A Perspective Study of Virtual Machine Migration

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ABSTRACT
Generally, the term "virtualization" refers to the process of converting a hardware-based entity into a software-based component. The final result of such a procedure is encapsulation of an entity's logic and hence Virtual Machine (VM) derived its name. Virtualization separates hardware from software and has benefits of server consolidation and live migration. The main advantage of this technique is that multiple VMs can run on top of a single physical host, which can make resource utilization much more efficient. Of particular interest are those VMs with high availability requirements, such as the ones deployed by cloud providers, given that they generate the need to minimize the downtime associated with routine operations.

While physical hosts have to be powered down for maintenance, the VMs that they serve can migrate to execute on other physical nodes. It is also common to migrate VMs when load balancing is needed in the physical plane. The process of migrating VMs without any perceptible downtime is known as Live Virtual Machine Migration and is the topic of this paper. This nontrivial problem has been studied extensively and reasonable solutions have been put to practice.

Keywords
Machine Migration; Load balancing; Offline Migration; SLA parameters

1. INTRODUCTION

1.1 Cloud Computing
Cloud is a computing framework which usually denotes to mutually the applications as amenities over the Internet, the H/W as well as software framework in the some specific information centers which also arrange for those specific services. Cloud Computing is handled by means of the great prospective paradigm utilized for placement of applications taking place over Internet. This perception also elucidates about the applications which are widen on the way to be manageable over and done with the Internet. Cloud applications utilize huge information centers as well as operational servers which are utilized to host net applications plus services.

1.1.1 Emergence of cloud computing
From the former few eras, there has a speedy progress in Cloud Computing. Cloud Computing provides an extensive variety of assets, for instance, computational platforms, computational power, and applications to operators by the use of internet. The foremost Cloud suppliers in the existing market sector are Microsoft, Google, Sales force, Amazon, IBM and so forth. Due to a growing amount of businesses/organizations rearranging in the direction of utilizing assets in the Cloud, there is inevitability for guarding the information of several clients. Some most important trials which are being confronted through Cloud Computing are safe and sound, defend and handle the information that is the assets of the client. We have explained two key states which also embrace that your information is available in the cloud: the the minute the information is in transit as well as after the data is at time out, wherever the information is much anticipated to be additionally safe. The further down exemplified are the two foremost circumstances that we have concentrated in the direction of understanding the need of security of the information and data in the Cloud.

Figure 1 explains about a situation in which a local network is associated towards a Cloud network, in which some specific part of the network data is damaged by the local network, and later it is located in the Cloud, nevertheless the perilous information be inherent in the specific local network itself. In this circumstance, the Cloud supplier does not have any kind of privilege of retrieving the information physically that is in the particular local network. But then again in several circumstances, the Cloud necessitates in the direction of accessing some data that is in the specific local network, throughout that access; there happens to be a probability of unsanctioned access of those specific local network assets. It refers to the distinctive challenge in network safety wherever the data could aspect active in addition to passive assaults. The active assaults take account of amendment of messages, impersonating, replay assault, in addition to denial of service. Passive assaults comprises of traffic investigation. These assaults are to be expected to take place the minute the stream of data leaves the user network towards the Cloud network.

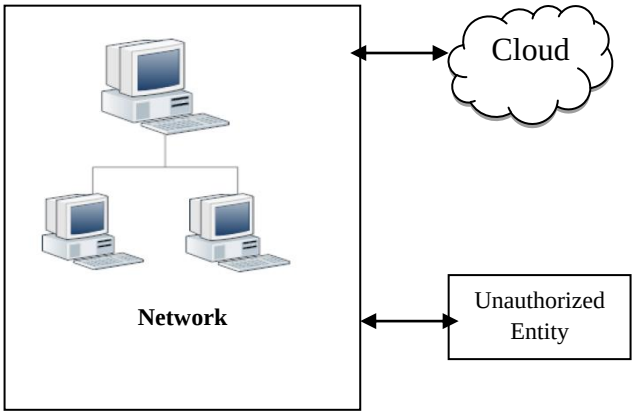

Fig 1: Unauthorized access of data between the network and Cloud

1.2 Crucial issues in cloud computing
1. Load Balancing
2. Virtual Machine Migration
3. Fault Tolerance

Load Balancing: It is the process of distributing jobs or load evenly among various nodes of the system so that time

efficiency can be increased. Also proper utilization of resources takes place.

