

A Survey on Enhancing the performance of live migration of a virtual machine in the cloud environment

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Abstract: Cloud computing uses virtualization for cost effectiveness and flexibility. Virtualization allows multiple operating systems to run on single physical system by sharing the underlying resources. Virtualization uses virtual machines which in turn use hypervisor to manage the underlying resource. Also, these virtual machines are managed through live migrations. Live virtual machine migration is a method of moving virtual machine across hosts within a virtualized datacenter. It provides significant benefits to the cloud administrator to manage datacenter efficiently by performing load balancing, server consolidation, hotspot mitigation, fault tolerance etc. Also, it reduces service interruption by transferring the virtual machine without stopping at source. In this work we are going to reduce the total time and downtime, minimize the data while transferring from source host to destination host

Keywords— Cloud Computing, Virtualization, Virtual Machine Migration, Live Migration, pre copy.

I. Introduction

In IT industry cloud computing is playing a very important role because it is helpful in storing the data. Cloud computing works based on pay-as-use; it's like whatever the data is going to store that data is going to retrieve from cloud. Cloud computing uses virtualization for cost effectiveness and flexibility. Virtualization is software where multiple operating systems can run on a single system by sharing underlying resources.

Virtualization uses the virtual machine for managing purpose and it acts as a manager of virtualization. Virtual machine is an emulator of a computer and uses the hypervisor for managing purpose. Hypervisor is a software or hardware and it acts as a manager of virtual machine. Virtual machine migration here virtual machine can move from one virtual machine to another virtual machine. Migration involves the migration of CPU, memory, host connected system devices. VM migration is used to maintain load among the VM and maintains fault tolerance. VM migration has two types: those are 1. Non live migration and 2. Live migration. Non live migration here migration takes place when a VM is in a shutdown state; here no services are offered to the users. And here a large amount of downtime is present. Live Migration here the migration takes place when a VM is in a running state. In a live migration two factors are very important: those are Total time and Downtime. Total time is the time taken for VM to completely move from one host to another host. Downtime is the suspended time known as a downtime or VM is not in a running state; that time is known as a downtime.

Live migration has two methods

1. Pre copy method
2. Post copy method.

1. Pre copy method: here VM migration takes place when VM is in a running state; pages are transferring from source to destination VM. While transferring some pages are changed; these changed pages are known as dirty pages. These dirty pages are also copied to the destination VM until the rate of changed pages is greater than the dirty rate.

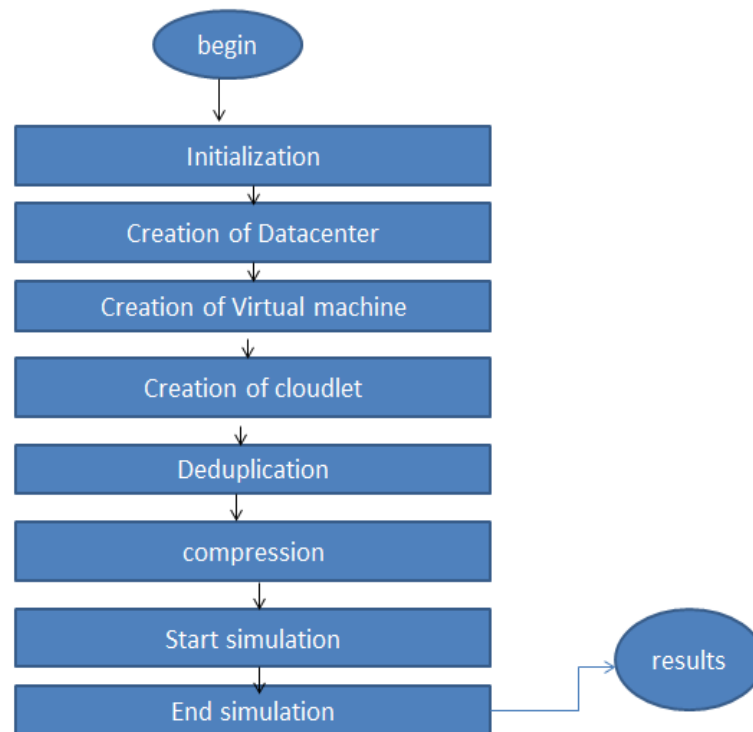
2. In post copy method VM migration starts with the suspension of source host; the transformation of a VM takes place to the destination host. The source host actively sends the pages to the destination host; this is known as pre-paging. If VM wants to access pages from the destination host that are not present in the destination host, it will give a page fault.

