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LOAD BALANCING ALGORITHMS IN CLOUD COMPUTING: A COMPARATIVE STUDY

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Abstract:

Green Cloud computing is the expanded understanding of cloud computing. Cloud Computing is a national integrated data infrastructure network (Servers, Networks, Applications, Hardware's, and software's). The environmentally sustainable use of computer tools is green computing. Green Cloud Computing is the synthesis of green computing and cloud computing. GCC provides reliability and performance. Mobile computing and cloud computing variations are termed mobile cloud computing. Now the computer science has shifted to details. Load balancing is also a strategy for shifting the load across a given Green cloud network. The load balancing algorithms are studied in detail in this proposed framework. Cloud loading is a mechanism by which the cumulative load is passed to the individual nodes within a given network. A comparative analysis with its consistency metrics of load balancing algorithms is outlined.

Key Words: Cloud computing; Load balancing; Cloud services; Cloud models

Introduction:

The cloud machine offers dynamic supply of hardware, applications and data sets on a virtualized network, which has scalable capacity on demand. In data centre networks, load balancing systems have been used. The IAAS (Infrastructure as a Service), SAAS (Software as a Service), PAAS (Platform as a Service) models support both mobile and green cloud computing environments. The Green Cloud Computing is built, produced, used and disposed of computer resources with minimal impact to the environment. Mobile cloud infrastructure promises the availability of computing resources that are high performance, scalable and low cost. The Cloud Load is a way to simplify the use of resources to boost device performance. It is important to reduce energy/carbon pollution in GCC to use the Load Balancing Algorithms. The new framework to develop a new system is Virtual Cloud Computing, integrating Mobile Computers with Cloud Computing, where the Cloud carries out a comprehensive lifting of complex computing functions and data storage [1 - 4].

A. Cloud Service Models:

- Software as a Service (SaaS): Which is also known as the "on demand software', a software licence based on subscription.
  - Applications: Web Services, Multimedia, Businesses
  - Example: Google Docs, You tube.
- Cloud Platform as a Service (PaaS):- Customers are entitled to use the cloud infrastructure for such a service, for the use of programming or providers-driven tools to build applications created by users or produced.
  - Applications: Data File Storage, Software Frameworks like Java, .Net.
  - Examples: Azure from Microsoft, AWS from Amazon.
- Cloud Infrastructure as a Service (IaaS): - Which is a capability that helps the user to install and manage applications by supplying computing, storage, networking, and additional main computer services.
  - Applications: Hardware Tools like CPU, Memory, Storage
  - Examples: Data Centers, Amazon EC2, Go Grid.

B. Cloud Deployment Models:

- Public Cloud: A Cloud available to any subscriber.
- Private cloud: A cloud accessible only for people working within an organization or business.
- Group Cloud: This cloud technology is widely used by many organizations. In this form of cloud a particular interest of one individual community is promoted.
- Hybrid Cloud: Composition of private group or public clouds two or three separate clouds. Hybrid cloud components are closely related. Load balancing algorithms can be in 3 distinct types:
  - Sender Initiated: When the sender initiates the load balancing algorithm.
  - Receiver Initiated: If the recipient initiates a load balancing algorithm.
  - Symmetric: The mixture of both the sender and the recipient initiated. The loads were usually distributed uniformly, evenly, and minimally overloaded between the system nodes [5 - 8].

Load Balancing Algorithms:

The primary focus of load balancing algorithms is on reducing resource utilisation, making it possible for scalability, bottleneck avoidance and over-supply. The algorithms for load balancing are static and complex. Restricted redirection rate load balancing for Internet Distributed services [6].

- The Balanced Static Load Algorithm is ideal for limited, fast Internet speed and unavoidable contact delays dispersed environments.
- Dynamic Load Balancing Algorithm is targeted at eliminating delays in communication and execution in wide distributed environments.
- A symmetrical allocation of allocated jobs and minimized coordination costs of dispersed nodes is the focus of the mixed load balancing algorithm [8].

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Table 1: Types of Load Balancing

Load Balancing Type	Algorithm Name	Advantages	Disadvantages
Static Algorithms: Equal division of load, Decides at compile time	Round Robin Algorithms	Priority based load distribution	Takes large time
	Min-Min Algorithms	Completion time short	Tasks variation prediction not good
	Max-Min Algorithm	Medium Completion time	Takes long time for completion
Dynamic Algorithms: Load distribution at runtime, Process is more complicated	Honey-Bee Foraging Algorithm	Response time short with high throughput	High priority tasks not possible
	Ant-Colony Algorithm	Takes minimum time to execute independent tasks	Long time to execute, Clarity is lower.
	Load Balancing Throttled	Equal management of tasks	Takes more time.

