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A Bi-Objective Approach for Cloud Computing Systems

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ABSTRACT: There are Various factors that affects the performance of the system among those makepan and the energy consumption are the important constraint that affects the performance of the system to great level, unlike previous approaches this method concentrates on both makespan and energy consumption of the task. So here in this method we propose a novel algorithm called Artificial Queuing Algorithm which is capable of reducing the completion time of the task that enter into the system. Also the system is composed of many subsystems which are independent in their functionality will reduce the burden of the server and it causes the system to act normally making the system to consume energy at a minimum rate. While observing the result we can determine that our approach outperforms previous scheduling methods to a better level minimizing both the makespan and the energy consumption.

I. INTRODUCTION

Scheduling a precedence constraint application in a heterogeneous computing environment in an optimal manner is not easy to achieve, so in order to accomplish it and obtain a performance oriented schedule there are certain aspects that has to be considered. Most of the previous work has focused on reducing the completion time of the task without considering the power consumption. So this method considers both the power consumption and completion time of the task.

Cloud computing is a technology that has developed from distributed computing, grid computing and utility computing. In cloud computing, the clients just no need to own any software to access the service of the organization they can access the any type of service through the cloud network. The client uses the services and pays for whatever service he has acquired. The cloud computing System can offer any kind of services it can start with a simple email application to Infrastructure and platform level. There are several standards that determine the quality of the service and its cost. The duration of this service (makespan) and the energy consumption are very important among these standards. Here this method focused mainly on providing the client with better service that considers both the service time and energy consumption into account [15].

There existed a problem of finding a balance between the completion time and the energy consumption of a precedence constrained parallel application. The solution to this problem is a set of Pareto points where the Pareto solutions are those in which Improvement in one objective will cause the one other objective to decline. Instead of a distinctive solution to the problem, the Pareto points are considered as the solution to the problem.

On the other hand, many works have focused on precedence-constrained parallel applications. Most of these works had used some algorithms to minimize the completion time of the tasks. But currently some of the works are been concentrating in reducing the energy consumption. Due to the importance of energy consumption, various techniques like resource hibernation have been considered in the previous works but here independent systems are been used to handle the various work of the server so as to avoid the system overload and by making the individual systems to process different kind of information and provide various kind of service will cause the system to run normally without any resource contention.

Our new approach consists of utilizing an Artificial Queuing (Arti-Q) algorithm. The outcomes clearly demonstrate the superior performance of this algorithm over the other algorithms like Task Duplication based Scheduling (TDS)

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algorithm [1] and Heterogeneous Earliest Finish Time (HEFT) algorithm. Arti-Q algorithms make it possible to explore a great range of potential solutions to a problem.

II. SYSTEM AND ITS ISSUES

The system present in this method need to hold two important things that has to be achieved ,first the makespan need to be reduced then the energy consumption has to be minimized with these things the system is been employed in this method.

2.1 SCHEDULING WITH LESS COMPLETION TIME

The most important performance factor is the makespan time, in order to effectively improve the performance of the tasks that enter into the cluster and also to provide a high interactive service to the end-users the completion time of the task should be reduced. Also it is known that the application scheduling problem is NP-complete due to this various algorithms were proposed and by using various ideas from that algorithm a novel algorithm named Artificial Queuing (Arti-Q) algorithm is been used here and this algorithm is used to achieve low time complexity

2.2 ENERGY CONSERVATIVE SCHEDULING

Mostly in the Heterogeneous computational environment the task that enters into the system are organized in a way to minimize the completion time of the task, so due to its importance in the cloud Environment the objective is been satisfied without focusing much on energy consumption. But later the energy consumption has become a major concern in heterogeneous computational environment. Here the main goal is to addresses the problem of scheduling precedence-constrained parallel applications on such systems where it uses a proxy scheduler to reduce the processing burden of the server while using this technique the energy consumed by the server will concurrently get reduced and thereby the energy consumed by the entire system will be minimized [3].

III. MODELLING AND APPROACH FOR SCHEDULING

In Heterogeneous Computational Environment in order to achieve an optimal schedule there are two thing that are to be considered they are make span and energy consumption by keeping these two factor in to consideration a schedule has to be designed., so here we derive a novel approach to solve this problem and it is been described in this section[10].

3.1 SYSTEM MODEL

The entire system is been modeled as an individual subsystems which are capable of performing different kind of functions and it can deliver variety of services and whenever a request is been received by the server it will be diverted to the appropriate subsystem present inside the cloud network consider the Fig 1 given below.

