International Journal for Rapid Research in Engineering Technology & Applied Science
ISSN (Online): 2455-4723
Vol 3 Issue 3 March 2017

Resource Scheduling in cloud Computing Using Genetic Algorithm

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***Abstract*:- Cloud computing is a distributed environment where various efficient computing engines are help to execute the clients request. Due to the unpredictable nature of work load in the cloud servers load balancing techniques are help to manage the work load and handle the request. The proposed work is intended to find the most appropriate algorithm for handling the work load on these servers. Therefore a comparative study is conducted in this proposed work. For performing the comparative study the data center load is evaluated using by modified Genetic algorithm distributed load scheduling scheme and implementation is in Cloud Simulator with performance evaluation.**

Keywords: Cloud Computing, Load Balancing, QOS, Resources

1. Introduction

1.1 Cloud computing

Cloud computing is a computing paradigm, where a large pool of systems are connected in private or public networks, to provide dynamically scalable infrastructure for application, data and file storage. With the advent of this technology, the cost of computation, application hosting, content storage and delivery is reduced significantly. Cloud computing is a practical approach to experience direct cost benefits and it has the potential to transform a data center from a capital-intensive set up to a variable priced environment.
An example of a Cloud Computing provider is Google's Gmail. Gmail users can access files and applications hosted by Google via the internet from any device [1].

Cloud computing is in grid computing based on a new calculation model, is the next generation network computing platforms core technologies, It builds virtualization super computer, with on demand rent way which provides data storage, analysis and scientific computing services through the distributed computing model and the resource pool technology. Cloud computing is also a kind of distributed computing, Through the virtualization technology will be distributed in the network computer resources of idle which combined into one huge resource pool, which is constituted as a super computing capacity of the computer. [2].
Cloud computing comes in focus development of grid computing, virtualization and web technologies. Cloud computing is an internet based computing that delivers infrastructure as a service (IaaS), platform as a service (PaaS), and software as services (SaaS). In SaaS, software application is made available by the cloud provider. In PaaS an application development platform is provided as a service to the developer to create a web based application. In IaaS computing infrastructure is provided as a service to the requester in the form of Virtual Machine (VM). [3]

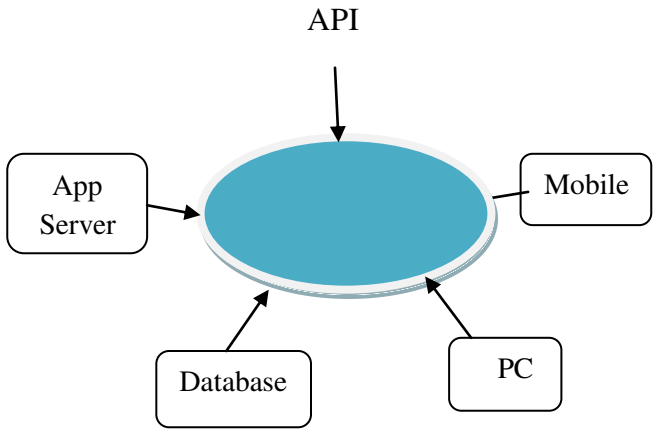
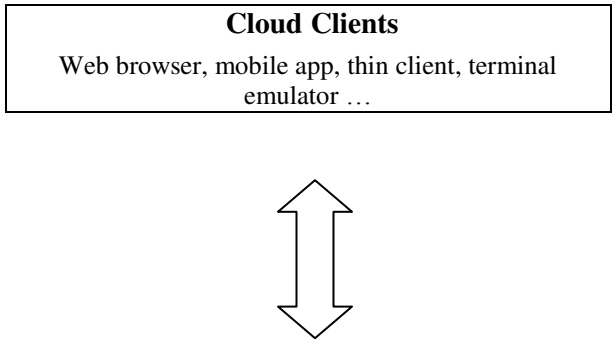


Fig 1.1: Cloud Computing

Characteristics

1. It must be an on-demand self service in which a customer can self-provision compute, storage, etc., without human interaction.
2. It must contain broad network access with reach ability and platform options (including thin and thick clients, phones and tablets).
3. It must be a multi-tenant environment fostering location-independence.
4. It must support rapid elasticity with the ability to grow and shrink based on policy, with no impact to applications or users.
5. It must be a measured service, metered by performance with a pay-as-you-go pricing model.[4]