- Cost-effective algorithms for load balancing
  The cost-effective load balance was split into many subtasks until a task was sent to the cloud service.
  - Optimal Cost Control algorithm - Manages incoming activities and optimises expenses and schedules on the basis of costs of services. Less was the expense of success.
  - Power Conscious Load Balancing: It collects each active node's consumption percentage. It installs a new VM with the maximum usage capacity of 70 percent device nodes.
  - Load Balancing Ant-Colony Optimization: To balance the entire load of the devices while reducing the range of a number of tasks. It guarantees easier reply time.
  - Bee-MMT: Minimum migration colony algorithm that uses a colony algorithm in order to detect expense used for the fastest migration time. Bee-MMT:
  - Particle Swarm Optimization: PSO only moves additional tasks from an overwhelmed VM to accomplish device load balancing, instead of migrating the whole overloaded VM. It is used to transfer additional activities to the new VMs host. The migration time is shortened.

The reliability of the load balancing facility for distributing customer requests among replicated resources is good performance in these environments. For geographically dispersed web services there are four types of load balance mechanisms

- DNS-based
- Server-based
- Dispatcher-based
- Client-based

DNS-based: Client-based program scheduler's function is performed by the replicated Network server Authoritative DNS (ADNS).
Server-based: The strategy of load equilibrium runs the server side. Replica of overloaded server will forward requests to other replicas.
Dispatcher-based: A host for clients and servers receives all the requests and transmits them to the matching replica.
Client-based: The client operates the delivery load strategy and chooses to send the requests to which server.

The load balancing procedure is carried out in such a way as to maximize the performance and minimize the responding time for any virtual machine in the cloud environment. The aim of load balancing is to increase customer loyalty and optimize the usage of resources and to dramatically boost cloud efficiency, minimizing energy consumption and carbon emissions [21-28]. The aim of load balance is to ensure that any processor or computer does the same amount of work during which the output improves, the response times are decreased and the number of jobs rejected is reduced. The key explanations for the general load equilibrium were the Centralize LB, Dynamic LB, and Hierarchical LB decision-making.

Cloud Balancing Algorithms:

Cloud balancing is an unnecessary complex local task load spread uniformly over all nodes. It is used to achieve high levels of customer interaction and utilization of resources, meaning there is no helmed node [2].
Green Cloud Infrastructure capabilities provide high scalability, flexibility, versatility and on-demand support. Environmentally conscious Green Computing helps enterprises to satisfy their market demands for cost-beneficent, energy-efficient, scalable, safe and reliable solutions [13]. Green Cloud Computing (GCC) technologies reduce deployment and maintenance costs, thus reducing energy efficiency and reducing detrimental environmental impacts. This only stresses the timing of jobs to balance loads correctly on virtual machines and then to position idles or non-used sleeping machines in the power management mode leading to a green cloud computing solution[9], [14], [15], [20], [16], [18].

- Minimizing Energy Usage - Load balancing helps deter overheating by balance the workload across all cloud nodes and thus minimize energy consumption.
- Carbon emission reduction - Energy consumption and emissions of carbon go together. The higher the energy used, the greater the carbon footprint. With the assistance of load balance, energy consumption is reduced.

Load Balancing Techniques (Mobile Cloud Computing):

Remote Cloud computing is a tool used outside of the mobile computer to use computational power. The key concept is to use the virtual machine Cloud Computing Resource to increase mobile device performance. In the mobile device is the resource control location. It must define and plan cloud apps. Mobile cloud computing, which incorporates mobile devices with cloud storage, is a modern method of creating a new platform that lifts computational functions extensively and preserves vast volumes of data [2], [9].

Medium Level Load Balancing Mechanisms:

Innovative new load balancing algorithm for medium load balancing. There's 100 rps on the server. Customer A can only accept 50 rps. After half of server requests are sent, redirect requests to client B automatically, then switch to Client C and so on as it hits half load. The algorithm for medium level juggling loads would boost customer loyalty and optimize the usage of energy.

Comparison Results of Performance:

The numerous qualitative measures deemed important for cloud computing load balance

- Throughput: The cumulative number of performed tasks is called by-product. For better device efficiency, high throughput is needed.
- Fault Tolerant: The algorithm's ability to operate correctly and reliably even under malfunction in any of the system's random nodes.
- Migration time: Time taken to move from one machine or pass a job to another machine.
- Response time: it is a minimum of time for a distributed system to respond to a particular algorithm for load balancing.
- Use of Resources: The level to which machine resources are used. LB offers full use of capital.
- Scalability: The device specifies a number of processors/machines for load balancing algorithms.
- Performance: This reflects the reliability of the load handling system. If all of the above parameters are optimally satisfied, so the efficiency of the system will be significantly improved.

Conclusion:

This has outlined the performance study of load balancing algorithms in cloud computing, green cloud computing and the consistency metrics mobile cloud computing systems. The new in novel Load Balancing algorithm is optimized for medium load management. More research is needed to enhance the performance.

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