A Survey: Virtualization Management Used with Virtual Migration in Cloud Computing

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Abstract— Cloud computing is a type of internet based computing that provides shared computer processing resources and data to computers and other devices on demand. In cloud computing data and applications are hosted on a cloud. A cloud consists of a pool of IT resources, such as storage devices and servers that are kept in the data center. These resources shared by using the internet in this enterprises, to access resources from the cloud on demand, cloud computing to manage resources while allocation. The scheduling mechanism is defined under parameters of resource utilization and the load balancing but in the proposed study we have planned to include a new parameter of user query satisfaction. The cloud environment taken in this work is the public cloud environment with multiple clouds. The work is performed on a generic system that can have n number of clouds. The obtain results shows the successful execution of all the processes within time limit.

Key words: Cloud Computing, Virtual Machine, Virtualization, Live Migration

I. INTRODUCTION

Cloud computing is an evolving paradigm to host services on the internet [1].Virtualization is a technique to run multiple OS simultaneously on single physical host. It is an important concept used in data centers and driven by the advantages of resource sharing, portability, application isolation, cost efficiency and fault tolerance. Virtualization offers a virtualized view of physical resources utilized to start VM. A VMM (virtual machine monitor) or hypervisor is used as a middleware to provide abstraction from physical resources. The reason behind the creation of virtual machine is to perform different task which are not performed by host environment. Virtual machines are created by hardware virtualization or software emulation methods. Virtualization software creates and manages multiple virtual machines on one physical host. VM acts as a physical computer, also having its own virtual RAM, CPU, NIC and hardware disk. There are many benefits of VMs that are:

A. Isolation

VMs share physical resources of a physical computer, and remain fully isolated from others as if they are different physical machines. For example, if there are five VMs deployed on one physical machine and one of them crashes, other four VMs remain available.

B. Encapsulation

A virtual machine is a software container that bundles a set of software resources (virtual resources), also an operating system and its applications within a software package. Encapsulation feature makes VMs portable and manageable. Hardware Independency: VMs are fully independent on the underlying hardware. For example, virtual machine can be configured with virtual components like CPU, SCSI controller and network card, that different from physical components present on the underlying physical hardware. Even virtual machines on single physical server can run different types of operating systems.

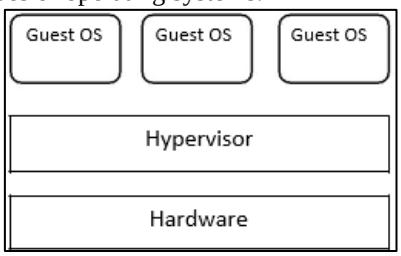

Fig. 1: Virtual Machine Diagram

II. LIVE VIRTUAL MACHINE MIGRATION

In cloud computing, virtualization technology enables VM migration to balance load in the data centers. Basically, migration is done to manage the resources dynamically. It has following goals:

A. Server Consolidation

The main goal of server consolidation is to remove the problem of server sprawl [2]. Server consolidation tries to pack VMs from lightly loaded host on to fewer machines to fulfil resources needs.

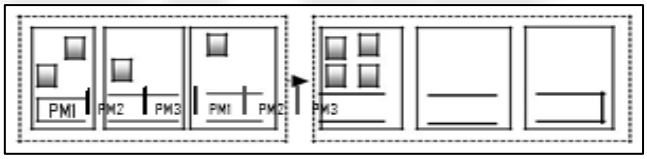

Fig. 2: Server Consolidation

The free physical machines can be switched off. It will reduce the power consumption and in turn reduce operational cost. This can be achieved by live virtual achieve migration.

B. Load Balancing

Load balancing removes the situation of large difference in resource usage level of the physical machines. It avoids machines from getting overloaded in the presence of low loaded machines. Live migration is used to balance the load across the systems. The whole system load can be balanced by moving virtual machines from fully loaded physical machines to low loaded physical machines.

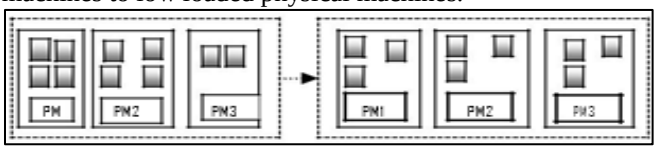

Fig. 3: Load Balancing

C. Hotspots and Coldspots Mitigation

Hotspots means the resources are not enough to fulfil the demand. It is the overloaded situation of a physical machine. In case of hot spots the performance of system falls below the acceptance level. Clodspots means the provided resources are not used efficiently. Under the condition of hot spots the resources can be allocated locally or within the set of physical machines. Sometimes, local resources are not enough to avoid hotspot, virtual machines can be moved to other available host to make the needed resources available.

