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A Survey on Virtual Machine Migration Techniques In Cloud Computing

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ABSTRACT

In the IT industry Cloud Computing is an emerging area. Now a day's whole the IT business migrated to the usage of the cloud. Cloud Computing provides access to computing resources for a fee or pay as per usage model. Client applications and services can be hosted in cloud. Number of user increase to the usage of cloud services, so at availability of the resources and based on the demand of resources to satisfy the user requirement Virtual Machine Migration is necessary.In cloud computing, Virtual Machine Migration is a useful tool for migrating Operating System instances across multiple physical machines. It is used to load balancing, fault management, low-level system maintenance and reduce energy consumption. There are various techniques for Virtual Machine Migration. This paper survey the various Virtual Machine Migration techniques.

Keywords: Cloud Computing, Virtual Machine, Virtual Machine Migration, Virtualization

1. INTRODUCTION

Cloud computing distributes the computing tasks to the resource pool made from a large number of computers. Virtualization assigns a logical name for a physical resource and then provides a pointer to that physical resource when a request is made. Virtualization can also be defined as the abstraction of the four computing resources (storage, processing power, memory, and network or I/O). The virtualization technology introduces software abstraction layer which is called Virtual Machine Monitor (VMM) or hypervisor[11]. Basically, two virtualization approaches were used[7]. In hosted architecture, the virtualization layer was installed as an application on top of operating system and it supports broader range of hardware[7]. Hypervisor (bare-metal) architecture installs virtualization layer directly on standard x86 hardware[7]. There are three virtualization techniques. Full Virtualization: All operating systems in full virtualization communicate directly with the VM hypervisor, so guest operating systems do not require any modification. Guest operating systems in full virtualization systems are generally faster than other virtualization schemes[12]. Para Virtualization: Para virtualization requires that the host operating system provide a virtual machine interface for the guest operating system and that the guest access hardware through that host VM. An operating system running as a guest on a para virtualization system must be ported to work with the host interface[12]. Emulation : the virtual machine simulates hardware, so it can be independent of the underlying system hardware. A guest operating system using emulation does not need to be modified in any way[12].

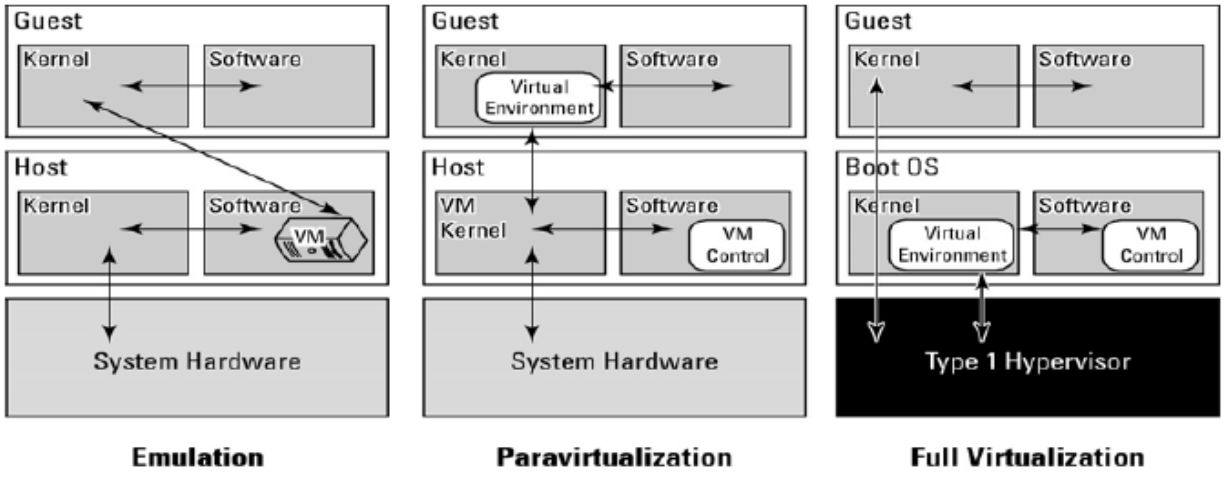

Figure 1 Emulation, Para Virtualization, Full Virtualization[12]

2. VIRTUAL MACHINE MIGRATION

VMs refer to one instance of an operating system along with one or more applications running in an isolated partition within the computer. There will be multiple virtual machines running on top of a single physical machine. When one physical host gets overloaded, it may be required to dynamically transfer certain amount of its load to another machine with minimal interruption to the users[11]. This process of moving a virtual machine from one physical host to another is termed as migration. In the past, to move a VM between two physical hosts, it was necessary to shut down the VM, allocate the needed resources to the new physical host, move the VM files and start the VM in the new host[2].
Virtual machine Migration has two type of Techniques[11]:

- **Live Migration:** Live migration can be defined as the movement of a virtual machine from one physical host to another while being powered on. When it is properly carried out, this process takes place without any noticeable effect from the end user's point of view.
- **Regular Migration:** Cold migration is the migration of a powered-off virtual machine. With cold migration, you have the option of moving the associated disks from one data store to another. The virtual machines are not required to be on a shared storage.

3. LITERATURE SURVEY

In the Cloud Computing Virtual Machine Migration is major issue for manages load balancing, fault management, low-level system management and reduce energy consumption. So here we discuss some Virtual Machine Migration techniques.

