



A Comparison of Features of VirtualBox and VMware

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Abstract—Virtual Machines are very important tools nowadays. Virtual machines give users facility to run different operating system on the current operating system. With the help of Virtual Machines users can test the new versions of the software whether they are meeting the requirements or not. Virtual Machines also help to decrease the hardware cost of the computer system as one can emulate the desired hardware needs. Main player of Virtual Machines are VirtualBox, VMware, QEMU, and Windows Virtual PC. In this paper two Virtual Machine software VirtualBox and VMware are discussed. Various Features of both the machines are also discussed.

Keywords: Virtualization, VirtualBox; VMware;

I. INTRODUCTION

Virtualization has become very important tool in modern computer system these days. Virtual machine allows users to run other operating system within the current operating system. Virtual Machine is a self contained operating environment that acts as a separate computer. For example running a java applet by java virtual machine that has no access to the computer operating system [1]. Virtual Machines are used to run other operating systems within current operating system in the computer. This operating system will run like any other program in the system. Virtual Machine is very useful to test other operating systems. One can also run software on the operating system for which it was not designed. For example we can run window program on Mac or vice-versa [2]. Main examples of virtual machines applications are 1) VirtualBox ii)VMware iii) QEMU (Quick Emulator) iv) Windows Virtual PC [3]. Operating system of the computer system on which any of the virtual machine application is installed is known as Host Operating System. It is the original OS installed on the computer System. Operating system which is running inside the Virtual Machine is known as Guest Operating System.

II. VIRTUAL MACHINE

Main advantages of using Virtual Machine are:

- i) Testing of new versions of the operating system: users can test new versions of the operating systems. For example one can check next version of the operating system which is under development on the previous versions of the operating system.
- ii) Practical experiment with the other Operating System: users can install another operating system in virtual machine and can learn how it is working.
- iii) Running software which is designed for the other Operating System.
- iv) Running software which requires outdated Operating System.
- v) Testing software on multiple platforms [2].
- vi) With the help of virtualization multiple virtual servers can be hosted on a single server hardware hence decreasing the hardware cost [4].

III. VMWARE

This virtualization software is provided by VMware a US based company. This company claims to be first who has successfully virtualized the x86 Architecture. VMware workstation allows users to run multiple instances of the operating system on a single physical machine. Users can set up more than one virtual machine and can execute different operating systems simultaneously. Main Operating System which are supported by VMware are Microsoft windows, Linux, MSDOS, and BSD (Berkeley Software Distribution) [5]. VMware Workstation is based on a design called the Hosted Virtual Machine Architecture.

This architecture allows it to co-exist with a pre-existing host operating system.

Main components of VMware workstation are VMAApp, VMDriver, VMM(Virtual Machine Monitor). These two components VMAApp and VMDriver are stored on the host operating system directly.

When VMware Workstation application is run on the host operating system VMAApp uses driver VMDriver which is also on the host operating system to start VMM (Virtual Machine Monitor Component) which run on the hardware directly. In this case whenever there is I/O operation by guest operating system VMM intercepts it and switch it to the host Operating System instead operating itself directly.

VMApp is used to perform various related I/O request on behalf of the virtual machine through appropriate system calls. This hosted architecture is a very powerful way to cope with the vast array of available hardware in hosted computer. Main drawback of this architecture is that I/O performance degrades. Since I/O emulation is in the host world, so extra switching of CPU is done between host Operating System and VMM. Another drawback of this architecture is that host Operating System is in full control of the machine resources, so it treats VMware workstation as an ordinary application [6].

IV. VIRTUALBOX

VirtualBox is cross-platform virtualization software from Oracle Corporation. VirtualBox can run multiple operating systems simultaneously. Main advantages of using VirtualBox are:

- i) VirtualBox allows users to run more than one operating system simultaneously. So users are able to run window software on Linux or on Mac operating system simultaneously without rebooting the system.
- ii) It can run on multiple operating systems e.g. on Windows, Mac OS, Linux and Oracle Solaris Systems.
- iii) No special hardware is required for running VirtualBox .Only requirement is x86 compatible system and enough memory for running the guest OS [7].
- iv) If a computer system has Intel VT-x or AMD-V hardware virtualization extensions then VirtualBox can utilize these to provide good guest operating system performance.

