INTERNATIONAL JOURNAL OF ADVANCE RESEARCH, IDEAS AND INNOVATIONS IN TECHNOLOGY

ISSN: 2454-132X
Impact factor: 4.295
(Volume 5, Issue 6)
Available online at: www.ijariit.com

Efficient job scheduling algorithm based on weighted average priority in cloud computing

Rabinder Kaur
mahajan1aastha1@gmail.com
Swami Sarvanand Institute of Engineering and Technology, Dinanagar, Punjab

Arshdeep Kaur
arshdeepk284@gmail.com
Swami Sarvanand Institute of Engineering and Technology, Dinanagar, Punjab

ABSTRACT

In cloud computing, the issue of the scheduling of a job is a greatest and testing issue. There are numerous algorithms for scheduling available that are utilized in the environment of cloud computing for better resource scheduling. Scheduling is assigning fundamentally a number of resources to the tasks in a manner that there will be maximum utilization of the resource, minimum time for total processing and minimum time of waiting. The basic aim of this paper is to study and analyze the various scheduling algorithms in cloud computing, to develop an improved task scheduling using QoS parameters of Virtual machines and priorities of the task based on the deadline, to compare the results of the proposed scheduling technique with the existing multi-objective task Scheduling technique. The proposed methodology is implemented with the help of Cloudsim and NetbeansIDE8.0. CloudSim is the library that provides the simulation environment of cloud computing and also provides primary classes describing virtual machines, data centres, users and applications.

Keywords— *QoS, Cloud Computing, Min Min algorithm, MIPS, Granularity Size, CloudSim, Task scheduling*

1. INTRODUCTION

The developers' interest is in utilizing the cloud for carrying out technical applications & also the enormous associations are on the edge of changing over to a hybrid cloud. Numerous applications which are very complex need parallel processing for executing the jobs efficiently. Because of the synchronization and communication among processes which run parallel, there is a reduction in the usage of resources of CPU. It is fundamental for a data centre to accomplish the use of hubs while keeping up the level of responsiveness of jobs which are running parallel. Cloud Computing is pulling in an expanded number of uses to keep running in the data centres which are remote. Numerous intricate applications necessitate capabilities of parallel processing. A portion of the applications which are running parallel demonstrate a decline in the usage of resources of CPU. At whatever point, there is an expansion in parallelism and there is no planning of jobs accurately, it lessens the execution of a computer.

According to R. Buyya et al.[1], the cloud is characterized as, "A Cloud is a type of parallel and distributed system consisting of a collection of inter-connected and virtualized computers that are dynamically provisioned and presented as one or more unified computing resource(s) based on service-level agreements established through negotiation between the service provider and consumers." Cloud computing is a distributed model at large scale for computing, which relies upon the monetary size of the operator of the cloud which is dynamic, virtualized and abstract. The primary content of cloud computing is to oversee storage, computing power, different sorts of services and platforms which are assigned to the external clients through the internet on their interest. Cloud computing is quickly developing a paradigm of computation with the objective of freeing up cloud's clients from the administration of data resources, networks, software and hardware and shifting these burdens to service providers of the cloud. There are three main layers of the architecture of cloud computing, for the software which necessitate services over the Internet on demand. Figure 1 below demonstrates diverse layers of the architecture of the cloud.

