

A Load Balancing and Status Evaluation in Public Cloud

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ABSTRACT- “Cloud Computing” is a term which involves the virtualization, distributed computing, networking, software and web services. It has gained a lot of hype in current world of I.T.. A cloud consist of several elements such as main controller, distributed servers and clients. It includes reduced overhead for users, reduced cost of ownership, on demand services, fault tolerance, scalability, high availability, flexibility etc. Effective load balancing algorithm helps to improve the system performance and maintain stability. Load balancing is the phenomenon that distributing load among various nodes in a distributed system. Load balancing algorithm ensuring that every node which is in the network having equal amount of work at any instant of time. In this paper introduces a better load balance model for public cloud based on cloud partitioning concept with a switch mechanism for different situations to resolve the issue of load balancing in public cloud computing.

Index Terms- Cloud Computing, Cloud Partition. Load Balancing, Public Cloud.

1. INTRODUCTION:-

Cloud is a technology discontinuity that, within next 10 years, is likely to dramatically change IT organizational missions, structures, roles, skills and operations [2]. Cloud computing is an internet computing in which the load balancing is the one of the challenging task [10]. Cloud computing is on demand service in which information, shared resources, software and other devices are provided according to clients request and its requirement at specific time. Users get service from a cloud without paying attention to the details [1].

Load balancing is the new technique that facilitates networks and resources by a maximum throughput with minimum response time [7]. Proper load balancing can help in utilizing the available resources optimally, thereby minimizing the resource consumption. Load balancing schemes depending on whether the system dynamics are important can be either static or dynamic [12]. Static load balancing scheme divide the traffic equivalently between the services. Dynamic load balancing scheme chooses the lightest server preferred to balance the traffic and selecting an appropriate server needed real time communication with network. The advantage of using dynamic load balancing scheme is that if any node fails, it will not halt the system, it will only affect the system performance [3]. Dynamic load balancer uses policies for keeping track of updated information.

A Public cloud is one which the services and infrastructures are provided over the internet [4]. Public cloud environment is very large and it hard to maintain. Thus, this model divides the public cloud in several cloud divisions. When the environment is very large, divisions simplify the load balancing. The cloud has a main

controller that chooses the suitable partitions for arriving jobs while the balancer for each cloud partition chooses the best load balancing strategy. There are many load balancing algorithm such as Round Robin load balancing algorithm, Throttled load balancing algorithm, Equally Spread Current Execution Algorithm, Ant Colony algorithm. Randles et.al.[9] giving the comparative analysis by checking cost and performance.

2. RELATED WORK:-

There have been many studies of load balancing for the cloud environment. Cloud computing is a recent trend in IT that moves computing and data away from desktop and portable PCs into large data centers. It refers to applications delivered as services over the Internet as well as to the actual cloud infrastructure — namely, the hardware and systems software in data centers that provide these services [11]. However, load balancing in the cloud is still a new problem that needs new architectures to adapt to many changes. There are many load balancing techniques given by the researchers over time to time same have advantages over and vice-versa. Distribute workload of multiple network links to achieve maximum throughput, minimize response time and to avoid overloading. There are many load balancing algorithm such as Round Robin load balancing algorithm, Throttled load balancing algorithm, Equally Spread Current Execution Algorithm, Ant Colony algorithm. Randles et.al.[9] giving the comparative analysis by checking cost and performance. Modified Throttled Algorithm using here because it gives better performance.

3. SYSTEM MODEL:-

A Public Cloud is based on the standard cloud computing model, with service provided by a service provider. A public cloud area is very large environment. So, it hard to manage it and complexity arises. Partitioning the cloud in small divisions to simplify load balancing and improving the system performance.

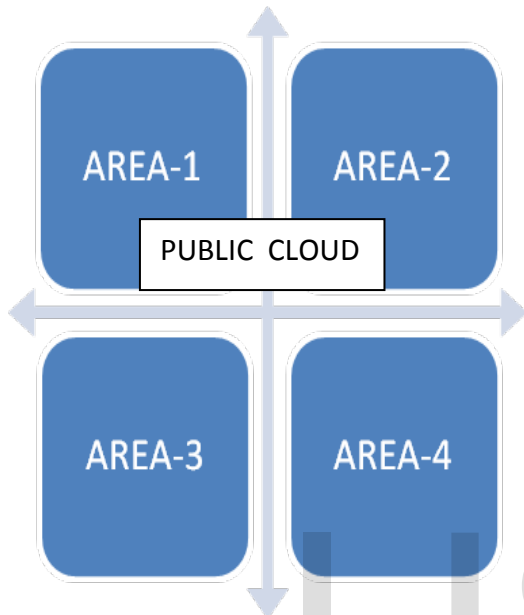


Fig. 1 Cloud partitioning.

