

An Efficient Dynamic Load Balancing Algorithm Using Machine Learning Technique in Cloud Environment

Bakul Panchal¹, Smaranika Parida²

¹Assistant Prof., I.T Department, L.D College of Engineering, Ahmedabad, Gujarat, India

²M.E(I.T), I.T Department, L.D College of Engineering, Ahmedabad, Gujarat, India

ABSTRACT

Cloud Computing is delivery of computing services- storage, databases, networking, and software over internet. Cloud service provider provides the service in pay as per usage basis. Load balancing process of making effective resource utilization by reassigning the total load to the individual nodes. LB is basically divided into two types such as static LB, Suitable for homogenous environment where load variations are low and dynamic LB which is more flexible and suitable for heterogeneous environment. Proposed algorithm based on dynamic load balancing using machine learning technique.

Keywords: Cloud Computing, Load Balancing, Machine Learning

I. INTRODUCTION

Cloud computing is an emerging technique; it provides services to its clients in on demand basis. It provides different services to its clients like Infrastructure-as-Service (IaaS), Platform-as-Service (PaaS), Software-as-Service (SaaS) in a virtualized environment. IaaS provides different services including data storage space, access to network features and also computers (both virtual or on dedicated hardware), PaaS provides platform which allow the client to focus on the deployment and management of the applications. SaaS is also referred as end-user applications, it provides a completed product that is run and managed by the CSP (cloud service provider).

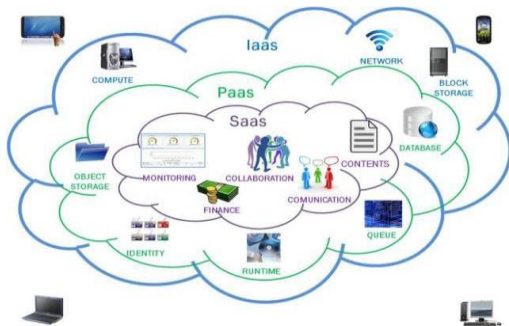


Figure 1. View of the Cloud Computing Environment

Cloud computing have been facing numerous challenges, like providing security, an efficient load balancing technique, scaling, proper resource scheduling, energy consumption of Data Centers, performance monitoring, Quality of Service management, and service availability. Load balancing process of distributing the entirety load of a system among individual nodes to guarantee that neither any node is overloaded and nor any under loaded, idle or doing little work. It is the process of assigning and reassigning the total load among all available resources, with the aim to maximize throughput, while minimizing the response time and costing, also improves resource utilization and performance as well as energy saving. Hence key to the success of cloud computing environments is providing an efficient load-balancing algorithms for distributing the total load evenly.

Load Balancing is one of the major challenges and concerns in cloud environments. The Proposed algorithm based on dynamic load balancing using

machine learning technique which will be useful in distributing the load more efficiently.

II. FLOW OF PROPOSED METHOD

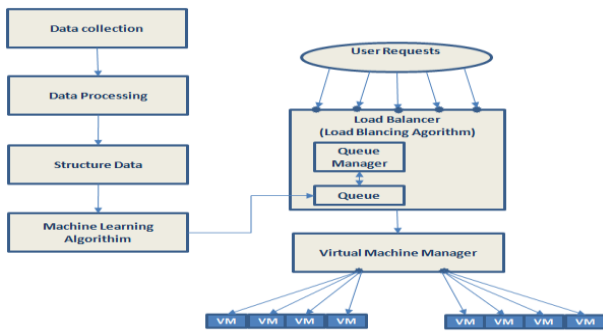


Figure 2. proposed system overview

When a new request will come, the load balancer will allocate the job to the appropriate VM by consulting with the queue manager in order to maintain balance. In the proposed method machine learning technique is used for efficient load balancing. In this ,first step different data about the VM will collected such as VM id, capacity, current load, cpu utilization,I/O, NetworkIn , NetworkOut, memory utilize etc. Then in the next step data are structured as per our requirement, using machine learning technique we have to find out the information about the VM and store that information in a queue. Next step is the former queue is replaced by this queue.

Algorithm for ML based Load Balancing :-

INPUT:

Upper_threshold = X%,

Lower_threshold = Y%

Virtual machine data.

