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Fuzzy Based Improved Multi Queue Job Scheduling For Cloud Computing

Er. Inderpal Singh, Er. Aman Arora (H.O.D.)
Department of Computer Science & Engineering
Sri Sai College of Engineering & Technology, Manawala, Amritsar.

Abstract: - This paper has focused on extending the MpQS based scheduling algorithm by using fuzzy values for cloud computing environment. With cloud computing, an organization has the capacity to install computers for the employees and instead of installing applications or application on the individual computers, a single request has the capacity to be loaded on multiple computers. That not only diminishes the software and equipment needs of the user's device but also develops the major training of application in to most of the other computers in the system therefore making the user's device a lot more efficient. That workload change has observed many corporations resorting in to cloud computing. The use of fuzzy logic seems to be efficient as it comes up with best alternative for shifting the load from one position to another. Also the use of fuzzy logic will reduce the overall overheads of the live migration techniques.

Keywords:-Cloud Computing, Load Balancing, Multi Queue Job Scheduling

I. INTRODUCTION

Cloud computing technology growing very vastly in IT industries and in R&D. Cloud Computing is that in which we utilize applications over the internet and allows us to generate, arrange, and modify the applications online. In different way, we consider that Cloud is something that is present at remote areas. Cloud has capabilities to give services under public and private networks, i.e., WAN, LAN or VPN. There are some examples of applications that execute on the cloud are as e-mail, web conferencing, customer relationship management (CRM). Cloud computing indicates the manipulation, modification and accessing the hardware as well as software resources remotely and provides online information storage, infrastructure as well as applications. There are some services and models that running at the back scene which create the cloud computing feasible and reachable to end users easily. There are working models for cloud computing are as following:

a. Deployment Models
b. Service Models

A. Deployment Models:

Deployment models are those type of models which classify the kind of access to the cloud, i.e., how the cloud is located? There are four types of cloud: Public cloud, Private cloud, Hybrid cloud, and Community cloud. The public cloud is open to general people and offers systems as well as services to general public which are assessed easily. Public cloud services and applications are almost free. Officially there is little bit or no dissimilarity between public and private cloud architecture, however public cloud is differ from private cloud on the basis of security issues. There is one drawback of Public cloud that it is less secure due to its openness. The private cloud offers systems as well as services that are accessible and shared within firm and it is handled inside or outside of the firm which depends on the needs of firm. The private cloud is more securable than public cloud because it is not open to everyone but it is limited to an organization. The community cloud is nor open to everyone like public cloud neither only accessible in one organization like private cloud, So it allows systems which are chiefly accessible by a set of organizations. The hybrid cloud is the improved version of cloud and it created by combining two or more clouds i.e. private cloud, community cloud or public cloud. The hybrid cloud removes isolation and provider limits so that it can't be consider only in one class of private cloud, public cloud, or community cloud. The hybrid cloud extends the capacity as well as the potential of a cloud service, by aggregation, combination or modification with another cloud service.

B. Service Models:

The concept of cloud computing is totally based on service models. Every service model has some similarities as well as differences. These service models are basically classified as below:

a. One is that in which infrastructure is supplied in terms of service. i.e. IaaS.
b. Other is that in which platform is supplied in terms of service. i.e. PaaS.
c. Last is that in which software is supplied in terms of service. i.e. SaaS.

IaaS service model handle applications, information, operating system, middleware, runtime and in this, service owner has the responsibility for handling virtualization, servers, networking and storage. In this way, it reduces costs for hardware as well as for human capital. The best and suitable example for IaaS is the Microsoft. PaaS service model offers the runtime environment for software, development and deployment tools, etc. The best and suitable example for PaaS is the Google app engine. SaaS is that service model which helps us to run applications in the cloud where every part is handled by the cloud seller. Using SaaS, there is better compatibility and collaboration among users because every user will be using the similar software. The best and suitable examples for PaaS are online banking and email like Gmail and Hotmail. As the selection of services distributed over internet are increased, then sometimes referred to as "XaaS" which indicates " Everything-as-a-Service".