3.1 Main controller and balancers

Load balancing done by main controller and the balancers. When a job arrives at public cloud, first step is choosing the right partition to perform the required operation. Main controller first assigning job to suitable partition and communicate with balancers to refresh the status information of all the partition giving idea of status (busy/ideal). Balancer gathers the status information of all partition of every node.

3.2 Assigning jobs to the cloud partition

When a job arrives at the public cloud, the first step is deciding to choose right partition. The cloud partition status can be divided into three types:

- (1) Idle: When the percentage of idle nodes exceeds, change to idle status.
- (2) Normal: When the percentage of the normal nodes exceeds, change to normal load status.

- (3) Overload: When the percentage of the overloaded nodes exceeds, change to overloaded status [5].

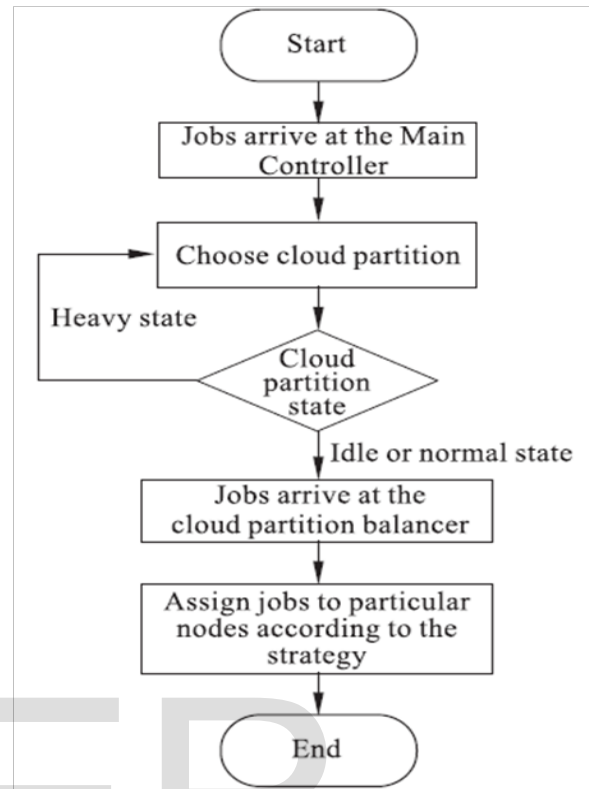


Fig.2 Job Assignment Strategy

3.3 Assigning job to the suitable cloud partition

Cloud partition state gather all status information from the node and compute load degree of the partition. Load degree is depend on various static and dynamic parameters. Static parameter is memory speed of CPU, number of CPU include in load balancing and memory size. Dynamic parameters is CPU utilization ratio, Network bandwidth, memory utilization ratio [1].

BEST PARTITION SEARCHING ALGORITHM

```

begin
while job do
    searchBestPartition (job);
    if partitionState == idle || partitionState == normal
then
    Send Job to Partition;
else
    search for another Partition;
end if
end while
end
    
```

Load degree is computed from these parameters are as follows:

Compute Load Degree

Inputs:

The static parameters include the number of CPU's, the CPU processing speeds, the memory size, etc. Dynamic parameters are the memory utilization ratio, the CPU utilization ratio, the network bandwidth.

Process:

1. Define a load parameter set:
 $F = \{F_1, F_2, \dots, F_m\}$ with each F_i presents the total number of the parameters.

2. Compute the load degree as

$$\text{Load Degree}(N) = \sum \alpha_i F_i$$

where $i = 1 \dots m$

3. Average cloud partition degree from the node load degree statistics as:

$$\text{Load degree}_{avg} = \sum_{i=1}^n \text{LoadDegree}(N_i)$$

4. Three level node status are defined

IDLE:

$$\text{Load_degree}(N) = 0$$

NORMAL:

$$0 < \text{Load_Degree}(N) < \text{Load_Degree}(N)_{high}$$

OVERLOAD:

$$\text{Load_Degree}(N)_{high} \leq \text{Load_Degree}(N)$$

Output :-

Idle or Normal Or Overloaded

4. CLOUD PARTITION AND LOAD BALANCING STRATEGY:-

Good load balancing algorithm improving the performance of cloud. Cloud partition state gather all status information from the node and compute load degree of the every partition. When a new job arrives, according the status of load degree which partition is suitable is decided. Balancer for each cloud partition chooses the best load balancing strategy. In this paper Throttled load balancing algorithm are used.

Throttled load balancing algorithm gives the better performance than Round Robin algorithm. This algorithm implements a throttled load balancer (TLB) to monitor the loads on each VM. Here each VM is assigned to only one task at a time and can be assigned another task only when the current task has completed successfully. Throttled load

balancing algorithm is completely based on virtual machine. In this algorithm client first requesting the load balancer to check the right virtual machine which access that load easily and perform the operations which is give by the client or user. The process first starts by maintaining a list of virtual machines each row is individually indexed to speed up the look up process. The job of TLB is to maintain an index table of all VMs as well as their current states (Available or Busy). If match is found on the basis of size and availability of the machine, then the load balancer accepts the request of the client and allocates that virtual machine to the client [4]. The TLB scans the index table from top to bottom until the first available VM is found. If it finds, then TLB returns the VM id to the Data Center Controller. The Data Centre communicates the request to the VM identified by the id. On the other hand, if the TLB doesn't find any VM in the available state it simply returns null. In this case Data Center Controller queues the request until the availability of any VM.

