# A Survey on 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 and sometimes this traffic may overwhelm VMs resources. A VM machine that hosts several different application in heavily loaded PM can be migrated to another under loaded PM in order to exploit the availability of the resources and to balance the load. In this paper, we present the survey on different strategies for migration of virtual machine from the heavily loaded PM to under loaded PM and balance the load on VM.*

***Keywords***- Virtual Machine (VM), VM Migration, Load Balancing, Cloud Computing.

## I. 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]

## II. 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 neawly 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.

## III. RELATED STUDY

### 3.1 Virtual Machine Migration Strategy in Cloud Computing.[1]

The Bandwidth Aware Dynamic Virtual Machine (VM) Migration Framework is aiming to provide two services, working as a load balancer, and facilitating required bandwidth fir live VM migration by controlling user traffic dynamically on Physical Machine (PM) at peak times.

This approach will dynamically control user traffic on busy physical server and facilitate the minimum required bandwidth for VM migration during peak times, it will schedule VM migration in an efficient manner.

### 3.2 Load Balancing in Cloud Based on Live Migration of Virtual Machine.[2]

To avoid the over and underutilization of available resources the paper present an algorithm which dynamically allocate resource based on the need and distribute the load across the server.

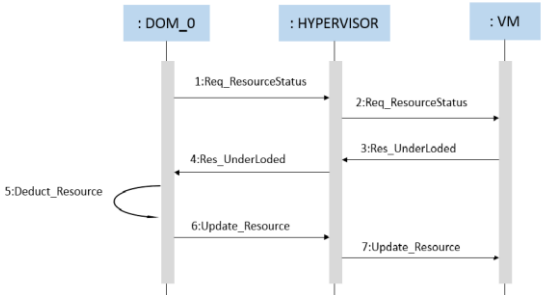


Figure.1. Sequence of activities to scale down the resources.[2]

In Figure.1. The server deduct the free resources from under loaded which allocated to the overloaded.as shown in Figure.2.

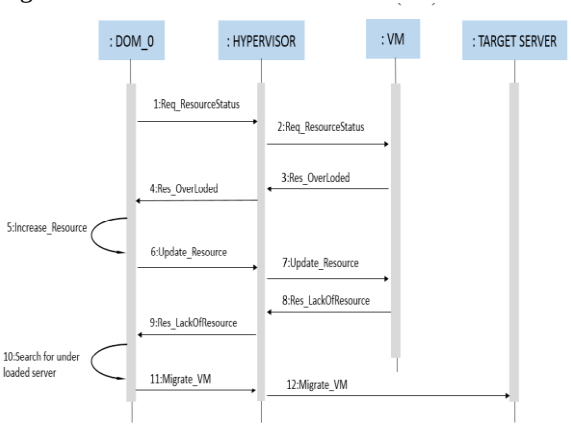


Figure.2. Sequence of activities to migrate VM to suitable target server.[2]

### 3.3 Cloud Light Weight: A New Solution for Load Balancing in Cloud Computing.[3]

It is a new method for load balancing named Cloud Light Weight (CLW), which balance the load among virtual machine and it also assures QoS for users. On the other side this algorithm reduces the number of VM migration process and the migration time during application execution.
It uses two approach

1) Sender initiated and
2) Receiver initiated.

In sender initiated the sender node select the PM based on VMAttributeset, if the sender not receive any request form the other under loaded PM.

On the other side in receiver initiated approach the under loaded virtual machine generate an event for accepting the load from the heavily loaded virtual machine. The architecture of CLW is shown in below Figure.3.

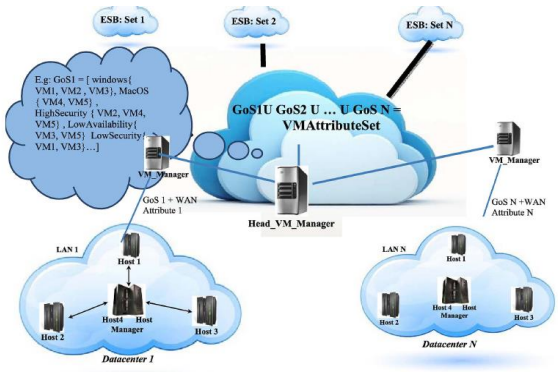


Figure.3. CLW architecture.[3]

### 3.4 Efficient Virtual Machine Migration In Cloud Computing.[4]

Live migration has been extensively used in load balancing, energy reduction and dynamic resizing to increase availability and hardware maintenance. Which causes transferring huge number of unnecessary memory pages resulting into increase in the total migration time and downtime. To reduce unnecessary transfer of pages this the paper present the Characteristics Based Compression (CBC) algorithm. It handle two factor 1) total migration time and 2) total downtime and make migration process more effective.

