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Synthesis of Virtual Machines in Cloud Datacenter

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Abstract:
Cloud is the most used Buzz word of the era. Cloud computing is rapidly gaining popularity due to its enormous benefits. Cloud has made managing enterprises easy due to the reduced effort in maintenance and cost effectiveness. Data center is the key component and central hub of processing in cloud. Virtual Machines (VMs) play a vital part in data centers.. The main objective of this paper is to introduce a method for consolidation of VMs. Effective synthesis of VM will lead to cost effective cloud. Synthesizing VM by migration procedure reduces the VM selection time, effective datacenter utilization and makes the approach cost effective.

Keywords*: *Cloud computing, Datacenter, Synthesis, Consolidation, virtualization

I. INTRODUCTION

Cloud computing is based on Pay-as you-Go model ,this provides on demand access to resources .Cloud is providing a cost effective approach for enterprises by providing the infrastructure required by them. Success of cloud can be attributed to several factors, namely ease of use, pay as you go approach, reduced maintenance effort and many more.

Cloud computing is based on service model. It provides three types of services, they are following, Infrastructure as a service (IaaS), Platform as a Service (Paas), and Software as a Service (Saas).Fig 1 depicts the services of cloud.

Cloud based application cost is associated with two parameters namely virtual machine and data transfer corresponding to the user base. This approach can be related to the multi dimension problem, and consolidation of VMs with respect to RAM is presented.

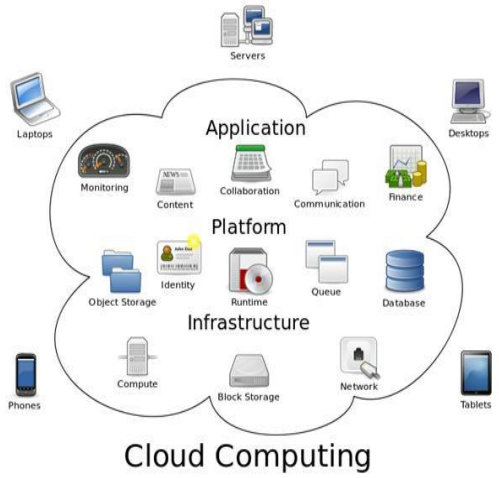

Figure 1: Layered cloud architecture.

Two types of probabilistic procedures for VM consolidation include, the VM assignment and migration. Both procedures result in consolidation of workload thus save electrical costs and fulfill service level agreements of users and increase the server utilization. All this is done by delegating the key decisions to single servers, while the local decisions are combined by datacenter manager.

The consolidation algorithm characteristics that make synthesis approach novel and differentiates it from other solutions. Among such characteristics are the following:

1) The use of the swarm intelligence paradigm, simple operations of autonomous actors are combined to solve a complex problem.
2) The probabilistic procedures usage inspired by the operations of real ants.
3) The VM assignment to servers dynamically by considering workload variations, that results in self-organizing behavior of the system.

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II. RELATED WORK

2.1 Request Routing in Datacenter

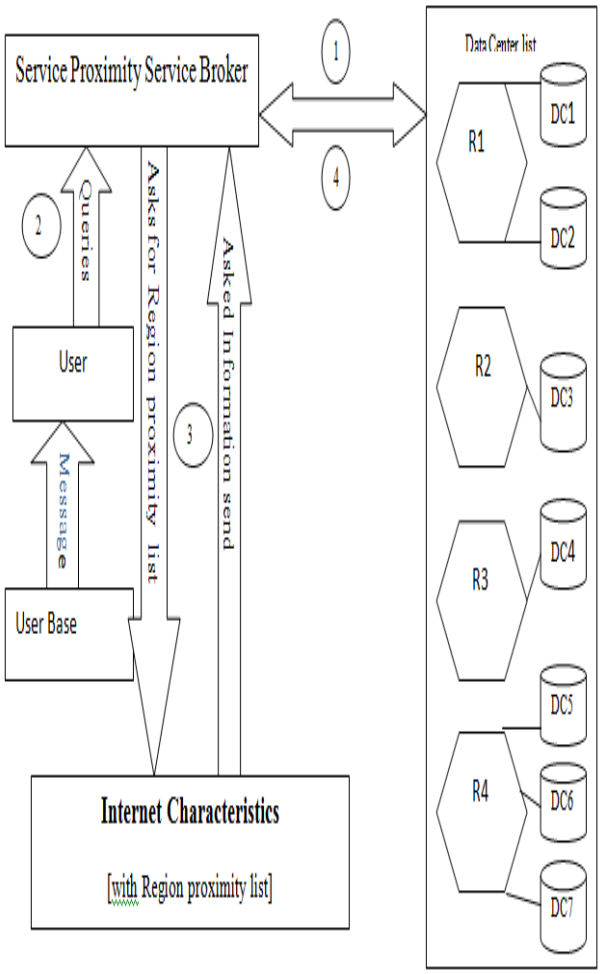

Figure 2:Request routing in cloud datacenter.

The above Fig 2 depicts the routing of requests in cloud datacenters.

