

A Comparision Study: XenMotion vs VMotion

Divya Kapil

School of Computing, Graphic Era Hill University, Dehradun, India

Abstract: Virtualization technology allows abstraction and isolation of lower level functionalities and underlying hardware. Virtual machine monitor, also called a hypervisor, which is a logical layer between underlying hardware and computational processes, and runs on the top of a given host. Virtualization provides facility to migrate virtual machine from one host (source) to another physical host (destination). Virtual Machine Migration is a useful tool for administrator of data centers. The reasons for VM migration are: Load Balancing, accomplished by migrating VMs out of overloaded / overheated servers, and Server Consolidation. Two major VM migration technologies are VMotion and XenMotion respectively supported by two major virtualization vendors-VMware and Citrix. In this paper we are comparing these two live virtual machine migration techniques.

Keywords: Virtualization, Live Virtual Machine Migration, XenMotion, VMotion

1. Introduction

Virtualization technology was implemented on IBM mainframe 1960. Virtualization is a widely adopted technique for resource multiplexing problems. Virtualization can be applied to either single physical resources of a computing system or to a complete computing system, also known as *Platform Virtualization*; it allows multiple "Virtual Machines" running in the same computing host. Hence Virtualization is the abstraction of the physical resources needed to complete a request and underlying hardware used to provide service.

Virtualization can run multiple operating systems concurrently as shown in Fig. 1. A single host can have many smaller virtual machines in which isolated operating system instances are running. The physical server is called the **host**. The virtual servers are called **guests**. The virtual servers behave like physical machines. Each system uses a different approach to allocate physical server resources to virtual server needs. Virtualization can provide many benefits, such as resource utilization, portability, and application isolation, reliability of system, higher performance, improved manageability and fault tolerance.

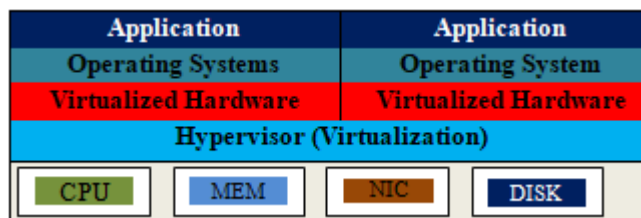


Figure 1

Hypervisor/VMM (Virtual Machine Monitor)

IBM introduced another level of indirection in the form of a virtual machine monitor (VMM) (also called a hypervisor), which is a logical layer between underlying hardware and computational processes, and runs on the top of a given host. VMware ESX / ESXi, Virtual PC, Xen, and Microsoft Hyper-V, KVM, and VirtualBox are popular virtualization software.

Types of Hypervisor

- 1) Type-1(Bare-metal)
- 2) Type-2(Hosted)

Type 1 (or *native*, bare metal) hypervisors run directly on the host's hardware to control the hardware and to manage guest operating systems (runs on another level above the hypervisor). Fig 2 shows Type-1 hypervisor.

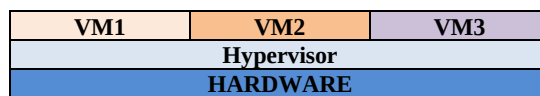


Figure 2

Type 2 (or *hosted*) hypervisors run within a conventional operating system environment. With the hypervisor layer as a distinct second software level, guest operating systems run at the third level above the hardware. VMware Workstation and VirtualBox are examples of Type 2 hypervisors. Fig 3 shows Type-3 hypervisor.

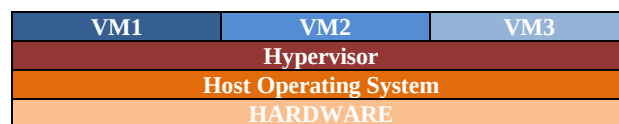


Figure 3

2. Live Virtual Machine Migration

Live virtual machine migration is the process of moving virtual machine from one physical host to other host without disturbing others. When a virtual machine is being copied between different physical hosts, it is said to be migrating. The migration techniques can be classified as either static or dynamic. There are two methods for static migration and several for dynamic migration. Static and dynamic techniques differ in their process of migrating data. A virtual machine is completely inoperable while being migrated using static techniques while dynamic techniques attempt to minimize the total downtime by allowing execution to continue while the migration is occurring. The static techniques include static migration and cold migration. In static migration, the virtual machine is completely shut down through the operating system. In cold migration the virtual machine is paused, suspended, or frozen in its current execution state. Dynamic migration, also known as live migration, transmits memory pages between the source and target hosts as the virtual machine continues executing.

The reasons for VM migration are: *Load Balancing*, accomplished by migrating VMs out of overloaded / overheated servers, and *Server Consolidation*, where servers can be selectively brought down for maintenance after migrating their workload to other servers, energy saving, efficient resources utilization.

- 1) *Online maintenance*: A system must be connected with the clients to improve system's reliability and availability and the up gradation and maintenance of the system is also necessary.
- 2) *Load Balancing*: VMs can be migrated from heavy loaded host to light loaded host to avoid overloading of any one server.
- 3) *Energy Management*: VMs can be consolidated to save the energy. Some of the underutilized server VM's are switched down and the consolidated servers ensure power efficient green cloud.
- 4) *Server Consolidation*: Server consolidation is the process of aggregating number of VM in to a single physical server. It is useful in power consumption and energy of the data centers
- 5) *Proactive maintenance*: It deals live virtual machine can replace the failure virtual machine by moving in to new physical machine. Disaster recovery is other important feature of live migration. It also used for load balancing.[5]

3. Virtual Machine Migration Techniques

Two major VM migration technologies are VMotion and XenMotion respectively supported by two major virtualization vendors-VMware [2] and Citrix [3]. Though both VMotion and XenMotion mainly use pre-copy approach to transfer data their underlying VM memory allocation mechanism and data transferring protocol could be quite different. Such diversities result in different performance quality under the same network condition.

