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Dynamic Load Balancing: Improve Efficiency in Cloud Computing

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Abstract: ***In cloud computing the major problem area is fault tolerance. When many clients request the server simultaneously, server is overloaded which causes fault. In our approach the load balancing technique is used to avoid fault. There are various fault tolerance techniques in existing cloud computing. They are self healing, job migration, static load balancing and replication. There are some drawbacks in this technique. In our proposed method, the dynamic load balancing technique is used to avoid this fault tolerance in cloud computing. The Dynamic Load Balancing algorithm checks the utilization of the CPU. If CPU has less utilization as given in the algorithm, it responses the client request otherwise the request is shifted to another server with the help of load balancer. This technique gives a better result. This paper analyzes the fault tolerance method by using fault tolerance algorithm.***

Keywords: ***Cloud computing, Fault tolerance, Load balancing, Replication, Load balancer.***

I. INTRODUCTION

This Cloud computing is the fastest technology today. Service means different types of applications provided by different servers across the cloud. It is generally given" as a service", services in a cloud are of 3 types as given in [1]

Fig1: Cloud Computing Services

Infrastructure as a Service (IaaS): The infrastructure layer builds on the virtualization layer by offering the virtual machines as a service to users. Instead of purchasing servers or even hosted services, IaaS customers can create remove virtual machines and network them together at will.

Platform as a Service (PaaS): The platform layer rests on the infrastructure layer's virtual machines. At this layer customers do not manage their virtual machines; they merely create applications within an existing API or programming language. There is no need to manage an operating system.

Software as a Service (SaaS): Services at the software level consist of complete applications that do not require development. Such applications can be email, customer relationship management, and other office productivity applications. Enterprise services can be billed monthly or by usage, while software as service offered directly to consumers, such as email, is often provided for free.

II. OVERVIEW OF LOAD BALANCING

Load balancing is the important concept in network. The load balancer accepts multiple requests from the client and distributing each of them across multiple computers or network devices based on how busy the computer or network device is. Load balancing helps to prevent a server or network device from getting overwhelmed with requests and helps to distribute the work. For example the client can send application request to the server at that time the server over loaded in another process the current process is wait for some time till the serve is idle. Here the client can wait. To avoid this first we check the utilization of the server and process the client request. The CPU utilization can properly do by load balancing algorithm. The load balancing algorithm which is dynamic in nature does not consider the previous state or

behaviour of the system, that is, it depends on the present behaviour of the system [2].

Goals of Load balancing

- To improve the performance substantially
- To have a backup plan in case the system fails even partially
- To maintain the system stability
- To accommodate future modification in the system

III. EXISTING CLOUD COMPUTING

In the existing cloud computing there is no intermediate node like load balancer [4]. The process of the load balancer is to check server utilization if the server has maximum load the request is transfer to another server and identify the reliable server to process the client request. If the load balance is not available the client can wait for long time and process their request in the particular server only where the client give request. The existing the cloud use the following technique instead of load balancer [5].

Self healing: Maximum human interaction. Use certain rules.

Job migration: During the time of failure the job is migrating into another server.

Replication: The same data is stored in different place. Replication-Various task replicas are run on different resources, for the execution to succeed till the entire replicated task is not crashed. It can be implemented using tools like HAProxy, Hadoop and AmazonEc2 etc.

Static load balancing: Only fixed capacity of the data is transfer. There are many drawbacks in above four methods. To overcome this drawback the cloud computing use intermediate node in the recent days [5].

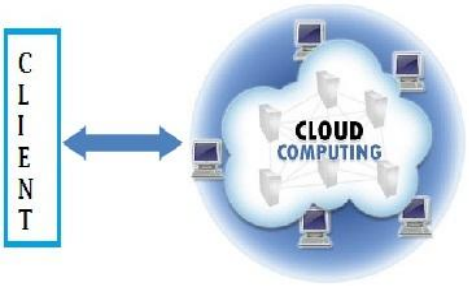

Fig 2: Cloud without intermediate node

IV. PROPOSED CLOUD COMPUTING

A load balancing algorithm which is dynamic in nature does not consider the previous state or behaviour of the system, that is, it depends on the present behaviour of the system. The important things to consider while developing such algorithm are : estimation of load, comparison of load, stability of different system, performance of system, interaction between the nodes, nature of work to be transferred, selecting of nodes and many other ones. In proposed method the dynamic cloud computing environment is used, The intermediate node is used to monitor the load of each Virtual Machine (VM) in the cloud pool. In this approach the user can send the request to the intermediate node. It is responsible for transfer the client request to the cloud. Here, the load is considered as in terms of CPU load with the amount of memory used, delay or Network load

