



Review of Load Balancing in Distributed Computing and Bat Algorithm

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Abstract: *management of the resources in the various workloads is the key factor of the performance of the distributed computing infrastructure such as (cloud computing, cluster computing and grid computing). Maximizing the resource utilization and enhance the overall performance of the distributed computing infrastructure distribute the workload among the available resource. We can say that the performance is also dependent on the policy of load balancing if load balancing policy is good its leads to better performance and maximize the resource utilization. Grid computing is collection of heterogeneous system from the multiple administrative domains which are geographically distributed to perform parallel processing on demand and provide single coherent view to the user. It suffers from three main challenges scalability, adaptability and heterogeneity. In this paper we provides a detailed study of various load balancing techniques used in the distributed computing which provides you better understanding of various load balancing algorithm with the distributed computing infrastructure.*

Keyword: *Load balancing, grid computing, cluster computing, cloud computing, distributed computing.*

I. INTRODUCTION

Distributed computing is the most favourable area computer science in which the resources are physically distributed and connected via network and perform communication the help of message passing techniques to perform a common goal the user is always unknown about that processing is going on parallel multiple system he always think the process is going on single system because distributed computing provide single coherent view to the user. Applications of the distributed computing are (cloud computing, grid computing, peer to peer and cluster computing). [1] Distributed computing always able to run those applications which is especially written for run in distributed environment we cannot run all the application on distributed infrastructure and message passing is performed for communication with the help of various methods such as RPC (Remote Procedure Call), HTTP and message ques.[2] Challenges in the distributed computing is the maintain various kind of transparency such as location transparency, migration transparency and relocation transparency.

Cloud computing is mechanism of providing on demand services for the various purpose such as (storage, processing and infrastructure). It is an application of the distributed computing it is used internet based communication system means user can demand for the service by using internet and cloud computing provides the resource on demand as per the need of the user. Cloud computing is the pool of the resources where all users are sharing the resources transparently they are not aware of that any other user is also using the same resource each user things the resource used by them is only dedicated to them this is due to transparency maintain by the cloud service provider with the help of virtualization and they also offer virtualization on hardware level not only application or storage level. We have three types of cloud infrastructures model are [3]:

(Infrastructure as a service) IaaS: the IaaS provide infrastructure on the user demand such as (processing, storage and network) or any kind of computing resources which provide user to ease of running numerous number of applications with parental control over allocated resource's and limited control over network constituents.

(Platform as a service) PaaS: PaaS provides on demand platform to user as per requirement of user it includes (languages, tools, services and libraries) and user cannot have parental control over the infrastructure but provides control on the desired application.

(Software as a Service) SaaS: SaaS provide on demand application services to user on the cloud server. User can access these services with help of various devices or with the help of browsers but they cannot have parental control over any of cloud infrastructure as well as application.

The clouds having four types of the deployment model which are:

