

Technical Review on Live Virtual Machine Migration Techniques for Eucalyptus Cloud

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Abstract

Cloud Computing has emerged as the most trust worthy and secure technology amongst its users. Migration of virtual machine is an important aspect of this technology. Migration of instances makes data centers and clusters handier in the terms of its administration and management. Intrinsically, Migration is done to boost the processing power of computers and it is done by procuring the power management, load balancing, fault tolerance, reducing response time and increasing the quality of service. Because the use of this technique is highly dependent on cloud computing infrastructure architecture in some cloud infrastructure, such as Eucalyptus the virtual machine migration technique has not been used yet.

Keywords— Cloud Computing, Virtual Machine, Eucalyptus, Migration.

I. INTRODUCTION

Cloud Computing is a new way of accessing and managing user data over internet without creating the infrastructure at the user's location. User can remotely access their data in a cost beneficial way and also without worrying about its management and security issues. Cloud computing is has major advantages compared to its disadvantages. The major advantage of cloud computing is that the same resources can be shared between the multiple users by Virtualization technique.

Virtualization technology plays a significant role in providing multi tenancy to users. Virtualization allows multiple instances of guest operating systems to run on a single host system by abstracting the hardware. Virtualization allows a migration of virtual machines from one to another physical machine. Use of Virtual Machine Monitor (Hypervisor) allows avoiding the dependencies between the physical host machine and the virtual machine.

Eucalyptus [7] is an open source software framework for cloud computing. It provides Infrastructure as Service architecture to create private and hybrid clouds. Eucalyptus stands for Elastic Utility Computing Architecture for Linking Your Programs to Useful Systems. The major weakness of this platform is that there is no Virtual Machine migration technique and no migration algorithm available. Here we describe some of the available migration techniques for Eucalyptus.

The rest of the paper is organized as follows, Section II discusses related work. Section III will conclude the paper.

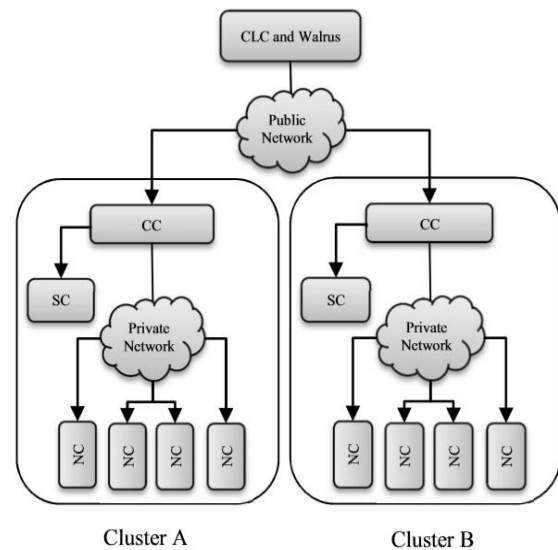


Fig. 1 Eucalyptus Architecture

II. LITERATURE SURVEY

The main aim of migration process is to transfer the complete state of the virtual machine which is being migrated. While measuring the performance of the migration process these two things must kept in mind: 1. Total Migration Time: Total migration time is the time which is required for migration of virtual machine from host to destination and to start it on the destination machine. 2. Downtime: Time duration virtual machine takes to resume its working. Total Migration Time and Downtime must be kept as minimum as possible to gain the high performance of the virtual machine. To improve the performance memory pages must be transferred in an efficient way and this transfer can be classified into three phases (i)

Push Phase (ii) Stop and Copy Phase and (iii) Pull Phase.

A. First Approach

Pre-copy [2] approach is the first approach for migration. There are basically three steps for migration. In the first step the memory pages are transferred in several rounds using the iterative push phase. In the next step CPU states and the remaining dirty pages are transferred in an iterative stop and copy phase. After the execution of each and every iterative operation there will be some dirty pages modified by the virtual machine as it is continuously running on the source side. In the final step, source and destination memory pages are synchronized via pull phase.

Pre-copy method works pretty well for read intensive applications but due to fast updation of memory pages in write intensive applications the performance is degraded and it is the major limitation of this method. There are different variants of pre-copy method to decrease to the performance overhead.

