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Review on Improved Energy Efficient job scheduling in cloud computing

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Abstract: *Cloud computing has offered services related to utility aligned IT services. Reducing the schedule length is considered as one of the significant QoS need of the cloud provider for the satisfaction of budget constraints of an application. Task scheduling in a parallel environment is one of the NP problems, which deals with the optimal assignment of a task. To deal with the favorable assignment of some task, task scheduling is considered as one of the NP problem. In this research work the jobs are distributed in a centralized environment. In Centralized environment every job request is forwarded to a central server. The central server passed the jobs to sub servers that are present with in the area of request. This has been performed by using distance formula. In our research work we reduce the energy consumption by each sub-server and it is possible by using formation of feedback queue. Job scheduling has been optimized on the basis of priority by using genetic algorithm Fuzzy logic also used for classification of the jobs to decide which job has been allotted to the system. Metrics namely, SLR, CCR (Computation Cost Ratio) and Energy consumption are used for the evaluation of the proposed work. All the simulations will be carried out in Cloud sim environment.*

Keywords: *CLOUDSIM, Computation cost ratio (CCR), Genetic algorithm (GA), SLR, energy consumption, Fuzzy logic.*

I. INTRODUCTION

Energy supply should be diverse Modern times have seen unprecedented developments in the field of embedded systems and very high speed wireless networked technology with Mobile Computing devices like Smart phones, Smart watches (wearable devices) and Smart tablets etc. With the aid of wireless high speed technology a number of jobs are being performed with these smart devices [1].

But till date the Smart phones are using traditional power supplying materials with limited Battery life before preceding further it is imperative to define the following terms

1. Cloud Computing
2. Mobile Cloud Computing
3. Energy Efficiency and Energy optimization
4. Task Scheduling
5. Energy Model and their role in Acyclic graph
6. Dynamic Voltage Frequency Scaling(DVFS)

ARCHITECTURE OF CLOUD COMPUTING

Architecture of cloud mainly consists of different service models Software-as-a-service (SaaS), Infrastructure-as-a-service (IaaS) and Platform-as-a-service (PaaS) as shown in Fig. below. It refers to the components and sub components required for cloud computing. [11].

These Components mainly consists of Front end platforms and backend platforms (servers and storages), Cloud delivery services and the network.