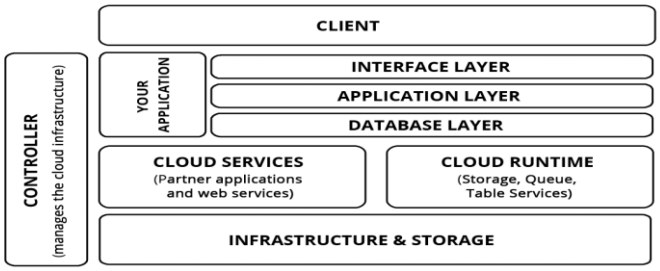


Fig. 1: Layered View of Cloud Architecture

1.1 Job Scheduling

In Cloud Computing, scheduling plays a vital role in efficiently managing the computer services; It is the progression of captivating decisions regarding the allocation of available capacity and/or resources to jobs and/or customers on time. Millions of users share cloud services by submitting their millions of computing tasks to the cloud computing environment [35]. Scheduling of these millions of tasks is a clash to the cloud environment. The scheduling crisis in the cloud makes it difficult to work out, predominantly in the case of large composite jobs like workflows. At the same time, the scheduling strategies focus on throughput, efficiency, space, cost of time and improve the class of service of the entire cloud computing environment. Scheduling process in the cloud is divided into three stages namely; Resource discovering and filtering, Resource selection and Task allocation. In Resource discovering and filtering, the data centre broker discovers the resources present in the network system and collects status information about the resources. In Resource selection, the target resource is selected based on the requirements of task and resource. This is the deciding stage. In task allocation, the task is allocated to the selected resource. Job Scheduling is utilized to assign definite jobs to specific assets specifically time.

The needs of job scheduling in cloud computing are load balance, quality of service, economic principles, best running time, throughput. In the environment of cloud computing, the issue of the scheduling of a job is a greatest and testing issue. Subsequently, the job scheduler ought to be rapid. The scheduling of job in cloud computing is principally centred to enhance the effective utilization of resources like reducing the completion time, memory and bandwidth. A productive strategy of job scheduling must intend for yielding less time of response in such a way that the execution of jobs submitted happens inside a conceivable least time and hence there would be a happening of the event of in-time where a reallocation of jobs is done. Subsequently, few dismissals of jobs happen and an additional quantity of jobs could be put forward to the cloud by the customers which at last show expanding results in quickening the business execution of the cloud. [35].

1.2 Task Scheduling

Cloud comprises of various resources that are diverse with one other through some methods and expense of performing tasks in cloud utilizing resources of cloud is distinctive so tasks scheduling in cloud is not the same as the customary strategies for scheduling thus scheduling of tasks in cloud require better regard for being paid in light of the fact that administrations of cloud rely on upon them. Task scheduling assumes a key part to enhance adaptability and unwavering quality of frameworks in the cloud.

2. PROPOSED SYSTEM

2.1 CloudSim

Cloud user can deploy the large scale application over the real cloud without taking any responsibility for resource management and resource provisioning. CloudSim toolkit provides the modelling and simulation of the cloud computing system and application provisioning policy implementation. This Simulation tool provides the repeatable and controlled environment to set up a new virtual cloud computing environment with different cloud component properties. CloudSim Toolkit provides the flexibility to the user to implement his own resource provisioning policy.

2.2 NetBeans IDE

NetBeans is a software development platform written in Java. The NetBeans Platform allows applications to be developed from a set of modular software components called modules. Applications based on the NetBeans Platform, including the integrated development environment (IDE), can be extended by third-party developers. It is primarily intended for development in Java but also supports other languages, in particular, PHP, C/C++ and HTML5. The NetBeans Platform is a framework for simplifying the development of Java Swing desktop applications.

