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EFFICIENT OPTIMAL TASK SCHEDULING ALGORITHM IN THE CLOUD COMPUTING ENVIRONMENT

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Abstract:
Cloud computing is a new distributed computing technology that allows for a pay-per-use model based on user demand and requirements. A cloud is a collection of virtual machines that includes both computational and storage capabilities. Cloud computing's primary goal is to provide efficient access to remote and geographically distributed resources. The cloud is evolving at a rapid pace and faces numerous challenges, one of which is scheduling. Scheduling is a set of policies that control the order in which work is performed by a computer system. A good scheduler adapts their scheduling strategy to the changing environment and task type. In this paper, we presented a Generalized Priority algorithm for efficient task execution and compared it to FCFS and Round Robin Scheduling.The algorithm should be tested in the cloud Sim toolkit, and the results show that it outperforms other traditional scheduling algorithms.
Key words: Virtual Machine, Scheduling, CloudComputing

1. INTRODUCTION

Cloud computing is driving the advancement of grid computing, virtualization, and web technologies.Cloud computing is a type of internet-based computing that provides infrastructure as a service (IaaS), platform as a service (PaaS), and software as a service (SaaS) (SaaS). The cloud provider makes software applications available in SaaS. PaaS is a service that provides an application development platform to developers in order for them to create a web-based application. IaaS provides computing infrastructure as a service to the requester in the form of Virtual Machines (VM). These (VM). These are the services are made available to customers on a subscription basis via a pay-as-you-go model, regardless of theirlocation. Cloud computing is still in its early stages and faces numerous issues and challenges. Among these issues, scheduling plays a critical role in determining effective execution.

Scheduling is a set of policies that govern the order in which work is performed by a computer system. Job scheduling is one of several types of scheduling algorithms that exist in distributed computing systems. The primary benefit of a job scheduling algorithm is that it achieves high performance computing and the highest system throughput. Scheduling manages CPU memory availability, and a good scheduling policy maximises resource utilisation. Here compared three algorithm execution times. Priority algorithm that is shared, shreds space, and generalises.

2. RELATED WORK:

Hierarchical scheduling is presented in this paper [1], which aids in achieving Service Level Agreements with quick response from the service provider. Quality of Service metrics such as response time are achieved in our proposed approach by executing the high priority jobs

(deadline based jobs) first by estimating job completion time, and the priority jobs are spawned from the remaining job using Task Scheduler.

The author of paper [2] proposed a task scheduling algorithm based on load balancing in cloud computing. Based on load balancing, this paper described two levels of task scheduling. This type of task scheduling not only meets the needs of the user but also maximises resource utilisation. The implementation of an efficient Quality of Service (QoS) based Meta-Scheduler and Backfill strategy based light weight Virtual Machine Scheduler for dispatching jobs was presented in this paper.

The authors of paper [3] presented an optimised algorithm for task scheduling based on the genetic simulated annealing algorithm. This takes into account the QoS requirements such as task completion time, bandwidth, cost, distance, and reliability. Annealing is used after selection, crossover, and mutation to improve the genetic algorithm's local search ability.

This section describes the related work ok task scheduling in a cloud computing environment.

The author of paper [4] provided a brief description of the cloud Sim toolkit and its functionality. Cloud Sim toolkit is a platform where you can test your work before applying it to real work; in this paper, we learned how to simulate a task using different approaches and scheduling policies.

The algorithm for transaction intensive cost constraint cloud Work flow scheduling was presented in the paper [5].The two most important considerations for algorithms are execution cost and execution time. The algorithm minimises costs while meeting user-specified deadlines. Our proposed methodology is primarily based on the computational power of Virtual Machines.

The author of paper [6] proposed an algorithm called Ant colony optimization, which uses a random optimization search approach to allocate incoming jobs to virtual machines. This algorithm employs a positive feedback mechanism and mimics the behavior of natural ant colonies in searching for food and communicating with one another via pheromones laid on paths travelled.

The author presented an optimised algorithm for task scheduling based on Activity Based Costing in paper [7]. (ABC). This algorithm uses cost drivers to assign a priority level to each task. ABC assesses the cost of the object as well as the performance of the activities.

A new VM Load Balancing Algorithm is Weighted Active Monitoring Load Balancing Algorithm using CloudSim tools, for the Datacenter to effectively load balance requests between the available virtual machines assigning a weight, in order to achieve better performance parameters, is described in paper [8]. Here, VMs with varying processing power are assigned or allocated, and tasks/requests are assigned or allocated to the most powerful VM, then to the least powerful, and so on.