II. LOAD BALANCING

It is procedure that is helpful for dividing the work among different number of computers or machines

consequently extra jobs passed away in same range of time, so the speed to carry out work is increased and commonly, all clients get served faster. Load balancing techniques focus on to optimize resource utility, increase throughput, reduce response time, and keep away from overload of any single resource. If we use different number of devices instead of single one, will enhanced consistency. There are a variety of techniques of load balancing are as following:

A. Round Robin:

It is the technique in which scheduler allots a fixed time unit per process, and cycles through them. RR scheduling scheme has great overhead, especially with a unit having small time .Once a task is initiated for particular time duration, then task is preempted and other task is executed for a particular given time duration. The concept of context switching is very popular for saving states of preempted processes. The precedence of assigning time unit to processes is depended on its arrival time, similar to FCFS.

B. Weighted Round Robin:

This technique overcomes the limitation of the simple round robin: Incoming requests are delivered across the cluster in a sequential pattern, while considering a static "weighting" that can be pre-allotted per server. The capacities of the existing servers are described by administrator by weighting the servers.

C. Least connections method:

Both round robin schemes do not examine that how many connections are connected with system over a particular given time .So that's why least connections scheme is used in which requests are delivered on the behalf of the connections that each server is presently maintaining. The server in the network with the smallest number of active connections will get the next request by default.

D. Earliest deadline first:

EDF is special category of active load balancing scheme in which time constraints expresses key role for holding jobs in priority list. This list is very helpful for running tasks because it tells that which job is carried out at which time. When the load balancing procedure starts, the queue will find the process which is nearest to its deadline, and then execute that process to next which is nearest to its deadline.

E. Fixed Weighted:

The Real Server which has maximum weight value will be considered while another Real Server(s) have lesser weight values. If maximum value's weight server falls, then Real Server with the next peak priority number will be available for the clients. The weight allotted for each Real Server on the basis of priority between Real Server(s).

F. DNS Based Load Balancing:

It is straightforward procedure in which we configure DNS to send dissimilar identifier to dissimilar devices on TCP/IP network when it is required. It is related to even task allotment procedure, excluding that it cache the identifier of device related to TCP/IP network and after that continuously following similar IP address before the entrance of new DNS.

III. MULTI QUEUE JOB SCHEDULING

The MQS is that method in which jobs are clustered into different groups on the basis of burst time which is described in fig 1. Jobs submitted by client, are sorted in the ascending order of the burst time. All jobs are treated equally. It uses dynamic allocation of jobs to reduce starvation and choose most suitable jobs from one of the available. It does not decrease performance of system. The queue manager plays a vital role for allocating resources to the network. It handles the utilization of all resources in the network. The queue manager checks time to time that which are presently running the jobs by balancing force one of the metascheduler and its disposal. It handles the output of the tasks that are collected by the queue manager.

Different queues are made in ascending order on the basis of burst time.

a. In the small jobs queue, jobs have small burst time in which first 40% of jobs are stored.
b. 2. In the medium jobs queue, jobs have medium burst time in which next 40% of jobs are stored.
c. 3. In the long jobs queue, jobs have long burst time in which remaining 20% jobs are stored.

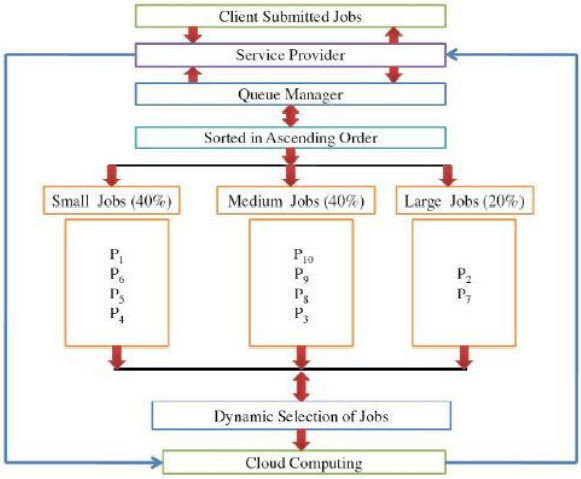

Figure 1: shows the mechanism of MQS.