B. Second Approach

Post-copy [5] is the second method. In this approach the execution of the virtual machine is stopped at the source side and it is transferred to the destination. The virtual machine is transferred along with its state information and then again its execution is started on the destination. Than host call for the memory pages which are necessary. The main advantage of post-copy method over pre-copy method is the memory pages are transferred only once not like in pre-copy where after every updation in memory pages it is transferred which creates the network overhead.

Although, pre-copy method is fault tolerant since it contains memory pages at both source and destination sides, whereas in post-copy it is only maintained at the single side only. There are different variants of post-copy method which provides incremental improvements.

Both of these default pre-copy and post-copy approaches cannot be used for Virtual machine migration in Eucalyptus because as we know there is no shared disk available hence we cannot use these methods in non-shared disk environments. In addition, Eucalyptus has number of challenges that must be solved before applying the migration so these pre-copy and other migration methods may not work.

C. Third Approach

Shayan, Mohammad and Morteza proposed this method which is compatible with unique architecture of Eucalyptus. Different characteristics of Eucalyptus made pre-copy and post-copy failed for migration.

However in this method they focused on these different characteristics and build a algorithm which works pretty well. They have created a disk transmission algorithm which is no longer dependent on the shared disk.

This method works as follows. In Eucalyptus all the commands are issued by the Cloud Controller (CLC); further more Cluster Controller (CC) and Node Controller (NC) behave as an Observer and worker respectively. Client and Cloud Administrator send their request to the CLC through the running API functions. In order to create the virtual machine migration ability to Eucalyptus an API function is created.

Through running API, the CLC finds nodes IP address that the instance is currently running on it. After that these three values- source and destination NCs IP address, instance id name are transferred to the related CC. After CCs stub receives commands, it check the amount of needed resources and makes decision about sending migration command to the nodes.

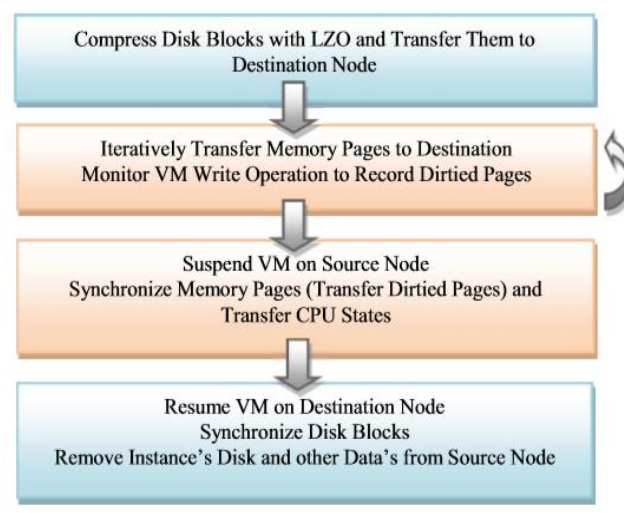


Fig. 2 Steps of Third Method

After the sources NC receives migration command its migration stub finds the instances information. Then it tries to make a connection to destination host and its hypervisor. While the connection is being established, the disk transfer process is started. When disk transfer process is completed, the source hypervisor would send memory pages and CPU states in pre-copy method.

In few seconds the migration will be completed and the information at source and destination will be updated. When updation process finishes CLC sends back a message to admin, which notice the migration process successful.

They also have used the LZO compression algorithm to compress the disk blocks and after that they are migrated to reduce the transmission time.

This method is best amongst the other methods because it helps to complete the migration process. But this method has certain limitations such as it is using pre-copy method to transfer CPU files so when Pre-copy fails this method also fails.

III. CONCLUSION

In this paper, the methods for virtual machine migration and the problems they face over Eucalyptus cloud computing infrastructure are presented. In the third method they have proposed a method which is compatible with the unique architecture of the Eucalyptus. Though they have just considered the compatibility issue of eucalyptus features like load balancing and power management are still a major challenge to achieve. While migrating the virtual machine network throughput reduces up to 50 percent that should be kept as minimum as possible. Through using this information, empowerment of cloud environment will lead to a next level and the creation of more efficient algorithms may take place.

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