### 3.5 A Live Migration Algorithm for Virtual Machine in a Cloud Computing Environment.[4]

It present the virtual machine dynamic forecast migration (VM-DFM) algorithm. In this first calculate the actual memory consumption and memory SLA violation is grater then the over consuming threshold. Then it will choose the virtual machine to migrate. The VM-DFM algorithm is as shown in below Figure.4.

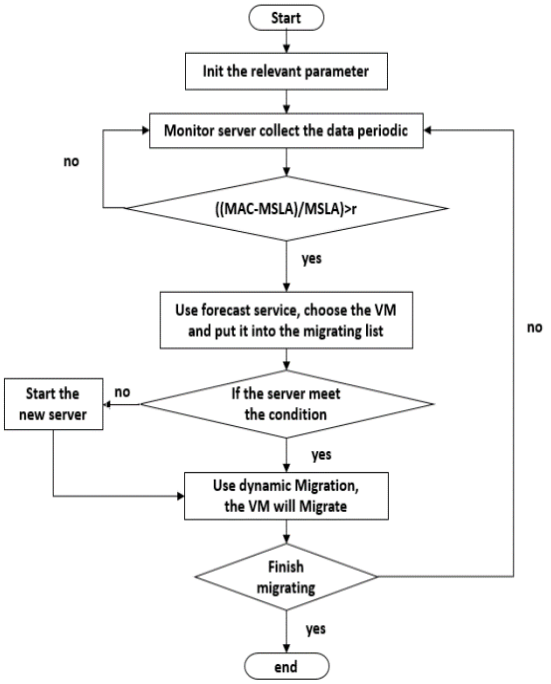


Figure..4. Central load balancer algorithm Flowchart.[5]

### 3.4 A Novel Approach for Load Balancing in Cloud Data Center.[4]

This paper presents a load balancing algorithm "central load balancer" will balance the load among virtual machines having different hardware configurations and will distribute the load based on hardware configuration and states of virtual machines in data center. This technique will be able to perform quick and reliable load balancing through utilization of all virtual machines according to their computing capacities.

### 3.5 Other study

In [7] present a novel virtual machine assign load balance algorithm which allocates the incoming request to the all available virtual machines in an efficient manner. In [8] proposed a bandwidth allocation algorithm for live VM migration to improve the performance of live migration.

## IV. COMPARATIVE STUDY

| No | Method used | Advantages | Disadvantages |
|---|---|---|---|
| 1 | Dynamic bandwidth allocation and load balancer algorithm. | Efficient utilization of the resources/VMs, Eliminates under / over utilization (VMs) situations. | It setting a static CPU and Memory utilization threshold to detect overloaded PMs. |
| 2 | Scaling and credit based resource allocation and load balancing algorithm. | Dynamically allocate resources based on the need distribute the load across servers. | The performance of the virtual machines are dependent on the amount of resources that allocated to particular instance. |
| 3 | Cloud Light Weight (CLW) Algorithm. | Minimum Migration Time, Distributed Algorithm, High Stability, Scalability, QoS. | Uses constant threshold to determine VM's status. |
| 4 | Characteristic Based Compression. | Reduce migration time and downtime, work better for high dirty page rate environment. | Compression time is create performance bottleneck. |
| 5 | VM – Dynamic Forecast Migration. | Forecasting the VM Actual memory consumption provide the decision making information for the VM Migration. | Physical memory resource threshold is set according to cloud environment. It is different for different cloud environment. |

Table.4. Comparative study

## V. CONCLUSION

In this paper we conduct a survey on the different virtual machine migration techniques and how it helps improve the performance of the system. There are various issues related to VM migration such as resource allocation, migration time, down time, scheduling etc.

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