First Iteration: P1 → P6 → P10 → P9 → P2
Second Iteration: P5 → P4 → P8 → P3 → P7

IV. LITERATURE SURVEY

Randles, Martin, David Lamb, and A. Taleb-Bendiab. et al. [1] Cloud computing is an technology which dependable on intense researches in case of internet Servicing, networking, and also virtualization is very useful in this area. This technology is very beneficial to the user which is not much costly and also is flexible and it is easily available to the users. As a result of advantages of reliable cost and other factors which increases requirement of cloud infrastructure. Due to these advantages the customers are attracted towards this technology and number of user are increases day by day. This technology becomes an important part of web services and other services which also working quietly if there is any error or interrupts. This technology easily handles various numbers of resources. On the behalf of this concept, it gives birth to the methods like balance of efficient loading. Because these machines are so complex and result of this, the allotment of the jobs in centralized way is not feasible. This research focus and based on some

conclusions which are basis on Honeybee Foraging Behavior, Biased Random Sampling and Active Clustering.

Rimal, Bhaskar Prasad, Eunmi Choi, and Ian Lumb. et al. [2] The computing area is increasing day by day and becoming much complex. Cloud Computing flourishing and becomes superb infrastructure which handles great amount of information among different groups. The Google is example of this technique. On the behalf of requirement of users , this technique is established according to amount of the information required by users. Presently, the users prefer the pay-per-use approach which is more beneficial for them. They made classification which tells cloud technology structure. After that, they used classification for checking numerous old services that are provided universally. They use this classification and research results not only to check cons and pros, instead also check topics demand more investigation. Hu, Jinhua, Jianhua Gu, Guofei Sun, and Tianhai Zhao.et al.[3] The arrangement and allotment of virtual devices that are present in cloud ambiance focus on existing status of the equipment or device. These devices rarely focus on device changes and its past info content.

This results into instability of the device in terms of the load. Due to this instability in the devices, they present research work which is based and centered on method known as genetic procedure. The past content and existing condition of the device with help of genetic procedure, the new work handles the various effects on the different number of devices and after that gets the best and optimal results and also get the best and superb stability for balancing requests which minimize transferring of jobs in the active environment. The new procedure handles the stability of load efficiently that increases the expenditure of transferring jobs from one machine to other. The investigated outcomes confirm that new procedure can handle load effectively.

The new method maximize the use of devices when the devices have static or dynamic load. Wang, Shu-Ching, Kuo-Qin Yan, Wen-Pin Liao, and Shun-Sheng Wang.et al.[4]For developing the energetic web arrangement, its bandwidth is very important concern. The cloud ambiance get great consistency by using less consumption machines. The cloud ambiance uses non-centralized way for allotting resources check the category of the machine. The Cloud technology handles the running of big processes by using machines or devices. Then the devices which are picked for running the jobs in that ambiance check the strength of the devices which is centered on characteristics of the task. In this survey the 2-step procedure in 3-step ambiance of cloud where number of systems interconnected. They made new method that mix the two techniques in which one is min-min LB procedure and other one which take frequent action to handle load. Both these two methods handle tasks in best manner. Zhang, Zehua, and Xuejie Zhang.et al.[5] In cloud ambiance it has great impact on information technology in the coming years.

This technique is very helpful in many fields, and it is solution of many troubles that are occur in the fields of computing. The balance of load among the interconnected nodes is an example of the troubles, so it shows that this technique is very helpful. They made a procedure which is centered on the well known technique that is called as ant colony method with sophisticated interconnected nodes in unblocked cloud ambiance. They enhanced the various factors that are related to Ant procedure. Then, this method considers the features of sophisticated interconnected nodes.

Consequently, there is improvement thoroughly checked and implemented with software by simulating it. Foster, Ian, Yong Zhao, Ioan Raicu, and Shiyong Lu.et al. [6] they consider that Cloud ambiance is cant behind Web 2.0. There are numerous explanations for it. it's intricate link with the relatively new but thirteen-year established grid computing paradigm, and other relevant technologies such as for example utility computing, cluster computing, and distributed systems in general. This research helps in evaluation of cloud ambiance against grid ambiance at different points. Chieu, Trieu C., Ajay Mohindra, Alexei A. Karve, and Alla Segal.et al. [7] they stated that the number of resources increased and decreased in the case of network which is easily handled by different companies.

