IMPROVED ANT COLONY LOAD BALANCING ALGORITHM IN CLOUD COMPUTING

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ABSTRACT
Cloud computing mainly deals with networking, software, data access and storage services that may not require end-user
knowledge of the physical location and configuration of the system that is delivering the services. In the cloud storage,
load balancing is a key issue. Load balancing is one of the main challenge in cloud computing which is required
to distribute the dynamic workload across multiple nodes to ensure that no single node is over loaded. It helps in
proper utilization of resources and hence in enhancing the performance of the system. A few existing algorithms can
maintain load balancing and provide better strategies through efficient scheduling and resource allocation techniques as
well. Here, we proposed an algorithm for load distribution of workloads among nodes of a cloud by the use of Improved
Ant Colony Optimization (ACO). This is a modified approach of ant colony optimization that has been applied from the
perspective of cloud or grid network systems with the main aim of load balancing of nodes. This modified algorithm has
an edge over the original approach in which each ant build their own individual result set and it is later on built into a
complete solution. Resource scheduling management design on Cloud computing is an important problem. Scheduling
model, cost, quality of service, time, and conditions of the request for access to services are factors to be focused. A good
task scheduler should adapt its scheduling strategy to the changing environment and load balancing Cloud task scheduling
policy. Therefore, in this paper, Artificial Bee Colony (ABC) is applied to optimize the scheduling of Virtual Machine (VM)
on Cloud computing. The main contribution of work is to analyze the difference of VM load balancing algorithm and to
reduce the make span of data processing time. The scheduling strategy was simulated using Cloud Sim tools.
Experimental results indicated that the combination of the proposed ABC algorithm, scheduling based on the size of tasks,
and the Longest Job First (LJF) scheduling algorithm performed a good performance scheduling strategy in changing
environment and balancing work load which can reduce the make span of data processing time.
INTRODUCTION

Cloud computing, a framework for enabling convenient and on-demand network access to a shared pool of computing resources is emerging as a new paradigm of large-scale distributed computing. It has widely been adopted by the industry. There are many existing issues in cloud computing like Load Balancing, Virtual Machine Migration, Server Consolidation, Energy Management etc. that are not fully addressed. Central to these issues is the issue of load balancing that is a mechanism to distribute the dynamic workload evenly to all the nodes. It provides high user satisfaction and high utilization of resources. It helps in preventing bottlenecks of the system which may occur due to load imbalance. When any component of any service fail, load balancing helps by implementing fail over, i.e. it helps in provisioning and deprovisioning of instances of applications without fail. It also ensures that every computing resource is distributed efficiently and fairly. Consumption of resources and conservation of energy is not always over, i.e. it helps in provisioning and deprovisioning. When any component of any service fail, load balancing helps by implementing fail over, i.e. it helps in provisioning and deprovisioning of instances of applications without fail. It also ensures that every computing resource is distributed efficiently and fairly. Consumption of resources and conservation of energy is not always a prime focus of discussion in cloud computing. Load balancing is a relatively new technique that facilitates networks and resources by providing a maximum throughput with minimum response time. Traffic is dividing between servers, so data can be sent and received without delay. There are different kinds of algorithms are available that helps in load balancing. A basic example of load balancing is related to websites. Users could experience major delays, time outs without load balancing.

Fig 1: Cloud computing

A. TYPES OF CLOUD

Clouds are divided into 4 categories:-

1) Public Cloud: - Public cloud allows users to access the publically. It is access by interfaces using internet browsers. Users pay only for that time duration in which they use the service, i.e., pay-per-use.

2) Private Cloud:- A private clouds operate in within an organization’s internal enterprise data center. The main advantage here is that it is very easier to manage security in public cloud. Example of private cloud in our daily life is intranet.

3) Hybrid Cloud: - It is a combination of public cloud and private cloud. It provides more secure way to control all data and applications. It allows to access information over the internet. It allows the organization to serve its needs in the private cloud and if some occasional need occurs it asks the public cloud for some computing resources.

4) Community Cloud:- When cloud infrastructure construct by many organizations, such cloud model is called as a community cloud. The cloud infrastructure could be hosted by a third-party.

B. SERVICES OF CLOUD MODEL

There are different types of services are provided by cloud models like: Software as a Service (SaaS), Platform as a Service (PaaS), and Infrastructure as a Service (IaaS) which are deployed as public cloud, private cloud, community cloud and hybrid clouds.

