REVIEW ON LOAD BALANCING IN CLOUD COMPUTING ENVIRONMENT

R.Justin Kennedy[1], Dr.L. Jayasimman[2],

[1]Research Scholar, PG and Research Department of Computer Science, Bishop Heber College, Trichy,Tamilnadu,India.

[2]Assistant Professor, Department of Computer Science, Bishop Heber College, Trichy,Tamilnadu,India.

Abstract: Cloud computing is a high performance distributed computing and computing utility that provides the massive collection of virtual resources and basic services which can be simply accessed anytime using the network. The load on the cloud is rising tremendously with the development of fresh applications. Load balancing (LB) is a significant technique of cloud computing. Several researchers have been proposed many techniques to develop the load balancing method. *LB techniques ensure efficient resource utilization to customers on his demand and increase the overall performance of the Cloud.* In this paper, an analysis on LB schemes utilizes in cloud computing.

I. INTRODUCTION

Cloud Computing is an emerging and quickest technology in the world wide [1]. Cloud computing is nothing but to access and store huge amount of data over a Network to access cloud database remotely from anywhere. Cloud computing affords flexible approach to maintain files and data that includes web services, distributed computing and virtualization. The main goal of cloud computing provides minimum cost with maximum services at anytime. The benefits of Cloud computing faces a number of research challenges like network level migration [2], ensuring appropriate access control [3], security [4], data availability [5], transitive trust problems and Official quagmire, data origin and unintended leak of sensitive information [6], Data lineage, besides the most frequent issue in cloud computing is load balancing approach. As a result of spending more attention to the load balancing [7], such as, a variety of new characteristics are developed in cloud computing. Balancing the workloads between available nodes in cloud is a significant facet. An effective, efficient LB method assures effective resource utilization [8] by the provisioning of resources [9] to cloud users on demand basis by using pay-as-you-go-scheme. Load balancing balances the workload between the available nodes by reducing the execution time [10], maximizing resource utilization, minimizing communication delays and maximizing the throughput utility. In load balancing algorithms [11], it is categorized into two ways dynamic and static algorithms. In static algorithm, it generates better results in stable environments and it is used for performing stable and homogeneous environments. But, static algorithms cannot accept the alterations of attributes during execution time and also not flexible. In other way, dynamic algorithms are used as more flexible in dynamic computing environments. It considers different kinds of attributes in the environment both prior to and during run-time [11]. The load balancing methods have been proposed like Throttled Load Balancing Algorithm, Round Robin, and Equally Spread Current Execution. The main aim of this literature survey provides a systematic analytical review of popular pre-existing load balancing techniques and algorithms in cloud computing.

II. LITERATURE REVIEW

A lot of researchers have carried out their work in this section. we are discuss about previous work related to load balancing in cloud by using different technique. This paper presents here a couple of such techniques and enlists the major research work in this area.

[2017] Venkateshwarlu Velde, *et al.* **[12]** proposed the new effective load balancing approach using fuzzy logic primarily based on RR (Round Robin) load balancing method to attain measurable upgrades in aid usages and availability of cloud-computing surroundings. The community topology or structure additionally required to think about, while growing the logical regulations for the load balancer. Two parameters named because the processor speed and assigned load of Virtual Machine (VM) of the machine are together used to evaluate the balanced load on statistics centers of cloud computing surroundings thru fuzzy good technique. The consequences obtained with overall performance assessment and stability the weight with decreases the processing time as well as improvement of normal reaction time, which are leads to maximum use of resources. So, the obtained result indicates the proposed Load Balancing algorithms (FRR) carry out higher than Round Robin (RR) Load balancer and it is able to be greater appropriate in real life utility efficient and efficaciously.

[2017] Kripa Sekaran, *et al.* **[13]** presented diverse algorithms are highlighted and to settle the concern of the task scheduling and the load balancing in a cloud computing. Along with the drawbacks of the different load balancing algorithms are also specified and performed. Various load balancing algorithms like SHC and JIQ provides a methodology for an efficient load balancing and optimized response time. The major drawback in SHC algorithm is the overloading of requests at one single datacenter. Therefore, it is an inefficient algorithm for balancing the load. It is combined with a JIQ approach to formulate a SIQ algorithm to improve the response time and have better resource utilization. This SIQ algorithm is proposed and achieved effective resource utilization and a better response time.

