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Load Balancing On Cloud Data Centers

Mr. Atul Parte
Department of MCA, Bharati Vidyapeeth's Institute of Management and Information Technology (BVIMIT), Navi Mumbai
Email: atulparte345@gmail.com

Dr. Kirti Muley
Department of MCA, Bharati Vidyapeeth's Institute of Management and Information Technology (BVIMIT), Navi Mumbai
Email: ikirti13@gmail.com

ABSTRACT

Cloud computing is based on data centers that are capable of handling a high number of users. Clouds' dependability is determined by how they handle loads; to address this issue, clouds must include a load balancing mechanism. Load balancing will assist clouds in enhancing their potential and capacity, resulting in more powerful and reliable clouds.

This paper is a quick look at how to evaluate load balancing on a cloud model that has been proposed. The distribution of workloads and computing resources among one or more servers is known as load balancing. This type of distribution ensures the highest possible throughput with the shortest possible response time. The burden is split amongst two or more servers, hard drives, network interfaces, or other computing resources, allowing for more efficient resource use and faster system response times. As a result, good cloud load balancing helps assure business continuity for a high traffic website.

Keywords

Load Balancing, cloud sim, Throttled algorithm, cloud analyst, Virtual machine, Round Robin Algorithm.

1. INTRODUCTION

Cloud computing is critical in expanding the range of options for determining service quality in both businesses and non-business clients. Because providing service to clients through multiple applications is a popular trend among modern businesses, the company client provides out sourcing through a variety of external data centers For instance, Amazon, Google, Yahoo, and a slew of other services. The controllable data centers allows providers to outsource their resources.

This technology provides services in a variety of ways, including software via web browsers, platforms, and cloud-based application design and development. Cloud Service is in charge of the infrastructure's backend. Providers (CSPs) who maintain Data Centers, servers, and other infrastructure [1]. Although there are other alternative service delivery methods available, Infrastructure as a Service (IaaS) model is the focus of this research in this technology. This technology's server- side for resource allocation.

Virtualization is the backbone and important point of cloud- grounded operations. This exploration aims to enhance resource allocation in the IaaS model; this conception is abecedarian as it deals with balancing resources handed to clients and the user's requests on servers. The cloud users access services by transferring requests; these are represented in Virtual Machines (VMs) in the cloud environment [2].

CSPs should provide services that benefit businesses while also improving user satisfaction. As a result, the suggested Load Balancing algorithm is primarily focused on the IaaS model of the three cloud service models, where authors deal with the backend of Cloud Computing technology, such as server workload. There are a few In a typical cloud environment, there are two components: the frontend and the backend [3].

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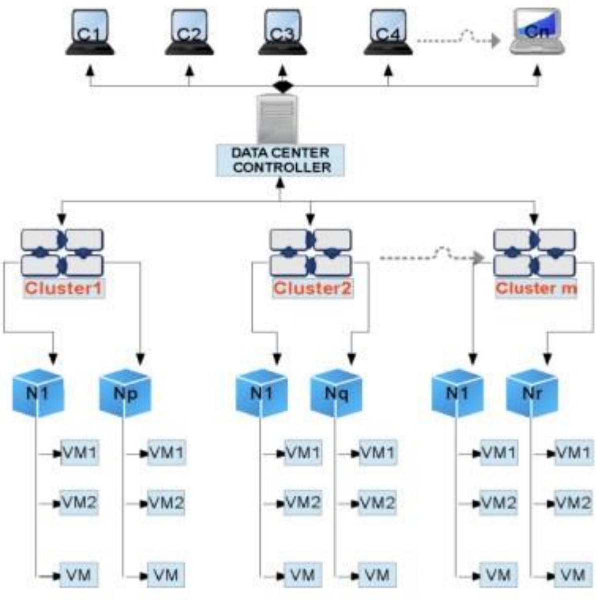
Fig. 1. Load balancing



Virtualization is also in charge of balancing the load throughout the entire system, scheduling, and resource allocation efficiency. When it comes to determining which VM will be assigned to a user on demand, the load balancing algorithm is crucial. There's also the risk that a large number of requests will be received at the same moment [4].As a result, some requests are kept in the queue, requiring the request to be forwarded to supplemental service providers. As a result of the load balancing algorithm's availability, users can choose whether to stay in the queue or seek services from other providers [5].

