Survey of Scheduling Algorithms in Cloud Computing through QoS Parameter Analysis

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ABSTRACT-Cloud computing is one of the recent trend in the digital world. This powerful and stylish technology makes a wonderful evolution in the internet services. Cloud computing helps the individuals and enterprises to think and work beyond their limitations by using different types of cloud services with desired quality of service(QoS). In provider perspective of view ,the main challenge in the cloud computing is to scheduling of workload to provide demanded quality of service. So workflow scheduling is the main focusing area of research in this domain. There are different types of scheduling algorithms are raised now a days and some of them are suitable for cloud computing also. This paper surveyed different scheduling algorithms in cloud computing area.

Keywords-*Cloud Computing, QoS, Workflow Scheduling*

I. INTRODUCTION

Every day is beginning with at least one new technology evolution in the digital world. When thinking about the computer, the main idea comes to our mind is performing tasks. The simple definition of computer is that "It is a machine that helps the human being to perform some digital and arithmetic tasks".

Computing is the process of one or more computers are working together to perform specific task. The first category of computing are centralized[1] and distributed[2] computing. The parallel[3] and grid[4] computing are evolved from the above types of computing.

Cloud computing[5], which is the most popular and recent computing paradigm in the digital computing world. Cloud computing is evolved from parallel and distributed computing which consists of virtualized[6] and physical computers that are dynamically used as computing resources. The allocation of computing resources is based on Service Level Agreement(SLA)[7] between the provider and consumer.

SERVICES OF CLOUD

There are different three main services provided by the cloud. This service models named as Infrastructure as a Service (IaaS) ,Platform as a Service (PaaS), and Software as a Service (SaaS). IaaS service model provide virtualized hardware and storage .The users can deploy their own applications and services on top of IaaS. Amazon is one of the popular Iaas type service provider. PaaS model provide an application development environment which is known as platform.The users can implement and run applications on this Cloud platform. Microsoft Azure is Paas type cloud. SaaS cloud will provide software applications to the users. The SaaS will either provide entire to the user as a service or as web service in which the user can develop their applications. Google Docs is an example of SaaS.Fig I shows the cloud service model

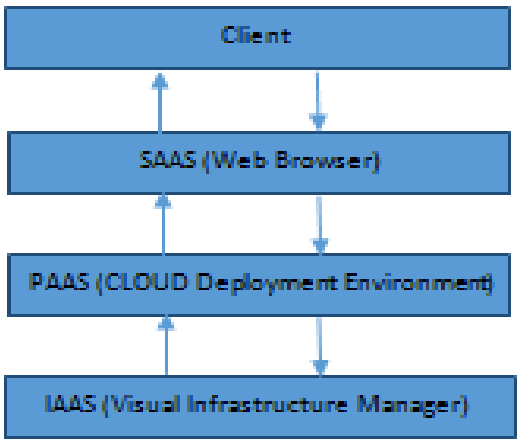

Fig I:Cloud Service Model

CLOUD SCHEDULING PARAMETERS

The overall performance of cloud is depends on the following characteristics.

1. Resource Utilization

Resource utilization is the measure of how effectively the resources are utilized in the cloud. The scheduling algorithms shout maximizes the resource utilization

2. Load Balancing

Load Balancing is the distribution of workloads across the cloud resources. The distribution of workload among the servers or resources will reduces the overall load to be found on alone server. .

3. Execution Time

The CPU time or burst time spent by the computer system for execution of a task is known as execution time.In cloud , including the time consumed to provide system services for task execution.

4. Response Time

The amount of time taken by the cloud ,to reply the user task very first time for required service. Response time for a particular service should be minimized.

5. Energy Consumption

Energy consumption is the amount of resource energy used to produce the output. Energy consumption should be minimal. The Cloud Computing environments require a big amount of communication among resources so it will consume more energy. The energy consumption should be minimized

6. Scalability

Scalability is the process of make changes according to the changes in the demands

7. Makespan

The makespan is the maximum time to complete all jobs. The amount of time, from start to finish for completing a set of tasks For better performance of the system .Makespan of scheduler must be minimum.

8. Throughput

Number of processes completed per unit time by the system is used to measure the performance of any system. The main objective of scheduling algorithms is to increase the throughput of the system

DEPLOYMENT OF CLOUD

The public cloud, private cloud , community cloud and hybrid cloud [2] are the four ways of cloud deployment. Microsoft and Google are the main public cloud providers. They are having own infrastructure and offer access for users via Internet. Public cloud provide applications, storage, and resources available to the general public. Private cloud is giving more importance to the security and confidentiality and are generally owned by individual organization for their own purpose .Hybrid cloud is a combination of two or more clouds (private, community or public) .But in Hybrid cloud the flexibility and security are compromised. The cloud that is shared among the organizations is known as Community cloud. The Banks are using Community Cloud for their better services and communication among the Banks.