[2017] M.Padmavathi, *et al.* **[14]** proposed an Elasticity, innovative and Dynamic Algorithm to achieve the load balancing by Ant colony Optimization to perform load Balance among the Systems existing in the Data centers. The Designed Algorithm applies Dynamic and Elasticity manner. The proposed Algorithm was computed d by Open Source

ClouSim Simulation Tool kit. The Experimental results shown that the Proposed Algorithm Average Make Span is less than Existing Algorithms. Standard Deviations also compared over 10 Runs.

[2017] Mao-Lun Chiang, *et al.* **[15]** introduced a dispatching algorithm, known as Advanced MaxSufferage algorithm (AMS), is proposed to develop the dispatching efficiency in the cloud computing network. The main conception of the AMS is to assign the tasks to server nodes by comparing the *MSV* value, *SV* value, and average value of expected completion time of the server nodes between the scheduling tasks. Essentially, the AMS algorithm can achieve better task execution time compare than previous works and can obtain load balancing in cloud computing network.

[2016] Mr. Shubham Sidana , *et al.* **[16]** proposed an algorithm to balance load on cloud which is based on arrangement of resources according to processing speed for virtual machines and then assigning cloudlets to the resources to processing requirement. The list of virtual machines and cloudlets is next submitted to broker for the allocation. Subsequently, the broker allocates via mid-point algorithm and separates the cloudlet list and VM list at most one cloudlet or virtual machine in the list and then allocation of resources is finished. Using this algorithm assigns the resources in such a manner that job requiring less processing are not assigned to the machines with high processing power.

[2016] Pradeep Kumar Tiwari, *et al.* **[17]** researched an approach that depends on DWLM (Dynamic Weighted Live Migration) to control load imbalance issue. Load balance manager policy handles the logical and physical resources. UB Jobs request approach to nearby Virtual Machines (VM). It is executed the UBs requested jobs. Threshold model handles the Load Imbalance management policy. Threshold value aids to divide the low and high load VMs. DWLM manager handles the cloud and discovers the VMs and it migrates the jobs with the aid of threshold model. Mechanism effectively allocates and reallocate of VMs. The algorithm separates into two parts, first algorithm are responsible for managing the VMs, management of UB request in VMs and migration of VMs. The second Algorithm is responsible the threshold of VMs to check whether the overload condition. In Cloud analyst simulator, Algorithm is simulated and that result might be differences in real environment. The researcher know how to be used the real environment to implement the proposed algorithm. Finally, the proposed algorithm results compared with Throughput, Availability factor, Scalability, Migration time from Push Pull algorithm and Equally Spread Current Execution load balancing algorithm (ESCEL).

[2016] Shyam Singh Rajput, *et al.* **[18]** an ILBMM (Improved Load Balanced Min-Min task scheduling algorithm) has been developed using GA (genetic algorithm) to increase the resource utilization and also minimize the makespan. At this point, the proposed algorithm utilize a mutation, crossover and fitness function of GA and a genetic based approach apply on MIPS of VM and MI of task. The improved LBMM algorithm has been implemented using CloudSim with two virtual machines and four cloudlets. The entire cloudlets are assigned to the virtual machine and the results of this improved LBMM algorithm demonstrate that

the algorithm is minimized the makespan than to the pre-existing LBMM algorithm.

[2016] Ronak R Patel, *et al.* **[19]** proposed the Load-balancing algorithm based on the improved new GA with Population Reduction Method (PR) provides suitable results. It's first identified that resource that has better population if at all possible than others and makes an effort to provide priority to complete the jobs. It is transfer that load to ideal and also it is handled the overburden resource. After chosen resources by PR technique to overburden the resource and reassign that load to ideal are handle. The cloud-sim simulator is used for checking the work-load and allocation of resources. In case that the tasks are entered into the cloud simulator, afterward first population is named on population PRM technique and after finishing all tasks the response-time for resource will specified an idea for finishing job time.