The efficiency of a computing system is determined by a number of factors, one of which is load balancing. The load balancing method is completely reliant on the amount of work assigned to the system over a certain period of time. This is the period when the system must manage and work in accordance with the basic priorities. In this study, the interaction with factors is investigated, as well as several load balancing algorithms that can be applied to such factors. There are a number of load balancing algorithms that can be used to increase and optimize cloud performance [6]. The interaction with load balancing algorithm which can be applied for such factors are studied in the current paper. There are several load balancing algorithms for the improvement and optimization of cloud performances [7]. The nature of the algorithm can be dynamic or static, although some algorithms are simple under some situation, they work more effectively. Cloud computing is a service oriented architecture, which is provided via the internet.

There are a number of load balancing algorithms that can be used to increase and optimize cloud performance. The algorithm's nature can be dynamic or static some algorithms are basic, yet they perform better under certain conditions. Cloud computing is a type of service-oriented architecture that is delivered over the internet. The service provider's sole goal is to deliver maximum resource output, which can be accomplished by adopting a load balancing algorithm that aids in achieving this goal [8]. The paper provided an algorithm that was tested in a virtual machine setting. The paper offers a comparison of a number of algorithms.

2. LITERATURE SURVEY

Load balancing is a broad topic that applies to networks of all sizes. There has been a lot of research done on load balancing, and various researchers have authored scientific publications and research papers on the subject. [1] discusses a conceptual model for the future of cloud computing based on load balancing methods. The proposed model is used for resource management, cloud service reliability, and load balancing techniques such as static load balancing algorithms (SLBA), dynamic load balancing algorithms (DLBA), and dynamic nature inspired load balancing algorithms (NDLBA). DLBA and NDLBA are found to be more efficient than SLBA. [3] conducted a study on load balancing methods using the simulation tool Cloud Analyst. The performance of the round robin algorithm, and Throttled Load Balancing (TLB)

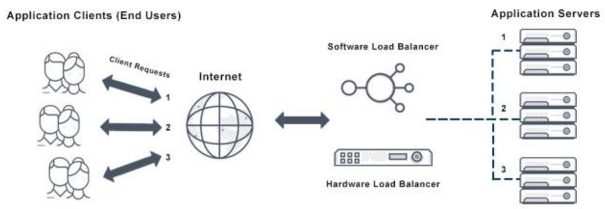
algorithm was investigated by the researchers. TLB is found to be the most effective of the three algorithms. In the literature of [3] a meta-study on load balancing and server consolidation in cloud computing settings was undertaken. Because data centers and their applications are growing at an exponential rate, it is claimed that load balancing with server consolidation enhances resource usage and can improve Quality of Service (QoS) metrics.
The role of quality of service and load pattern in cloud computing, according to Rodrigo, fluctuates from time to time [4]. The composition, development, requirement, and provisioning facilities for application service posting in the cloud computing model are all unique. Policy changes in cloud computing Cloud SIM tool kit can evaluate the workload model energy source performance, which is critical for resolving challenges linked to correct configuration. These two kits represent the model's behaviour in a data center with several virtual machines. According to Sheng, load prediction in cloud computing systems is crucial for ensuring proper service quality [5]. For accuracy and prediction, Baye's model can be used to estimate the mean load over a lengthy period of time. It also offers the most effective mix of the available features. The experiment that uses Baye's method achieves the best accuracy with the least amount of error. The development of a cloud computing environment, according to Lizheng, is centered on quality of service and optimal performance.
A routing algorithm based on service proximity uses the closest data center policy. As its name adverts, the earliest data center is chosen for servicing the request. The proximity list of data centers is prepared in terms of least network latency. When there are multiple nearby data centers, one data center is randomly selected from the proximity list. The closest data center policy is extended by the optimize response time policy, which is based on performance optimization[6].

The six continents in the world are considered as six regions in Cloud Analyst. The user bases and data centers are geographically scattered over the six regions .Request from a user base need to be routed to a data center, where it can get serviced. Response time, data centers processing time, and cost are all determined by this process. A crucial factor in establishing these parameters with effective levels is service broker policy.

3. LOAD BALANCING ALGORITHMS

Two load balancing strategies are discussed in the paper: the round robin approach, and throttled load balancing.
Round Robin: Round robin use the time slicing mechanism. The algorithm's name implies that it operates in a circular fashion, with each node receiving a time slice and waiting for their turn. Each node is given an interval once the time has been divided. Each node is given a time slice during which to complete its duty. In comparison to the other two algorithms, this one has less complicity. An open source simulation performed the algorithm software know as cloud analyst, this algorithm is the default algorithm used in the simulation [4]. This algorithm simply distributes the work in a round-robin fashion without taking into account the load on various workstations.

