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An Energy Efficient Cluster based Load Balancing Algorithm Applied in Cloud Computing

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Abstract— In this paper we have proposed an energy efficient load balancing algorithm for cloud computing. This proposed algorithm categorized the virtual machines and the queued jobs in HIGH, MEDIUM and LOW clusters considering different criteria, jobs would be assigned accordingly to competent virtual machines. The proposed algorithm is considering battery power also for categorize its cluster, which promotes it as energy efficient algorithm.

Keywords— Cloud Computing, Cluster, Energy Efficient Algorithm, Load Balancing, Virtual Machine

I. INTRODUCTION

Cloud computing is gradually changing the computing paradigm, now computing has become a service. Cloud can be defined as model for enabling ubiquitous, convenient, on-demand network access to a shared pool of configurable computing resources (e.g., networks, servers, storage, applications, and services) that can be rapidly provisioned and released with minimal management effort or service provider interaction. This cloud model is composed of five essential characteristics, three service models, and four deployment models.[1].

Essential Characteristics are On-demand self-service, Broad network access, Resource pooling, Rapid elasticity, Measured service and models are service model and deployment model.

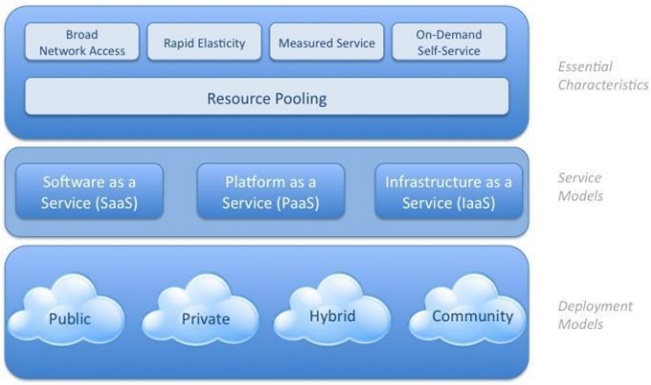

Fig. 1. NIST Cloud Model

Cloud computing servers its customers in an efficient and scalable manner. Cloud computing uses multiple virtual servers. As numbers of virtual machines are working continuously so load balancing is a key factor in cloud computing.

Load Balancing: Load balancing is a process to distribute the load among different virtual machines. There are following benefits of cloud computing:
High-availability
Scalability
Flexibility
Economical

II. RELATED WORK

There are plenty of work in the field of static and dynamic load balancing for cloud computing. Round Robin is a very popular load balancing algorithm which is basically random sampling based.[2]. In [3] authors proposed a max-min and priority based load balancing algorithm which is very efficient. Y. Fang et al. has proposed another algorithm that utilizes two level task scheduling mechanism.[4] . LBMM (Load Balanced Min-Max) with resource utilization has proposed by Chen, H., Liu, Q., & Ai, Q[5]. Obaid Bin Hassan, A Sarfaraz Ahmad have proposed intelligent load which is bio inspired.[6]. In [7] authors have proposed which is inspired by artificial intelligence. In [8] authors have proposed another load balancing algorithm based genetic algorithm. Brototi Mondala et al. have proposed a cloud load balancing algorithm that uses Stochastic Hill climbing[9] In

[10] the authors have proposed a Dynamic well Organised load balancing algorithm for virtual machines. In[11] the authors have proposed JLGA which is very efficient. NASR is another efficient load balancing algorithm which considers network, dynamic environment and self-regulation[12]. Ronak Patel et al have proposed another load balancing algorithm with the features reduction techniques.[13]. In[14] an efficient load balancing algorithm considering priority factors has proposed by authors. Another energy efficient algorithm that considers the server's capacity also has proposed by authors in [15].

III. METHODOLOGY

The proposed method is divided in following three sections:

a. Categorized jobs(HIGH, MEDIUM, LOW)
b. Categorize Virtual Servers(HIGH, MEDIUM, LOW)
c. Assignment jobs in competent servers.

Categorized jobs (HIGH, MEDIUM, LOW)

Whatever the jobs are coming for processing they are being categorized in three different clusters as HIGH, MEDUM and LOW by considering the priority, waiting time and response time.

