

Virtual Machine Migration Strategy for Load Balancing in Cloud Computing

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ABSTRACT

In a typical Cloud based datacenter, several physical machines (PM) host has a dozens of virtual machines (VM), which run various application and services. VM load varies according to the different types of user's applications and traffic, sometimes this traffic may overwhelm VMs resources. Energy consumption has become a major issue in cloud computing infrastructures. Cloud computing data centers consume high amount of electrical power resulting in high amount of carbon dioxide that affects the green environment as well as high operational costs for cloud providers. In this study we introduce new method for managing underutilized host to reduce the energy consumption of network.

Key words: Virtual Machine (VM), VM Migration, Load Balancing, Cloud Computing.

1. INTRODUCTION:

Cloud computing has revolutionized the IT industry in recent years. Cloud Computing is a paradigm where processing, storage, and network capacity are made available to users in an on demand manner through virtualization on a shared physical infrastructure. The Cloud Computing concepts are based on distributed, parallel and grid computing coupled with virtualization.^[1]

There are three basic service modules in the Cloud Computing, Software as Service (SaaS), Platform as a Service (PaaS), and Infrastructure as a Service (IaaS). Today many organizations are experiencing the benefits of Cloud Computing, they build out private clouds using various tools such as VMware or Open Stack, and establish online services that are not limited to internal users, but outside their firewalls as well.

Cloud computing provides a number of large computing infrastructures for large scale data centers, which contain dozen of physical nodes with multiple virtual machines running on them. These VMs could also be migrated across different physical nodes on demand to achieve various goals.^[1]

Virtual Machine (VM) is a software implementation of a computing environment in which an operating system or program can be installed and run. In Cloud Computing, applications and services are hosted on Virtual Machines that span over several physical servers with dedicated resources (CPU cores, RAM, Disk Space, etc.) are allocated to these VM in order to closely match the applications needs.^[1]

Live migration is a very important feature of virtualization where a running VM is seamlessly moved between different physical hosts. Source VM's CPU state, storage, memory and network resources can be completely moved to a target host without disrupting the client or running applications.^[1]

Virtual machine Migration

VM migration refers to the process of moving a running virtual machine or application between different physical machines without disconnecting the client or application. Memory, storage, and network connectivity of the virtual machine are transferred from the original guest machine to the destination.

The Virtual machine migration requirement are as under

1) Load balancing

The VM is migrate from heavily loaded host to the least loaded host, and to use the newly added Capacity.

2) Maintenance

The virtual machine is migrated for the purpose of fault tolerance and to maintain the network.

3) Recovery from host failure

The VM is migrated for the recovery from the failure occur in network such as in disaster the network is broken in the affected area.

There are two main types for migrating the virtual machine.

1) Cold Migration

In this type of migration the virtual machine is first shutdown at the one host and it will start at the other node after copying it.

2) Live Migration

In this type the virtual machine copy on destination while VM Continues to run then stop it and recopy the dirty pages and VM to the destination and start at the destination node.

2. LITERATURE REVIEW:

- Akshay Jain et. al [1] proposed a method for dynamically balance the load on the physical machine. This method determined new method based on threshold band. In which the threshold value is determined by using

CPU utilization of all Physical Machine in cluster and it is calculate periodically. The threshold band is used to determine the overloaded host. If host utilization lies above the threshold band it consider as the over utilized host and it became source to migrate the virtual machine(VM) on the other side the utilization of host lies below it consider as the normal loaded or under loaded host and it became possible destination for VM migration.