D. Steps evolved in migration

Live migration means the migration of a VM from source physical machine to destination when the virtual machine is powered up. Virtual machine migration should occurs in such a way that it should minimize both total migration time and down time. Downtime is the time for which service is not available. Downtime is transparent to the users. Total migration time is the time from when the migration is started to when the source virtual machine is discarded. Source physical machine is taken for maintenance, repair and upgrade [3]. The tradeoffs between the requirements of total migration time and downtime become easy by dividing memory placement into following phases:

1) Push Phase

In this phase, the VM on source keeps running while required phases are placed to the destination through the network. To maintain consistency, the pages which are change during migration must be sent again.

2) Stop and Copy Phase

In this phase the source virtual machine is stopped. The pages are transferred from source to destination and the new virtual machine is started. The time gap between halting the virtual machine on source host and initiating the VM on the destination host is called downtime. Downtime depends upon the memory size and applications executing on the virtual machines. It is from few milliseconds to seconds. Some techniques like PDF (probability density function) exist to minimize downtime.

3) Pull Phase

In pull phase, the new virtual machine is created and if it need a page which is not present, then the page fault occurs. And the page is pulled from source across network. The virtual machine migration is done by suspending the virtual machine at source. When the virtual machine is suspended at the source, required state of CPU, memory and registers is transferred at the destination. The virtual machine is resumed at destination, the whole memory state is not moved yet, small amount of data still exist on the source. When the needed page is not present on the destination host, then page faults are occurred, known as network fault. Source machine recover network fault by sending the required pages across the network. Pure demand paging and pre paging is used. Live virtual machine is highly used in virtualized data centers and IT departments. It separate physical servers and software from each other and offers features like dynamic load balancing and online server maintenance etc.

E. Following logical steps evolved in migration:

1) Stage 0 Pre-migration

Virtual machine migration is initiated with an active virtual machine on source host A. To speed up future migration process, a destination host is pre-selected and the required resources for migrating VM should be guaranteed.

2) Stage 1 Reservation

The request is generated to move an operating system from physical host A to physical host B. First of all it is confirmed that the required resources are present on host B and virtual machine container of same size is reserved. If the required resources are not there then the VM continuously run on host A.

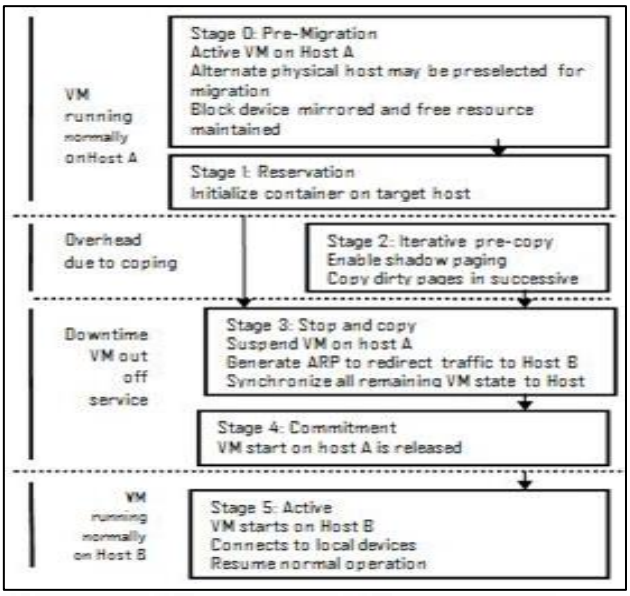

Fig. 4: Migration Timeline

3) Stage 2 Iterative Pre copy

During first iteration, the whole memory pages are moved from host A to host B. Next iteration only copy those pages which becomes dirty during previous phases.

4) Stage 3 Stop and Copy

In this phase running operating system instance is suspended at host A and the network traffic is redirected from host A to host B. The remaining memory pages and CPU state are transferred. At the end of stop and copy stage, both host A and host B has consistent suspended copy. The pages at a are considered primary and are resumed if any type of failure occurs.

5) Stage 4 Commitment

Indication is given by host B to host A that the consistent operating system image is received. Acknowledgement is given by host A and original virtual machine is discarded by host A. Now host B is primary host.

6) Stage 5 Activation

The migrated virtual machine on host B is activated. Device drivers are reattached to the destination machine and post migration code advertise IP address.

III. BACKGROUND

Virtual machine migration was first proposed by Clark et al. [4] described the achievement of impressive performance with low downtime; also demonstrate the placement of whole operating system instance on a commodity cluster. The time between halting the virtual machine and resuming it on another host is as low as 60ms.it is shown that the performance is enough for live migration. Designing part is also considered for migrating operating systems, also focus on cluster environment and data center. The whole system was built on the top of Xen VM monitor.

