New Grouping Base Task Scheduling Model In Cloud Computing

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Abstract

Cloud Computing is a new and inevitable technology in the fields of scientific, and engineering, and as well as in commercial, and industrial enterprises. In cloud computing there are many tasks that needs to be executed by the available resources to acquire high performance, reduce task completion time, minimize response time, utilization of resource usage and etc. However, user tasks developed for cloud might be small and of varying lengths according to their computational needs and other requirements. Certainly, it is a real challenge to design an efficient scheduling strategy to achieve high performance in cloud computing. There are many existing algorithms for task scheduling but not reducing communication overhead time and computation time, and on the other hand maximizing resource utilization. The purpose of the study is to analyze and achieve better performance by taking new concept of grouping based task scheduling Therefore, this paper proposes "New Task Scheduling Grouping Base Model" with the objective of minimizing overhead time and computation time, thus reducing overall processing time of tasks.

1. Introduction

Cloud computing always refers to Internet based development and utilization of computer technology, and hence, cloud computing can be described as a model of Internet-based computing. Actually, it is a style of computing, in which dynamically scalable (and mostly virtualized) resources are provided as a service over the Internet. [1]. A process of task scheduling is manages and maps the execution of mutually dependent tasks on the resources It allocates suitable tasks to resources so the execution is often completed to satisfy objective functions imposed by client.

Scheduling is a critical problem in Cloud computing, because a cloud provider has to serve many users in Cloud computing system. So scheduling is the major issue in establishing Cloud computing systems. Suitable task scheduling will have important impact on the performance of the system. The general issue in scheduling tasks on distributed resources belongs to a category of issues called NP-hard issues. This type of problems it is difficult to find algorithms to build the optimal solution within polynomial time. Even if the task scheduling problem can be solved by using comprehensive search, the methods difficulty for solving task scheduling is very high. In Cloud environments, scheduling decision must be made in the minimum time possible, because there are many clients computing for resources, but at any time, time slots required by one customer could be taken by another customer. There are some major components in a task scheduling system: the task scheduling, data movement and fault management. Task scheduling find out resources and allocates tasks on proper resources to fulfil client requirements, whereas data movement manages data transfer between selected fault management and resources provides mechanisms for failure handling throughout execution. Additionally, the enactment engine provides opinion to a monitor therefore users can scan the task methodology standing through a task scheduling monitor [1].

The Task grouping is done found on a particular granularity size. Granularity size is the time within which a task is processed at the resources. It is used to measure the total amount of tasks that can be completed within a specified time in a particular resource. Relationship between the total number of tasks, processing requirements of those tasks, total number of available Cloud resources, processing capabilities of those resources and the granularity size should be determined in order to achieve the minimum. Task execution time and cost, and minimum communication overhead time and maximum utilization of the Cloud resources.

The rest of this paper is organized as follows: Section 2 briefly discusses related work, whereas

Section 3 task Scheduling model and Scheduler architecture Section 4 proposed Scheduling Algorithm Finally, Section 5 conclude the paper.

2. Related Work

In this section, some of the delegate research works on Task scheduling in distributed computing systems and Cloud computing environment have been reviewed to explore the relevance of these works.

Scheduling structure for Bandwidth-Aware Job Grouping-Based strategy that groups the jobs according to MIPS and Bandwidth of the resource, but the lack of the algorithm is first, groping strategies does not utilize resource sufficiently, and second, consideration of bandwidth strategy is not efficient to transfer the job[2].A Bandwidth-Aware Job Grouping-Based scheduling strategy, that groups the jobs according to the MIPS and bandwidth of resources, but short comings of the algorithm is first, the model sends group jobs to the resource whose network bandwidth has highest communication or transmission rate, but the algorithm does not ensure that resource having a sufficient bandwidth will be able to transfer the group jobs within required time[3].Constraint-Based Job and Resource scheduling (CBJRS) algorithm in which reducing the processing time, processing cost and enhance the resource utilization in comparison to other algorithms. Resources are arranged in hierarchical manner. So top of resource have maximum computational power. Job grouping strategy is use for job scheduling and it is based on the characteristics of resource. Using grouping strategy processing and communication time can be reduced. Main factors in job grouping strategy that influences the way job grouping is performed to achieve the minimum job processing time and maximum resource utilization of the Grid resources. So the constraint based job grouping strategy give maximum utilization of the resources [4].GBJS algorithm in which reducing the communication time, processing time and enhance resource utilization. This is study presents and evaluates an extension from Computational-Communication to Computational-Communication-Memory based Grouping Job Scheduling strategy. GBJS provides real time grid computational and reduces the waiting time of the grouped jobs. Group base Job Scheduling is achieve better performance in terms of processing time. Job grouping method is gives better results for solving job scheduling problem and can achieve minimum communication time, better processing time and maximum utilization of the resources in grid computing [5].