Aim : In this study consist design and develop technique to reduce the total time and downtime for enhancing the performance of virtual machine of live migration.

Virtual Machine Migration Techniques

- Deduplication
- Compression
- Trace and Relay

II. METHODOLOGY



FLOW OF WORK:

Initialization in this step initialization of CloudSim takes place here creation of datacenter and virtual machine, cloudlet takes place this is basic environment for the VM migration.

Deduplication :

In a Deduplication Method duplicates are removed from the file. The file may be the fixed size and variable size. for Deduplication SHA used SHA algorithm will divided the file into fixed sized number of chunks these are stored in a hash table with a hash code. If same file comes the hash table is not going to store into table because it's already in table it will considered it as a duplicate and this file going remove from the hash table. For security purpose MD5 algorithm used it will security to hash table file so one is going to attack on that file.

Compression :

In a compression Method the file is going to reduced. Huffman algorithm is used to compression method.

III. LITERATURE REVIEW

1. Clark et al. (2005) proposed the first work and it uses pre copy method for virtual machine live migration and it is based on Xen virtualization platform. And he is mainly concentrated on downtime. In this it traces writable working set (WWS), which is a set of frequently updated pages and it will be sent at the end, instead of each time they are updated. In this way, it reduces transfer of redundant pages. The paper also introduces another method named 'dynamic rate limiting', to further enhance the performance of the virtual machine live migration. This method adapts dynamic bandwidth limit with respect to dirty rate for transferring of pages during migration. Which results into decrease in downtime by increasing bandwidth has been shown.

2. Jin et al. (2009) proposed a technique called an adaptive memory compression technique for migration. And it is analyses data to find similarity within it and memory pages are divided in three types : 1. Memory having large number of zero bytes. 2. Memory with high similarity. 3. Memory with low similarity. Based on the type of memory pages the compression algorithm is used to balance the overload of compression. by using this approach improve the performance of migration method while balancing the overload due to compression.

3. Kamran Zamanifar(2014) proposed a scheduling algorithm Credit technique is used on pre copy method based on Xen hypervisor. Here he is reducing total migration time and downtime in live migration. In this paper he reduce the number of dirty pages used by the CPU scheduling algorithm and pages transfer algorithm Credit, consequently. This reduces up to 51% of the total time for the live migration and 98% the time of system disability is improved.

4. Bin Shi(2016) proposed a system named Memory/disk operation aware Lightweight VM Live Migration across data-centers with low performance impact (MLLM).based on pre copy method and platform used here is QEMU/KVM. he is concentrated on total migration time and downtime. by reducing the amount of dirty data in the migration process. MLLM reduces 62.5%-71.4% migration time and reduces 34.5%-47.4% service downtime. for this he uses the reading working set and working set. A working set is a

collection of data which is more frequently accessed during a period of time. he also present two optimizing methods to filter unused blocks and to de-duplicate data content by a hot data cache, thereby greatly decreasing the amount of data to be transferred.

5. Umamakeswari(2020) proposed a mirroring technique this is mainly concentrated on reducing total migration time. It avoids the iterative transmission of memory pages from the source host to destination host. this technique reduce 36% of the data transmitted during migration and 26% of the total migration time.

6. Zhang et al(2010) proposed another method based on compression approach with data deduplication in migration. By utilizing the self-similarity of run-time memory image, authors apply RLE method during migration to remove redundant memory data. For calculating the similarity of pages, hash based fingerprints are used. For this, it maintains two FNHash and FPHash LRU hash tables. This approach improves migration performance with space and CPU resource overhead.

7. Ruan, Y.(2016) proposed a pre-filter-copy technique it is concentrated on total migration time and downtime. this technique identify the dirty pages. The dirty pages are frequently modified pages. A novel data filter is designed to filter the dirtied pages. here three parameters are consider those are migration time, downtime, memory space. And works on KVM platform and based on pre copy method. This will results like by memory space is increased from 512Mb to 1Gb.The memory of the frame is increased to transfer more number of pages and also to increase the speed of the transaction. By reducing the migration time and downtime the performance can be increased.

8. Ma et al(2012) proposed a compression based approach, in which authors use a compression technique, called as Run Length Encoding (RLE).and it reduces the number of memory pages when migration is taking place.by doing this reduction of total memory pages transferred takes place by doing this leads to the reduction in total time and downtime takes place. RLE technique compresses only allocated pages. It uses the Linux memory management mechanism.