The author of [9] suggests a priority-based dynamic resource allocation in cloud computing. This paper investigates how multiple SLA parameters and resource allocation via a pre-emption mechanism for high priority task execution can improve cloud resource utilisation. The paper's main selling point is that it provides dynamic resource provisioning and achieves

multiple SLA objectives through priority-based scheduling. Because cost is an important consideration in cloud computing.
In paper [10], the basic OS algorithms such as FCFS, Priority Scheduling, and Shortest Job are analysed and evaluated in a cloud environment using Cloud Sim. First, we test which scheduling policy performs best under various conditions.

3. PROPOSED ARCHITECTURE AND METHODOLOGY:

Resource allocation and scheduling are important factors that influence the performance of networking, parallel, distributed, and cloud computing. Many researchers have proposed different algorithms for efficiently allocating, scheduling, and scaling cloud resources.
The cloud scheduling process can be divided into three stages, which are as follows:

1. Resource discovering and filtering –
2. Datacenter Broker discovers and filters the resources present in the network system and collects status information about them.
3. Resource selection - The target resource is chosen based on specific task and resource parameters.

In this section, we will primarily discuss three scheduling algorithms: first come, first served, round robin scheduling, and a new scheduling approach called generalised priority algorithm.
First Come First Serve Algorithm - FCFS is used for parallel processing and selects the resource with the shortest waiting queue time for the incoming task. For internal job scheduling, the Cloud Sim toolkit supports the First Come First Serve (FCFS) scheduling strategy. The virtual machine provisioned component is responsible for allocating application-specific VMs to Hosts in a Cloud-based data centre. The default policy implemented by the provisioned VM is a simple policy that allocates a VM to the Host on a First-Come-First-Served (FCFS) basis. One of the drawbacks of FCFS is that it is not preventative. The shortest tasks at the back of the queue must wait for the long task at the front to complete. It has a slow turnaround and response time.
Round Robin Scheduling Algorithm - The Round Robin (RR) algorithm prioritises fairness. To store jobs, RR employs the ring as a queue. Each job in a queue has the same execution time and is executed sequentially. If a job cannot be completed during its turn, it will be returned to the queue and held until the next turn. The RR algorithm has the advantage of executing each job in turn, eliminating the need to wait for the previous one to finish.However, if the load is discovered to be heavy, it will take RR a long time to complete all of the jobs. For internal job scheduling, the Cloud Sim toolkit supports the RR scheduling strategy. The disadvantage of RR is that the largest job takes a long time to complete. Generalized Priority Algorithm- Customers define the priority based on user demand, and you must define the parameters of the cloudlet such as size, memory, bandwidth scheduling policy, and so on. The tasks in the proposed strategy are initially prioritised based on their size, with the largest having the highest rank. The Virtual Machines are also ranked (prioritised) according to their MIPS value, with the highest MIPS having the highest rank. Thus, the key factor for prioritising tasks is their size, and for VM, it is their MIPS. This policy outperforms FCFS and Round Robin scheduling.
Consider a 5 computational specific VirtualMachines represented by their Id and MIPS

As V = {{0, 250}, {1, 500}, {2, 750}, {3, 1000}, {4,250}}. Here Vm4 will get first preference because ofthe highest MIPS, second preference is given to Vm3and then Vm2, Vm1 and Vm5 get rest preferences.

Algorithm-

The algorithm is given below. This algorithm storesall suitable Virtual Machines in a VM List.

---

prev −99
push first vertex
while Stack 6= Empty do
get unvisited vertex adjacent to stack top
if no adjacent vertex then
if prev 6= StackTop then
copy all stack contents to VM List
end if
pop
if Stack 6= Empty then
prev = StackTop
end if
else
mark the node as visited
push adjacent vertex
end if
end while

Here are

Step -1 Assign VMs to different Datacenters based on the computational power of the host/physical server in terms of processor cost, processing speed, memory, and storage.

Step 2: Determine cloudlet length based on computational power.

Step 3: Vm Load Balancer keeps an index table of Vms; currently, vm has no allocation.

Step 4: Cloudlet is bound based on its length and MIPS.

Step 5: The cloudlet with the longest length receives the most MIPS from the virtual machine.

Step 6: The datacenter broker sends the request to the Vm with the id

Step 7: Refresh the available resource.