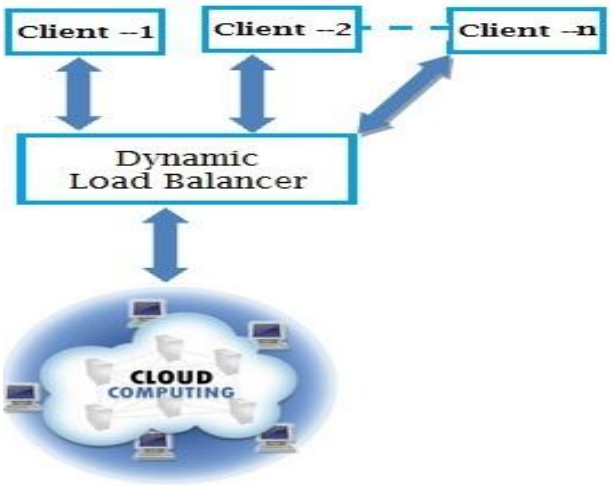

Fig 3: Cloud with intermediate node

V. PROPOSED DYNAMIC LOAD BALANCING ALGORITHM

The VM load balancing algorithm is used to balance the load in the cloud pool. This algorithm checks the CPU utilization depending upon the request.

Input: Cloud, VM nodes, Task and allocate the server to the client.
Output: Solution(s) i.e. performing the Task without Fault.

```
Begin
    for each VM:  n1, n2,n3... ni
    Node Utilization U(ni) = 0;
    Memory Uses M(ni) =0;
    do
        for each cloud c1, c2,c3…ci
        do Select VM node (n)
        end
    end
    do
        Select task Random (t)
        Allocate to cloud Ci ← ti
        Calculate U(ti) && M(ti)
        Calculate U(ni)&& M(ni)
    if U(ti) < U(ni) && M(ti) < M(ni) && U(ni) < 80% && M(ni)<80%
        do allocate task to VM
    end
    if any fault(s) occurs
        do while task completes
         do Switch VM
        go to if U(ti) < U(ni) && M(ti) < M(ni) && U(ni) < 80% && M(ni)<80%
        Allocate task (ti)
    end
    return solution(s);
    end
```

VI. EXISTING STRATEGIES IN DYNAMIC LOAD BALANCING

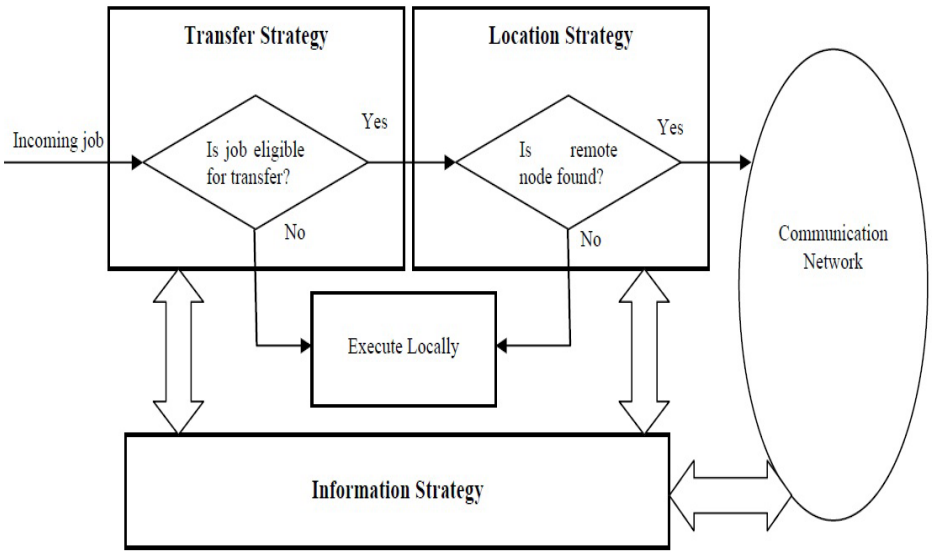

Fig 4: Interaction among components of a dynamic load balancing algorithm

There are 4 policies [6]:

- **Transfer Policy:** The part of the dynamic load balancing algorithm which selects a job for transferring from a local node to a remote node is referred to as Transfer policy or Transfer strategy.
- **Selection Policy:** It specifies the processors involved in the load exchange (processor matching).
- **Location Policy:** The part of the load balancing algorithm which selects a destination node for a transferred task is referred to as location policy or Location strategy.

Information Policy: The part of the dynamic load balancing algorithm responsible for collecting information about the nodes in the system is referred to as Information policy or Information strategy.

VII. ANALYSIS

In a distributed system, dynamic load balancing can be done in two different ways: distributed and non-distributed. In the distributed one, the dynamic load balancing algorithm is executed by all nodes present in the system and the task of load balancing is shared among them. The interaction among nodes to achieve load balancing can take two forms: cooperative and non-cooperative. In the first one, the nodes work side-by-side to achieve a common objective, for example, to improve the overall response time, etc. In the second form, each node works independently toward a goal local to it, for example, to improve the response time of a local task. Dynamic load balancing algorithms of distributed nature, usually generate more messages than the non-distributed ones because, each of the nodes in the system needs to interact with every other node. A benefit, of this is that even if one or more nodes in the system fail, it will not cause the total load balancing process to halt; it instead would affect the system performance to some extent. Distributed dynamic load balancing can introduce immense stress on a system in which each node needs to interchange status information with every other node in the system. It is more advantageous when most of the nodes act individually with very few interactions with others.