II.TASK SCHEDULING

Task scheduling or workflow scheduling is the process of allocating appropriate resources to the workflows for performing the task in desired QoS. The workflow can be represented in a Directed Graph because of their nature there for need to handle this with most care. The scheduling of this workflows consists of sequence of steps in order to schedule them effectively. Each workflow consists of set of dependent tasks. The Workflow scheduling is the process of allocates tasks on suitable resources. The overall performance of the cloud system id mainly depends on the proper scheduling of workflows. For proper scheduling various scheduling algorithms are used

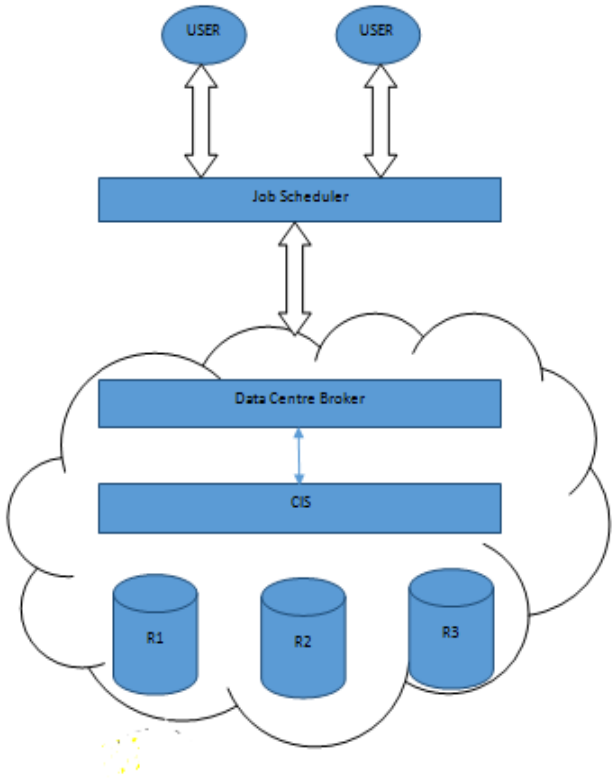

Fig 2:Cloud Scheduling Model

III.EXISTING TASK SCHEDULING ALGORITHMS

The various Task Scheduling algorithms are discussed in this section. The related scheduling parameters are also highlighted . Table 1 is the overall analysis and comparison of the existing Task Scheduling algorithms on the basis of their parameters

The Multi-Objective Task Scheduling Algorithm discussed in [7] considered the parameters makespan and cost. It also focusing on reducing the resource consumption. This paper says that the traditional scheduling algorithms are taking only one parameters and none of them are bothering about multiple parameters. The results shows that, Multi-Objective Task Scheduling Algorithm minimizes cost and makespan simultaneously and maximizes average utilization of resources.

A Particle Swarm Optimization based Heuristic for Scheduling Workflow Applications[9] introduced an algorithm based heuristic to schedule the applications to cloud

resources .This algorithm focused on computation and data transmission cost.. The results shows that PSO can minimize the cost and good distribution of workload onto resources.

In Particle Swarm Optimization based Task Scheduling [8] the resource allocation is through Berger model. The algorithm makes changes in the Particle Swarm Optimization (PSO) algorithm and introduced a quality of service based dynamic particle swarm optimization (QoS-DPSO) algorithm. The experiment results show that the user tasks can be effectively executed and the fairness in allocation of system resource can be achieved by this algorithm.

Tha paper [10] introduced Multiple Qos constrained scheduling strategy for multi-workflows. They implemented a strategy for multiple workflow management system with multiple Quality of Service. This algorithm minimizes the make span and cost of workflows .

Market-Oriented-Hierarchical Scheduling[11] which working on both service level scheduling and task level scheduling. The service level scheduling deals with the Task to Service assignment and the task level scheduling deals with the optimization of the Task to Virtual Machine assignment in local cloud data centers.

Green Energy-Efficient based Task Scheduling Algorithm [12] is based on priority Task Scheduling algorithm. This algorithm focusing on minimization of resource usage by the tasks. The main aim is to reduce power consumption and enhance resource utilization. The results shows that the power consumption is reduces as comparing with others.

Table 1:Comparison Of Existing Task Scheduling Algorithms

Scheduling Algorithm	Parameters Considered	Finding
Multi-Objective Task Scheduling [7]	Make span Resource Utilization Cost	Maximizes average resource utilization Minimizes cost and make span
A particle swarm optimization-based heuristic[9]	Resource utilization time	Good distribution of workload Cost Minimization
Particle Swarm Optimization based Task Scheduling [8]	Resource Utilization Scalability	Fair resource allocation
Multiple Qos constrained scheduling strategy for multi-workflows[10]	Cost Time Make span	Minimize execution time and Cost
Market oriented hierarchical strategy[11]	Cost,cpu time	Minimize Cost and cpu time
Green Energy-Efficient based Task Scheduling Algorithm [12]	Resource Utilization Energy Consumption	Minimize Power Consumption

IV.CONCLUSION

Task scheduling is one of the major issue in cloud computing environment. This paper studied various parameters which should be considered for smooth running of cloud and surveyed the various existing scheduling algorithms in cloud computing and compare their various parameters. It is very difficult to consider every parameters in a single algorithm. Instead of considering all, take the most important parameters to the front. The important parameters should be considered are Energy Consumption ,Scalability, Execution Time and Cost.

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