Modified Throttled load balancing algorithm steps using in public cloud are as follows:

MODIFIED THROTTLED ALGORITHM FOR PUBLIC CLOUD

1. MainController maintains the status information of all partitions and ThrottledVmLoadBalancer maintains an index table of VMs and the state of the VM (BUSY/AVAILABLE). At the start all partition and its VM's are available.

2. Main Controller receives a new request.

3. Main Controller queries the all partition ThrottledVmLoadBalancer to give the status.

4. Choosing cloud partition according status of load degree of all partition.

5. Assigning job to the suitable partition.

6. Assigning job to particular partition node which are idle or normal status.

7. ThrottledVmLoadBalancer parses the allocation table from top until the first available VM is found or the table is parsed completely.

If found:

i) The ThrottledVmLoadBalancer returns the VM id to the MainController.

ii) The MainController sends the request to the VM identified by that id.

iii) MainController notifies that partition ThrottledVmLoadBalancer node the new allocation.

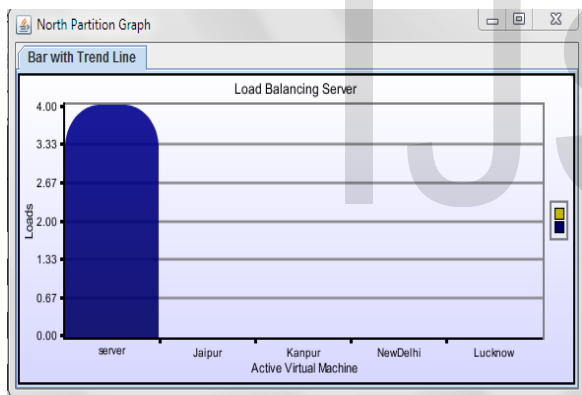
iv) ThrottledVmLoadBalancer updates the allocation table accordingly.

If not found:(All the partitions are BUSY)

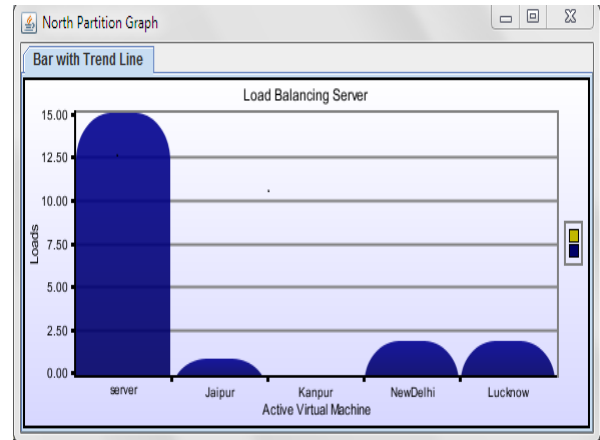
- i) All partition ThrottledVmLoadBalancer returns -1.
 - ii) The MainController queues the request.
8. When the VM finishes processing the request, and the MainController receives the response cloudlet, it notifies that partition ThrottledVmLoadBalancer of the VM de-allocation.
6. The MainController checks if there are any waiting requests in the queue. If there are, it continues from step 3.
7. Continue from step 2.

5. CONCLUSION:-

This paper demonstrated the applicability of using partition techniques and Modified Throttled Load Balancing Algorithm to obtain measurable improvements in resource utilization and availability of cloud-computing environment and increase the business performance in cloud based sector. According the partition load, status of partition is calculated. for experimentation public cloud is divided into three partitions.



Any upcoming request is handled by main controller. Main controller having the idea about all partitions. Above graph giving the idea about server is fully loaded. Then upcoming request is handled by other partition server. If all partition server is loaded then upcoming request is handled by suitable partition virtual machines.



This graph giving idea about server and virtual machine load. In this partition server is fully loaded and virtual machines are in normal or in idle state. From this status evaluation of partition is calculated.

6. FUTURE WORK:-

Cloud partitioning is a method to make partitions of public cloud. Public cloud is made up of several nodes situated in deferent geographic location. Cloud partitioning is a method to make partitions of huge public cloud in small partitions. Other partitioning concept can used in public cloud because public cloud is very area and hard to maintain it. In this paper Modified Throttled load balancing algorithm are used for balancing the load in public cloud. In this algorithm there improvement or development can be occur. Other load balancing strategy can give better result and improving the performance. So, tests are needed to compare different load balancing strategies. A good algorithm is needed for setting the load degree high and low.

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