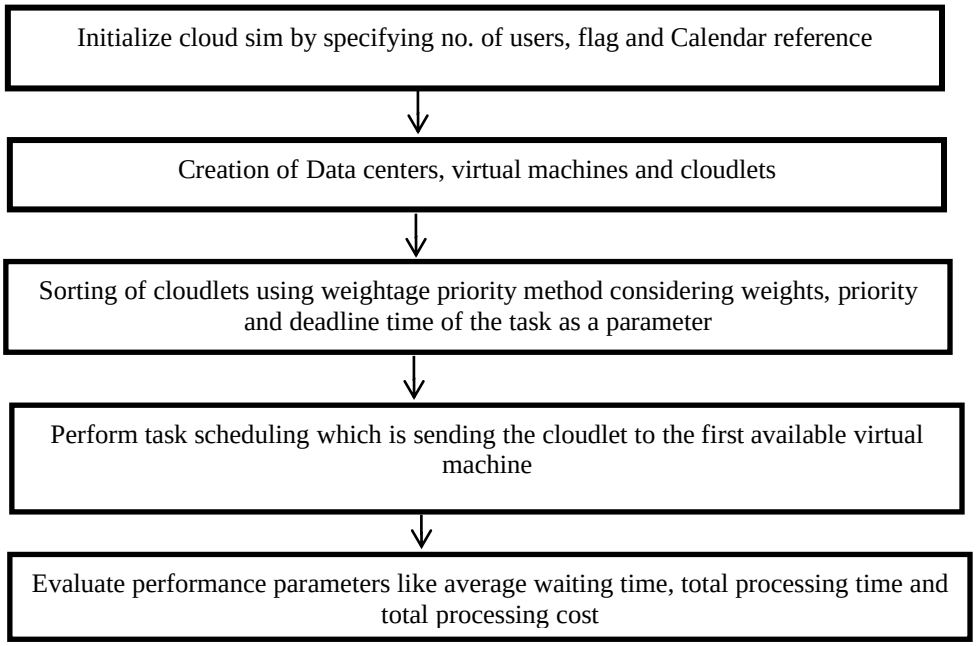


Fig. 2: Flowchart of the proposed approach

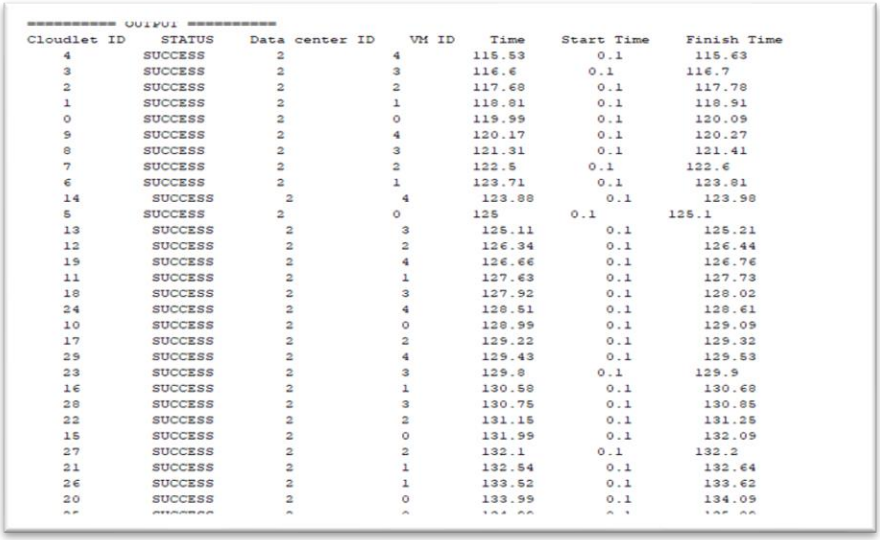
3. RESULTS

3.1 Proposed Algorithm for Broker

```
Total Processing time : 660.843957805667
Total Processing Cost : 440.58
Average Waiting Time : 0.5790041441721877
```

Table 1: Results for 30 Cloudlets and 5 Virtual machines using Proposed Algorithm for Broker

30 C Cloudlets and 5 Virtual Machines	
Average Processing Time	660.660.84
Average Processing Cost	447 440.58
Average Waiting Time	0.57 0.579
Makespan Time	135.135.09