Performance Metrics

The following metrics[5] are to measure the performance of live migration:

- 1) *Downtime*: The time during which the migrating VM's is not executing. It includes the transfer of processor state.
- 2) *Resume Time*: This is the time between resuming the VM's execution at the target and the end of migration, all dependencies on the source are eliminated.
- 3) *Pages Transferred*: This is the total amount of memory pages transferred, including duplicates, across all of the above time periods.
- 4) *Total Migration Time*: This is the total time of all the above times from start to finish. Total time is important because it affects the release of resources on both participating nodes as well as within the VMs.

4. XenMotion Vs VmMotion

VMotion

VMware is a company that provides virtualization software for x86-compatible computers. The term "VMware" is often used in reference to specific VMware products such as VMware Workstation, VMware Virtual Desktop Infrastructure, VMware Player and VMware Server. VM, which stands for "Virtual Machine", is a software

implementation of a computing environment in which an operating system or program can be installed and run". In 1998 VMware was founded by Diane Greene. VMware developed a range of products(hypervisors). VMware's type 1 hypervisors running directly on hardware, along with their hosted type 2 hypervisors.

VMware Workstation

VMware Workstation is a hypervisor that runs on x64 computers; it enables users to set up multiple virtual machines (VMs) and use them simultaneously along with the actual machine. Each virtual machine can execute its own operating system, such as Microsoft Windows, Linux . As such, VMware Workstation allows one physical machine to run multiple operating systems simultaneously. VMware Workstation can save the state of a virtual machine in one point of time. This saved states, known as a "snapshots" can later be restored, effectively returning the virtual machine to the saved state. VMware Workstation includes the ability to designate multiple virtual machines as a team which can then be powered on, powered off, suspended or resume as a single object, making it particularly useful for testing client-server environments. VMware Workstation provides the most dependable, high performing and secure virtual machine platform. VMware Workstation supports over 200 operating systems, including Windows 7, Windows Server 2008 R2 and over 20 other versions of Windows along with Redhat, Ubuntu, and 26 additional versions of Linux. [2]

VMware VMotion enables the live migration of VMs from one host to another with continuous uptime. It allows admins to perform server maintenance without disrupting guest VMs, and it makes disaster recovery faster and more efficient. In addition, vMotion facilitates VM load balancing across physical hosts. That improves VM performance and optimizes resource usage.

Key Features :

- 1) Reliability, VMotion continues to set the standard for the most dependable live migration capabilities.
- 2) Performance, Perform live migrations with downtime unnoticeable to the end users. Optimal use of CPU and network resources ensures that the live migrations occur quickly and efficiently.
- 3) Live migrate virtual machines across different generations of hardware. Migrate virtual machines from older servers to new ones without disruption or downtime.
- 4) Manageability: Migration wizard, quickly identify the best destination for a virtual machine using real-time information provided by migration wizard. Also provides multiple concurrent migrations.

Xen

Xen is provided by Citrix[4]. It is an open-source virtualization solution. The Xen hypervisor acts as a thin layer between the hardware and the operating system, allowing multiple virtual servers to run simultaneously on a single physical server. Each virtual server acts independently of the others, with its own allocated area of RAM and virtual disks. Xen makes it possible for multiple guest operating systems to run on a single computer by using a software layer called a hypervisor to mediate access to the real hardware.

XenMotion

XenMotion is a feature of Citrix Xen Enterprise that gives an administrator the ability to move a running virtual machine from one XenServer to another. Virtual machines can be moved from server to server without service interruption for zero-downtime server maintenance. Administrators can move running application workloads to take advantage of available compute power.

5. Conclusion

In this paper we compare XenMotion and VMMotion. There are two major elements that can influence the performance of live VM migration quality. They are total live migration data and the data transfer mechanism. VMotion generates much less data transferred than XenMotion, which provides significant benefits for live migration over LAN. VMotion performs much worse than XenMotion in certain network with moderate delay and packet loss. This indicates that XenMotion may be more suitable for live migration over WAN compared to VMotion. Hence data center administrator use VMotion for Intra-data center migration and XenMotion for Inter-data center migration. The performance of both VMotion and XenMotion degrades in network with delay and packet loss. The existing live migration technology performs well in LAN live migration, but it still need to be optimized for WAN live migration.

References

- [1] F. Xiujie, T. Jianxiong, L. Xuan, and J. Yaohui, "A performance study of live VM migration technologies: VMotion vs XenMotion," USA, p. 83101B (6 pp.).
- [2] <http://WWW.vmware.com>
- [3] Xen, "Xen Hypervisor.", (2012), [online]. Available: <http://www.xen.org/products/xenhyp.html> [Nov 1, 2012].
- [4] <http://www.citrix.com/products/>
- [5] Divya Kapil, Emmanuel S Pilli, R.C. Joshi, "Live virtual machine migration techniques: Survey and research challenges", Advance Computing Conference (IACC), 2013 IEEE 3rd International.