VIII. Results

In proposed method we take three VM for test. We check the CPU usage and the memory usage of the three VM and we identify the reliable VM which contains fewer loads and high memory can process the client request. The balancing section is responsible for determining where virtual machines will be instantiated. It does this by first gathering the utilization percentage of each active compute node. In this algorithm the load balancer node check the CPU utilization if the CPU is less than 80% utilization the request accepts otherwise VM load balancing Algorithm instantiates a new virtual machine on the compute node with the lowest utilization number [7] The algorithm is to identify the reliable VM and process the client request. For that the algorithm cerate cloud pool. The cloud pool contains the VM.

We find the CPU and the memory usage. If the memory and the CPU has reliable to process the request that VM is selected from the cloud pool. First the client request is sent to load balancer. The load balancer can send that request to cloud pool with the use of client IP address. The cost analysis of the load balancing cloud computing is very efficient and improve the time. The VM payload barrier load balancing algorithm is efficient algorithm in VM cloud.

The performance analysis of the load balancing gives the high throughput and increases the performance.

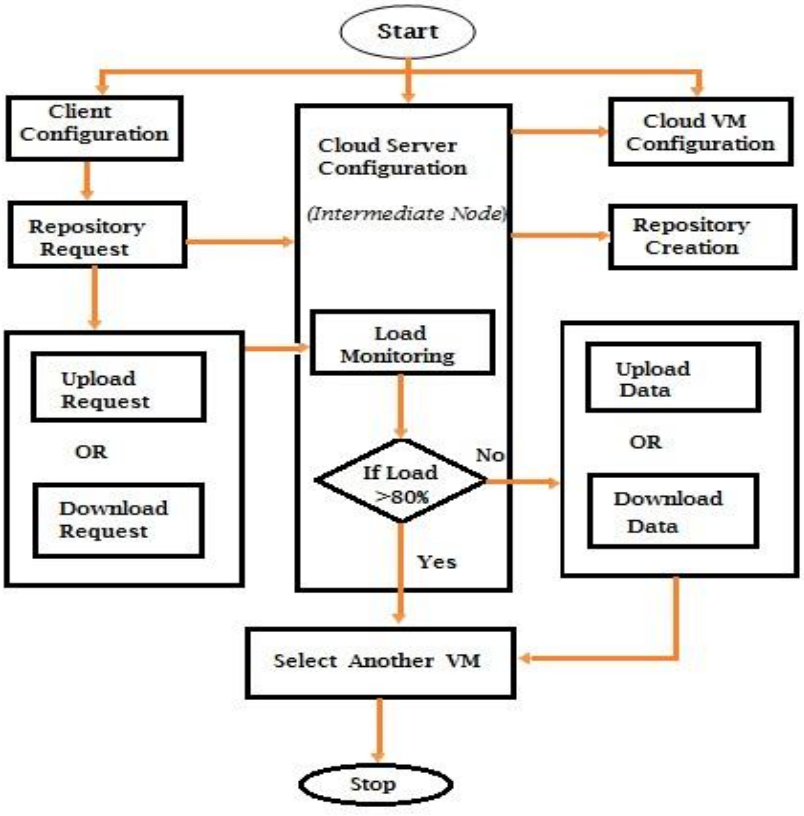

Fig 5: Proposed Wok flow for Dynamic Load Balancer

In proposed cloud computing the VM monitoring systems can achieve the following
 High scalability
 Dynamic load balancing
 Fault tolerance
 Low overhead
In proposed cloud computing the VM monitoring systems can achieve the following concepts [8]

 High scalability: The scalability in cloud computing refers to increase the number of clients request with simultaneous request can perform better without fault.

 Dynamic load balancing: The dynamic load balancing refers to the client can upload or download the document for the cloud server without any specific memory capacity. The intermediate node will check the CPU and the memory usage. If the CPU usage is above 80% the client will process otherwise the client request will go to next available VM.

 Fault tolerance: The fault in cloud can reduce with the use of dynamic load balancing algorithm. The load balancing algorithm checks the CPU utilization and loads the request.

 Low overhead: Setup an alternate computer or network device that can be used as an alternative access point or can share the load through a load balancing.

IX. CONCLUSION

The Dynamic load balancing is a technique to use the cloud computing in efficient manner. The algorithm used in this approach can automatically monitor the load balancing with the use of load balancer The data replication, job migration and the static load balancing is avoided in our method. The CPU and Memory can be utilized properly and the reliable VM in the cloud pool can be identified.

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