Jobs[N] : is the jobs array. N= No. of Jobs
Property [N][p]: is the property matrix , where N=No. of Jobs and p= no of properties , in our case it is 3.
Resultant [N] =Property[i][j]* Property[i][j+1]* Property[i][j+2], where N = No. of Jobs
And i is from o to N-1 and j is from 0 to 2{considers the number of priorities}

{Computing the values sin 10 scale}

If 10== Resultant [i]>=7 , Assign to Cluster : HIGH
If 7> Resultant [i]>=5 , Assign to Cluster : MEDIUM
If Resultant [i]<5 , Assign to Cluster : LOW

Categorize Virtual Servers (HIGH, MEDIUM, LOW)

Similarly the virtual machines are also categorized considering energy, numbers of jobs in queue list and capacity.

VC [M]= array of Virtual Machines. Where M=Numbers of Virtual Machines
VC_Property[M][3]= storing the properties as
VC_Property[i][0]= Energy
VC_Property[i][1]= (1/ Numbers of jobs in queue list)
VC_Property[i][2]= Capacity
VC_Resultant[M]=VC_Property[i][j]*
VC_Property[i][j+1]* VC_Property[i][j+2]
And i is from o to M-1 and j is from 0 to 2{considers the number of priorities}

If 10== VC_Resultant [i]>=7 , Assign to Cluster : HIGH
If 7> VC_Resultant [i]>=5 , Assign to Cluster : MEDIUM
If VC_Resultant [i]<5 , Assign to Cluster : LOW

IV. RESULTS AND DISCUSSION

After formation of the cluster for the jobs and as well as Virtual machines, the jobs from the HIGH cluster would be assigned to Virtual machine at HIGH cluster and accordingly for the MEDIUM and LOW cluster also.

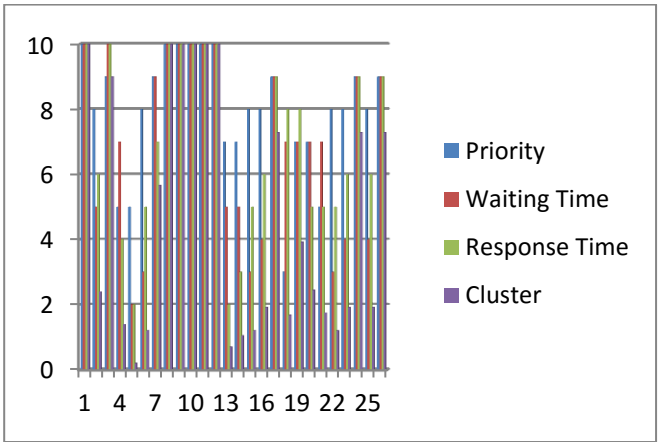

Fig. 2. Cluster formation of Virtual Machines considering features

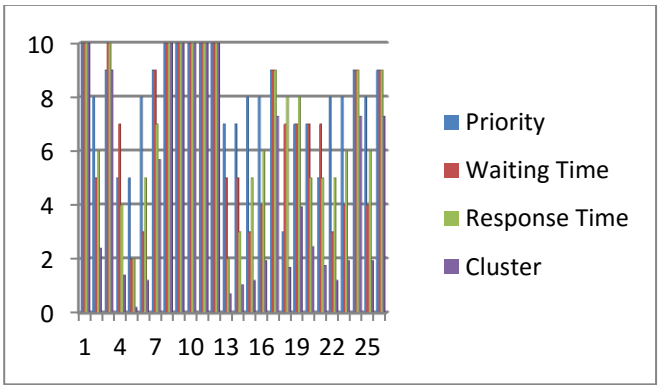

Fig. 3. Cluster formation of Jobs considering features

V. CONCLUSION AND FUTURE SCOPE

The proposed method has considers capacity, energy which directly contribute and queue length which inversely contributes in cluster categorization in case of Virtual machine and in case of jobs all the three factors are directly contributing in cluster categorization. The method as energy efficient as it considers the virtual machine energy as a evaluating factor.

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