The great necessities are very expensive for balancing particular resources. The Cloud ambiance is powerful ambiance which provides facility to users on pay-per-use method which is the best and frequent way to use resources. The research work explains the infrastructure for vibrant increasing and decreasing of internet apps that are focused on critical conditions in virtual cloud ambiance. They point up that scaling procedure which has particular front loading mechanism for sending packet from source to destination in network and handles different tasks of internet apps. An active scaling procedure for programmed handling of virtual devices which is purely focused the critical values of running message carriers on the network. According to the user's requirement, cloud allots devices to them to carry out their work. This research work shows that how handle load burst, allotment of devices to the different numbers of clients by balancing devices utility and maintain overall expenditure of cloud ambiance. Wickremasinghe, Bhathiya, Rodrigo N. Calheiros, and Rajkumar Buyya.et al. [8] for deep research, the cloud concept generates many ways to get online apps producers. If we see back, the important matter of online apps producers was to create and launch apps. Due to this, it need to buy sever for static volume to manage optimum range of apps. After that, server was non-optimally used due to the traffic that occurs at different points in terms in time. By using cloud concept, the creation and launching of apps is quite simple process but it is important for producers to get owner of cloud that providing development.

Therefore, the deficiency of techniques that handles big problems by allotting servers with respect to location and needs. To remove this deficiency, CloudAnalyst is introduced which is easily capable of handling and simulating big apps and also check its properties. It also optimizes the apps working and allots apps among different clients. Youseff, Lamia, Maria Butrico, and Dilma Da Silva.et al.[9] The cloud concept is not a single term but it is derived by mixing different technologies and researchers also focused this concept with intensive care. They focused in this research about the decomposition of cloud concept into different levels, so they considered 5 levels. These 5 levels were investigated about the relations and its dependent nature with the different existing concepts. The optimum knowledge of particular concept permits the creation of good service that gives different number of resources and develops nodes that manage some networks.

So this is very helpful for researchers to add up their aid towards technical areas. Dillon, Tharam, Chen Wu, and

Elizabeth Chang.et al.[10] Some people make assumption about the restructuring of IT sector with help of cloud concept. This research study mentioned the some important concept regarding cloud. They described that how get the resources from different areas to accomplish universal target and also explain procedure which is helpful for changing creation, consumption of software apps. From these two descriptions, they evaluate their corresponding relations with cloud ambiance. They analyzed different measures regarding promotion of Cloud concept. Buyya, Rajkumar, Rajiv Ranjan, and Rodrigo N. Calheiros.et al. [11] They mentioned that the infrastructure made up of devices, interconnections and their management is easily handled while allotting work to different clients and apps must be in quality according to the client necessities.

The needs of cloud apps vary from one to another by its development features. Various procedures used for the allotment of tasks in cloud and their working way is improved over various circumstances i.e. load, working efficiency. The big size of the system is difficult to operate it. For making straightforward this procedure, this research introduced CloudSim which is extended for handling sophisticated problems to simulate them. These extended tools are very helpful for creating and configuring virtual devices and makes relation between tasks, datacenters to virtual devices. This is very helpful tool for handling various numbers of datacenters simultaneously. After that, the procedures for the transferring virtual devices are also explained. Li, Bo, Jianxin Li, Jinpeng Huai, Tianyu Wo, Qin Li, and Liang Zhong.et al. [12] The cloud is the backbone for IT sector and day by day , the clients of it are increasing which is very critical matter for researchers and their users.

Because of these concerns, it is also very difficult to combine demanded apps for existing computing devices and also checks regarding consuming power of energy which is much difficult for online apps. This research work eliminates all these problems by introducing a scheme which is called as EnaCloud. This new procedure easily handles all issues regarding their efficient energy and randomly places apps in active and live ambiance. They combine apps with virtual devices that are helpful for ordering apps and transfer jobs from one device to other which decreases the number of active machines then consequently which decreases energy wastage. There are some procedures to save energy and continuously checking devices that are very helpful to getting optimal outcomes.

