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Cloud Computing – Task Scheduling based on Modified CHC Algorithm

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Abstract - Cloud Computing refers to Internet based development and Utilization of computer technology and so it can be described as a Internet Based Computing. Scheduling is a critical problem in cloud, because cloud provider has to give services to many users in the Cloud Environment. The main objective of scheduling is to maximize resource utilization and to minimize processing time of task, where resource utilization is Cloud Service provider's perspective to ensure that resource are utilized efficiently and processing time of task is the User's perspective by considering quality of service parameters like task completion time or task execution cost. This paper includes algorithm CHC with using Max-min which satisfies both Cloud Service provider's perspective and User's perspective and improves performance and gives efficient output. The experimental results show that Modified CHC algorithm has good efficiency , the total completion time is relatively shorter.

***Key Words*: cloud computing; task scheduling; CHC algorithm, max-min algorithm, cloudsim**

1.INTRODUCTION

Cloud computing is experiencing a rapid development both in academia an industry; it is promoted by the business rather than academic which determines its focus on user applications. This technology aims to offer distributed, virtualized, and elastic resources as utilities to end users. It has the potential to support full realization of 'computing as a utility' in the near future[1]. With the support of virtualization technology[2, 3], cloud platforms enable enterprises to lease computing power in the form of virtual machines to users. Because these users may use hundreds of thousands of virtual machines (VMs)[4], it is difficult to manually assign tasks to computing resources in clouds[5,6]. So we need an efficient algorithm for task scheduling in the cloud environment[7].

2. THE CLOUD TASK SCHEDULING OF IMPROVED CHC ALGORITHM

Cloud consists of a number of resources that are different with one other via some means and cost of performing tasks in cloud using resources of cloud is different so scheduling of tasks in cloud is different from the traditional methods of scheduling and so scheduling of tasks in cloud need better attention to be paid because services of cloud depends on them.

Task scheduling plays a key role to improve flexibility and reliability of systems in cloud. The main reason behind scheduling tasks to the resources in accordance with the given time bound, which involves finding out a complete and best sequence in which various tasks can be executed to give the best and satisfactory result to the user. In cloud resources like firewall, network all are always assigned dynamically so task scheduling is a dynamic problem[6].

2.1 Scheduling Process

Scheduling theory for cloud computing is receiving growing attention with increase in cloud popularity. In general, scheduling is the process of mapping tasks to available resources on the basis of tasks' characteristics and requirements. It is an important aspect in efficient working of cloud as various task parameters need to be taken into account for appropriate scheduling. The available resources should be utilized efficiently without affecting the service parameters of cloud.

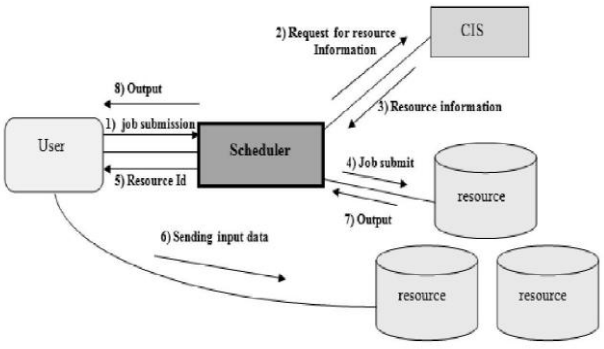

Fig. -1: Scheduling Process

The fig.-1 shows basic scheduling process which is done in cloud environment and its components. Each step of process is described through 1 to 8 description notation mentioned on arrow mark. This process is categorized into 3 stages and all these are described below.

Scheduling process in cloud can be generalized into three stages shows in below:

Resource discovering and filtering - Datacenter Broker discovers the resources present in the network system and collects status information related to them.

Resource selection – Target resource is selected based on certain parameters of resource. This is deciding stage.
Task submission -Task is submitted to resource selected.

2.2 Existing Task Scheduling Algorithm

Now in this section we will discuss the existing task scheduling algorithms which are widely used now days due to its characteristics. The various task scheduling algorithms need to be studied are as follows:

Min-min Algorithm

Min-min heuristic selects the smallest task first from all the available tasks and assigns it to a machine which gives the minimum completion time (fastest machine) for that task. This method increases the total completion time of all the tasks and for this reason increases the makespan. But Load of the machine is not considered before scheduling as simply assigning smaller tasks on faster machines. The execution time and expected completion time for a task are measured to be almost same values. The long tasks have to wait for completing the execution of smaller ones. But overall throughput of the system is improved by this method [3].

Round Robin Algorithm

In this, the DCC assigns the requests to a list of VMs on a rotating basis. The first request is allocated to a VM which is randomly picked from the group and then the subsequent requests assigns in a circular order by the DCC. Once the VM is assigned the request, the VM is moved to the end of the list.