- Private cloud
- Public cloud
- Community cloud
- Hybrid Cloud

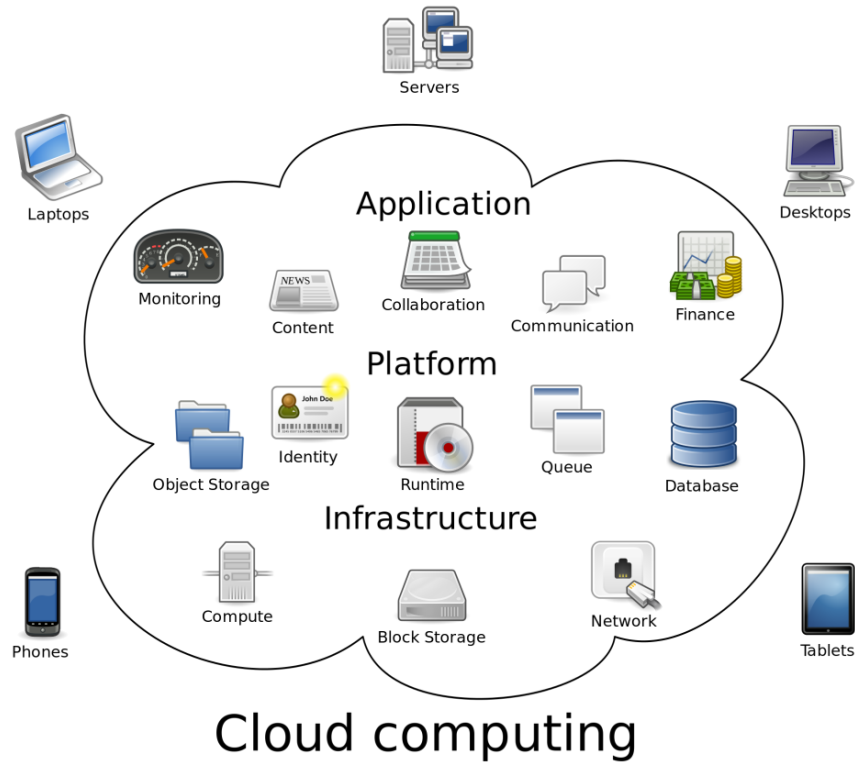


Figure 1: Basic cloud architecture

Grid computing is the collection of computer resources from multiple locations to reach a common goal. The grid can be thought of as a distributed system with non-interactive workloads that involve a large number of files. What distinguishes grid computing from conventional high performance computing systems such as cluster computing is that grids tend to be more loosely coupled, heterogeneous, and geographically dispersed.[4] Grid computing, most simply stated, is distributed computing taken to the next evolutionary level. The goal is to create the illusion of a simple yet large and powerful self-managing virtual computer out of a large collection of connected heterogeneous systems sharing various combinations of resources. The standardization of communications between heterogeneous systems created the Internet explosion. The emerging standardization for sharing resources, along with the availability of higher bandwidth, are driving a possibly equally large evolutionary step in grid computing.[5] The term grid, coined in the mid-90s in the academic world, was originally proposed to denote a distributed computing system that would provide computing services on demand just like conventional power and water grids do. During the last few years, as the technology evolved and the grid concept started being explored on commercial endeavours, some slight but meaningful changes have been made in its original definition. Nowadays, an accepted definition, world-wide, states that a “grid” is a system that: “coordinates resources that are not subject to centralized control using standard, open, general-purpose interfaces and protocols to deliver non-trivial qualities of service” For more information, refer to “What is the Grid? A Three Point Checklist” by I. Foster in GRID Today, July 20, 2002. Nowadays, most of the interest driven toward the grid concept derives from the fact that, stated as it is, a grid can be regarded as a technology with no boundaries. Figure 2 basic architecture of grid computing.

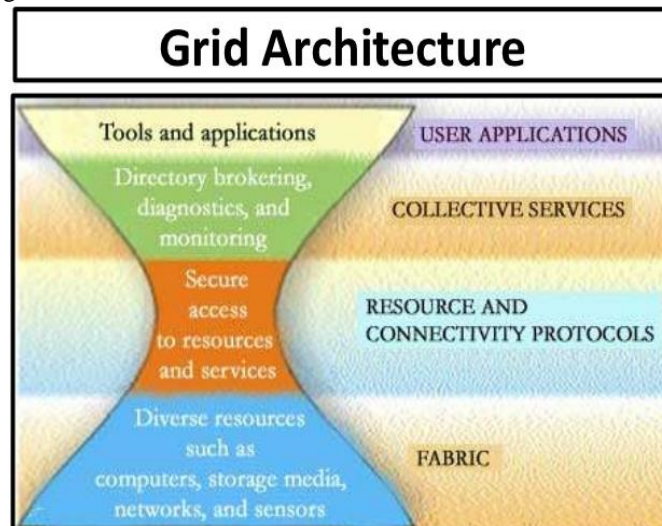


Figure 2: basic grid architecture

Type of Grid

Grid is classified in following types which are:

- **Computational grid:** These grids provide secure computation or we can say execution of the job by on the geographically distributed resources for computation examples are NASA IPG, the World Wide Grid, and the NSF TeraGrid.
- **Data grid:** These are concerned with providing scalable database services with the help of distributed database resources.
- **Network grid:** This type of grid is concerned with providing networking services.
- **Application Services:** This type of grid deal with the provision application services such as remote software and libraries.
- **Information services:** These types of grid deal with extraction and presentation of the data meaning full manner with the help of computational model.

II. RELATED WORK OF LOAD BALANCING TECHNIQUES

In this research work, various load balancing techniques are reviewed, including: Fuzzy Logic based Load balancing technique, Fuzzy and Glow-swarm optimization based load balancing technique, ant colony based load balancing and hybrid approaches to achieve optimization in load balancing in cloud computing environment. In [18], author has described the basics of cloud computing and authentication technique applied for security purposes. In the below given table, reviewed techniques are compared and advantages and disadvantages of each technique, along with the methodology is given.