[2016] Vinza V Suthan, *et al.* **[20]** a genetic algorithm approach for perfect the CMSdynMLB was proposed and implemented. The most important difference in CMS model from previous models is that CMS look at a practical multiservice dynamic scenario in which at different time steps, clients can modify their locations, and each server cluster only managed a specific type of multimedia task in order that two performance objectives were optimized at the same time. The main characteristic is included not only the proposal of a mathematical establishment of the CMSdynMLB problem but also a theoretical analysis for the algorithm convergence.

[2016] WANG Bei, *et al.* **[21]** presented a MPGA-based load balancing task scheduling strategy and it is testified a better scheduling performance via the simulation experiments. The MPGA-based scheduling strategy accepts min-min and max-min algorithm to initialize part of the populations and then use the Metropolis criterion to keep away from local optimum. The experiment results show that the MPGA-based task scheduling algorithm has better performance than SAGA and TCGA in processing costs with time consumption, and also it balances the inter-nodes load well. Besides, it can handle numerous tasks more effectively than AGA in cloud computing.

[2016] Hussain A Makasarwala, *et al.* **[22]** implemented GA based approach used for balancing the load in cloud. The proposed method provides better Average Response time compared to previous available techniques from the results and performance analysis. In this concept using the priority of request can be the chosen factor for faster results. The proposed algorithm is considered time however there can be several other parameters that can be considered for evaluating the priority of request. Moreover, the range of request Id's (Cloudlets) increases permutation encoding method. The proposed technique can be used for visualization work of GA that it was one of the objectives of proposed algorithm in real world scenario.

[2015], Mr. Mayur S, *et al.* **[23]** researched a genetic algorithm (GA) based load balancing is used to reduce the make span of a given task sets in cloud infrastructure. GA utilizes that the natural selection approach with the intention that the performance is increased and effective load balancing is successfully completed. By giving the prioritized input to the genetic algorithm the response time can be boosted and by

that the response time will be reduced and decreases the make span of given task set. At this point the jobs are assumed that having same priority that may not be actual case to that can be taken for further work and the various selection techniques for GA can be varied for better performance and mutation techniques can be changed to obtain better performance.

[2015] Reena Pan war, et al. [24] proposed a dynamic algorithm to manage the load incoming by focusing on their present status at cloudlet for all free VMs to be used at request assignment and will take more requests that are dynamic in nature. The response time has been improved efficiently. The simulated algorithm has response time better when relates to Optimal VM-Load balancer because the research have a dynamic set of available virtual machine and unlike the previous one and don't considers an overloaded machine again and again for scheduling. It leads to the better response time. Therefore the proposed algorithm distributes the load nearly efficiently among VMs with improved time in comparison to the previous algorithms [2] and solves all the problems of ineffective usage of the present VMs. The experimental results has shown that this algorithm have minimum response time and proper resource utilization by using Cloud Analyst tool and checked its performance on different load distributions. At this point Simulation results indicated that the proposed Dynamic Load Management algorithm outperforms the existing virtual machine load balancing algorithms.

[2015] Kalra, et al. [25] introduced a Ant colony based algorithm to balance the load by locating the under loaded node, and experimentally proves this approach is to be more appropriate than the traditional approaches such as local search algorithm, SHC (Stochastic Hill Climbing), FCFS (First Come First Serve), another soft computing approach Genetic Algorithm (GA). ACO is a random search algorithm which works like ant colonies. Ants searches food and connect to each other through pheromone which is evaporative stuff on paths travelled. All the jobs are predicted to be holding the same priority though Fault torrent issues are not taken into account. Here few suggestions and ideas for the future research work are proposed on the cloud scheduling technique too [41]. Using different function variation and fault tolerance is conducted by the pheromone value evaluation.

[2015] Navtej Singh Ghumman, et al. [26] proposed an Improved Max-Min Ant colony Algorithm utilize the original concept of Max-Min. The main intention of this research work is to balance the entire load of cloud system. The research aims to reducing the total makespan. The CloudSim toolkit is gives simulation results. Results show the comparison between improved Max-Min ant approach and new hybrid improved max min algorithm so that it focuses on processing cost and total processing time of that algorithm. Finally, the proposed hybrid improved max min and ant approach are used to better load balancing in cloud. The load can be memory capacity, delay or network load and CPU load.