Virtual Machine Migration: Virtual Machine (VM) migration is a powerful management technique that gives data centre operators the ability to adapt the placement of VMs in order to better satisfy performance objectives, improve resource utilization and communication locality, mitigate performance hotspots, achieve fault tolerance, reduce energy consumption. A virtual machine provides interface identical to underlying bare hardware i.e. all devices, interrupts, memory, page tables etc.

Fault Tolerance: Fault tolerance allows the virtual machines to continue its job even after any part of the system fails. This technique migrates the virtual machine from one physical server to another physical server. Based upon the prediction of the failure occurred, fault tolerant migration technique is used to improve the availability of physical server and avoids performance degradation of applications.

1.2.1 Virtual machine migration

Virtualization plays a main role in the cloud computing technology. Usually in the cloud computing, users share the data there in the clouds like application etc, but with virtualization users share the communications. Moreover, virtualization means, not only organizing multiple operating systems on a single machine but sharing all the hardware resources. And it helps us to give the pool of IT resources so that we can share these IT resources in order to get profit in the business.

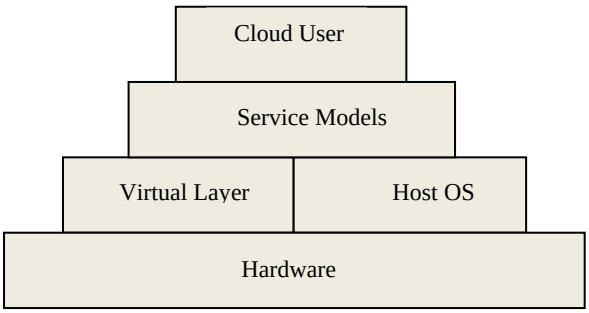

Fig 2: Virtual Model

The vital virtualized model consists of cloud users, service models, virtualized layer and its host os and their hardware. The service models consist of software as a service which is used for the applications that are interrelated to the cloud users, and then the next service model is platform as a service. It is one of the most central service models in cloud for providing effective services to the cloud users. In this cloud, provider provides computing stage for accessing their applications, so, users develop their program and execute it in the implementation environment provided by the cloud provider. In this the capital that is existing with cloud users such as computers storage resources mechanically match with the application of particular compute platforms that they do not need to lodge the resources manually. Then the further replica in the virtualized model is Infrastructure as a Service. It is one of the most significant service models as long as security to the public cloud computer is concerned. And it provides computer with machines which are used for maintaining clouds with security.

Basically, virtualization differs from cloud computing since virtualization is software that manipulate hardware, while cloud computing refers to a service that results from that manipulation. "Virtualization is an opening element of cloud computing and helps to deliver the value of cloud computing."Cloud computing is the release of shared computing capital, software or data as a service and on-demand from side to side Internet."Most of the uncertainty occurs because virtualization and cloud computing work collectively to provide different types of services, as is the case with private clouds.

It has been described that by the angle of resource, plural subsets are being created by the virtualization (by the full set of the given resources) as shown by the tuple below:

<CPU, Memory, Storage, I/O, Networking…>.]

The tuple view of the defined resources is described as:

$$M =< c, s, d >$$

Here, M is the point either on virtual machine or in physical machine with no difference. C is the calculating capacity of the CPU and the memory.

