A Survey Paper on Dynamic Reallocation of Virtual Machine

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***Abstract*—Virtualization rapidly gains popularity affecting multiple levels of the computing stack. Virtualization decouples OS from hardware.As virtualization provides high flexibility through dynamic reallocation of the resources and migration help us in the proper load balancing. In this Paper we made a Survey of different methods which are used to implement Dynamic Allocation of virtual machine that helps in improvement of the overall responsiveness of the system. This Paper also presents Migration strategy, such as whether a migration is triggered, what virtual machine should be migrated, and where the destination host of the virtual machine is.**

***IndexTerms*— Live migration, VM allocation**

I. INTRODUCTION

Virtualization is a technology that combines computing resources to present one or many operating environments using methodologies like hardware and software partitioning or aggregation, partial or complete machine simulation, emulation, time-sharing, and others. Virtualization also decouples physical resources from their users, has in recent years rapidly gained renewed interest. Virtualization can be applied at many levels and as its level it can be divided into three typesoperating system virtualization, storage virtualization, and application virtualization [3].

In general, architecture of virtual machine system is thin software or firmware layer called a hypervisor executes on a physical machine (PM) and presents an abstraction of the underlying hardware to host multiple virtual machines (VMs).Virtualization refers to the creating a virtual version of something that looks like real but not actually in real. Execution of virtual machine is either unmodifiedor slightly modified. If it runs unmodified then it is called full virtualization and if modified then it is called para-virtualization. Hypervisor provides many functionality like creation, deletion, restart, suspend, migration of virtual machine.

Virtualization provides greater flexibility in terms of managing resources. Proper management of the resources gives significant benefits [2] like

- Server Consolidation[6]: To consolidate workloads of multiple under-utilized machines to fewer machines to get increase in server utilization and decrease in running cost.
- Application consolidation: A legacy application might require newer hardware and/or operating systems. Virtualizing the newer resource fulfill that need of such legacy.
- Sandboxing: Virtual machines are useful to provide secure, isolated environments (sandboxes) for running foreign or less-trusted applications.
- Multiple execution environments: Virtualization can be used to create multiple execution environments (in all possible ways) and can increase the QoS by guaranteeing specified amount of resources.
- Multiple simultaneous OS: It can provide the facility of having multiple simultaneous operating systems that can run many different kind of applications.
- Debugging: It can help debug complicated software such as an operating system or a device driverby letting the user execute them on an emulated PC with full software controls.
- Software Migration: Eases the migration of software and thus helps mobility.
- Testing/QA: Helps produce arbitrary test scenarios that are hard to produce in reality and thus eases the testing of software.

One of the idea to optimize the resources is dynamic reallocation of VM based on the need. Figure shows that idea of dynamic reallocation of VM between the different PM. VM reallocation is achieved by dynamic migration of VM.

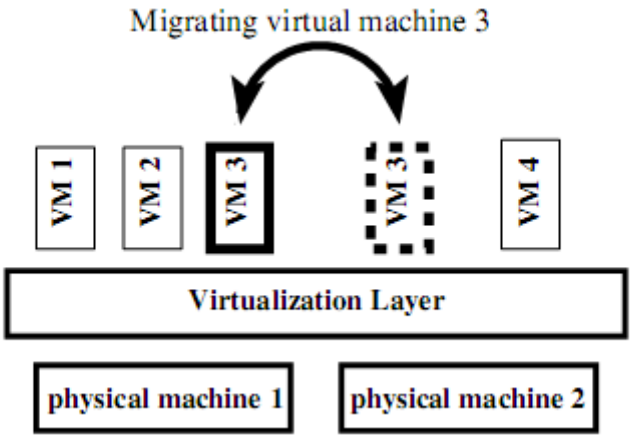


Figure 1 Two physical servers with a virtualization layer execute four virtual machines. Virtual machine 3 (thick line) is being migrated between physical machines 1 and 2.

Dynamicmigration of virtual machines can significantly reduces the overall cost and power consumption[8]. The live virtual machine migration strategymigrates the entire VM operating system instance from theoverloading host to thehost who has low load.

Live migration of virtual machines mainly focused on three aspects[7]: (1) Choose the virtual machine for migration and it can be done by finding the load status and forecasting methodology. (2) When to migrate the VM. (3)Choose the destination host which receives the VM.

In this paper we have discussed survey on different strategy to implement live migration. Different author use the different implementation strategy to improve server utilization and reduce the overall cost. This paper presents different methods for live migration.