4. EVALUATION AND EXPERIMENTATION

To validate our algorithm, we ran tests on an Intel(R) core(TM) i5 Processor 2.6 GHz, a Windows 7 platform, and the CloudSim simulator. The Cloud Sim toolkit allows you to model cloud system components like data centres, hosts, virtual machines, as well as scheduling and resource provisioning policies. A tool kit is an application that allows for the evaluation of hypotheses prior to software development in an environment where tests can be replicated. We created 5 Virtual Machines with the Vm component and set the RAM property to 512 MB for all Virtual Machines, as well as the MIPS to 250, 500, 750, 1000, and 250, respectively.

We created 14 tasks with the Cloudlet component and set the Cloudlet length to 20000, 10000, 20000, 10000, 10000, 20000, 10000, 10000, 20000, and 10000, respectively. We considered 5 Virtual Machines with MIPS 1000, 750, 500, 250, 250, and 512 MB RAM. Experiments are carried out for varying numbers of tasks such as 100, 200, 300, 400, and 500. For comparison and analysis, we used the FCFS, Round robin, and Generalized priority algorithms.

Table1: Comparison of FCFS, Round Robin and Generalized Priority Algorithms

FCFS Algorithm			Round Robin Algorithm			Generalized Priority Algorithm		
Execution Time (ms)	Data Centerid	VM	Execution Time	Data Centerid	VM	Execution Time	Data Centerid	VM
87	2	4	238	2	5	19	2	2
14	2	5	112	2	2	18	3	1
85	2	3	156	2	3	41	3	4
22	3	4	42	2	4	37	2	3
45	3	4	25	3	1	38	3	5
80	2	5	234	2	4	38	2	2
10	2	1	112	2	2	21	2	3
85	2	2	152	3	4	42	3	4
24	3	4	45	2	4	40	2	2
44	3	5	25	3	5	40	2	1
81	2	1	234	2	2	41	3	2
13	2	2	115	2	2	21	3	5
46	3	2	117	3	4	27	2	4
42	2	5	125	2	5	29	3	2
48.42			123.71			32.28		

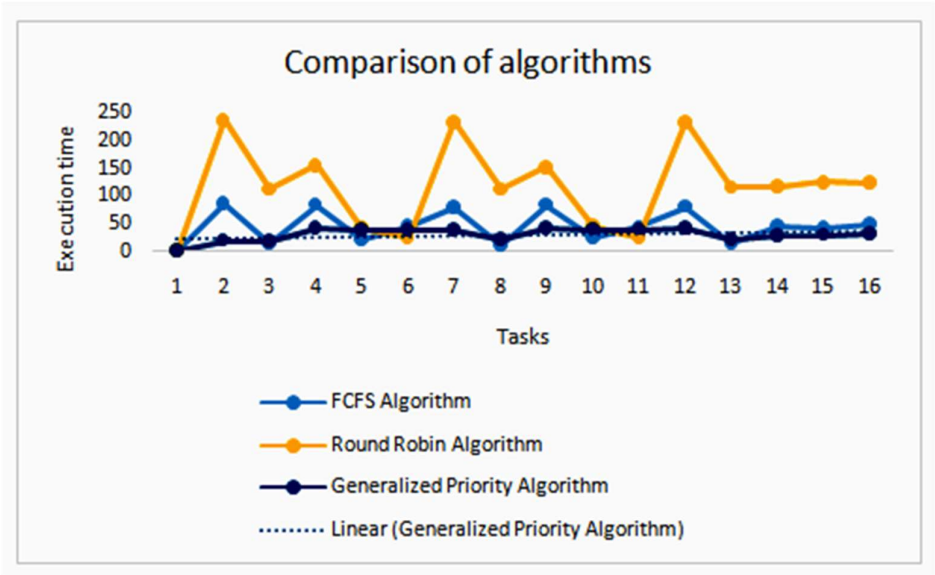

Figure 1: Comparison of Three algorithms

5. CONCLUSION

Scheduling is a critical task in the cloud computing environment. In this paper, we examined various scheduling algorithms for efficiently scheduling computational tasks in a cloud environment. We developed FCFS, a round-robin scheduling algorithm, and a new proposed scheduling algorithm, (GPA), which stands for generalised priority algorithm.Priority is an important consideration in cloud job scheduling. The experiment is carried out with a variable number of Virtual Machines and workload traces. The experiment is compared to FCFS and Round Robin. The results show that the proposed algorithm outperforms the FCFS and Round Robin algorithms. In this paper, we primarily discuss three algorithms. We developed a new generalised priority-based algorithm with limited tasks; in the future, we will take more tasks and try to reduce the execution time as presented; and we will adapt this algorithm to a grid environment and compare the time difference between cloud and grid.

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