9. Jin et al.(2011), Liu et al.(2010) proposed a slowdown scheduling algorithm. This algorithm reduces the dirty rate by adjusting CPU resources allocated to the migration domain. This results into decreasing CPU activity, and reducing dirty page rate. It improves migration performance but also affects the application performance running within the migration domain. Liu et al. (2011) presents a fast.

10. Svård et al.(2011) proposed a compression technique with dynamic page transfer reordering. in this technique pages are arranged based on retransfer of frequently updated pages is reduced and the number of times a page is being updated during migration, page weight for each page is calculated and pages are reordered accordingly.by doing this it will give results in terms of reduction in number of pages transferred during migration. The author will combine delta compression it will give reduction in migration time and downtime.

11. Changyeon Jo(2013) proposed a technique to reduce the total time required to migrate a running VM from one host to another while keeping the downtime to a minimum.in this paper. he is mainly concentrated on reducing the total migration time by minimizing the data sent across the distinct physical hosts for this he uses the shared devices and pre copy method. In this technique tracks the VM's I/O operations to the network-attached storage device and maintains an updated mapping of memory pages that currently reside in identical form on the storage device. here instead of transferring pages from the source to the target host, the memory-to-disk mapping is sent to the target host which then fetches the contents directly from the network-attached storage device. , the presented technique shows a reduction of up over 30% on average of the total transfer time. And he uses Xen hypervisor.

12. V.Jayanthi(2017) proposed Optimized VM Allocation Policy and Host Overload Detection Algorithm, VM Selection Policy and Migration Dirty Page Rate (MDPR) Model to select Multiple Virtual Machines (VM) and to migrate VMs from overloaded host to another host. And here he is concentrated on both total migration time and downtime. For allocation policy several algorithms used that are skewness algorithm, control algorithm, vector-dot algorithm, green scheduling algorithm and benchmark algorithm. Host overload detection and VM Selection algorithm is used to reduce the energy consumption. In order to reduce the energy consumption, overload detection algorithm has been redesigned and updated using heuristics method and implemented in VM selection algorithms. VM Selection methods are built using Cloud Sim tool kit, which includes Minimum Migration time (MMT), Random selection (RS) and Maximum correlation (MC). Algorithms are implemented through simulation.

13. Naga Malleswari TYJ(2019) proposed an adaptive Deduplication mechanism for reducing VM disk image file size by performing fixed length and variable length block-level Deduplication processes. he is reduces the total migration time and downtime in live VM migration process by reducing the amount of VM memory transferred from the source host to destination host during the process of migration. His results show that he achieved a maximum of 83% overall reduction in image storage space and 89.76% reduction in total migration time are achieved by adaptive Deduplication method.

14. J.Arputharaj Johnson(2013) proposed improved time-series based pre copy approach technique. based on Xen hypervisor platform. He is concentrated on total migration time. Here frequently updated dirty pages are identified more precisely, and transmit them in the last round of iteration, in order to reduce unnecessary, repeated transmission of dirty pages. By applying this he reduces the total migration time.

15. Michael R.(2009)proposed a technique adaptive prepagging this technique is to minimize the number of page faults across the network .here used method is post copy and platform used here is Xen hypervisor. For eliminating the transfer of free memory pages in both post copy through a dynamic self-ballooning (DSB) mechanism used here. DSB periodically reclaims free pages from a VM and significantly speeds up migration with negligible performance impact on VM workload.

IV. ISSUES

ISSUES

- Wide Area Network(WAN) Environment.
- Multiple Virtual Machine migration on concurrent way.
- Energy Consumption.
- Security.

V. CONCLUSION

Live virtual machine migration is a method of moving virtual machine across hosts within a virtualized datacenter. It provides significant benefits to the cloud administrator to manage datacenter efficiently by performing load balancing, server consolidation, hotspot mitigation, fault tolerance etc. Also, it reduces service interruption by transferring the virtual machine without stopping at source. The transfer of live virtual machine may result in long migration time and downtime, which affects the overall system performance. The situation may become even more unbearable when migration takes place over slower network or over long distances within a cloud. To reduce total time and downtime several techniques are like compression, Deduplication, three phase method, check point method. By using these techniques we are going to reduce the total time and downtime and minimize the data while transferring from one source host to destination host.

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