1.2 Service models



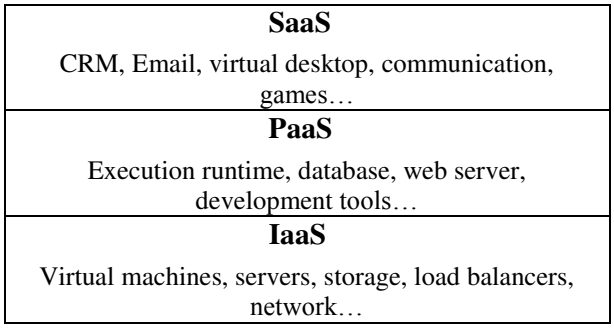


Fig 1.2: Service Models

1.3 Infrastructure as a service (IaaS)

It offers a service to get a virtual server in few minute and pay only for the resource they use. It allows accessibility of infrastructure using Internet technology consist of server, storage and other peripherals devices. It can be coupled with managed services for operating system and application support. And the IaaS model focus on enable technologies. IaaS model offer a service to get a virtual server in few minutes and pay only for the resources they use. In IaaS model consumer can directly use infrastructure components (storage, firewall, network etc).Example is Amazon EC2) offers consumers with physical or virtual resources including CPU, memory, OS and storage, to meet the demands of the users. [5]

IaaS is used by System Manager. Services provided by IaaS are Virtual machine, operating system, Message queue, Network, Storage, CPU, memory, backup service. It creates a platform for service application test, development, integration and deployment [6].

1.4 Platform as a service (PaaS)

It is another type of service model of cloud computing which provides a computing platform and solution stack as a service. In this model user or consumers creates software using tools or libraries from the providers. Consumer also controls software

deployment and configuration settings. Main aim of provider is to provide networks, servers, storage and other services.PaaS offers deployment of applications by reducing the cost and complexity of buying and maintaining hardware and software and provisioning hosting capabilities. There are various types of PaaS vendors which offer application hosting and a deployment environment along with various integrated services. The services offer scalability and maintenace [7].

Examples: Apprenda

1.5 Software as a service (SaaS)

This model has been recently proven to be attractive to many users, as it alleviates the burden of software maintenance and the ongoing operation and support costs. Furthermore, it exports the computational work from the users' terminal to the data centers where the cloud applications are deployed. This in turn lessens the hardware requirements needed at the users' end, and allows them to obtain superb performance for some of their CPU-intensive and memory-intensive workloads without necessitating large capital investments in their local machines. Arguably, the cloud application layer has enabled the growth of a new class of end-user devices in the form of "notebook" computers, which are less expensive end-user devices that rely on network connectivity and cloud applications for functionality.

SaaS Examples: Google Apps, Sales force, Workday, Concur, Citrix GoToMeeting, Cisco WebEx [8]

2. Background

2.1 Service-level agreement

"Service Level Agreement" as a format that contains an explanation of the agreed service, parameters of the level of service, the guarantees regarding the Quality of Service, and arrangements for all cases of violations. The SLA is very significant as a contract that is held between the provider of the service and another party who could be one of following; consumer of the service, broker negotiator, or monitoring negotiator. The key concept of SLA is to provide a clear description of the official agreements about service expressions such as performance, availability and billing……., etc. [9]

SLA puts borders and prospects for service supplying and delivers the following advantages:

2.1.1 Improved customer acceptance level: An obviously explained SLA enlarges the customer approval level, as it supports providers to concentrate on the customer needs and confirms that the work is placed on the right way.

2.1.2 Enhanced relationship between the parties: An obvious SLA specifies the remuneration and retribution policies of the service provided. The consumer can examine services according to Service Level Objectives (SLO) determined in the SLA. Moreover, the specific contract assists parties to solve disagreements without difficulty.