[2015] Lu Kang, et al. [27] apply ASAMT - a traffic scheduling algorithm based on the cognitive network to cloud computing architecture, and build model on the simulation software OPNET, conduct the analogue simulation on the algorithm, compare and analyze the results with the unimproved least connection scheduling algorithm, and draw the conclusion that, without affecting the entire network effect, the dynamic adaptive traffic scheduling algorithm

enables the servers to provide network service in a balanced manner, better achieving the purpose of load balancing, and making it to adapt to the current cloud computing application architecture.

[2015] Chunling C, et al. [28] proposed energy saving task scheduling technique based on vacation queuing theory for dynamic environment in cloud computing. The vacation queuing model is used with exhaustive service to schedule the tasks. On the basis on busy period and busy time they have analyze the energy consumption of nodes. They have simulated algorithm using Matlab tool.

[2015] Hafiz Jabr Younis, et al. [29] proposed a hybrid algorithm to develop the cloud computing performance. It depends upon greedy algorithm to consider the CPU capacity factor and the current resource information. The experiment results were implemented using CloudSim toolkit. Both the average response time and average processing time compare by way of other algorithms for improving the hybrid algorithm. The performance of hybrid algorithm has developed in heterogeneous cloud computing.

[2015] K R Remesh Babu, et al. [30] proposed a load balancing technique based on foraging behavior of honey bees. This algorithm removes the tasks from overloaded VMs and it is submitted to the most appropriate under loaded VM. In case that the load is not only in the balance condition, but also the priorities of tasks consider in the waiting queues of Virtual Machines. The task with least priority is chosen for performing migration operation. So no tasks are needed to wait longer time in order to get processed. The proposed algorithm minimizes number of task migrations, the makespan and degree of imbalance to provide better QoS for end users.

[2013] Dhinesh Babu et al. [31] developed Honey bee behavior load balancing algorithm. This algorithm is motivated by honey bee behaviour of food findings. Bees widely search for the food and upon finding the location of food, they broadcast through waggle dance and this dance provides an idea about quality ,quantity and location as well as distance of the food. Using this idea, other bees start to acquire the food. Then again they return and perform wagle dance which provide the same ideas useful for rest of others. Same aproach is applied in cloud computing for load balancing, in this when any Virtual machine has been overloaded then it migrate the task to underloaded VM, here tasks is considered as bees and food sources are VMs. After migrating the task it will update the details about load on that machine and available tasks with their priorities. This information is useful for other waiting tasks to choose VM based on their criteria as discussed. It also confirmed that a VM which has less number of high precedence task and if a high precedence task assigned to this then that task will be executed at its first. Sorting of VM will be in ascending order to their load. This algorithm increases the throughput and reduces the waiting time in queue because of priority based techniques. Though here overhead is also low, but at the same time response time of VMs is found to be low.

[2013] Mr. M. Ajit, et al. [32] introduced Load rebalancing algorithm cannot overload the central node so that the algorithm implementation is finished with the support of Hadoop distributed file system. Because apache Hadoop is

used, security issues are occurred. To solve these security problems and to get better security, Kerberos authentication protocols are mainly used to perform with multiple nodes. This paper shows real time implementation experiment on cluster. Cloud computing has enhanced document format compatibility, reduced software cost, enhanced performance, unlimited storage capacity, instant software updates and so on. Hadoop's demand and use in the network, and also handle big data security develop into critical, So that authentication structure Kerberos is used. This approach has the advantage that one could continue to use the tokens to supplement a different primary authentication mechanism.

III. CONCLUSION

Nowadays, the cloud computing handle the biggest challenges of load balancing. The issue deals with ensuring that no single node be overloaded. Among all the nodes has to be fairly distributed by the load. The main advantages of Load balancing are optimal utilization of resources and increase throughput with less power consumption finally resulting in green computing. From this paper, many load balancing algorithms are broadly analyzed and proposed by various researchers in cloud computing. For future work will help to provide an efficient load balancing and avoid fault tolerant technique in order to remove these problems permanently and to design the approach more cost-effective.

