenance, upgrades and repairs to be done in a production environment without negatively affecting business operations something that plagued physical servers for years (Malhotra et al., 2014). A system that runs virtualization software can easily be configured to work with other hosted virtual systems allowing for the elusive 99.999% uptime which is nearly impossible in the physical world.

### **Consolidated Infrastructure**

New laws such as the Sarbanes-Oxley, Gramm Leach Bliley and HIPAA have required strict privacy, security and auditing mandates on organizations especially those that hold sensitive information from customers. The use of consolidated computing and networking infrastructure helps alleviate these demands and through virtualization there is the ability to support higher management functions, security, auditing and tracking. Having the critical servers hosted in a single controlled environment also offers a higher level of security than having the company data be spread across many office and several divisions (Figueiredo, Dinda & Fortes, 2005).

### **Virtualization Software**

Virtualization software allows for one to run multiple operating systems on a single hardware system effectively creating virtual machines that is independent of the current host operating system. This ability offers many advantages over previous implementations such as dual-booting, boot-camp or multiple hard drives to support multiple operating systems on a single hardware system. Virtualization allows for businesses and enterprises many benefits such as more efficient use of hardware, reduced power consumption and costs, lower environmental footprint, consolidation of servers which can lead to increases security (Lombardi & Pietro, 2010).

The three most commonly used desktop virtual machine software include VM Player from VMWare, VirtualBox from Oracle and Virtual PC from Microsoft. All three software packages allow for the users to create their own hosted virtual machines on a physical system that meets the minimal requirements to support virtualization software; however, there are key differences leading to one of the three products being superior in most situations. The comparison includes several factors such as:

#### *1) Speed of guest virtual machines*

Assuming the host machine has all the recommended hardware such as: Multi-core processors, 8GB or more of RAM and, 500GB or larger hard drives guest virtual machines are installed on the physical machine and the speed of the guest virtual machine is of critical importance between if it is too slow then it can be rendered useless and not a suitable replacement for a physical machine.

#### *2) Speed of the host machine*

Even with the recommended hardware if the virtualization software is not optimal the host machine's performance could be degraded enough where it can no longer perform as well as it should while supporting the guest virtual machines.

3) *Networking features and options*

New networking technologies such as virtual LANs (VLANs) and bridging has allowed for full networking connectivity in-between virtual machines so networking features and options are important when comparing the products.

4) *Cloning and snapshots*

Cloning and snapshots refer to the ability for the virtualization software to effectively copy or take a running snapshot of a virtual machine which can then be duplicated or copied to another host. The snapshot feature allows for a virtual machine to be stopped and then resumed in it snapped state within minimal interruption.

5) *USB support and transfer speed*

USB support for USB 1.1, 2.0 or 3.0 standards and transfer speeds are compared between the three products.

6) *Support of other file formats*

If the user wants to create different file formats or share the file with different virtual machines software this feature determines whether the files are readily readable by other VM software.

7) *Full view and mouse integration*

The full-screen display and full mouse integration are important for seamless control from the user while using either the host system or another virtual machine.

8) *64bit virtualization support*

This tests the ability for the virtual machines software to support 64bit operating systems increasing the feature set of the software package as more and most applications are being written in 64bit.

9) *Virtual disk support*

This deals with the ability of the software package to support virtual disks versus requiring the needs for the physical free disk space.

10) *Cost of the product*

Cost of software is an important issue, however, cost may not be an issue with these products which happen to be all free and are easily downloadable (Deepak, Mohan, Vasudevan & Naik, 2012).

The results of the comparative analysis of VMware Player 12.0, Oracle VirtualBox 5.0, and Windows Virtual PC 6.0 are presented in the Table 1.

### **Conclusions**

The results of the comparison show that even though all three virtualization software packages offer many of the features needed by an organization that wants to use virtualization technology, VirtualBox is the preferred virtualization software due to its benefits over VMware player and Virtual PC. A few of the more enhanced features of VirtualBox include full virtual disk support and the improved overall speeds of the guest and host machines. VMware player slightly edges out Virtual PC. Further research and comparative analysis could be done on server-side virtualization software keeping in mind the myriad of options and costs associated.

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Comparison Factor	VMware Player 12.0	Oracle VirtualBox 5.0	Windows Virtual PC 6.0
Virtual Machine Speed	Normal	Fast	Slow
Host Machine Speed	Normal	Fast	Normal
Networking Features and Options	Very good	Very Good	Good
Cloning and Snapshots	Not available	Good	Good
USB Version Support and Speed	Good	Good	Good
Support for Other File Formats	Normal	Normal	Normal
Full View and Mouse Integration	Normal	Normal	Normal
64bit Virtualization Support	Very Good	Good	Good
Virtual Disk Support	Good	Very Good	Good
Cost of the Product	Free	Free	Free

Table 1. Comparison of VMWare Player, VirtualBox and Virtual PC