2.1.3 Enhanced Service Quality (QOS: Quality of Services): Each element in an SLA suits a Key Performance Indicators (KPI) that determines the customer service among an inner institute by checking whether or not these indicators match the Service Level Objectives (SLOs) of the agreed contract between customers and service providers. A contract is a means of clarifying the difference in needs for both the provider and the user. An SLO always contains level services, specific period, and a specific value as a target to achieve. These actual performance values are compared with the stated ones in the contract to make performance reports used for evaluation

2.1.4 Fault tolerance: is defined by the reliability of the system which refers to the• degree of dependability. Fault-tolerance QoS assurance mechanism is mainly used by the service provider to catch and resist faults or crashes during the treatment. These faults can be classified as either job failures or job delays. An unsuccessful job execution can be classified as job failure. To determine a job delay, some provider's information needs to be known such as execution time of the job and request response time. Finally, by solving the delayed jobs during the request treatment, fault tolerance is guaranteed. [10]

2.2 Shared resource

In computing, a shared resource, or network share, is a computer resource made available from one host to other hosts on a computer network. It is a device or piece of information on a computer that can be remotely accessed from another computer, typically via a local area network or an enterprise intranet, transparently as if it were a resource in the local machine. Network sharing is made possible by inter-process communication over the network [11].

Some examples of shareable resources are computer programs, data, storage devices, and printers. E.g. shared file access (also known as disk sharing and folder sharing), shared printer access (printer sharing), shared scanner access, etc. The shared resource is called a shared disk (also known as mounted disk), shared drive volume, shared folder, shared file, shared document, shared printer or shared scanner [12].

2.3 Resource management

Resource management is the efficient and effective deployment and allocation of an organization's resources when and where they are needed. Such resources may include financial resources, inventory, human skills, production resources, or information technology. Resource management includes planning, allocating and scheduling of resources to tasks, which typically include manpower, machines, money and materials. Resource management has an impact on schedules and budgets as well as resource leveling and smoothing [13].

Cloud is a type of parallel and distributed system which consists of a collection of interconnected and virtualized computers. These computers are dynamically provisioned and presented as one or more unified computing resources based on service-level agreements, which are established through negotiation between the service provider and consumers. The computing resources can be allocated dynamically upon the requirements and preferences of user. The consumers may access applications and data of the Cloud from anywhere at any time, it is difficult for the cloud service providers to allocate the cloud resources dynamically and efficiently. Physical resource are Computer, Processor, disk, database, network, Bandwidth, scientific instruments and the logical resources are Execution, monitoring, communicate application and etc [14]

The cloud computing technology enables all its resources as a single point of access to the customer and is implemented as pay per usage. Even though there are many undisputed advantages in using cloud computing, one of the major concerns is to understand how the user / customer requests are executed with proper allocation of resources to each of such request. Unless the allocation and management of resources is done efficiently in order to maximize the system utilization and overall performance, governing the cloud environment for multiple customers becomes more difficult. [15]

Resource Management is an important issue in cloud environment. Cloud computing is the delivery of computing and storage capacity as a service to a community of end-recipients. The name comes from the use of a cloud-shaped symbol as an abstraction for the complex infrastructure it contains in system diagrams. Cloud computing entrusts services with a user's data, software and computation over a network. [16]

2.4 Resource

2.4.1 Networks: - A computer network, often simply called a network, is a collection of computers and devices that are interconnected by communication channels. These channels allow for the efficient

sharing of resources, services, and information among the network... [17]

2.4.2 Servers: - server is an instance of a computer program that accepts and responds to requests made by another program; known as a client. Servers are used to manage network resources. For example, a user may setup a server to control access to a network, send/receive e-mail, manage print jobs, or host a website [18].

2.4.3 Storage: - The place where a computer puts data storage has been divided into: (1) primary storage, which holds data in memory and other "built-in" devices such and (2) secondary storage, which holds data on hard disks, tapes, and other devices requiring input/output operations. [19].

2.4.4 Applications: - An application is any program, or group of programs, that is designed for the end user. Application software can be divided into two general classes: systems software and applications software. Applications software (also called end-user programs) includes such things as database programs, word processors, Web browsers and spreadsheets [20].

2.4.5 Services: - A service is a system process that runs independent of any program. Some services run automatically such as the DNS client service other services only start when activated by a program [21].

2.4.5 Data & Program: - Data is distinct pieces of information, usually formatted in a special way. All software is divided into two general categories: data and programs. A computer program is a sequence of instructions (statements) q Expressed in a given language (e.g. C) q the language has a 'vocabulary' § a set of words [22].

2.4.6 Firewall: - The firewall has a mechanism to allow some traffic to pass while blocking other traffic (this is often called filtering). The rules describing what traffic is allowed enforce the firewall's policy [23].