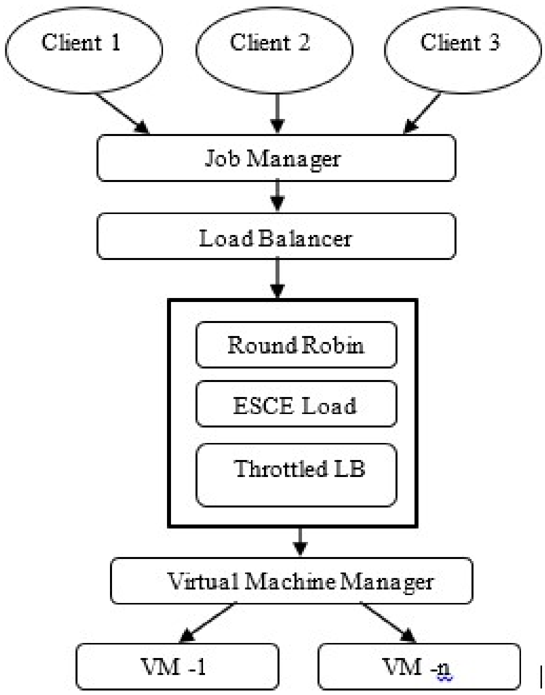
Fig. 2. Round Robin Load Balancing



Round Robin with Server Affinity [10]: A VM Load Balancing Algorithm for Cloud Based Infrastructure is a VM Load Balancing Algorithm for Cloud Based Infrastructure, that the Round is limited by the available Virtual Machine. The previous state is not saved by the Robin algorithm. Allocation of a VM to a request from a specified User base, while the request is being processed. The proposed approach saves the same state. The Circle Robin's server affinities two load balancers are maintained by the VM load balancer. The following is a list of data structures. 1) Hash map: This keeps track of the last VM assigned to a request from a certain User base. 2) VM state list: this list keeps track of each VM's allocation status (i.e., Busy/Available). When a request is received from the User base, if an entry for the specified User base exists in the hash map and that particular VM is accessible, the suggested approach eliminates the need to perform the Round Robin VM load balancing algorithm, saving time.

Throttled Load balancing: Cloud Computing Load Balancing This technique, which uses the Modified Throttled Algorithm [11], focuses on how incoming jobs are intelligently assigned to available virtual machines. Similar to the Throttled algorithm, the modified throttled algorithm stores a virtual machine index table as well as the state of virtual machines. There has been an endeavour to enhance reaction time and make efficient use of the virtual machines that are accessible. The proposed approach uses a method for picking a VM for processing a client's request in which the VM at first index is chosen based on the VM's current state. If the VM is available, it is assigned to the request and the VM's id is returned to the Data Center; otherwise, the Modified Throttled Load Balancer keeps an index table of VMs and their status (BUSY/AVAILABLE).All VMs are available at the start [10]. The Throttled algorithm operates by selecting the best virtual machine to use for a specific task. The job manager is having a list of all virtual machines, using this indexed list, it allot the desire job to the appropriate machine. A job should be assigned to the relevant machine if it is suitable for that machine. The job manager waits for the client request and adds the job to the queue for quick processing if there are no virtual machines ready to accept jobs. The cloud analyst simulation is being used experimentally to run this algorithm and test the results in relation to the virtual machine. The algorithm used for load balancing in a cloud computing environment is depicted diagrammatically in the environment [6], [7]. The cloud analyst simulation tool, which is based on cloud sim and offers a GUI user interface to assist with the experimental work, is used to simulate the three algorithms that are used in this paper. This tool is shown in the picture along with the three algorithms that are used.

Fig. 3. Load balancing Diagram



By adjusting the parameters, the cloud simulation allows for the examination of various restrictions. Java is the foundational programming language for the cloud sim. The figure above shows various load

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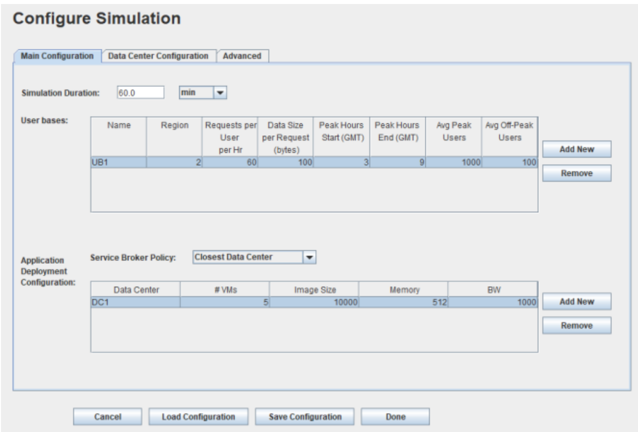
balancing strategies. The experimental work demonstrates how well these algorithms perform.