Cloudlet ID	STATUS	Data center ID	VM ID	Time	Start Time	Finish Time
4	SUCCESS	2	4	115.53	0.1	115.63
3	SUCCESS	2	3	116.6	0.1	116.7
2	SUCCESS	2	2	117.68	0.1	117.78
1	SUCCESS	2	1	118.81	0.1	118.91
0	SUCCESS	2	0	119.99	0.1	120.09
9	SUCCESS	2	4	120.17	0.1	120.27
8	SUCCESS	2	3	121.31	0.1	121.41
7	SUCCESS	2	2	122.5	0.1	122.6
6	SUCCESS	2	1	123.71	0.1	123.81
14	SUCCESS	2	4	123.88	0.1	123.98
5	SUCCESS	2	0	125	0.1	125.1
13	SUCCESS	2	3	125.11	0.1	125.21
12	SUCCESS	2	2	126.34	0.1	126.44
19	SUCCESS	2	4	126.66	0.1	126.76
11	SUCCESS	2	1	127.63	0.1	127.73
18	SUCCESS	2	3	127.92	0.1	128.02
24	SUCCESS	2	4	128.51	0.1	128.61
10	SUCCESS	2	0	128.99	0.1	129.09
17	SUCCESS	2	2	129.22	0.1	129.32
29	SUCCESS	2	4	129.43	0.1	129.53
23	SUCCESS	2	3	129.8	0.1	129.9
16	SUCCESS	2	1	130.58	0.1	130.68
28	SUCCESS	2	3	130.75	0.1	130.85
22	SUCCESS	2	2	131.15	0.1	131.25
15	SUCCESS	2	0	131.99	0.1	132.09
27	SUCCESS	2	2	132.1	0.1	132.2
21	SUCCESS	2	1	132.54	0.1	132.64
26	SUCCESS	2	1	133.52	0.1	133.62
20	SUCCESS	2	0	133.99	0.1	134.09

Fig. 3: Output for 30 Cloudlets and 5 Virtual machines using proposed Algorithm for Broker

