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A COMPARATIVE ANALYSIS ON TRADITIONAL Vs EVOLUTIONARY OPTIMIZING ALGORITHMS

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Abstract

Cloud computing is a new archetype for serving remote computing resources through a network. One of the main issues in cloud computing is load balancing. Load balancing plays a vital role in making the performance more effective. In cloud computing, various cloud optimizations technique is coiled in order to overcome the drawbacks in load balancing process. Cloud load balancing is the process of distributing workloads across multiple computing resources. Load balancing aims to optimize resource use, maximize throughput, minimize response time, and avoid overload of any single resource. In this paper, we are going to discuss about various optimization algorithms in cloud and multi-cloud environment and conclude which algorithm is better.

Key works: cloud computing, load balancing, optimization algorithm, multi-cloud.

1. Introduction

Cloud computing definition in various aspects: i) cloud computing is defined as a type of computing that relies on sharing computing resources rather than having local server or personal device to handle application. [1] ii) Cloud computing is a model for enabling ubiquitous network access to a shared pool of configurable computing resources. [2] iii) Cloud computing and storage solutions provide users and enterprises with various capabilities to store and process their data in third party data centers. It relies on sharing of resources to achieve coherence and economics of scale. [3] iv) Cloud computing often referred to as simply "the cloud" is the delivery of on-demand computing resources, everything from application to data centers over the internet on pay-for-use basis. [4] v) In the simplest terms, cloud computing means storing and accessing data and programs over the internet instead of the computer's hard drive. The cloud just a metaphor for the internet. [5]

To need ever changing business needs organization need to invest time, budget to scale up their IT infrastructure such as hardware, software and services. In on

premises IT infrastructure the scaling process to achieve optimal utilization of the IT infrastructure. Cloud communication provides computing over the internet. A communication service consists of highly optimized data centers that provide various software, hardware and information services/ resources for use. We needed organization can simply connect to the cloud and use the available resources on the pay for use basis. This helps company to avoid capital expenditure and additional on premises infrastructure resources and instead of scale up or scale down according to business requirements.

2. Cloud Computing Overview

2.1 Types of Cloud:

Private cloud: The cloud infrastructure is provisioned for exclusive use by a single organization comprising multiple consumers (e.g., business units). It may be owned, managed, and operated by the organization, a third party, or some combination of them, and it may exist on or off premises. [6]

Public cloud: The cloud infrastructure is provisioned for open use by the general public. It may be owned, managed, and operated by a business, academic, or government organization, or some combination of them. It exists on the premises of the cloud provider. [6]

Hybrid cloud: The cloud infrastructure is a composition of two or more distinct cloud infrastructures (private, community, or public) that remain unique entities, but are bound together by standardized or proprietary technology that enables data and application portability (e.g., cloud bursting for load balancing between clouds). [6]

Community cloud: The cloud infrastructure is provisioned for exclusive use by a specific community of consumers from organizations that have shared concerns (e.g., mission, security requirements, policy, and compliance considerations). It may be owned, managed, and operated by one or more of the organizations in the community, a third party, or some combination of them, and it may exist on or off premises. [6]

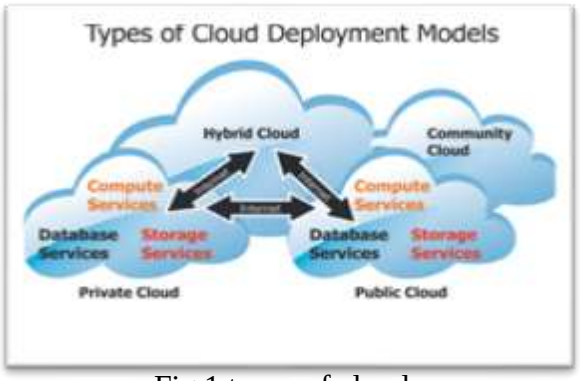

Fig.1 types of cloud

Components:

1. *End user:* The users who are utilizing the service resources of the cloud.
2. *Network:* It helps to connect the end user to the cloud.
3. *Storage:* The data or information is stored in the cloud storage.

There are two types:

NAS- Network Attached Service: the process or services which are related to the network on premises.

SAN: Storage Attached Network: It mainly deals with the storage which is often connected to network.

4. *Platform:* It is simple acts as the application supporting medium.
5. *API- Application Program Interface:* It is a set of routines, protocols and tools for building software application. It also specifies how software components should interact and API's are used when programming GUI components.

2.2 Cloud services:

2.2.1 ***PaaS – Platform as a Service****:* Cloud providers deliver a computing platform typically including operating system, programming language execution environment, data base and web server. The capability provided to the consumer is to deploy onto the cloud infrastructure consumer-created or acquired applications created using programming languages, libraries, services, and tools supported by the provider. The consumer does not manage or control the underlying cloud infrastructure including network, servers, operating systems, or storage, but has control over the deployed applications and possibly configuration settings for the application-hosting environment. The testing, implication, error checking is done in PaaS. It depends on operating system.