C. CHALLENGES IN CLOUD

- Security
- Efficient load balancing
• Performance Monitoring
• Consistent and Robust Service abstractions
• Resource Scheduling
• Requires a constant and speedy Internet connection.

LOAD BALANCING IN CLOUD
Load balancing is a generic term used for distributing a larger processing load to smaller processing nodes for enhancing the overall performance of system. In cloud computing, load balancing is required to distribute the dynamic local workload evenly across all the nodes. Load balancing helps in air allocation of computing resource to achieve a high user satisfaction and proper resource utilization. High resource utilization and Proper load balancing aid in minimizing resource consumption. It helps in implementing fail over, scalability, and avoiding bottlenecks etc. Load balancing is a method that facilitates networks and resources by providing a maximum throughput with minimum response time. Load balancing is dividing the traffic between all servers, so data can be sent and received without any major delay. There are many different kinds of algorithms are available that helps in traffic loaded between all available servers. Most of them can be applied in the cloud environment with suitable verifications. According to simple classification, job scheduling algorithms in cloud computing can be categorized into two main groups are Batch mode heuristic scheduling algorithms (BMHA) and online mode heuristic algorithms. Jobs are queued and collected into a set when they are arriving in the system in BMHA. The BMHA scheduling algorithm will start after a fixed time period. There are many things to mention while Developing such algorithm are: estimation of proper load, comparison of all load, stability of all different systems, performance of purpose system, interaction between all the nodes and nature of work to be transferred. The most important thing is selecting the nodes and its also include many other ones. CPU load, amount of memory used, delay or Network load is considered together to calculate the load of particular system.

LOAD BALANCING CLASSIFICATION
Fig.1 represents different load balancing algorithms. This is mainly divided into two categories: static load balancing algorithm and dynamic load balancing algorithm

1) Static approach: - This approach is mainly defined in the design or implementation of the system. Static load balancing algorithms divide the traffic equivalently between all servers.

2) Dynamic approach: - This approach considered only the current state of the system during load balancing decisions. Dynamic approach is more suitable for widely distributed systems such as cloud computing. Dynamic Load balancing can be divided in two types as distributed approach and non-distributed (centralized) Approach. It is defined as following:

a) Centralized approach: - In centralized approach, only a single node is responsible for managing and distribution within the whole system. Other all nodes are not responsible for this.

b) Distributed approach: - In distributed approach, each node independently builds its own load vector. They collecting the load information of other nodes. All decisions are made locally using local load vectors. Distributed approach is more suitable for widely distributed systems such as cloud computing.

Ant colony optimization (ACO) is a population-based meta heuristic that can be used to find approximate solutions to difficult optimization problems. In ACO, a set of software agents called artificial ants search for good solutions to a given optimization problem. To apply ACO, the optimization problem is transformed into the problem of finding the best path on a weighted graph. The artificial ants (hereafter ants) incrementally build solutions by moving on the graph. The solution construction process is stochastic and is biased by a pheromone model, that is, a set of parameters associated with graph components (either nodes or edges) whose values are modified at runtime by the ants.

FLOWCHART OF HYBRID TECHIQUE USING ACO + BCO
Agents in BCO:

- The Employed Bee
- The Onlooker Bee
- The Scout

1. The Employed Bee: It stays on a food source and provides the neighborhood of the source in its memory.

2. The Onlooker Bee: It gets the information of food sources from the employed bees in the hive and select one of the food source to gathers the nectar.

3. The Scout: It is responsible for finding new food, the new nectar, sources
New Methodology

1. Initialise population with random solutions or it is generated using Cloud Sim tool.
2. Initialize the Pheromones.
3. Evaluate the Matrix, Inverted Matrix and Mutexes.
4. Evaluate fitness of the population of the Bees.
5. While (stopping criterion not met)
   //try searching for new nodes
6. Select sites for neighbourhood search.
7. Calculate the Probability and find the Next Probable Node using the values of Pheromones.
8. Recruit bees for selected sites (more bees for best sites) and evaluate fitnesses.
9. Select the fittest bee from each patch and select the Node whose Pheromone is highest.
10. Assign remaining bees and remaining ants to search randomly and evaluate their fitnesses and pheromones.
11. End of Program.

References