IV. REFERENCES

[1]. Reena Panwar and Bhawna Mallick, "Load Balancing in Cloud Computing Using Dynamic Load Management Algorithm", IEEE International Conference on Green Computing and Internet of Things, 2015, pp. 773-778.

[2]. Zhang Q, Cheng L, Boutaba R 2010 Cloud computing: State-of-the-art and research challenges *J Internet Serv Appl.* **1**(1) 7–18

[3]. Casola V, Cuomo A, Rak M, Villano U 2013 The CloudGrid approach: Security analysis and performance evaluation *Futur Gener Comput Syst.* **29**(1) 387–401

[4]. Ryoo J, Rizvi S, Aiken W, Kissell J, State P 2014 *Cloud Security Auditing* (December)

[5]. Carvalho M, Cirne W, Brasileiro F, Wilkes J 2014 Long-term SLOs for reclaimed cloud computing resources P*roc ACM Symp Cloud Comput - SOCC '14* [Internet] 1–13

[6]. Haryani N, Jagli D, Sangita O, Dhanamma J, Jagli1 M D, Solanki R, et al. 2014 Dynamic Method for Load Balancing in Cloud Computing *Int Conf Circuits, Syst Commun Inf Technol Appl* [Internet] **5**(4) 336–40

[7]. Milani A S, Navimipour N J 2016 LER URGENTE - Load balancing mechanisms and techniques in the cloud environments: Systematic literature review and future trends *J Netw Comput Appl* [Internet] Elsevier

[8]. Zhao J, Yang K, Wei X, Ding Y, Hu L, Xu G 2016 A Heuristic Clustering-Based Task Deployment Approach for Load Balancing Using Bayes Theorem in Cloud Environment *IEEE Trans Parallel Distrib Syst* [Internet] **27**(2) 305–16

[9]. Zhang J, Huang H, Wang X 2016 Resource provision algorithms in cloud computing: A survey *J Netw Comput Appl* [Internet] Elsevier **64** 23–42

[10]. Gopinath P P G, Vasudevan S K 2015 An In-depth analysis and study of load balancing techniques in the cloud computing environment. *Procedia Comput Sci* [Internet] Elsevier Masson SAS **50** 427–32

[11]. Randles, M., D. Lamb and A. Taleb-Bendiab, "A Comparative Study into Distributed Load Balancing Algorithms for Cloud Computing," in Proc. IEEE 24th International Conference on Advanced Information Networking and Applications Workshops (WAINA), Perth, Australia,April 2010.

[12]. Venkateshwarlu Velde, B. Rama,"*An Advanced Algorithm for Load Balancing in Cloud Computing using Fuzzy Technique,* International Conference on Intelligent Computing and Control Systems ICICCS 2017, 978-1-5386-2745-7/17/ ©2017 IEEE

[13]. Kripa Sekaran, K R Kosala Devi, "SIQ Algorithm for Efficient Load Balancing In Cloud", Sri Krishna College of Engineering and Technology Coimbatore, India, ©2017 IEEE

[14]. M.Padmavathi, Prof.Shaik. Mahaboob Basha, "Dynamic And Elasticity ACO Load Balancing Algorithm for Cloud Computing", International Conference on Intelligent Computing and Control Systems ICICCS 2017, 978-1-5386-2745-7/17/©2017 IEEE

[15]. Mao-Lun Chiang, Hui-Ching Hsieh, Wen-Chung Tsai, Ming-Ching Ke, "An Improved Task Scheduling and Load Balancing Algorithm under the Heterogeneous Cloud Computing Network", 2017 IEEE 8th International Conference on Awareness Science and Technology (iCAST 2017), 978-1-5386-2965-9/17/© 2017 IEEE

[16]. Mr. Shubham Sidana , Mr. Anurag Gupta , Ms. Neha Tiwari Student, Mr. Inall Singh Kushwaha, "NBST Algorithm: A load balancing algorithm in cloud computing ",International Conference on Computing, Communication and Automation (ICCCA2016), ISBN: 978-1-5090-1666-2/16/©2016 IEEE