Procedure Supervised ML based Load Balancing regression

For all the N Servers

For all VM ∈ N

CPU_UTIL[] ←Fetch the cpu utilization

End for

Apply regression analysis

Calculate Average cpu_util of that slot

```

If Average current cpu_util[] >
upper_threshold of predicted data
Queue1 < id(VM)
else
Queue2 < id(VM)
EndIf
if cpu_util == 0% || cpu_util <
lower_threshold of predicted data store the id of that
VM in sleepQueue[ ]
End For
    
```

Figure 3. VM creation

Figure 4. Fetching initial parameters of different virtual machines

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Tomcat v8.0 Server at localhost [Apache Tomcat] C:\Program Files\Java\jdk1.8.0_131\bin\javaw.exe (M
Info: VM CPU Info...
i-04afdf069fb989bb7 CPU: 16.0%
i-0d313fb6ef0b99044 CPU: 13.0%
i-0ab61becdfae3a068 CPU: 15.0%

Info: VM RAM Info...
i-04afdf069fb989bb7 Memory: 24.606724%
i-0d313fb6ef0b99044 Memory: 29.309488%
i-0ab61becdfae3a068 Memory: 24.835396%

Info: Calculating Utilization of each VMs
VM: i-04afdf069fb989bb7 utilization: 20.303362%
VM: i-0d313fb6ef0b99044 utilization: 21.154743%
VM: i-0ab61becdfae3a068 utilization: 19.917698%

Upper Thresold: 1.1002727%

Allocated host: us-east-2b for VM id: i-04afdf069fb989bb7
Allocated host: us-east-2b for VM id: i-0d313fb6ef0b99044
Allocated host: us-east-2b for VM id: i-0ab61becdfae3a068

Info: Printing queue...
i-04afdf069fb989bb7 is in average queue with ip 13.59.54.75
i-0d313fb6ef0b99044 is in average queue with ip 18.219.159.193
i-0ab61becdfae3a068 is in average queue with ip 18.217.232.125

Info: Wait time... 2min

Request: smaranika@gmail.com
Instance: 13.59.54.75
Redirect to: http://13.59.54.75:80

Execution time: 12ms

```

Figure 5. Generating queue and allocating request to it

III. RESULT ANALYSIS

For implementation AWS EC2 has been used. EC2 has its own load balancer which allocates the resource to the request in round robin fashion. When first request comes it allocates that request to the lightly loaded VM, without analysing the efficiency of the node. But using proposed method the load balancing becoming more efficient.

III. CONCLUSION

Cloud computing is an emerging technique; users of cloud environment are increasing day by day. So load balancing is becoming biggest challenge where load should be transfer from overloaded machine to under loaded machine in order to maintain balance. So using machine learning technique in load balancing results in efficient load balancing in cloud infrastructure. The proposed algorithm will give more fine-tuned analytical data on which we can make current load scheduling mechanism.

V. REFERENCES

- [1]. S. G. Domanal, G. R. Mohana Reddy, "Load Balancing in cloud computing Using Modified Throttled Algorithm," IEEE International Conference on Cloud Computing in Emerging Markets (CCEM), pp.1-7, October 2013.
- [2]. Mohit Kumar, S.C.Sharma , " Dynamic load balancing algorithm for balancing the workload among virtual machine in cloud computing", 7th International Conference on Advances in Computing & Communications, ICACC-2017, 22-24 August 2017, Cochin, India .
- [3]. Priyadarashini Adyasha Pattanaik, Sharmistha Roy, Prasant Kumar Pattnaik, "Performance Study of Some Dynamic Load Balancing Algorithms in Cloud Computing Environment", 2015 2nd International Conference on Signal Processing and Integrated Networks (SPIN).
- [4]. Ojasvee Kaneria, R K Banyal, "Analysis and Improvement of Load Balancing in Cloud Computing", International Conference on ICT in Business Industry & Government (ICTBIG) January 2016.
- [5]. Samuel A. Ajila Akindele A. Bankole Cloud "Client Prediction Models Using Machine Learning Techniques.", 37th Annual International Computer Software & Applications Conference, Kyoto, Japan, 2013 .
- [6]. Huahui Lyu, Ping Li, Ruihong Yan, Yaoying Luo," Load Forecast of Resource Scheduler in Cloud Architecture", 2016 International Conference on Progress in Informatics and Computing (PIC)
- [7]. <https://aws.amazon.com>
- [8]. Ren et al., "The load balancing algorithm in cloud computing environment," in International Conference on Computer Science and Network Technology, Changchun, China, 2012.
- [9]. S. Mohapatra, K. Smruti Rekha, S. Mohanty, "A comparison of Four Popular Heuristics for Load Balancing of Virtual Machines in Cloud Computing,"
- [10]. S. Kundu, R. Rangaswami, K. Dutta, and M. Zhao. Application Performance Modeling in a Virtualized Environment. In Proc. of IEEE HPCA, January 2010.