The EnaCloud procedure is tested with virtual devices and gives optimal outcomes. Zhao, Yi, and Wenlong Huang. et al. [13] The transferring of jobs from one devices to other is very helpful concept to save the energy of the devices and increases the efficiency of the virtual devices. This research work introduce a new procedure which uses storage of sharing nature that is helpful in diminishing the job transferring time for virtual devices which raise the efficiency of the whole system. While transferring the jobs from one device to other, it is very important to remember the connection of virtual LAN with virtual device. They made procedure that is purely focused on samples which are used to evaluate and maintain load to get optimal outcomes. Mohsenian-Rad, A-H., and Alberto Leon-Garcia. Et al. [14] The virtual design that consists of computing devices and network is standing due to raising of cloud. So these virtual designs intake large quantity of energy which is very serious matter for researchers and also have bad effect in the area where they exist. These virtual designs and cloud promote this factor that they easily work if there is any little failure and also handle load in optimal way. In this research work, they express the trouble of sending data packets that are needed by user in cloud and examine energy for delivering data with help of electric signals and after that, check the relationship between these two troubles. Simulation is handled in twenty four-bus of IEEE. Consistency analyzing device helps to improve the sending data packets with help of electric signals in cloud further improves the balance of load. Due to this, consistency of sending data packets with help of electric signals is improved and no chances of breakdown of connection. Zhang, Hui, Guofei Jiang, Kenji Yoshihira, Haifeng Chen, and Akhilesh Saxena. Et al. [15] this research work mentioned that the optimal load scheme is provided which improve the client interaction by using hybrid cloud. It makes coordination in companies inside and outside that capable for sending online apps and this all is depended on the load of work.

This elegant scheme determines the load of work immediately and also checks the quality of info by changing data content. Azeez, Afkham, Srinath Perera, Dimuthu Gamage, Ruwan Linton, Prabath Siriwardana, Dimuthu Leelaratne, Sanjiva Weerawarana and Paul Fremantle. Et al. [16] Many IT companies do analysis of the cost from different perspectives which including their management, maintenance and apps fee. There are some schemes that are helpful in dropping all such costs, so cloud provides some levels which are very helpful in dropping all these costs for IT companies. By sharing a single app among different number of clients which is the optimal solution to this costs trouble. So this concept of sharing apps that makes the tiny objects of apps for different clients which normally dropping the IT sector costs. This research is much helpful presents a structure of procedure with help of which clients' shares apps at SOA stage which helps clients to perform their work in multiple clients' ambiance and helps to develop the apps in SOA ambiance which is very convenient to the large number of clients.

This research work also explains the structural design and consider all problems when apply this work into practical. This research is very helpful for multiple clients and realization of apps in SOA for multiple clients with less or none changes. Kondo, Derrick, Bahman Javadi, Paul Malecot, Franck Cappello, and David P. Anderson. et al. [17] Cloud concept is that which suddenly burst into IT sector and increases attention of many researchers towards its costs analysis , how handle increasing and decreasing number of devices while considering the concept of energy efficiency in the mind. In this research work, evaluations carried out in regarding of financial pros of clouds for offline apps while considering its volume and mass and also evaluate efficiency of one technology over other. Also analysis the expenditure of different platforms and tells that how use the cloud base with desktop clusters to increases financial efficiency with time constraints grids. Liu, Chang et al. [18] mentioned hierarchical key exchange method, CBHKE. According to previous work, CBHKE provides secure and well-organized scheduling method for cloud computing environment. In their new technique, they developed a two-phase layer-by-layer iterative key exchange policy to attain extra proficient AKE without sacrificing the

level of information security. Both theoretical investigation and experimental conclusions stated that after deployed in cloud computing environment, effectiveness of the proposed technique was dramatically improved than its predecessors CCBKE and IKE methods. Karthick, A. V., E. Ramaraj, and R. Ganapathy Subramanian et al. [19] The scheduling is the one sophisticated problem in the cloud which optimally handle all the tasks that are waiting for the quick response.