- An ACO based scheduling strategy for load balancing is proposed by Wei-Tao Wen, et. Al[2]. In this method the host with over utilization is generate some memory ants which store the status of VM which is selected to migrate. This ants traverse through different path randomly and calculate its fitness function to find optimal path to migrate VM. An ACO method apply two different traversing strategy based on different load condition. Which are positive strategy for high load condition and negative traversing strategy for low load condition.
- Matthias Sommer, et.A1 [3] proposed the method based on prediction of CPU utilization. In beginning it use the LR method as the fallback policy. This method find the utilization forecast based on historic data. Each VM on the host calculate the utilization forecast for next migration period. The upcoming utilization of host is calculated as the sum of all VM utilization forecast and the utilization percentage is calculated by dividing hostmipsforecast by number of mips of host h.finally, the safety parameter s is applied to the utilization percentage. If utilization percentage exceed 1 then it consider as overloaded and trigger the migration process, otherwise not.
- Seyed Mohssen Ghafari, Mahdi Fazeli, Ahmad Patooghy, Leila Rikhtechi [4] proposed a method based on Artificial bee colony. In this method is to determine which one of the hosts are over utilized and then in the next part migrate some VMs from this host to other hosts to improve its utilization. After migrate some VMs from Over utilized hosts, because of the fact that their utilization decreased, they become less suitable and less charming food sources for the bees. Hence other hosts with the higher load can be candidate for the best food sources.
- S.Yakhachi, S.M.Ghafari, M.Yakhchi, M.Fazeli, A.Patooghy [5] proposed Our proposed method consist of three different Stages. First of all, to find the over-utilized hosts, we applied ICA. Following that, in terms of decreasing the utilization of the over-utilized hosts, we selected some of the VMs from these hosts to migrate to the other hosts. In the final stage, we managed underutilized host. We considered all the hosts except over-utilized ones as underutilized hosts and attempted to migrate all their VMs to the other host and switch them to the sleep mode. It is noticeable that, if this process could not be completed, the underutilized host kept active.

3. PROPOSED METHOD:

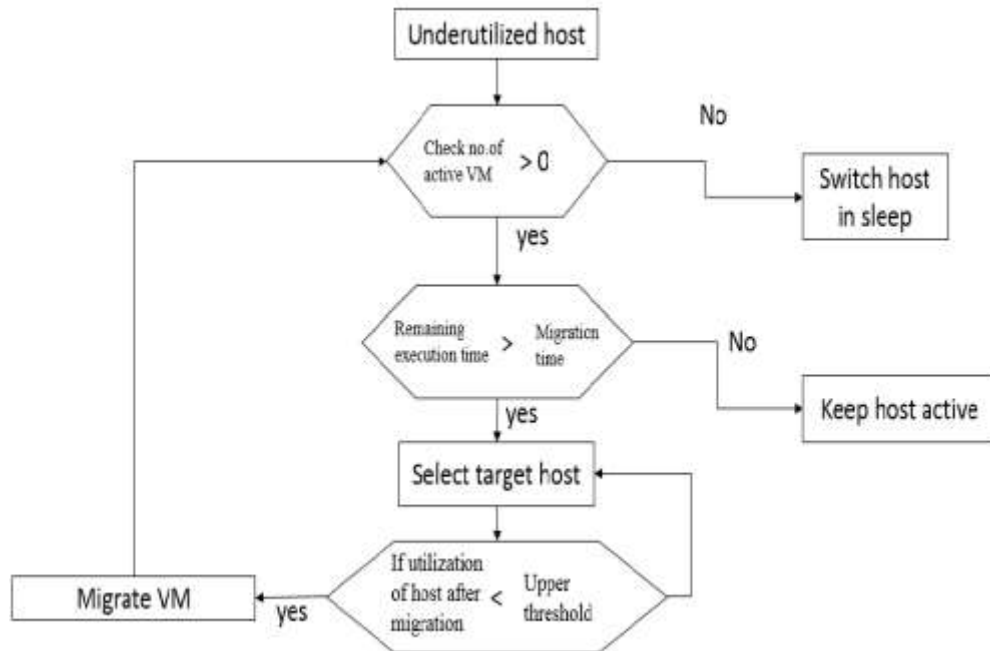


Figure 2: flow diagram of proposed method.

4. RESULT ANALYSIS:

Implementation result

Energy consumption	SLA	SLATH	Number of Migration	Execution time mean	Execution time standard deviation
184.88	0.00331	5.03	26292	0.60193	0.98329
188.86	0.00315	4.96	26476	0.59817	1.61826
163.15	0.00463	5.84	27632	1.09149	9.57136
2410.80	0.00	0.00	0	-	-

We implement the proposed method in cloudsim environment using planatlab. We use 800 host and execute our method. Our method reduce the execution time as shown in table by which it reduce the energy consumption insignificantly.

4. CONCLUSION:

Load balancing is one of the main challenges in cloud computing. It is a technique which is required to distribute the dynamic workload across multiple nodes to ensure that no single node is overloaded and reduce the power consumption. In this, we have seen various method to migrate VM from one host to other host for load balancing and energy aware distributed in cloud computing. Our proposed method manage the underutilized host and execute in heterogeneous network it reduce the execution time and reduce energy consumption insignificantly.

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