2.1 Problems encountered in VM Migration

Cloud computing allows hosting of multiple services on a globally shared resource pool where resources are allocated to services on demand. It uses virtualized environment for functioning services, because without virtualization computing is inefficient and not flexible. But it has some performance degradations of services and also has energy overheads and large amount of power consumption. In past, many researchers worked on making energy efficient algorithm for reducing energy consumption. Many algorithms were implemented for saving energy of data centres by turning off or by putting idle servers to sleep mode of servers. But these techniques were not so effective because of performance degradations of services and improper resources utilization. A, Beloglazov*et al.* proposed an idea for making energy efficient algorithm for data centres. They proposed Virtual machine placement algorithm that is minimization of migration (MM), which consider utilization of host cpu and according to that list of virtual machines in decreasing order of CPU utilization. The performance of algorithm is better than other placement algorithms but they did not consider SLA parameters while selecting virtual machine for migration, which might be effected by live migration. Most of the violations occur during live migration of virtual machines, migration impact the parameters of SLA (like power consumption, response time, throughput, completed jobs etc.).

2.2 Proposed Solution

Our goal is to overcome the above limitations and based on it a virtual machine has been created randomly along with random tasks. After creating virtual machines, load has been dispatched on each VM and hence three factors viz, Power_Overall_Consumed, Jobs_Overall_Iteration and Percentage Of The Completion Of Jobs have been calculated.

2. RESULT ANALYSIS

In this paper, a virtual machines have been created randomly along with a number of random tasks. Load is put on VM's in every iteration and correspondingly power that gets consumed in every iteration is recorded. Also the number of tasks that gets completed after each iteration are also observed. The system was planned with the prime focus on optimization so as to achieve accurate results. Finally, Power consumed, jobs overall iteration and the Percentage of the Completion of Jobs have been plotted on graphs.

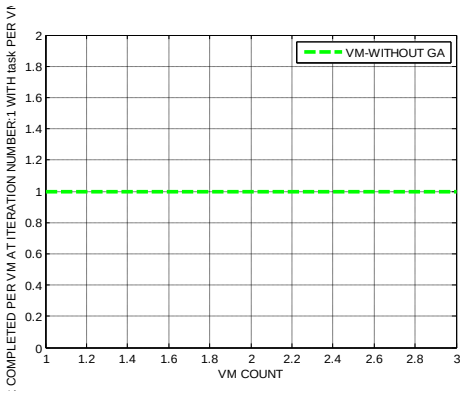

Fig 4

Figure 4 shows the count of VM's and the number of jobs that have been completed at iteration 1 per VM.

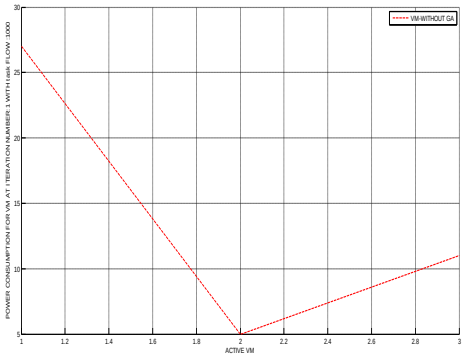

Fig 5

Figure 5 shows the Active VM's and the Power consumption for that VM at iteration 1 where task flow has been taken to be 1000.The percentage of completion of tasks at iteration 1 is 1000.

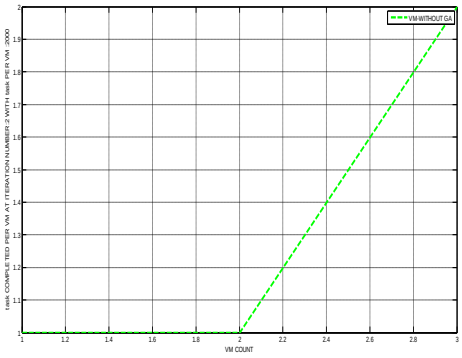

Fig 6

Figure 6 shows count of VM's and the number of tasks that have been completed at iteration 2 with 2000 tasks per VM.