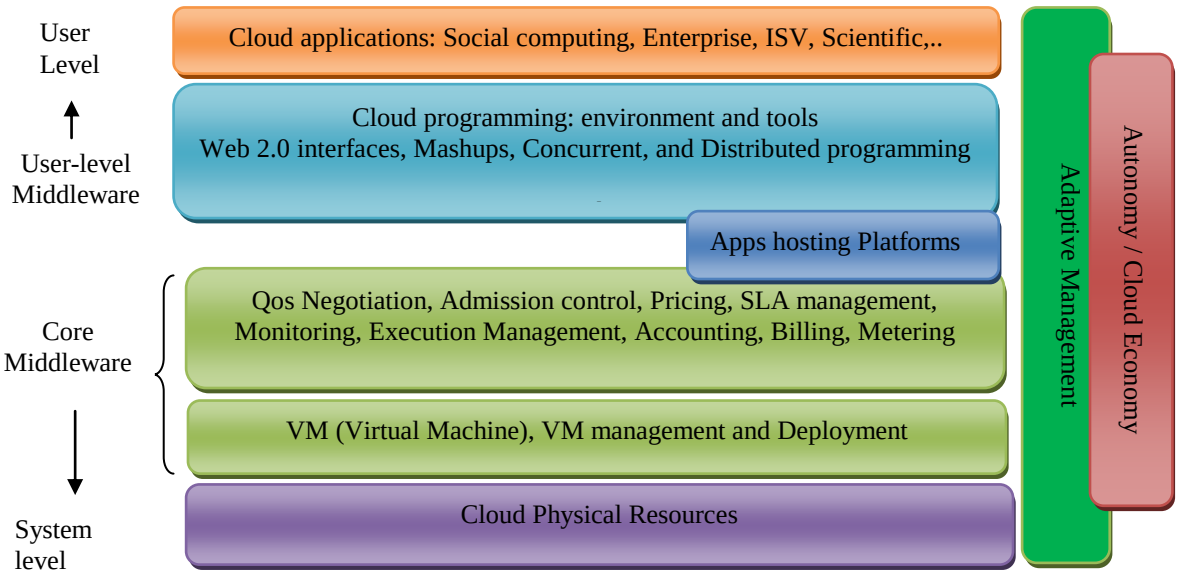

Figure I.1 Cloud Architectures

In Fig above, the lowest level of the stack specifies the physical resources on top of which the infrastructure is positioned. Nature of resources can be different i.e. clusters, data-centers, and spare desktop machines. Infrastructures supporting commercial Cloud deployments are more likely to be constituted by data centres hosting hundreds of VMs, but, in private clouds heterogeneous environment is there, in which even the idle CPU cycles of spare desktop machines are used to share compute workload. The physical architecture is managed by the core middleware layer which provides a runtime environment for applications and use resources carefully. Core middleware rely on virtualization technologies for providing advance services like application isolation, quality of service and sandboxing. Among the different virtualizations, hardware and programming level virtualization are most important.

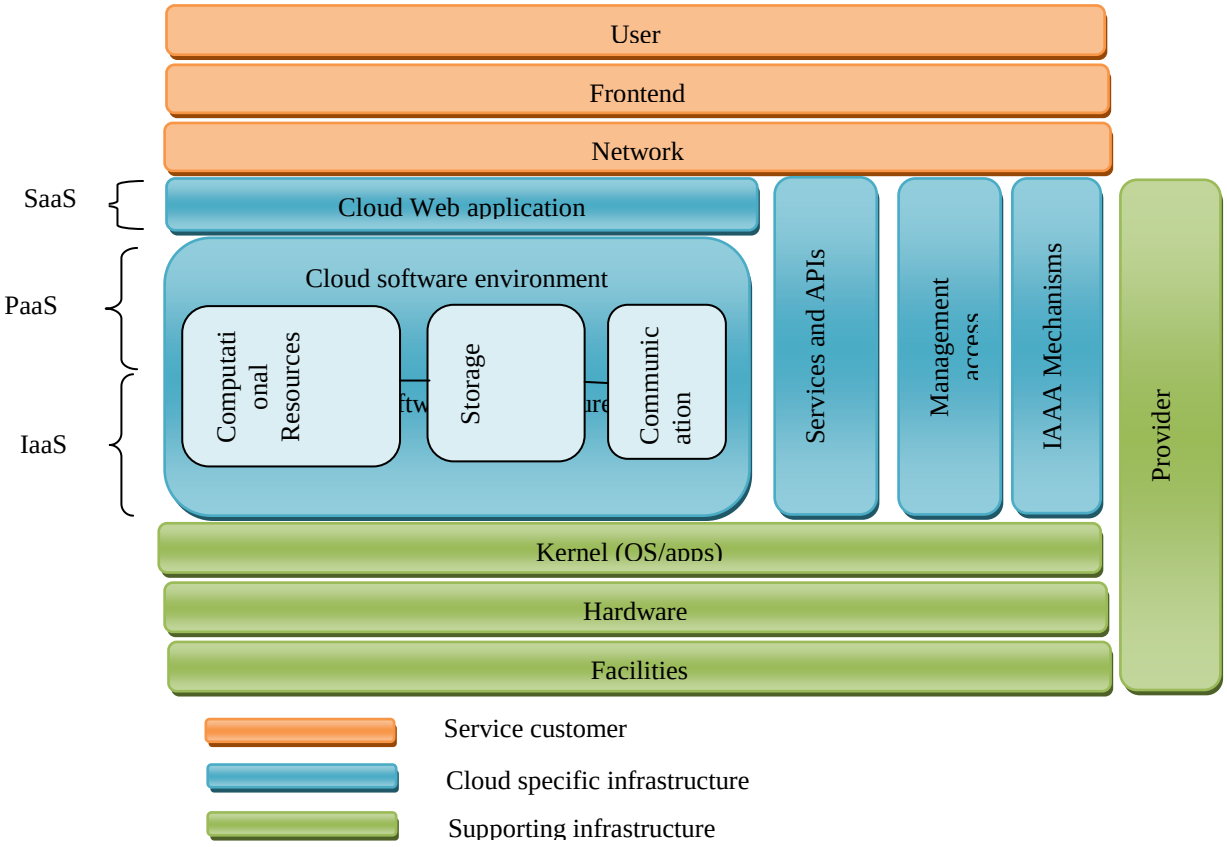

Figure 2: Cloud Computing Layered Architecture

Core middleware provides a wide set of services like quality of service, admission control, execution management and monitoring, accounting and billing that assist service providers in delivering a professional and commercial service to end users. The services forwarded by the core middleware are taken through a user level middleware. This provides Environment and tools simplifying development with the use of applications in the Cloud Tools like web 2.0 interfaces, command line tools, programming languages, libraries. The user-level middleware creates the access point of applications to the Cloud [12].