3.2 Comparison of different Algorithms used for Broker

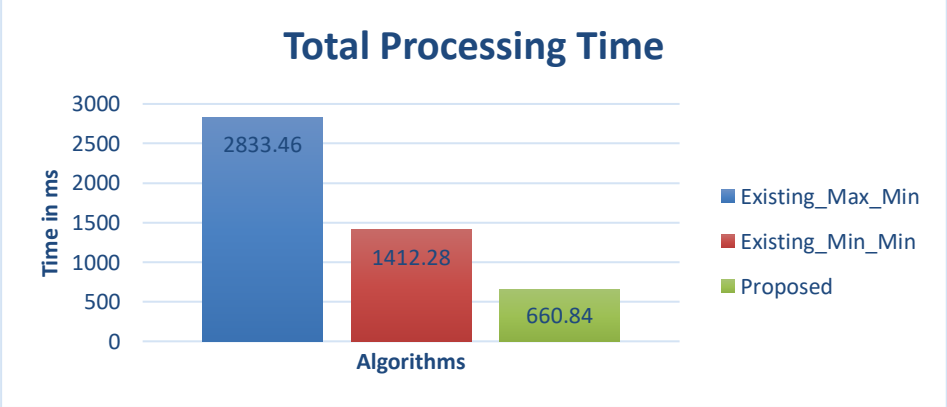


Fig. 4: Processing Time Comparison of different algorithms used for the Broker

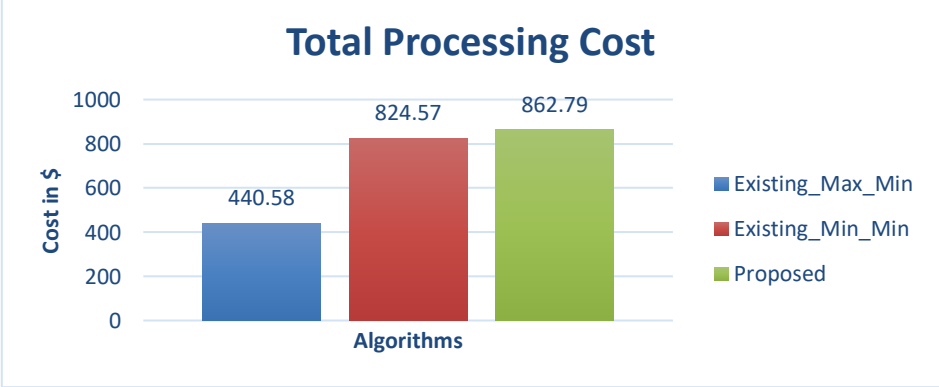


Fig. 5: Processing Cost Comparison of different algorithms used for the Broker

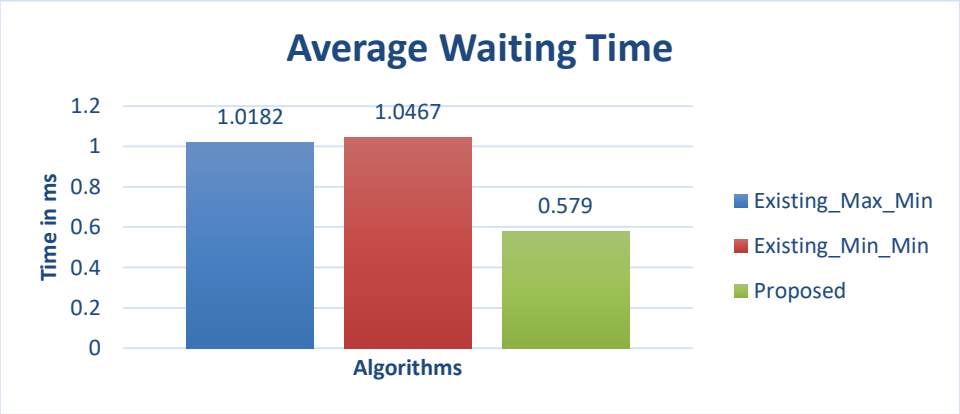


Fig. 6: Average Waiting Time Comparison of different algorithms used for the Broker

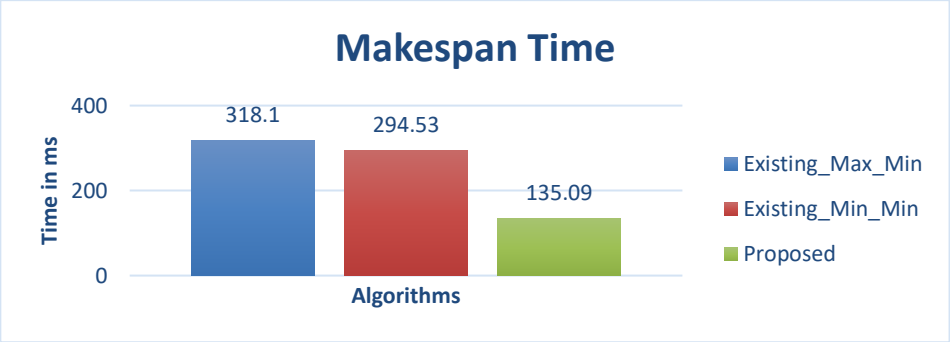


Fig. 7: Makespan Time Comparison of different algorithms used for the Broker

4. CONCLUSION AND FUTURE SCOPE

In this research work, credit-based adaptive load balancing task scheduling is emphasized and to achieve the scheduling problem solution, a credit-based scheduling algorithm based on length and priority is proposed considering the user's Quality of Service requirements. In addition to this, the research aims to achieve load balancing on VMs and improved resource utilization. The evaluation parameters considered in the work includes total processing cost, average waiting time and total processing time.

The work can be further extended in future aiming to achieve more efficient performance results. The proposed work is using Load balancing with scheduling algorithm. In future work, resource allocation can be performed with improved versions and evolutionary algorithms. In additions to this, the proposed system can be further implemented in a real-time scenario.

5. REFERENCES

[1] Buyya, R., Yeo, C.S., Venugopal, S., Broberg, J. and Brandic, I., "Cloud Computing and Emerging IT Platforms: Vision, Hype, and Reality for Delivering Computing as the 5th Utility", *Future Generation Computer Systems*, Vol. 25, no. 6, pp. 599-616, 2009.

[2] Abdullah, M. and Othman, M.," Cost-Based Multi-QoS Job Scheduling using Divisible Load Theory in Cloud Computing," *International Conference on Computational Science*, pp.928-935,2013.

[3] Bornaee, Z. and Tareghian, S., "Algorithm to improve job scheduling problem in a cloud computing environment," 2015 IEEE *2nd International Conference on Knowledge-Based Engineering and Innovation (KBEI)* 2015.