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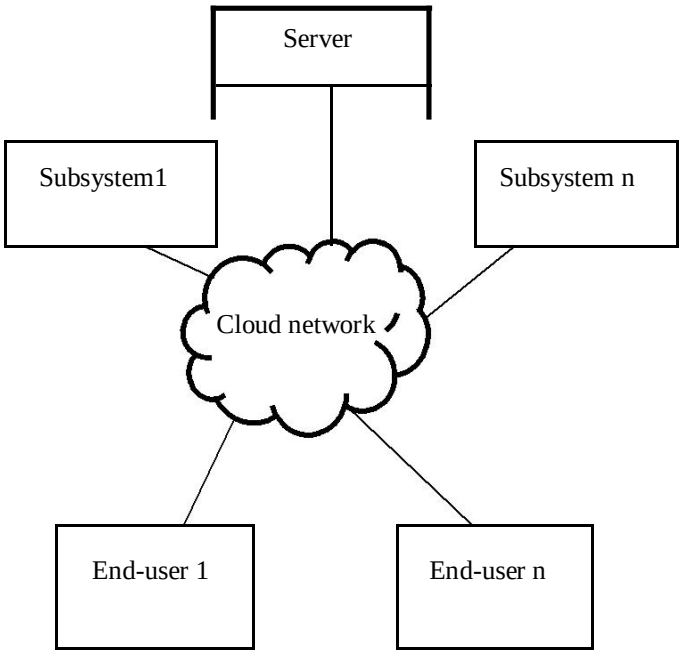

Here the cloud network is composed of central server, subsystems and it enables the end-user to acquire the service of the network. Each subsystem is capable of providing their own service the request that is been captured by the system is been determined to check what kind of service is been requested by the user and then according to it the server will transfer the request to the corresponding subsystem.

3.2 ARTIQ ALGORITHM

In order to activate the algorithm there are various steps that needs to be followed as soon as the timer is been enabled. Activate the timer with time variation of one second so that the time that request that has been made to the server can be determined then the time is been saved in the database.

Artiq Algorithm

1: Enable Timer with Interval of one second time variance.

2: When timer hits any incoming request, break the requested Data and apply to switch case and match with the mobile Syntax below

3: User Defined Syntax 1

4: User Defined Syntax 2

5: User Defined Syntax 3

6: If match with the syntax found then

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7: Determine where the request has to be passed.

8: If Server busy then

9: Use the proxy Scheduler

10: End If

11: Call the appropriate function

12: End If

13: Analyze the request for similarity

14: If two or more request found similar then

15: Prepare the response for all requests simultaneously

16: Once packet is ready send it to the Corresponding client

17: End If

18: Calculate the difference between request time and response Time.

19: Use the Performance Counter API to calculate the Energy consumed by the CPU.

Determine the type of request that the user has made and then check the syntax and then according to its type the server can decide to which system the request can be transferred. According to the servers current load the algorithm can determine and it can use a proxy server to schedule the incoming jobs so that the load on the server can be reduced, by doing that the response time of the job can be reduced and also the energy consumption done by the system can be minimized. The actual time of the response given to the user is been noted and then it is been stored in the database and after that the request time is been gathered from the database and then it is been used with the response time to calculate the actual service time which will be minimal compared to the genetic algorithm

3.3 A PROXY BASED APPROACH FOR SCHEDULING

The task in the Directed Acyclic Graph (DAG) is been arranged according to the level of priority and then it is been collected by the incoming job manager and the incoming job manager sends the request to the server and the server is capable of collecting various types of requests, and then the server analyses the nodes in its cloud network and then it determines which system is capable of performing the required service and then according to it the server transfer the control to the appropriate node [1].

When the server is been overloaded it employs a proxy server which is capable of scheduling the incoming jobs to the systems, and by this the service time will get improved which can be calculated by finding the difference between the arrival time of the job and its response time. After that the processing done by the server will take a less energy due to the utilization of the proxy scheduling which saved the server from overload problem which may consume much amount of power. Unlike the genetic algorithm this algorithm uses a proxy scheduler which reduces the response time of the service

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and parallely it minimizes the energy consumption done by the system which will improve the performance of the system in a greater level. [11].

IV. EXPERIMENTATION AND RESULTS

Herein this method the experimental results of the proposed Artiq based system is been considered using .Net Framework also we have explained the working of the independent system in this method.