ACO Based Load Balancing [12] this proposal based on the behaviour of bats. While the incoming task came the artificial ants were created to found the best fitting virtual machine. After a every search the ants maintain information about all virtual machine. This information used to balance the weighted virtual machine. Time delay occurred, every time the income task want to wait until the ants finish their search. Fuzzy Based Load Balancing [14] Fuzzy logic implemented in two level (i)cluster level (ii)node level. Local manager contains the info about all nodes in every cluster separately Grid manager maintains info about all the clusters. Job assigning task to the virtual machine was easy and fast manner with help of local and grid manager. All the fuzzy instructions are predefined For uncertainty situation the proposal not worked properly.

Fuzzy and GSO Based Load Balancing [15] Fuzzy logic used to assign the task to VM simultaneously GSO technique used for balance the heavy loaded VM The waiting of the task to get the service was decreased The proposed system provide the optimal solution when the jobs came in FCFS format. Hybrid Load Balance Algorithm [4] Implementing the Hash table for sharing the loads between VM the DHT maintains load and position of the every processor at each interval with help of Hash table. DHT also responsible for routing so the tasks quickly get the process. Min-Min Algorithm [10] the algorithm assigns the small task fast. Fast and provide the better performance High waiting delay. Pigeon Optimization Based Load Balance [19] The algorithm based on the behaviour of pigeon. The vision radius of pigeon is used to find the best VM..

III. ADVANCEMENT IN BAT ALGORITHM

In today's era, different types of meta-heuristic techniques are used to solve combinatorial and NP-Hard optimization problems. These optimization techniques are nature-inspired. The standard BAT Algorithm is based on the echolocation behaviour of the bat and his algorithm is proposed by Xin She Yang in 2010 [17]. The author has focused on three main parameters, namely, position, frequency, velocity, pulse emission rate and loudness. These parameters are updated timely to hunt the prey. The author in [16] has reviewed the application areas of BAT algorithm. In this work, binary bat algorithm, improved bat algorithm, fuzzy based bat algorithm, multi-objective bat algorithm, multi-swarm bat algorithm and many other related algorithms are studied and based on that, comparison is drawn. R. Y. M. Nakamura, L. A. M. Pereira [11] Binary Bat Algorithm for Future Selection OPF used for find the subset quickly. Robustness of the proposal is better than GA. Selim Yilmaz and Ecir U. Kucuksille [13] Improved bat for Continuous Optimization Decrease the lack of exploration and Increase the Local Search capability. Koffka Khan, Alexander Nikov [8] Fuzzy Based Bat Algorithm By change the velocity bats local best found easily to get better solution. Jian Xie, Yongquan Zhou [7] Bat Based Levy flight Trajectory The parameter initialization changes and improve the local search capability. Chiranjib Sur, Anupam Shukla [2] Bat Algorithm for Root Search Optimization The next position based upon the sensing parameter. By increase that value can get best optimum path. Djossou Adeyemi Amon [3] Bat Algorithm for Power Loss Reduction Bats kept the switch as long live and always found the best route to configure also maintain the switch state to protect powerloss. Marwa Sharawi [9] MOBA for Energy Preserving Optimization in WSN Maximum coverage CH selected and minimize the energy level of active nodes. Gai-Ge Wang, Bao Chang [5] Multi-Swarm Bat for Global Optimization Each algorithm produce different outcome, by choosing best from those in every round the final outcome was more accuracy and efficient one. Bhavna Bansal, Anita Sahoo [1] Bat Algorithm for Full Model Selection Bat used for select the relevant feature from set of feature and Robustness increased.

IV. CONCLUSION AND FUTURE SCOPE

This paper has thrown light on the concepts of cloud computing and its basic principles. Moreover, various load balancing techniques and BAT algorithm variants are explored in this work. The fields of future research are explored and shortcomings of each paper are mentioned in tabular format. This paper clearly defines the cloud computing basic

principles, how the load balancing technique plays a very important role in cloud computing and a new proposed bio-heuristic BAT algorithm then its various implementations. The BAT algorithm provides the efficient outcomes in wherever it was implemented. Since the BAT based algorithm is not implemented in cloud compute load balancing. The future work is to implement the BAT algorithm in the Cloud Compute Load balancing techniques

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