Job Scheduling In Cloud Computing

Since the development of the application, parallel computing has become the best system to meet the requirements of the application. Since parallel processing undoubtedly understood as a point of interest, it also has a broad weakness [11,29]:

- Parallel programs designing.
- Large tasks into small tasks partitioning
- Coordination between communication
- CommunicationSynchronization
- TasksScheduling

In this area, we have been brought different tests, but now the major issue of importance is scheduling and allocation in the frame work. Target of scheduling can be specified by the maximum number of assets to perform a framework to reduce the execution time. Scheduling problems can be of two types [8, 31]:

- Static and
- Dynamic

In static scheduling, execution time allocation error conditions are known in advance, and it ends at collection time. Thus, the use of the parallel program is represented as the DAG is called (directed acyclic graph) centre / edge weighted graph where the center of weight indicates the execution time and the weight of the edge, even if it is shows a time distribution corresponding to time of the assignment.

In dynamic scheduling, assignment execution time, the condition is known to assume only when needed. In this way, user can make two choices. There are two main elements of the scheduling of the main goals:

1. Execution time minimization of the assignment.
2. Scheduling overhead minimization.

Scheduling problem can be known as NP-complete problem. The scheduling problem as a set of tasks towards processor could be separated into following categories:

1. Job scheduling: Independent jobs are to be booked between the processors of a distributed registering framework towards upgrading general framework execution.
2. Scheduling and mapping: Various cooperating undertakings assignment of a solitary parallel program for minimizing the consummation time on PC framework paralleling.

Virtualization

Virtualization in cloud computing technology plays a major role, typically in the cloud, data, applications, and users such as shared in the cloud, but virtualization users to share communication. The main traditional virtualization technology are the cloud providers usually provide applications to the normal version of the user's cloud to understand the copyright notices issued and cloud providers must offer the latest version is likely that users will be clouds, but it was a more expensive. To overcome this problem, virtualization technology is used, with this, all servers and other cloud providers to enforce software functionality maintained by third-party personnel, cloud providers must pay the currency on a magazine or annual basis [4]. Most virtualization means organizing multiple operating systems on a single machine, but sharing is on all the hardware resources. It helps us to provide pools of IT resources that enable the user to share these IT resources in order to make a profit in our business.

Priority Scheduling

In priority scheduling, every development is scheduled for the priorities and the implementation of a way higher priority. Priorities are defined on internal or external basis [9].
In different priorities, the priority uses some quantity or value to be calculated for the process. For example, time limits, memory requirements, and the average number of unlocking files and input and output average burst rupture central processing unit is used to calculate the ratio of priority [10].

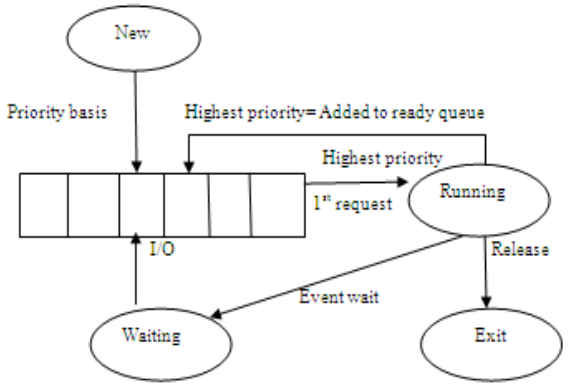

Figure 3: Priority based Scheduling

GENETIC ALGORITHM

According to Goldberg et al., 1989, GA (Genetic Algorithm) [45] is commonly used in applications where search space is huge and the precise results are not very important. The advantage of a GA is that the process is completely automatic and avoids local minima. The main components of GA [46] are: crossover, mutation, and a fitness function. A chromosome represents a solution in GA. The crossover operations used to generate a new chromosome from a set of parents while the mutation operator adds variation. The fitness function evaluates a chromosome based on predefined criteria [47]. A better fitness value of a chromosome increases its survival chance. A population is a collection of chromosomes. A new population is obtained using standard genetic operations such as single-point crossover, mutation, and selection operator [48].