II. THE DESIGN OF DIFFERENT LIVE MIGRATION STRATEGY

1) Load status

In paper [1] and [4], they run multiple virtual machines independently on a single host. Each host includes four resource components (CPU, memory, I/O, network bandwidth). Through weighting the utilization of the four resource components, we define the variable:

$$L_{host} = k_1 * L_{cpu} + k_2 * L_{memory} + k_3 L_{I/o} + k_4 * L_{net}$$

$$\sum_{i=1}^{4} k_i = 1$$

Here L_{cpu} represents the cpu utilization, L_{memory} represents the memory utilization, L_{io} is the I / O utilization, and L_{net} is the network utilization So L_{host} represents the loading condition of host.

2) Prediction Methods

In paper [4], The basis of this migration strategy is the OSVD(Optimal Singular Value Decomposition) algorithm, which analyzes currently system performance information,such as CPU, memory, disk I / O, network, and uses Singular Value Decomposition [5]to derive the the singular eigenvalue. Then the OSVD algorithm will process the singular eigenvalue to obtain the predicting result of the next moment. Noteworthy, the system must periodic collect load information from each node to the central management node, and this information is considerate as monitoring information.

Through the current load information and recently information, the OSVD algorithms will be used to predict the load value of the system at next moment. Then the system will select a virtual machine as the migration candidate. Finally, they combine OSVD predicting results again and select the destination of the candidate virtual machine.

In paper [1] and [3],They assume that they are given historical data on a resource demand of a VM in a form of time series Ui,where i =1, 2,...,L is a measurement interval index and L is a learning horizon. Our approach consists of

decomposing the demand time series Uiinto a sum of periodic components uj such that $u^j_{i+n*p_j} = u^j_i$ where n is an integer and pj is a period. Specifically,

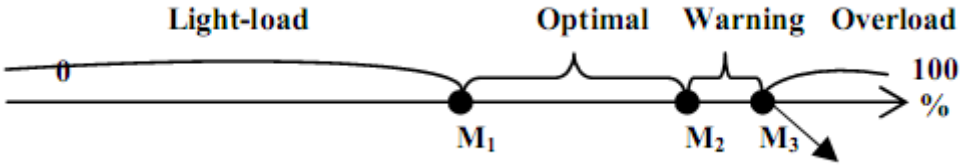
$$U_i = \sum_{j=1}^{j=P} u_i^j + r_i \quad for \quad i = 0, 1, \ldots$$

3) Migration trigger

Traditional trigger method for load balancing algorithm is based on the threshold values,that is, when any component of the node load exceeds the specified thresholds, the system will trigger a migration.However, it will result in frequently migration. Aimed to ensure a small instantaneous peak loads will not trigger unnecessary migration.

In paper [4] they use OSDV prediction method and current load status of host both to trigger migrate. Based on that combine result they decide whether VM is going to migrate or not. They first give the threshold value if any PM exceeds threshold then it checks the Forecast load of host if it is same at next moment then they trigger the migration.

In paper [1] they use four domain value based on three threshold values. Figure shows the four domain status.Depending on these four domains they give the algorithm and flowchart for each domain.



4) Choice of Candidate VM

Once a migration is triggered, there is required to select a virtual machine that will be migrated.There are some requirement to select the virtual machine, such as the migration overhead is smaller, and will not cause the system to enter the frequently migration.

In Paper [1], They first find for which resource overload the host machine. For that they take four variable present the trend degree about the utilization change of CPU, memory, I/O and network bandwidth.The one that have the biggest trend is the biggest contributors of bringing the host load up. They also specifies what is to be done whenever the CPU change trend is the biggest or If the memory change trend is the biggest.

In paper [4], they give two steps for VM choice which is going to migrate

Step 1: According to the results of OSVD performance prediction, they analyze the resource type of the future maximum utilization;

Step 2: Select a virtual machine that has the highest occupancy rate for the resources type. And the virtual machine will be a candidate to be migrated.

5) Choice of Destination host

In paper [4],The selection of the destination host follows these steps:

Step 1:they select the smallest load host current;

Step 2: On the smallest host load elected, they use the OSVD algorithm for performance prediction again, if this host load will not increase too much in period of time;

Step 3: If the load value of the virtual machine to be migrated plus t the load predicting value of step 2 will not exceed the threshold, then the host will be selected for the destination host.

In paper [1], theyuse three handshaking migration strategy. they also take care Not only is the destination able to provide the required resource for the virtual machine migrated into, but also should not exceed the warning threshold after migration.

If multiple virtual machines migrate into the same destination host at the same time, it will make the destination host overload instantaneously. In order to avoid this situation, the destination should increase the load value once it agrees the

request for migration from the requester. The destination should use the increased load to decide whether or not to agree the next request.

III. CONCLUSION

In this survey paper, we find the different techniques and different combination of different methods. The overall strategy is actually divided in five steps that is already discussed in previous section. This all research papers present the strategy for migration of VM that gives the better performance and utilization of available resources. These all papers also gives reduction in cost.

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