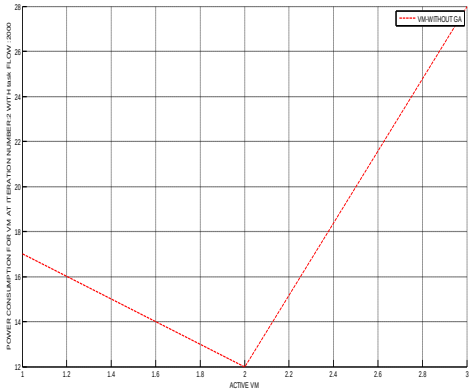

Fig 7

Figure 7 shows the Active VM's and the Power consumption for that VM at iteration 2 where task flow has been taken to be 2000. The percentage of completion of tasks at iteration 2 is 2000.

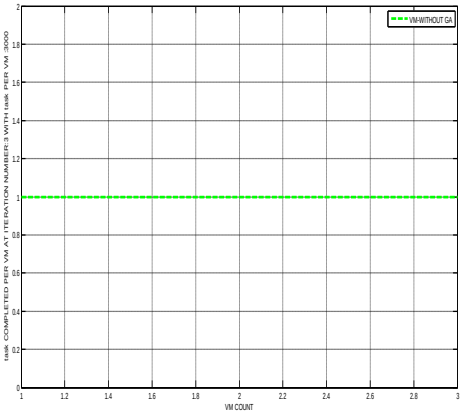

Fig 8

Figure 8 shows count of VM's and the number of tasks that have been completed at iteration 3 with 3000 tasks per VM.

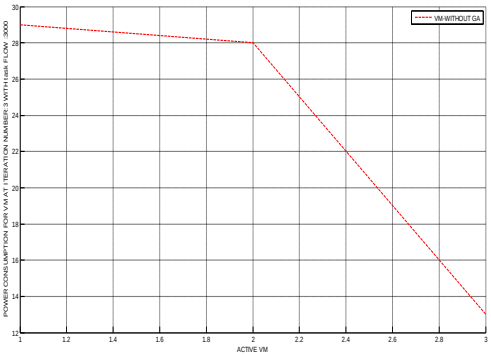

Fig 9

Figure 9 shows the Active VM's and the Power consumption for that VM at iteration 3 where task flow has been taken to be 3000. The percentage of completion of tasks at iteration 3 is 3000.

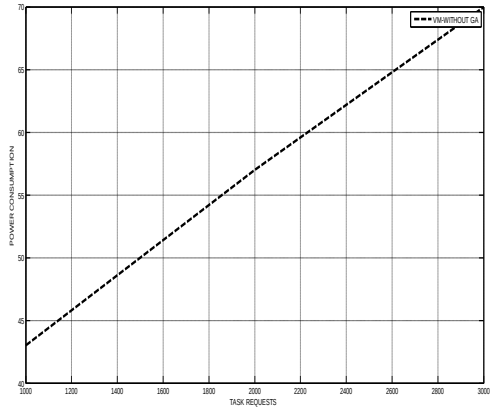

Fig 10

Figure 10 shows total number of requests and the Power consumed in completing those requests.

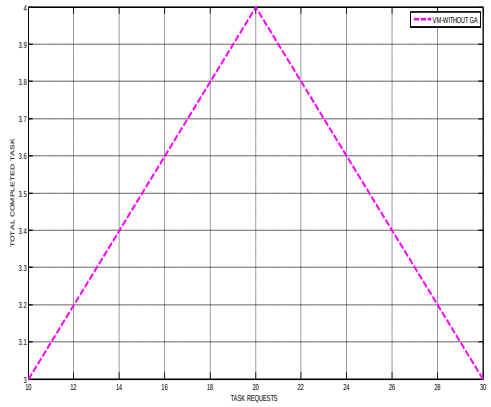

Fig 11

Figure 11 shows the Total number of requests and the total number of tasks that have been completed out of those requests.

3. CONCLUSION

The process of migrating VMs without any perceptible downtime is known as Live Virtual Machine Migration and is the topic of this paper. This nontrivial problem has been studied extensively and reasonable solutions have been put to practice. Results show that how VM's work. Tasks as well as VM's have been randomly created and hence Power consumed and the total number of tasks completed per VM have been recorded.

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