This research work mentioned that Multi Queue scheduling method is used for decreasing the expense of preserved and immediate order procedures utilizing the scheduling scheme for arranging them globally. The proposed scheme tells that the combine tasks with help of their burst timings. At that time of scheduling the standard methods such as for example First Come First Serve, Shortest Job First, EASY, Combinational Backfill and Improved backfill using balance spiral method are creates fragmentation. The new method removes this dilemma and decreases the starvation with in the process. This paper also spotlight some existing scheduling methods and issues linked to them in cloud computing. The MQS scheme helps to get the jobs randomly which is very helpful in achieving the best scheduling of jobs and consequently it uses unexploited space in an optimal financial way.

V. PROPOSED METHODOLOGY

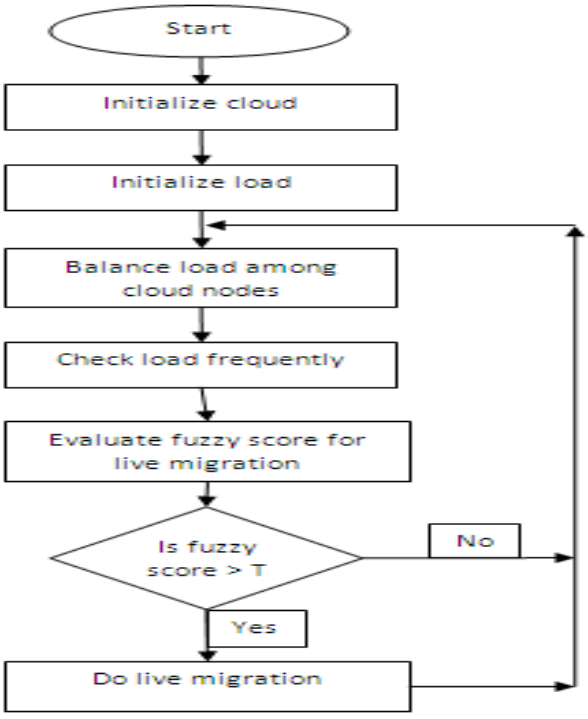

Figure 2: Shows the procedure of proposed algorithm.

Following are the steps of proposed methodology are as:

a. Initialize cloud.
b. Initialize load.
c. Balance load among cloud nodes.
d. Check load frequently.
e. Evaluate fuzzy score for live migration.
f. Is fuzzy score greater than threshold value, then live migration is carried out. But if fuzzy score is less than threshold value, then again balance load among cloud nodes.

VI. RESULTS AND DISCUSSIONS

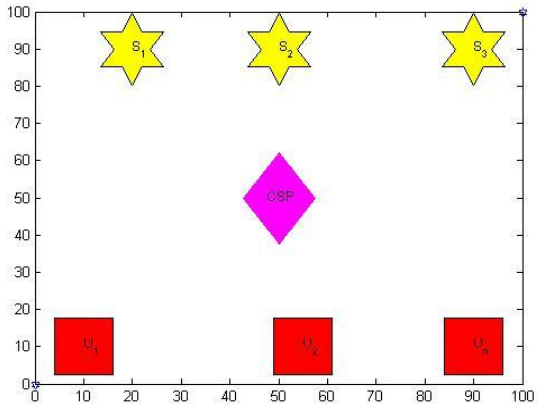

Figure 3: Shows the arrangement of user, carrier service provider and servers.

In this figure 3, U1, U2, UN are the n number of users and S1, S2, S3 are three servers. CSP stands for Carrier Service Provider which provides services to users and also evaluate servers. In this figure, user requests to CSP for some required resources or server, then CSP will check that which resources or servers are available for accepting request from user. If resource is available, then CSP will send request to suitable server but If there is no resource or server is available at that instant, then that particular user has to wait until suitable server is found and for a while another random user will request for resource or server. The server which has highest priority will accept the request of user. The server's priority is evaluated by its capacity and power consumption. At one instant, one user will request to CSP.