This study focuses and evaluates an extension to dynamic grouping based task scheduling, which aims to reduce overall processing time, minimize communication overhead time and reduce cost of processing in cloud environment.

3. Proposed Scheduling Model

The four basic building blocks of grid model are user, scheduler, Cloud Information System (CIS) and resources.

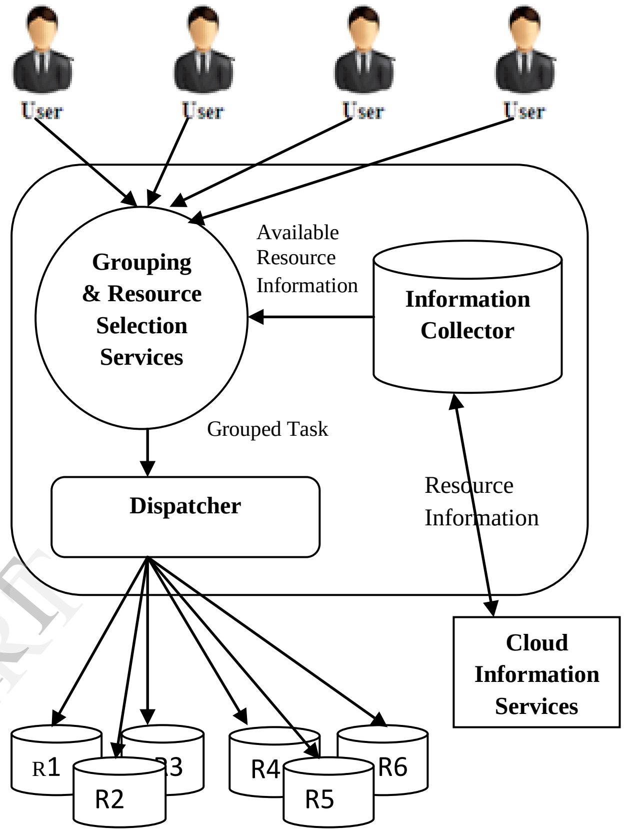
User
User
User
User
Grouping & Resource Selection Services
Available Resource Information
Information Collector
Grouped Task
Dispatcher
Resource Information
Cloud Information Services
R1
R2
R3
R4
R5
R6

Figure 1: Task Scheduling Model

User tasks submitted to the scheduler for scheduling to the resources with an objective of minimizing the processing time and utilizing the resources effectively. The scheduling framework illustrated in Figure.1 the design of the scheduler and its interactions with other entities. The scheduler is a service that resides in a user machine. When the user creates a list of tasks in the user machine, these tasks are sent to the scheduler for scheduling. The scheduler obtains information of available resources from the Cloud Information Service (CIS). Based on this information, the task scheduling algorithm is used to grouping the tasks and then resource selection for grouped tasks. When all the tasks are put into groups with selected resources, the grouped tasks are dispatched to their corresponding resources for computation by the dispatcher.

The Cloud Information Service (CIS) provides information about all the registered resources in a cloud. This service keeps track of all of the resources characteristics in the cloud. CIS collects resource characteristic information like operating system, system architecture, processing capability, network bandwidth and processing cost. It also provides users the availability information of the resources.

The information collector collects information from the Cloud Information Service (CIS). It accumulates the resource availability and processing capability to the resource information table. It also gathers information of the network bandwidth and processing cost of each listed resource provided by the CIS.