Request routing has following steps

1. Internet Cloudlet is generated by user base with application id for application and for routing back the RESPONSE name of the user base is included.
2. REQUEST is forwarded to Internet with zero delay.
3. Internet consults the service broker which uses service broker policy for the datacenter selection based on the REQUEST information.
4. Service broker sends information about selected datacenter controller to the Internet.
5. Appropriate network delay is added by Internet the REQUEST is added by internet and is sent to the selected data center controller.
6. Any one of the virtual machines load balancing policy is used by datacenter controller that is being selected.
7. Virtual machine is assigned based on user request by virtual machine load balancer .
8. After request processing selected data center sends the RESPONSE to the Internet.
9. Internet use the originator field of the Cloudlet information and adds appropriate network delay with RESPONSE and sends to the user base.

2.2. VM Assignment and migration in datacenter

An application request is sent from a client to the data center manager, which takes application characteristics like required amount of resources and type of operating system as specified by client into consideration for selecting a VM. Then, by following assignment procedure the VM is assigned to one of the available servers. The single server is sole decision maker and is responsible for acceptance or reject acne of a VM.

A Virtual machine in a particular host is migrated when the host is unutilized to save power. In this case VM is shut down. When host is overloaded then VM is migrated to another host such SLA is not violated.

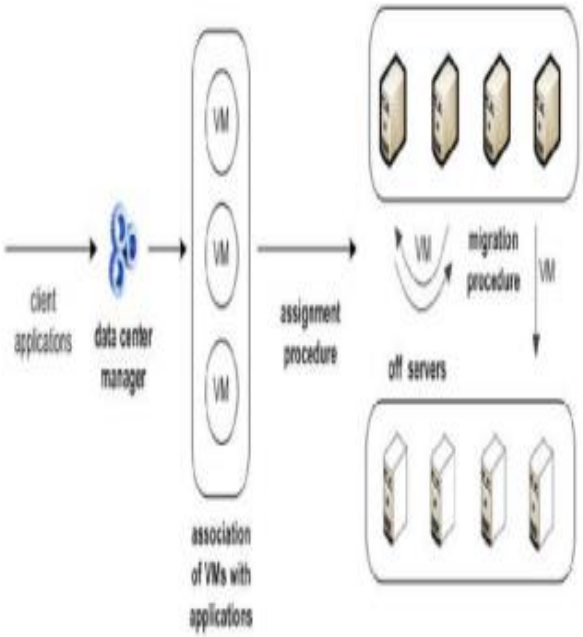

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Figure 3: VM Assignment and VM migration in a datacenter

III. MIGRATION of VMs

The data center manager plays a coordinating role, and for optimizing VM mappings it does not need to execute any complex centralized algorithm. Applications workload is dynamic, i.e., computational resources demand changes with time, for example, the workload created by web users determines CPU demand of a web server. Therefore, the assignment of VM is m continuously monitored and migration procedure is used to fine tune it.

The migration procedure has following two steps:

1. VM migration is requested by a server, based on CPU/RAM utilization.
2. Server that will host the migrating VM is selected by a technique similar to the one used by the assignment procedure.

Operator SLA for the whole computing resource entreated by a VM, is calculated as quantity of Million Instructions per Second (MIPS). If MIPS quantity obtained of a host does not fulfill the MIPS requirements of its VMs, we consider as SLA violation

The host overload identification scheme uses VM selection and the VM settlement procedures. The migration of VMs between hosts is governed by host overload identification outline. The selection of VMs that are to be migrated from an overloaded host is done using VM selection procedure. The selection of suitable host for migrating VM is done using VM settlement procedure. The CPU consumption ratio of a host is calculated as the ratio between entire assigned MIPS for VMs and the whole MIPS in the host. If the CPU consumption ratio of the host is less than a minimum threshold value, the whole number in the host is checked with the number of VMs in the host, when SLA violation occurred last. If either one of the two conditions pass, then it signals overload status of host. In the overloaded host a VM is selected for migration.

Algorithm: Selection Policy

Input: Datacenter ID Output: VMID to migrate

1. Start
2. Initialize VMID to zero.
3. Get the number of VM IDs of the datacenter.
4. If the list of VMs is empty then the migratableVM is assigned null.
5. When the host has a set of VMs then overloaded VM is identified by following steps:
   5.1. RAM utilization of the VM is noted.
   5.2. The CPU consumption ratio is estimated as entire assigned MIPS for VMs separated by the whole MIPS volume in the host.
   5.3. If the VM is underutilized i.e., if the RAM utilized is less than the minimum threshold value and if RAM utilization is less than CPU consumption ratio then that VM is selected for migration.
   5.4. Else if the CPU consumption ratio is less than the threshold value then that VM is selected for migration.
6. Return the VMID
7. End

IV. SIMULATION EXPERIMENTS

Simulator used for VM provisioning mechanism is CloudSim 3.0. Following are the specifications used for experiment:

- Host machine: HP Proliant ML 110 G4.
- RAM: 4 GB
- OS:“window 8” OS

We get results in comparison with provisioning mechanism in VM selection policy Mad (Mean absolute deviation) Minimum Migration Time.

Table 1: Comparison of policies

Metrics	**Mean deviation MMT**	**Proposed mechanism**
VM migration count	5265	5628
Execution time host selection mean	0.00154sec	0.00115sec

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Host shutdown count	1528	1632

V. CONCLUSION

The VM migration algorithm plays a significant role in assignment of the tasks in a cloud computing environment for effective load distribution in datacenters. Response time of jobs is improved and avoids the situation of host overloading and underutilization. This mechanism can be further extended to, take energy consumption into account and storage capacity i.e., update the storage capacity of server system and host system.

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