[4] Mandal, T. and Acharyya, S., "Optimal Task Scheduling in Cloud Computing Environment : Meta-Heuristic Approaches," 2015 *Proceedings of International Conference on Electrical Information and Communication Technology* (EICT) pp. 24–28, 2015.

[5] Vig, A., Kushwah, R.S. andKushwah, S.S., "An Efficient Distributed Approach for Load Balancing in Cloud Computing", 2015 *International Conference on Computational Intelligence and Communication Networks*, *IEEE*, 2015.

[6] Li, K., Wang, J., Song, J. and Dong, Q., "Improved GEP Algorithm for Task Scheduling in Cloud Computing," *Proc. - 2014 2nd Second International Conference on Advanced Cloud and Big Data*, pp. 93–99, 2014

[7] Ananth, A. and Sekaran, K.C., "Game-theoretic approaches for job scheduling in cloud computing: A survey," *Proc. - 2014 5th IEEE 5th International Conference on Computer and Communication Technology (ICCCT) 2014*, pp. 79–85, 2014.

[8] C. Zhu, Xihua Li, Victor C. M. Leung, X. Hu, and L. T. Yang, "Job Scheduling for Cloud Computing Integrated with Wireless Sensor Network," *2014 IEEE 6th International Conference on Cloud Computing Technology and Science*, pp. 62–69, 2014.

[9] Zhang, L., Tong, W. and Lu, S., "Task scheduling of cloud computing based on Improved CHC algorithm," 2014 IEEE *International Conference on Audio, Language and Image Processing (ICALIP)*vol. 8, no. 8, pp. 574–577, 2014.

[10] Dave, Y.P., Shelat, A.S. and Patel, D.S., "Various job scheduling algorithms in cloud computing: A survey," 2014 *IEEE International Conference on Information Communication & Embedded Systems*, no. 978, 2014.

[11] Tripathy, L. and Patra, R.R., "Scheduling In Cloud Computing," 2014 *International Journal on Cloud Computing: Services and Architecture (IJCCSA)*," vol. 4, no. 5, pp. 21–27, 2014.

[12] Singh, R.M., Paul, S. and Kumar, A., "Task Scheduling in Cloud Computing : Review," 2014 *International Journal of Computer Science and Information Technologies*(IJCSIT) vol. 5, no. 6, pp. 7940–7944, 2014.