For elevated performance virtual machine movement development based on RDMA (remote direct memory access) was projected by Huang et al. [5] a promising interconnects, InfiniBand, offers characteristic like remote direct memory access and OS bypass. RDMA (remote direct memory access) means a straight storage entrance from the storage of one system to that of another system without linking their OS. Remote storage can be write and read directly with the facility of remote direct memory access.

Luo et al. [6] described a whole system live migration scheme, it migrate the whole system run-time state, which including CPU status, stored data, and disk storage, of the VM (Virtual machine). Three-phase migration (TPM) algorithm is proposed in order to reduce the downtime due to the migration of large disk storage data, it keeps data consistency and integrity. Incremental migration (IM) algorithm is used to facilitate the migration back to initial source machine and to reduce the amount of the data to be migrated. To track the write access and Synchronization of the local disk storage during migration Block-bitmap is used. Experiments demonstrate that these algorithms work properly even when I/O-intensive workloads are running in the migrated VM. Downtime of the VM is approximately 100 ms, near to shared storage migration. Total time to migrate is significantly reduced by using IM. Block bitmap based synchronization method is simple and useful. Presentation overhead of copy all the writes on migrated VM is very low.

Bradford et al. [7] presented extended pre-copy algorithm in WAN environment. It is shown that the whole web server can be transferred, including its state with the delay of 68s in WAN. By adding dynDNS with tunneling, old connections can continue transparently while new ones are redirected to the new network location. Thus it is shown that by combining well - known techniques in a novel manner, system support can be provided for migrating virtual in the wide area. In addition this approach is transparent to the migrated VM, and does not interrupt open network connections to and from the VM during wide area migration.

Singh et al. [8] proposed an agile data center with integrated storage and server virtualization technologies. Such data center act as building block for advanced cloud computing architecture. A load balancing algorithm is presented called vectorDot for multi-dimensional and hierarchical resource constraints. It is also shown that how to use this integrated agility for load balancing in data centers across multiple resource layers - servers, storage, and switches. Toyoda method has inspired the algorithm. The proposed system is evaluated on VM ware ESXi servers, IBM SAN (Storage area network) Volume Controller, Cisco and Brocade switches.

Mishra et al. [2] presented an important role of live virtual machine migration in cloud computing. It also explains how virtual machine migrates between different data centers. It provides a framework to transfer and manage virtual machines. The approach which is used in this paper is heuristic, which mentions decisions for migration to be taken only on past performance of the data center. Virtual machine monitoring is not considered in this case.

IV. CONCLUSION AND FUTURE WORK

In this paper, we discuss the role of live migration in cloud datacenters. Virtual machine migration enables various goals such as hot spot and cold spot mitigation, server consolidation, and load balancing. It is an important tool to manage resources dynamically in modern data centers. We present that the migration approach which is used by the previous researchers is based on the past performance of the datacenters. New model for virtual machine migration can be designed for monitoring the VM migration and add our new concept like clustering algorithm to add more effect to the cloud VM migration. We can work on the performance parameters like execution time of various jobs request and cost.

REFERENCES

[1] Rimal, B.P., Choi, E., Lumb, I., 2015, “A taxonomy and Survey of Cloud Computing Systems” 25th International Joint Conference on INC, IMS and IDC.
[2] Mishra, M.; Das, A; Kulkarni, P.; Sahoo, A, 2014, "Dynamic resource management using virtual machine migrations", Communications Magazine, IEEE, Vol. 50, No.9, pp.34-40.
[3] Agarwal, A. and Raina, S. 2013,”Live Migration of Virtual Machines in Cloud”, International Journal of Scientific and Research Publication, Vol. 2, No. 6, pp 1-5.
[4] Christopher, C., Gorm, H.J., Steven, H., 2005,”Live virtual machines migration,” 2nd conference, Networked Systems Design Implementation: USENIX.
[5] Jiuxing, L., Panda, D. K., Wei, H., Qi., G., 2007, ”High performance virtual machine migration,” in IEEE Conference.
[6] Yingwei, L., Binbin, Z., Xiaolin, W., Zhenlin, W., Yifeng, S., and. Haogang, C., 2008,”Live and incremental whole-system migration of virtual machines using block-bitmap,” in IEEE International Conference on Cluster Computing, pp. 99-106.
[7] Robert, B., Evangelos, K.., Anja, F., Harald, S. and Berg, 2007,”Live wide-area migration of virtual machines including local persistent state,” ACM 3rd International Conference on Virtual execution environment, San Diego, California, USA.
[8] Singh, A., Korupolu, M.; Mohapatra, D., 2008, "Server-storage virtualization: Integration and load balancing in data centers," International Conference for High Performance Computing, Networking, Storage and Analysis, pp.1-12.