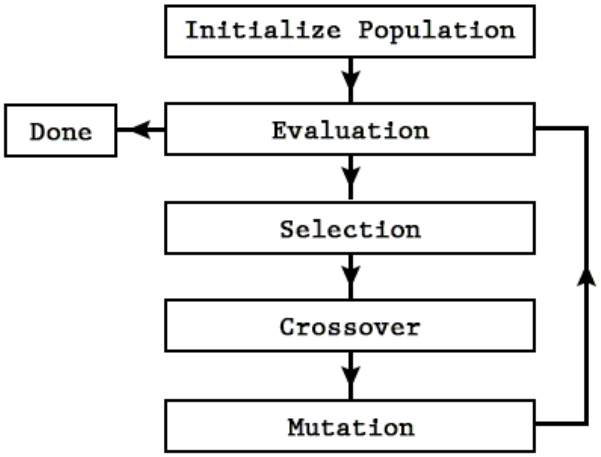

Figure 4: Flow Chart of Genetic Algorithm

1.5.1 Steps of Genetic Algorithm

Step 1: Initialize random population consists of chromosomes.

Step 2: Compute fitness function in the population.

Step 3: Develop new population consists of individuals.

Step 4: Selection of parent chromosomes to get best fitness function.

Step 5: Perform crossover to get copy of parents.

Step 6: Perform mutation to mutate new off springs.

Step 7: Place new offspring into the population.

Step 8: Repeat steps to get a satisfied solution.

Step 9: Stop

FUZZY LOGIC

Fuzzy logic [39] is the difficult mathematical model for understanding and it gives the uncertainty in reasoning. In the fuzzy logic, the knowledge of experts will be used using IF-THEN rules. A fuzzy logic [40] is a sub- set and whose membership functions are subsets of it. Fuzzy logic mainly depends on the three features, fuzzy values, linguistic variables and probability distribution. Fuzzy logic is easy to implement [41]. It takes the data as precise data. It works on the concept of the rules build to get the output. The development need of fuzzy logic lies in the human communication [42] [43].

Various features of fuzzy expert system are shown below [44];

- Input sample.
- Output sample.
- Subsets of input and output
- Rules related to fuzzy set.
- De- fuzzy fication

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II. PREVIOUS WORK DONE

Farhad Soleimanian Gharehchopogh talked about the security issues in cloud computing. According to the opinion, if the cloud computing services are going to be global, it should be taken care that they work in a better way everywhere like on mobile phones also as the mobile phones have applications to access everything. When the data is on a cloud platform, it is necessary to keep them in a safe way .The authors approach is only limited to keep the data on mobile devices which are related to cloud platform.

Vahid Ashktorab, Seyed Reza Taghizadeh has discussed the advantages of the cloud platform and the security risks of keeping the data on a cloud server. In this research, author have provided basic information about the security thefts of cloud server like SQL injection problem , DOS attacks and others.

K. S. Suresh discussed about the basic cloud features like Iaas,Paas and SaaS and the information that keeps the data at any cloud sever is providedand keep it encrypted so that no one can access the database to get the data directly. For the encryption mechanism, three good encryption algorithms namely AES, MD5 and RSA are presented.

Dr. A. Padmapriya discussed the general problems of the cloud computing server application and introduced a heterogeneous mode algorithm which is a combination of two or more security algorithms. The author has talked about the RSA and AES algorithm and provides information that they can be combined to create a new algorithm for the encryption part.

Tamleek Ali proposed a platform for the use of cloud computing for secure dissemination of protected multi-media content as well as documents and rich multimedia. They may have leveraged the UCON model for enforcing fine-grained continuous consumption control constraints on things residing in the cloud.

CONCLUSION AND FUTURE SCOPE

In this review paper, genetic algorithm optimization technique has been proposed along with Fuzzy logic for task scheduling in cloud computing. Genetic algorithm has been used for analyzing the number of jobs according to their execution time, cost, SLR etc. Then the analyzed jobs are scheduled or selected by using Fuzzy logic. The main aim to use fuzzy logic algorithm is to investigate the priority of a job that must be executed first. Secondly fuzzy logic has been used to adapt priorities of other jobs being waiting in case of new jobs arrives and considering deadlines for this jobs.Jobs having little processing time are assigned new higher processing priorities and hence improving user satisfaction.

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