[13] Ettikyala, K. and Latha, Y.V., "Rank Based Efficient Task Scheduler for Cloud Computing,"*2016 IEEE International Conference on Data Mining and Advanced Computing (SAPIENCE)*, pp. 343-346, 2016.
[14] Gupta, A., Bhadauria, H.S., Singh, A. and Patni, J.C., "A Theoretical Comparison of Job Scheduling Algorithms in Cloud Computing Environment," *2015 1st International Conference on Next Generation Computing Technologies (NGCT-2015)* pp. 4–5, 2015.
[15] Zhang, H., "Research on Job Security Scheduling Strategy in Cloud Computing Model," *2015 IEEE International Conference on Intelligent Transportation, Big Data & Smart City*, pp. 649–652, 2015.
[16] Himani and Sidhu, H.S., "Cost-Deadline Based Task Scheduling in Cloud Computing," Proc. -2015 *2nd IEEE Second International Conference on Advances in Computing and Communication Engineering(ICACCE)*, vol. 6, pp. 273–279, 2015.
[17] Bey, K.B., Benhammadi, F. and Benissa R., "Balancing heuristic for independent task scheduling in cloud computing," 2015 *12th International Symposium on Programming and Systems (ISPS)*, pp. 7–12, 2015.
[18] Karthick, A.V., Ramaraj, E. and Subramanian, R.G., "An efficient multi-queue job scheduling for cloud computing," *Proc. World Congress on Computing and Communication Technologies WCCCT 2014*, pp. 164–166, 2014.
[19] Edwin, C. and Madheswari, N., "Job scheduling and VM provisioning in clouds," Proc - 2013 IEEE *Third International Conference on Advances in Computing and Communications (ICACC)*, pp. 261–264, 2013.
[20] Song, X., Gao, L. and Wang, J., "Job scheduling based on ant colony optimization in cloud computing,"*2011 IEEE International Conference on Computer Science and Service System (CSSS)*pp. 3309–3312, 2011.
[21] Huang, Q. and Huang, T., "An optimistic job scheduling strategy based on QoS for Cloud Computing," 2010 *IEEE International Conference on Intelligent Computing and Integrated Systems*, pp. 673–675, 2010
[22] Mohammadi, F., Jamali, S. andBekravi, M., "Survey on Job Scheduling algorithms in Cloud Computing Abstract ," 2014 *International Journal of Emerging Trends & Technology in Computer Science (IJETTCS)* vol. 3, no. 2, pp. 151–154, 2014.
[23] Shabariram, C.P. and Rajeshram V., "HEURISTICS BASED MULTI QUEUE JOB SCHEDULING FOR CLOUD,"2015*International Journal of Research in Engineering and Technology (IJRE*T) vol. 4, no. 5, pp. 2319–2322, 2015.
[24] Banoth, S., "A Review of Selected Techniques in Job Scheduling in Cloud Computing," 2016*International Journal of Science and Research (IJSR)* vol. 5, no. 3, pp. 177–183, 2016.
[25] Patel, S. and Bhoi, U., "Priority Based Job Scheduling Techniques In Cloud Computing : A Systematic Review," 2013 *International Journal of Scientific & Technology Research* vol. 2, no. 11, 2013.
[26] Chen, Y., Guan, Z. and Shao, X., "A Comparative Analysis of Job Scheduling Algorithm," *2011 IEEE International Conference on Management Science and Industrial Engineering (MSIE)*pp. 1091–1095, 2011.
[27] Kaur, S.K.R. and Kinger, S., "Analysis of Job Scheduling Algorithms in Cloud Computing," 2014*International Journal of Computer Trends and Technology (IJCTT)*vol. 9, no. 7, pp. 379-386–, 2014.
[28] Mangla, R. and Singh H., "Recovery and User Priority Based Load Balancing in Cloud Computing," 2015, *International Journal of Engineering Sciences and Research Technology* vol. February, pp. 407-412, 2015.
[29] Chawla, Y. and Bhonsle, M., "A Study on Scheduling Methods in Cloud Computing,"2012*International Journal of Emerging Trends & Technology in Computer Science (IJETTCS)* vol. 1, no. 3, pp. 12–17, 2012.
[30] S. Ray and A. De Sarkar, "Execution analysis of load balancing algorithms in the cloud computing environment,"2012 *International Journal on Cloud Computing: Services and Architecture (IJCCSA)*, vol. 2, no. 5, pp. 1–13, 2012.
[31] Mishra, A. and Katyal, M., "A Comparative Study of Load Balancing Algorithms in Cloud Computing Environment,"2013 *International Journal of Distributed and Cloud Computing* vol. 1, no. 2, p. 14, 2013.
[32] Rajan, R. and Jeyakrishnan, V., "A Survey on Load Balancing in Cloud Computing Environments,"2013 *International Journal of Advanced Research in Computer and Communication Engineering (IJARCCE)*, vol. 2, no. 6, pp. 4726–4728, 2013.
[33] Gohel, P.V. and Mathukiya, E.S., "Efficient QoS Based Tasks Scheduling using Multi-Objective Optimization for Cloud Computing,"2015 *International Journal of Innovative Research in Computer and Communication Engineering*, vol. 3, no. 10, pp. 10131–10138, 2015.
[34] Thomas, A., Krishnalal, G. and Raj, V.P.J., "Credit-based scheduling algorithm in a cloud computing environment," 2015 Elsevier *International Conference on Information and Communication Technologies(ICICT 2014)* vol. 46, no. 2014, pp. 913–920, 2015.
[35] Zhang, J., Hu, X., Tan, X., Zhong, J.H. and Huang, Q. ," Implementation of an Ant Colony Optimization technique for job shop scheduling problem", Transc. Of the Institute of Measurement and Control, pp.93-108,2006.