4. EXPERIMENTAL WORK

By using a programme called Cloud Analyst for simulation, the experimental work is carried out. The simulation is built on the cloud sim simulator, which uses java and has a GUI interface to make configuring the attributes needed for the experiment simple. The cloud analyst simulation tool's environment is depicted in the diagram. Three crucial options are included with the simulation: configure, define, and run [8], [9] the Internet characteristics and simulation. This menu is used to set up the load balancing algorithms and configure the experiment. There are choices in the simulation tool to change the algorithm as needed.

Fig. 4. Cloud Analyst Configure Simulation



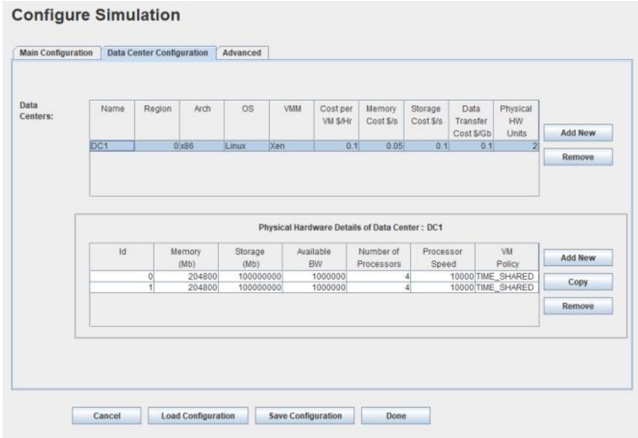


Fig. 5. Round Robin Configuration

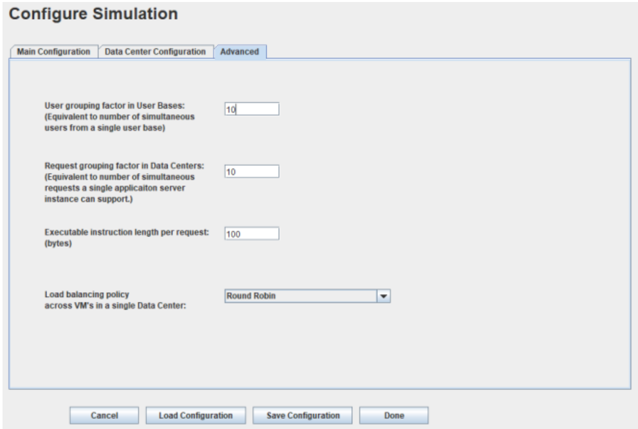


Fig. 6. Throttled Configuration

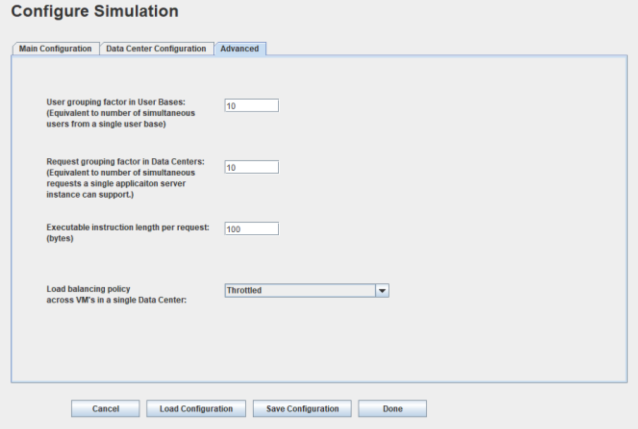
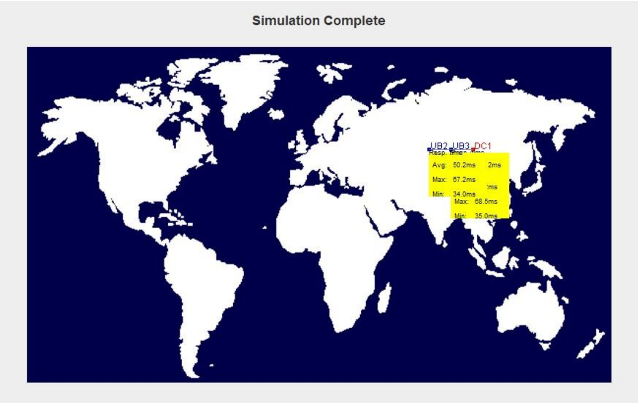


Fig. 7. Simulation Result



5. RESULTS

Following are the desired outputs for all three algorithms after doing experiments on the simulation. Table also shows the configuration assigned in terms of cost and data transfer. The costs are denominated in US dollars. To generate output, many users will interface with data centers. Simulation is also used to calculate the average, minimum, and maximum requesting times. After applying the technique, the cost of data transfer is determined and reported in Fig.10.