3. Literature Survey

Scheduling is one of the most important tasks in cloud computing environment. How to make better resource scheduling in cloud computing has always been a focus of research. we have analyzed various scheduling algorithm and tabulated various parameter. In the simulation software Cloud Sim simulation experiment, from the results we can see that, the algorithm for calculating node distribution and load balancing has good performance. The results of simulation experiments show that the improved frog leaping algorithm has good resource optimization and scheduling ability. We have created FCFS, Round robin scheduling Algorithm and new proposed Scheduling algorithm is (GPA) generalized priority algorithm. The result shows that the proposed algorithm is more efficient than FCFS and Round Robin algorithm.

Publication & Year	Paper Title	Advantages	Limitations
IJSRP, Volume 3, Issue 6, June 2013 [24]	Resource Management and Scheduling in Cloud Environment	Gives high throughput and cost effective.	They do not consider reliability and availability.
IJRDTMS Volume – 21, Issue 1,ISBN - 978-1-63102-445-0 , March 2014 [25]	A Greedy algorithm for task scheduling & resource allocation problems in cloud computing	With the help of task scheduling, the resources of the cloud systems are efficiently allocated and managed and optimized.	The cost based scheduling policy may be studied more efficiently using this approach.
IJCSI, Vol. 9, Issue 5, No 2,	Study on Cloud Computing Resource	the algorithm for	Do not provide high throughput

September 2012 [26]	Scheduling Strategy Based on the Ant Colony Optimization Algorithm	calculating node distribution and load balancing has good performance.	& cpu utilization.
IJGDC,Vol.8, No.1 (2015) [27]	Research on the Resource Scheduling of the Improved SFLA in Cloud Computing	This algorithm improve the efficiency of task processing and make the resource scheduling in cloud computing rational and effective.	
IJCTT , volume 9 number 7, Mar 2014 [28]	Efficient Optimal Algorithm of Task Scheduling in Cloud Computing Environment	Provide efficient access to remote and geographically Distributed resources .	Not capable to reduce the execution time
Volume 3, Issue 8, August 2013 IJARCSSE [29]	Review of Efficient Resource Scheduling Algorithms in Cloud Computing	Algorithm which takes care of reliability and performance without a fault.	Need of more energy efficient algorithms in the future as cloud computing applicability is increasing more energy will be needed for the further increasing load in use and more of the services will provided in future.

4. Proposed System

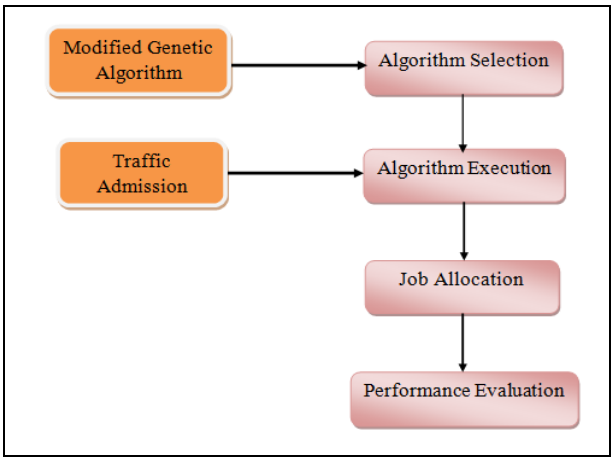


Figure Proposed Simulation Scenario

The reproduction of the cloud stage is ready to afford the weight over the cloud host for implementation of an order of actual time area workload. Here a log is offer as input, which restrains the actual time labor of actual cloud host for 24 hours.

Genetic algorithm is genetically inspired search process that finds the optimum solution in huge search space. The available resources are genetically treated to find the fittest response among a number of solutions, which is basically an iterative process for discovering more appropriate solution. This search technique guarantees to find the best solution, but intermediate solution is also produces in each progressive steps. Therefore before use of this algorithm the primary functioning of the genetic algorithm is required to learn.

Genetic Algorithms processes a pair of individuals, these individuals are the sequence of symbols that are participating in solution space.

5. Conclusion

Cloud Computing along with research challenges in load balancing. Major thrust is given on the study of Resource Scheduling algorithm, followed by a comparative survey of these above mentioned algorithms in cloud computing with respect to stability, resource utilization, static or dynamicity, cooperative or non-cooperativeness and process migration.

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