Oracle VirtualBox has a layered architecture. First layer consist of set of kernel modules used for running virtual machines. Second layer contains Oracle VM VirtualBox API layer used for managing the guests.

Third layer consist of user programs and services. At the core is hypervisor or virtual machine monitor (VMM) that is used to create and run virtual machines.

The Intel x86 architecture defines four levels of storage privileges called rings 0, 1, 2, and 3. Ring 0 is most privileged and ring 3 is least privileged. Operating system uses these rings to protect critical memory of the computer system when user applications are running. Ring 0 is important because it allows software to access real processor, registers, page tables, and service interrupts. Most operating systems execute user applications in ring 3 and their kernel services requirements are executed in ring 0. In case of VirtualBox all of the guest OS user code is run natively in ring 3.

In case of no hardware virtualization support guest kernel code is not allowed to run in ring 0 but instead it runs in ring 3. This scheme protects the host Operating System against failures in the guest.

Virtualizing the x86 architecture means placing a virtualization layer under the host operating system and it will manage the shared resources [8].

V. MAIN FEATURES COMPARISONS

1. Supported Host operating systems:

VirtualBox : Main operating systems which are supported by VirtualBox are :

Windows XP, Vista, 2003, 2008 Server, Windows 7, 2012 Server, Windows 8, Linux, Mac OS X, OpenSolaris, FreeBSD [7].

VMware: Under VMware main Operating System which are supported are : Windows 2000, XP, 2003, Vista, 7, 8, Linux (32bit and 64bit), Mac OS X [9].

2. Supported Guest Operating System are:

VirtualBox: Main operating systems supported are DOS, Windows 3.1, 95, 98, NT, 2000, XP, Vista, Windows 7, Windows 8, Windows Server 2003/2008/2012, Linux, OpenBSD, FreeBSD, OS/2, Solaris, OpenSolaris [9].

VMWare: VMWare support following guest operating systems: DOS, Windows 3.1, 95, 98, NT, 2000, XP, Vista, 7, 8, Linux, FreeBSD, Solaris

3. 64Host and 64Guest OS support:

VirtualBox : VirtualBox can run on many 64 bit Operating Systems and can support 64 bit guest operating systems [9].

VMware : It also support both 64 bit host as well as 64 bit guest operating systems [9].

4. USB Support

VirtualBox : It allows to access the USB devices by virtual USB controller [11]. There is no need to install hardware specific device drivers. Latest versions of VirtualBox also support USB 3.0.

VMware : VMware also support access to certain USB devices [9].

5. CD/DVD Writing :

VirtualBox : VirtualBox allows CD/DVD writing [9] [12].

VMware : It support reading of CD/DVD devices. DVD video is not supported (VMware workstation 11) [14].

6. Differences in USB Support:

VirtualBox: It uses the following controllers for USB devices. OHCI, EHCI, xHCI. Both controllers xHCI and EHCI are shipped as a VirtualBox extension Package [13].

VMware: It uses following controllers for supporting USB devices. USB 1.1 UHCI, USB 2.0 EHCI, USB 3.0xHCI [14].

7. Differences in Network Support:

VirtualBox: It support up to 8 virtual Ethernet cards, 4 of the network cards can be configured using GUI of VirtualBox [13].

VMware: VMware support up to 10 virtual Ethernet cards (VMware workstation 11)[14].

8. Reliability

VirtualBox: This product is newer, so it is not well known to the users and used very less by industries. Since it is newer so it is having more bugs.

VMware: It is very much famous in the industry and has proven its reliability, and it has very good snapshot support.

9. Efficiency:

VirtualBox : It is very lightweight. VMware is resource demanding and heavy as compared to VirtualBox.

It is less efficient in terms of performance, security, and availability.

VMware : more efficient in terms of performance, security, and availability[10].

Both VirtualBox and VMware are freeware but VirtualBox is an open source whereas VMware Player is not an open source . Virtual box is free for personal and educational use [9].

VI. CONCLUSIONS

Both products VMware and VirtualBox support a wide range of the operating systems as guest as well as host. VirtualBox is lightweight virtualization software for the desktop. It does not slow the host operating system performance. Graphical user interface in case of VMware is very good as compared to VirtualBox. Snapshot feature of the VMware Workstation product give users facility to return to the same state of the virtual machine repeatedly in case of any failure.

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