A. Performance Evaluation:

a. Waiting Time: It is the time duration involving when an action is requested and when it occurs is called waiting time. It is evaluated by:

Waiting Time = Start Time – Arrival Time

Table 1: Waiting Time

Sr. No.	Simulation Time	Existing Waiting Time	Proposed Waiting Time
1	10	69.3	2.9
2	20	735.3	473.1
3	30	496.5667	30.2667
4	40	1582.6	31.5
5	50	1812.2	964.72
6	60	2571.5	1234.7
7	70	4009.1	1864.8
8	80	3751.2	2364.6
9	90	4998.3	2521.3
10	100	4662.5	3160.2
11	110	7502	3533.7
12	120	5891.8	3257.9
13	130	6650.9	3606.3
14	140	9077.2	4707.1
15	150	7980.9	5448.6
16	160	10316	5355.4
17	170	11367	6217.8
18	180	10578	7290.4
19	190	11613	7200.3
20	200	11325	7273.9

Table 1 shows the waiting time of existing and proposed work with the variation of simulation time

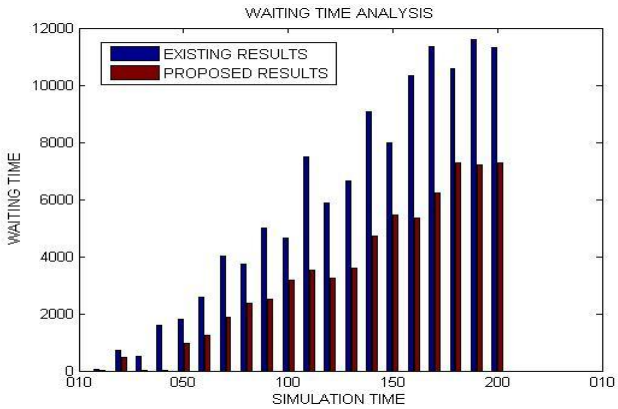

Figure 4: Simulation Time analysis

Fig 4 shows that waiting time of proposed algorithm is reduced against existing algorithm.

b. Response time: It is the length of period from submitting the request to the former reply of that request. It is evaluated by:

Response time = First Response Produced Time – Request Submission Time

Table 2: Response Time

Sr. No.	Simulation Time	Existing Response Time	Proposed Response Time
1	10	1.2	0.1
2	20	18.95	8.9
3	30	8.9667	0.4333
4	40	27.9	1.25
5	50	37.46	25.06
6	60	57.45	24.1833
7	70	70.3714	34.6
8	80	63.7750	44.9
9	90	95.6556	46.3222
10	100	86.97	62.03
11	110	128.1182	81.1
12	120	106.05	69.7667
13	130	130.2077	71.6231
14	140	162.7286	99.5286
15	150	162.7933	111.9933
16	160	188.2625	113.2938
17	170	209.4529	130.0588
18	180	213.6167	142.8278
19	190	221.1789	143.1895
20	200	226.47	150.7

Table 2 shows the response time of existing and proposed work with the variation of simulation time.

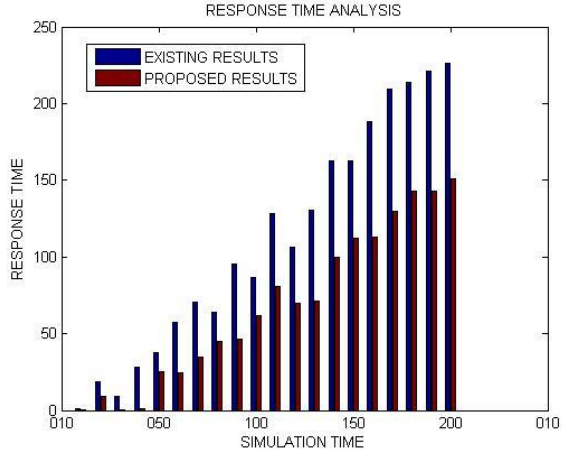

Figure 5: Response Time Analysis

Fig 5 shows that response time of proposed algorithm is reduced against existing algorithm.

VII. CONCLUSION AND FUTURE SCOPE

After surveying various techniques, it has been found that most of the existing researchers have neglected the scalability of cloud users and effectiveness of energy in cloud ambiance. By using live migration in energy efficient scheduling is also based on bivalent theory. Therefore to overcome these issues, an enhanced MQS scheduling using fuzzy if then rules that enhanced the load balancing based on fuzzy values has been proposed. The design and implementation has been done in MATLAB. Additionally, evaluations have been carried out on various performance measures. This comparison proves the efficiency of the proposed algorithm over the existing ones.

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