Max-Min Algorithm

The concept of Max-Min is related to min-min apart from that it selects the longest task(with maximum completion time) first to schedule on the finest machine existing based on the minimum completion time of that particular task on all available machines.[3]

CHC Algorithm

Eshelman proposed an algorithm named as CHC algorithm (Cross-generational elitist selection, Heterogeneous recombination, and Cataclysmic mutation) which uses an elitism selection method combined with a highly disruptive crossover promoting the diversity of the population. This algorithm was tested against different genetic algorithm approaches, in numerous static optimization problems, achieving superior results, especially on hard problems. The main characteristic of this algorithm is its capacity of preventing the convergence of the population, a key issue when dealing with dynamic environment[1][2].

In all above algorithms this paper focuses on CHC Algorithm.
In CHC Algorithm the system contains five different functions which are Chromosome coding, Population Initialization, Fitness Function, Crossover and Mutation[1]. In this crossover and mutation functions are also considered as Genetic operators. Crossover function also known as recombination[16]. All functions are used to do different kind of procedure which describe in below.
Chromosome Coding : Existing system uses indirect encoding method. Total number of sub-tasks indicates length of the chromosome. We can find total completion time of task through this function[1].
Population Initialization: S chromosome is generated randomly by the system and length of it is M, the range of gene is [1,R], where S indicates the population size, M indicates the total number of subtasks and R indicates total resources.
Fitness Function:This function calculates fitness value and according to that measures the quality of the represented solution domain. This function is always problem dependant[16].
Crossover: It selects individuals from the parental generation and interchanging their genes to obtain new individuals. Existing system uses multi-point crossover method. Because of this multi-point crossover method individuals behaviour will be controlled[1].
Mutation: When the hamming distance is d<0, this fuction would work. In intial stage mutation function is same as standard CHC algorithm.

2.3 Proposed Algorithm

The proposed algorithm mainly focuses on how the incoming tasks are scheduled to the available virtual machines efficiently and fairly. The basic methodology of the proposed algorithm is given in the following steps:

Step 1: Start

Step 2: Input the original data

Step 3: Design chromosome coding and initialize population

Step 4: Calculate population's fitness value

Step 5: Check resource load according to max-min time

Step 6: If DCmax >∑i=1 to tn Task(i).Vmload

Goto step:7

Otherwise

Goto step:3

Step 7: Improved multi-point crossover

Step 8: Check if population evolve to certain convergence period then

do

mutation

otherwise

Find the population for next generation

Step 9: If value is not meet to the fitness function

do

Gen=Gen+1

Otherwise

Output result

Step 10: End

3. EXPERIMENTAL RESULTS AND ANALYSIS

In order to prove the feasibility and effectiveness of this modified CHC algorithm in task scheduling, Cloudsim simulator platform has been chosen for simulation. By rewriting the DataCenterBroker class, of clousim simulator experiment result was taken. Also in this paper we have taken existing Round Robin, CHC and improved CHC algorithm for comparison of results.

The initial conditions of algorithm : S= 50, R=10, M=1000. Where S= Population Size, R= Total resources, M= the total number of subtasks.

The following chart-1 shows result of proposed algorithm with other traditional algorithms like CHC, Round Robin and Existing CHC algorithm.

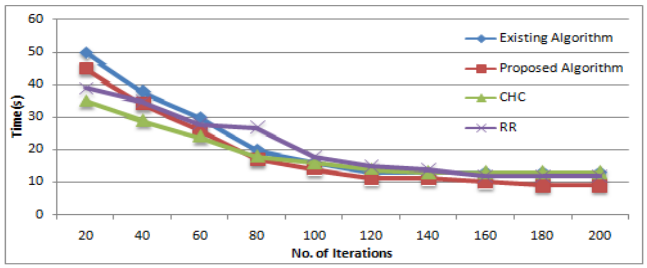

Chart -1: The Total Completion Time

The following Chart-2 shows efficiency parameter comparison of proposed algorithm with other traditional algorithms CHC, Round Robin and Existing CHC algorithm.

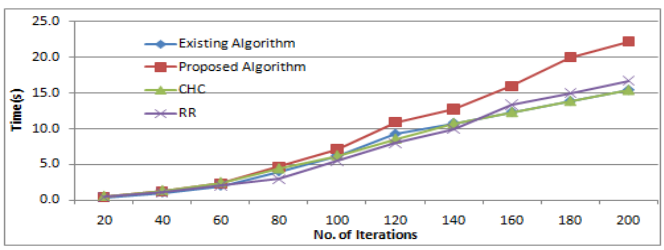

Chart -2: Efficiency Comparison

4. CONCLUSIONS

In Proposed CHC task scheduling algorithm, which not only focuses on the total completion time of task, but also takes the max-min time to complete the task into account. The Proposed CHC algorithm is faster than the existing algorithm for cloud computing to achieve an ideal task scheduling, thus it is a task scheduling algorithm of high efficiency.

In proposed algorithm I focused on the parameter time as I considered Max-min time for tasks which I want to schedule and according to that efficiency parameter is improved. So here I considered Max-min time of task where as in existing scenario average completion time of task is considered, where as total completion of task is common in both approach. In future research researcher can focus on another parameter of algorithm like throughput, makespan etc and try to get more efficient result for task assignment.

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