3.1 Application-aware Virtual Machine Migration in Data Centers[1]

Part of the challenge is due to the inherent dependencies between VMs comprising a multi-tier application, which introduce complex load interactions between the underlying physical servers. In this paper introduce Appware is a novel, computationally efficient scheme for incorporating (1) inter-VM dependencies and (2) the underlying network topology into VM migration decisions.Appware accepts as input the dependency graph, The weights which are obtained from measuring the volume of traffic transferred between any two VMs. The algorithm also takes as input the network diameter Distanceof the network topology of physical machines, and an existing mapping of physical machine and virtual machine. Also, the migration set indicates that VM should be migrated to physical machine. For each overloaded virtual machine, the total communication weight of all its incoming edges is computed. The overloaded virtual machines are then sorted in descending order of their total weight. The migration decision procedure is repeated until a mapping has been identified for all overloaded virtual machines or no other mappings can be found. Using simulations, it show that proposed method decreases network traffic by up to 81%compared to a other alternative VM migration method that is not application-aware.

3.2 Minimizing Communication Traffic in Data Centers with Power-aware VM Placement[2]

In this paper, can save the cost of resource usage and improve the performance of applications at the same time by optimizing the placement of VM. The objective is to minimize the total traffic in a data center. In this paper, consolidate VMs with high inter traffic on the same PM, because VMs on the same PM can communicate using only memory copy. Also need to reduce the number of active PMs to save the power cost. This paper first formulates the VM placement as an optimization problem. Also propose a heuristic algorithm based on clustering to deploy VMs on PMs. A greedy algorithm is used for the online scenario. For VM Consolidation there are two algorithm are proposed in this paper. 1) K-means Clustering 2) K-means Clustering for VM Consolidation. The experiment results on data sets collected from a data center. Results show that this algorithm can efficiently reduce the overall traffic and power cost in the data center.

3.3 Policy-based Agents for Virtual Machine Migration in Cloud Data Centers[3]

In this paper, an agent-based distributed approach capable of balancing different types of workloads like memory workload by using virtual machine live migration is proposed. Agents acting as server managers are equipped with 1) a collaborative workload balancing protocol, and 2) a set of workload balancing policies like resource usage migration thresholds and virtual machine migration heuristics to simultaneously consider both server heterogeneity and virtual machine heterogeneity. The agent-based framework for Cloud data center workload balancing consists of virtual machine agents, server manager agents, front-end agents, and user agents. Virtual machine agents are in charge of monitoring VM resource usages. VMAs send monitoring reports to server manager agents. VMAs are deployed on VMs. Server manager agents are in charge of: 1) handling VM request allocations, 2) allocating and removing VMs, 3) triggering VM migrations 4) migrating VMs 5) collecting and summarizing VM monitoring information 6) setting the administrator-defined workload balancing policies. The experimental results show that policy-based workload balancing is effectively achieved despite dealing with server heterogeneity and heterogeneous workloads.

3.4 Network Aware VM Migration in Cloud Data Centers[4]

In this paper, evaluate the performance of VMPatrol in an experimental GENI testbed characterized by wide-area network dynamics and realistic traffic scenarios. In this paper deploy OpenFlow end to end QoS policies to reserve minimum bandwidths required for successful VM Migration. Migration of VMs generates variable amount of network traffic between the source and the destination hosts. The volume of the network traffic depends on the VM's image size, its page dirty rate, the migration completion deadline and the available bandwidth along the migration path. The cost of migration model is based on a pre-copy live migration technique. The results indicate that time taken to complete VM Migration depends on VMs memory size, VM page dirty rate and the available bandwidth. The results also indicate that length of stop copy phase and minimum required progress amount are critical parameters in estimating the VM migration cost.

3.5 Geography Aware Virtual Machine Migration for Distributed Cloud Data Centers[5]

This paper focuses on decreasing the average distance of the clients from the VMs that the client is using periodically using VM migration to move VMs such that average distance is reduced. In this paper, introduce a framework for a system that identifies potential candidate VMs to migrate to target data centers chosen at run-time. The approach is use the geographical distribution of requests at the end of a period of time with t_i representing the end time of the i^{th} time period to place virtual machines for the next time period. This may require multiple VMs to be migrated. Each request is classified into a region based on the origin of the request. There are mainly four modules in this paper. The classification module is used as input to an algorithm that determines if a VM should be migrated to a different data center. The selector Module use the load-distance and distance metric. The migration module receives the set of candidate VMs for migration. For each candidate VM, the migration module first determines the migration cost. the migration module initiates the migration through the use of the SDN controller that programmatically removes the matching forwarding entries of the switches for migrating VMs and redirects the flows to the appropriate data center.

4. CONCLUSION

Cloud computing is the new paradigm where computing is on demand service. Virtual machine migration plays important role in cloud computing. Virtual machine migration is a major issue in cloud computing. With the increase in the popularity of cloud computing systems, virtual machine migrations across data centers and diverse resource pools will be greatly beneficial to data center administrators. In this our survey paper, we conclude that Network Aware, Power Aware, Application Aware, Geographical Aware Virtual machine Migration Techniques which provide Migration technique over the cloud. In this paper we study about the cloud computing, Virtualization, Types of virtualization, virtual machine, virtual machine migration and its various techniques.

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