4.1 ARTIQ BASED SYSTEM

The main aim of ARTI-Q system is to make machines take decision automatically using predefined codes and to avoid the human interaction in order to avoid any human errors. This technology is controlled by Asynchronous transmission commands supported device management and OBEX supporting mobile devices such as W220i model of Ericson mobile. The ARTI-Q uses the algorithm similar to priority based algorithm were its being implemented inside the program. The size of the packet is 140 characters. The capacity of the queue differs from the command that the client have requested. When a client sends a request using the syntax, all the request's made are stored into the queue. The working details of the Arti-Q system is shown below in Table 3.1 Here's how Arti-Q works, when many users send the request using any of the following syntax.

ROUTELIST (in order to find the available routes)
CC (Trace Client details with Customer Code)
CP (Trace Client details with Customer Phone Number)
TCL (Trace Total Client, Client balance, Pending CAN's, Delivered CAN's)
RL (Trace Client names according to Route List)
SUP (Trace Supplier Details)
SP (Trace Supplier code, Trader Name, Address)

Table 1. Command and Priority measure in Arti-Q

Current Queue	Request Command	Priority Response
Device1	TCL	2
Device2	Routelist	1
Device3	Prolist	1
Device4	RouteList	3

The entire request is stored into the queue. Where if any two request received were found to be similar, the ARTI-Q provides the corresponding response simultaneously to the two user to save time. Below in the Table 3.2 the 1st, 5th and the 2nd, 4th user has requested for the same information. Now the ARTIQ system will generate a similar type of response to two clients who has requested for the service and it provide the response to both the user's simultaneously (i.e.) the cc-

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routelist Customer details with Customer Code and the route list- to find the available routes will be sent to all the four users simultaneously.

Table 2. Command Entries in Artiq

Command	Cc135	Routelist	prolist	Routelist	Cc135
Entries	1	2	3	4	5

While applying this method the response time of the task will be reduced to a greater level. Also here many subsystems are been used to reduce the processing burden of the server which will cause the system to act normally consuming minimum energy [11]. So while using this method the energy consumed by the server will be reduced by balancing the processing work in the system.

4.2 MAKESPAN CONSERVATION

Here a simple experimentation is been done and it been carried out with five mobile client device which are been attached to the cloud network and a system is capable of receiving all the request and then analyze it and then transfer the request to the appropriate subsystems, here our method is been compared with a general cloud computing system which is been supported by Genetic algorithm to reduce the makespan of the task that enters into the system and Dynamic Voltage Scaling technique to minimize the energy consumption of the system.

Its show how the Artiq system performs well when it is been compared with the Genetic based methods both the time measurements are been calculated and the average of the time is been taken into consideration and the mean difference between both the time interval is 4.25 seconds which is more better than the genetic based system and the variation between the genetic and the Artiq based system is shown in the fig.3

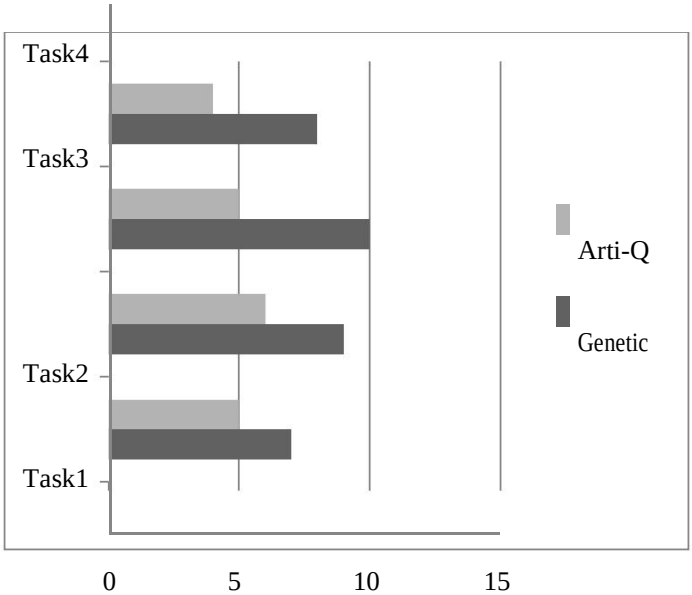

Fig 3. Response Time of various tasks

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V. CONCLUSION

Techniques like Proxy scheduling and Artiq algorithm reduced the power consumption and completion time of the task in the Cluster. whenever the task enters into the system a decision is been made to determine where to pass the task into the cloud network according to the decision the request will be handled by the server or in the case of overload the request may be passed to the proxy scheduler. The utilization of the proxy scheduler will be made transparent to the user, where the request seems to get processed through the actual server and by using this technique the completion time of the task will be reduced and the energy consumption also gets minimized, and this will enhance the performance of the entire system.

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