The grouping and resource selection service is responsible for grouping of task based on information collected by the information collector from CIS. In the task grouping process, user submitted tasks are collected by scheduler and tasks are grouped based on the selected available resource characteristics.

The dispatcher acts as a sender that sends grouped tasks to their respective resources. The dispatcher forwards the grouped tasks based on the schedule made by the grouping and resource selection service. The dispatcher also collects the results of the completed tasks from the resources.

4. Proposed Algorithm

Figure 1 shows the task Scheduling model in cloud computing. The Task grouping and scheduling algorithm is presented bellow. Detail description of Figure 2 is as follows: once the user tasks are submitted to the scheduler, the scheduler collects the characteristics of the available Cloud resources. Then, it choose a particular resource and multiplies the resource MIPS with the granularity size where the resulting value designate the total MI the resource can process within a specified granularity size. The scheduler groups the user tasks by accumulating the Processing requirements (MI) of each user task while comparing the resulting task total Processing requirements (MI) with the resource total Processing requirements (MI). If the total Processing requirements (MI) of user tasks is more than the resource Processing requirements (MI), the very last MI added to the task total Processing requirements (MI) will be removed from the task total Processing requirements (MI). Eventually, a new task (task group) of accumulated total Processing requirements (MI) will be created with a unique ID and scheduled to be executed in the selected resource. This process continues until all the user tasks are grouped into few groups and assigned to the Cloud resources. The scheduler then sends the task groups to their corresponding resources for further computation. The Cloud resources process the received task groups and send back the computed task groups to the Cloud user.

Task grouping and scheduling algorithm

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Step 1:The scheduler receives Number of tasks ‘n’to
          be scheduled  and Number of available
          Resources ‘m’
Step 2: Scheduler receives the Resource-list R[ ]
Step 3: The tasks are submitted to the Scheduler
Step 4: Set (Sum of the length of all the tasks to zero
Step 5: Set the resource ID j to 1 and the index i to 1
Step 6: Get the MIPS of resource j
Step 7: Multiply the MIPS of jth resource with
         granularity size specified by the user
Step 8: Get the length (MI) of the task from the list
Step 9: If resource MIPS is less than task length
    9.1 : The task cannot be allocated to the
          resource
    9.2 : Get the MIPS of the next resource
    9.3 : go to step 7
Step 10:If resource MIPS is greater than task length
Step 11: Execute steps 11.1 to 12 while Total length
          of all tasks is less than or equal to resource
          MIPS and there exists ungrouped tasks in
          the list
    11.1: Add previous total length and current  task
          length and assign to current total length
    11.2: Get the length of the next task
Step 12: If the total length is greater than resource
          MIPS.
    12.1: subtract length of the last task from Tot-
          leng
Step 13: If Tot-leng is not zero repeat steps 13.1 to
          13.4
    13.1: Create a new task-group of length equal to
          Tot-leng
    13.2: Assign a unique ID to the newly created
          task-group
      13.3: Insert the task-group into a new task
            group list
      13.4: Insert the allocated resource ID into the
            Target resource list of each grouped  job
Step 14: Set Tot-GMI to zero
Step 15: get the MIPS of the next resource
Step16: Multiply the MIPS of resource with
         granularity size specified by the user
Step 17: Get the length (MI) of the task from the list
Step 18: go to step 9
Step 19: repeat the above until all the tasks in the list
         are grouped into task-groups
Step 20: When all the tasks are grouped and assigned
         to a resource, send all the task groups to their
         corresponding resources list of Grouped task
Step 21: After the execution of the task-groups by the
         assigned resources send them back to the
         Target resource list.
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5. Conclusion

In Cloud computing, many scheduling algorithms are available to solve scheduling problem. Grouping strategy is very effective technique to solve scheduling problem in very efficient manner and efficient utilization of the resources. Task Grouping strategy help to increase performance in terms of low Processing time and cost if it applied to large number of tasks where each user task hold small processing requirements. The strategy groups the small scaled user tasks into few task groups according to the processing capabilities of available Cloud resources. Task Scheduling strategy help to reduce the processing time and cost and communication overhead time of each user tasks..

6. References

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