[17]. Pradeep Kumar Tiwari, Sandeep Joshi," Dynamic Weighted Virtual Machine Live Migration Mechanism to Manages Load Balancing in Cloud Computing, 978-1-5090-0612-0/16/$31.00 ©2016 IEEE

[18]. Shyam Singh Rajput, Virendra Singh Kushwah, "A Genetic based Improved Load Balanced Min-Min Task Scheduling Algorithm for Load Balancing in Cloud Computing", 2016 8th International Conference on Computational Intelligence and Communication Networks, 978-1-5090-1144-5/16 © 2016 IEEE DOI 10.1109/CICN.2016.139

[19]. Ronak R Patel, Swachil J Patel, "IMPROVED GA USING POPULATION REDUCTION FOR LOAD BALANCING IN CLOUD COMPUTING",2016 Intl. Conference on Advances in Computing, Communications and Informatics (ICACCI), Sept. 21¬24, 2016, Jaipur, India IEEE.

[20]. Vinza V Suthan, Kavitha K V, "*DYNAMIC LOAD BALANCING IN CLOUD BASED MULTIMEDIA SYSTEM WITH GENETIC ALGORITHM",* IEEE, 2016

[21]. WANG Bei, LI Jun, "**Load Balancing Task Scheduling based on Multi-Population Genetic Algorithm in Cloud Computing",** Proceedings of the 35th Chinese Control Conference July 27-29, 2016, Chengdu, China

[22]. Hussain A Makasarwala, Prasun Hazari," Using Genetic Algorithm for Load Balancing in Cloud Computing", ECAI 2016, 978-1-5090-2047-8/16/©2016 IEEE

[23]. Mr. Mayur S. Pilavare, Mr. Amish Desai," A Novel Approach Towards Improving Performance of Load Balancing Using Genetic Algorithm in Cloud Computing", *IEEE Sponsored 2nd International Conference on Innovations in Information Embedded and Communication Systems ICIIECS'15*

[24]. Reena Pan war, Prof. Dr. Bhawna Mallick, "Load Balancing in Cloud Computing Using Dynamic Load Management Algorithm", 978-1-4673-7910-6/15/$31.00 ©20 15 IEEE.

[25]. Kalra M, Singh S 2015 A review of metaheuristic scheduling techniques in cloud computing *Egypt Informatics J* [Internet] Ministry of Higher Education and Scientific Research **16**(3) 275–95

[26]. Navtej Singh Ghumman, Rajwinder Kaur," Dynamic Combination of Improved Max-Min and Ant Colony Algorithm for Load Balancing in Cloud System", 6th ICCCNT - 2015 July 13 - 15, 2015, Denton, U.S.A

[27]. Lu Kang, Xing Ting," Application of Adaptive Load Balancing Algorithm Based on Minimum Traffic in Cloud Computing Architecture", 978-1-4799-1891-1/15/$31.00 ©2015 IEEE.

[28]. Chunling Cheng, Jun Li, and Ying Wang, "An Energy saving task scheduling strategy based on vacation queuing theory in cloud computing", TSINGHUA SCIENCE AND TECHNOLOGY, Vol-20, issue-1, 2015

[29]. Hafiz Jabr Younis, Alaa Al Halees, Mohammed Radi, "Hybrid Load Balancing Algorithm in Heterogeneous Cloud Environment, International Journal of Soft Computing and Engineering (IJSCE) ISSN: 2231-2307, Volume-5 Issue-3, July 2015

[30]. K R Remesh Babu, Amaya Anna Joy, Philip Samuel," Load Balancing Of Tasks In Cloud Computing Environment Based On Bee Colony Algorithm, 2015 Fifth International Conference on Advances in Computing and Communications, © 2015 IEEE DOI 10.1109/ICACC.2015.47

[31]. Dhinesh Babu L D, Venkata Krishna P 2013 Honey bee behavior inspired load balancing of tasks in cloud computing environments *Appl Soft Comput J.* **13**(5) 2292–303

[32]. Mr. M. Ajit, Ms. G. Vidya, "VM Level Load Balancing in Cloud Environment", Computing, Communications and Networking Technologies (ICCCNT),2013 Fourth International Conference, July 2013, Pages:1-5.