The Benefits of PaaS:

- Develop applications and get to market faster.
- Deploy new web application to the cloud in minutes.
- Reduce complexity with middleware as a service.[7]

2.2.2 ***IaaS – Infrastructure as a Service:*** The capability provided to the consumer is to provision processing, storage, networks, and other fundamental computing resources where the consumer is able to deploy and run arbitrary software, which can include operating systems and applications. The consumer does not manage or control the underlying cloud infrastructure but has control over operating systems, storage, and deployed applications; and possibly limited control of select networking components (e.g., host firewalls).it does the work of administration.

The Benefits of IaaS:

- No need to invest in your own hardware.
- Infrastructure scales on demand to support dynamic workloads.
- Flexible, innovative service available on demand.[7]

2.2.3 ***SaaS – Software as a Service:*** The capability provided to the consumer is to use the provider's applications running on a cloud infrastructure2. The applications are accessible from various client devices through either a thin client interface, such as a web browser (e.g., web-based email), or a program interface. The consumer does not manage or control the underlying cloud infrastructure including network, servers, operating systems, storage, or even individual application capabilities, with the possible exception of limited user-specific application configuration settings. SaaS is mainly based on the end user requirements.

The Benefits of SaaS:

- You can sign up and rapidly start using innovative business apps
- Apps and data are accessible from any connected computer
- No data is lost if your computer breaks, as data is in the cloud
- The service is able to dynamically scale to usage needs. [7]

2.3 Optimization

It is the process of modifying a system to make some features of it work efficiently or use fewer resources. For example a computer program may be optimized so that it runs faster or it run with less memory requirement or other resources or to consume less power.

2.3.1 Optimization issues in cloud:

1. **Security:** It mainly deals with the authentications, authorizations, service

level agreements and cloud certificates.

2. **Quality of Service:** It mainly focuses on the throughput and delay reduction.
3. **Migration:** For temporary the data centers are migrated from one place to another in order to meet the security issues and service loss. If the service is lost then it is under go through the adaption process.
4. **Scalability:** Extending the process/service from a minimum to maximum count such that the adaption rate of the cloud does not ease rapidly.
5. **Access Time:** Time required for mapping a request service from the user end to the service at the user end.

3. Traditional algorithms

3.1 First Come First Serve

The algorithm is an optimized version of FCFS. In case of FCFS if the required resource is unavailable, then the system simply waits for availability whereas our algorithm would give the resource in parts or simply put the request in a wait queue and see if the next request can be serviced. It follows a dynamic allocation towards deadline constraint or cost constraint depending on current usage. It then proceeds to allocate data to requests based on whichever category the request would fit into. For deadline constraint, if a request is below the threshold value, it is immediately serviced, whereas if it is above the value it is considered for cost constraint based allocation. Within cost constraint allocation, among simultaneous requests the request that provides with most cost efficiency is allocated first and so on. [8]

3.2 Shortest Job First

A different approach to CPU scheduling is the shortest-job first (SJF) scheduling algorithm. This algorithm associates with each process the length of the process's next CPU burst. When the CPU is available, it is assigned to the process that has the smallest next CPU burst. If the next CPU bursts of two processes are the same, FCFS scheduling is used. As an example of SJF scheduling, consider the following set of processes, with the length of the CPU burst given in milliseconds. [9]

3.3 Round Robin

Round-robin (RR) is one of the algorithms employed by process and network schedulers in computing. As the term is generally used, time slices are assigned to each process in equal portions and in circular order, handling all processes without priority (also known as cyclic executive). Round robin scheduling is simple, easy to implement, and starvation-free. Round-robin scheduling can also be applied to other scheduling problems, such as data packet scheduling in computer networks. It is an Operating System concept. In order to schedule processes fairly, a round-robin scheduler generally employs time-sharing, giving each job a time slot or quantum (its allowance of CPU time), and interrupting the job if it is not completed by then. The job is resumed next time a time slot is assigned to that process. If the process terminates or changes its state to waiting during its attributed time quantum, the scheduler selects the first process in the ready queue to execute. In the absence of time-sharing, or if the quanta were large relative to the sizes of the jobs, a process that produced large jobs would be favored over other processes. Round Robin algorithm is a pre-emptive algorithm as the scheduler forces the process out of the CPU once the time quota expires. [9]

4. Evolutionary Algorithms

4.1 Particle Swarm Optimization

Particle Swarm Optimization (PSO) as a meta-heuristics method is a self-adaptive global search based optimization technique introduced by Kennedy and Eberhart. The PSO algorithm is alike to other population-based algorithms like Genetic algorithms (GA) but, there is no direct recombination of individuals of the population. The PSO algorithm focuses on minimizing the total cost of computation of an application workflow. As a measure of performance, Authors used cost for complete execution of application as a

metric. The objective is to minimize the total cost of execution of application workflows on Cloud computing environments. Results show that PSO based task-resource mapping can achieve at least three times cost savings as compared to Best Resource Selection (BRS) based mapping for our application workflow. In addition, PSO balances the load on compute resources by distributing tasks to available resources. [10]