Fig. 8. Round Robin Configuration

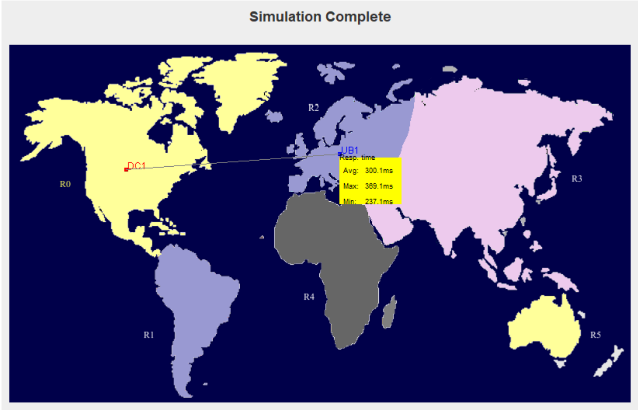


Fig. 9. Overall Response Time Summary

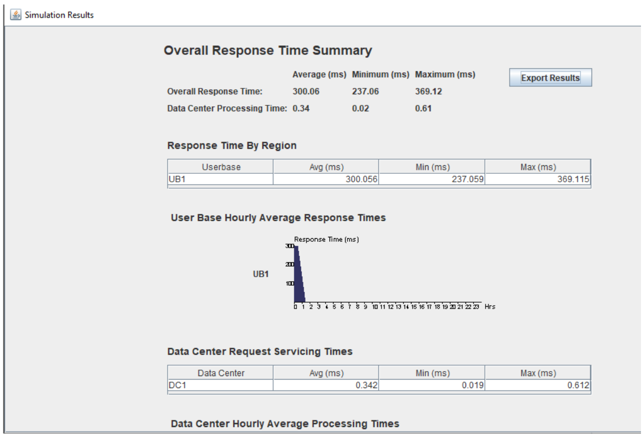
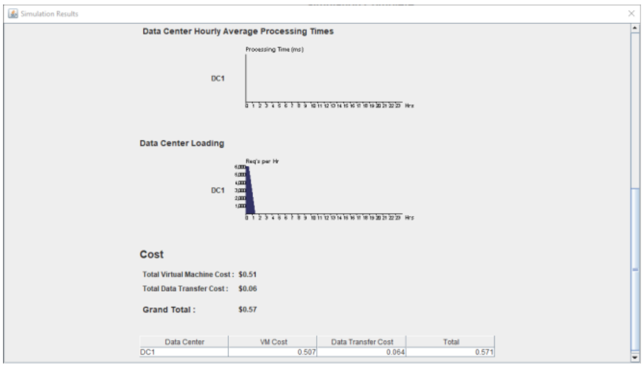


Fig. 10. Cost of Data Transfer



6. CONCLUSION

This study examines a variety of cloud computing load balancing strategies based on the environment and spatial distribution of nodes. We also go over the many types of algorithms, their knowledge bases, and the challenges and limitations that have been handled. This paper discusses load balancing, which is a growing study field that allows data center networks to reduce flow completion times, maximize bandwidth use, and save energy. First, we discussed data center network topologies, traffic characteristics, and the major functions and goals of load balancing techniques. The contrasts between data center load balancing and WAN traffic engineering were then discussed. Following that, recent load balancing proposals were reviewed and appraised.

The paper investigates the performance of three algorithms. The request times for the three policies (Round Robin and Throttled Load balancing) are identical, indicating that altering the methods has no influence on data center request times. The experimental work calculates the cost analysis shown for each algorithm. For two algorithms, the cost of virtual machine usage per hour is the same. Round Robin distributes current execution load evenly, but Throttled Load Balancing reduces the cost of utilization, hence Throttled Load Balancing is more cost effective for load balancing on cloud data centers.

7. ACKNOWLEDGEMENTS

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