4.2 Ant Colony Optimization

They proposed an algorithm for load distribution of workloads among nodes of a cloud by the use of 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 improving 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. [10][11] However, in their approach the ants consecutive update a single result set rather the updating their own result set. Further, as they know that a cloud is the collection of many nodes, which can support various types of application that is used by the clients on a basis of pay per use. So, the system, which is incurring a cost for the user should function smoothly and should have algorithms that can continue the proper system functioning even at pinnacle us hours. ACO is inspired from the ant colonies that work together into foraging behavior. In fact the real ants have inspired several researchers for their work, and the ants approach has been used by many researchers for problem solving in different areas. [12]This approach is called on the name of its inspiration ACO. [9] The ants work totally in search of new sources of food and simultaneously use the existing food sources to shift the food back to the nest. The approach aims at efficiently distribution of the load among the nodes and such that the ants never encounter a dead end for movements to nodes for building an optimum solution set. In our algorithm, first a Regional load balancing node is chosen in CCSP, which will act as a head node.

4.3 Honey- bee algorithm

A colony of honey bee can extend itself over long distances as to find many food sources such as flower patches and then these bees harvests nectar or pollen from these sources. A small fraction of the colony finds the environment looking for new flower patches. When food source is encountered the scout bees go in the field surrounding the hive and check for quality beneficial. When they return to the hive, the scouts collect the food harvested. There is an area in the hive called as the “dance floor”, where waggle dance is performed by the bees that found a very beneficial food. Through the waggle dance a scout bee passes the position of its search to idle spectator, which helps in the using of the flower patch. Here the duration of the dance is according to the scout’s rating of the food source, to harvest the best rated flower patches more foragers get recruited. When dance is done, the scout return to the food source it found to see more food. Till the food is profitable, food sources will be posted by the scouts when they return to their hive. Foragers who are recruited recently may waggle dance as well, which will step-up the recruitment for highly profitable flower patches. This autocatalytic process will go on to find most beneficial flower patches. [13]

5. Conclusion

This paper is based on cloud computing technology which has a very vast potential and is still unexplored. The capabilities of cloud computing are Interminable. Cloud computing provides everything to the user as a service which includes platform as a service, application as a service, infrastructure as a service. One of the major issues of cloud

computing is load balancing because overloading of a system may lead to poor performance which can make the technology unsuccessful. From this paper we are able to know that the evolutionary optimizing techniques for load balancing are more efficient than that of the traditional.

REFERENCES

[1]http://www.webopedia.com/TERM/C/cloud_computing.html

[2]Peter Mell, Timothy Grance, Recommendations of the National Institute of Standards and Technology , September 2011.

[3] M. Haghighat, S. Zonouz, & M. Abdel-Mottaleb (2015). CloudID: Trustworthy Cloud-based and Cross-Enterprise Biometric Identification. Expert Systems with Applications, 42(21), 7905–7916.

[4]http://www.ibm.com/cloud-computing/what-is-cloud-computing.html

[5]http://in.pcmag.com/networking-communications-oftware/38970/feature/what-is-cloud-computing

[6]http://www.servicearchitecture.com/articles/cloudcomputing/cloud_computing_definition.html

[7] 85-94, 2008.[11]Grosu, D., Das, A., "Auction-Based Resource Allocation Protocols In Grids", 16th Iasted International Conference On Parallel And Distributed Computing And Systems, 2004

[8] International Journal of Science and Research (IJSR), Load Balancing in Cloud Computing using Shortest Job First and Round Robin Approach , Volume 4 Issue 9, September 2015.

[9] Fazel Mohammadi , Dr. Shahram Jamali , and Masoud Bekravi "Survey on Job Scheduling algorithms in Cloud Computing"International Journal of Emerging Trends & Technology in Computer Science (IJETTCS) Volume 3, Issue 2, March – April 2014.

[10] Kousik Dasguptaa, Brototi Mandalb, Paramartha Duttac, Jyotsna Kumar Mondald, Santanu Dame, A Genetic Algorithm (GA) based Load Balancing Strategy for Cloud Computing" International Conference on Computational Intelligence: Modeling Techniques and Applications (CIMTA) vol 10,2013.

[11] Bharti Suri "Implementing Ant Colony Optimization for Test Case Selection and Prioritization" Bharti Suri et al. / International Journal on Computer Science and Engineering (IJCSE).

[12] Shilpa V Pius, Shilpa T S "Survey on Load Balancing in Cloud Computing" International Conference on Computing, Communication and Energy Systems (ICCCES-2014).

[13] About Bee Behavior and algorithm from"http://en.wikipedia.org/wiki/Bees_algorithm"