Abstract

Advance reservations plays very important role in optical grid environments. Advance reservations are essential for supporting scheduling of distributed resources. In the real world different organization has their own access policy, cost and mechanism for accessing the grid resource. This may cause inefficient resource usage, job failures and maximize the processing time of the job. The proposed system has a dynamic resource management which uses job grouping & parallel Dijkstra’s algorithm. This helps in advanced reservation of resources, reduction of processing time of the job and is reliable.

1. Introduction

Grid computing refers to the cooperation of multiple processors and its aim is to use the computational power in the areas which need high capacity of the CPU. The Grid is concerned with the exchange of computer power, data storage, and access to large databases, without users searching for these resources manually. Grid is used to share the most kinds of widespread resources in the distributed environment such as computing resources, storage resources, bandwidth resources, software resources, data resources, information resources, knowledge resources, etc [1]. Advanced Reservation is a contract between the resource owner and consumer that commits a certain resource for a defined time to the resource consumer. It can ensure the future availability of the Grids heterogeneous resources and help a scheduler to produce better schedules [4]. With advance
reservations users can obtain execution guarantees from local resource managers without requiring detailed knowledge of current and future workloads or of the resource owner’s policies. This mechanism guarantees the availability of resources to users at some specified future time. The major drawbacks enrolled in the grid system are job failures, unavailability of resources, QoS constraints (in terms of delay). These constraints can be removed by using a dynamic scheduling mechanism in a grid environment. In grid computing system, resources are not under the central control and can enter and leave the grid environment at any time. In a Grid computing environment, the scheduler is responsible for selecting the best suitable machines or computing resources for processing jobs to achieve high system throughput [2].

To facilitate it, grouping based job scheduling is used and the grid resource is reserved by an advanced prediction mechanism and then scheduled properly by a parallel Dijkstra’s algorithm. This enhances jobs success rate, job contention is removed and resources are properly utilized to complete jobs. This paper is organized as follows. In Section II, related work is surveyed, in section III basic grouping & reservation based job scheduling model is discussed, in section IV experimental setup and analysis is discussed and V concludes the paper.

2. Related work

In grid, areas such as advanced resource reservation and job scheduling, researchers have done much valuable work. Number of algorithms has been proposed by the researchers which in recent years each one has particular features and capabilities. In this section we review several scheduling and advanced reservation algorithms which have been proposed in grid environment. Jobs submitted to a grid computing system need to be processed by the available resources. Best resources in terms of availability status, processing speed, memory are more likely to be selected for the submitted jobs during the scheduling process. Best resources are categorized as optimal resources.

A Bandwidth-Aware Job Grouping-Based scheduling strategy schedules the jobs according to the MIPS and bandwidth of the selected resource, and sends job group to the resource whose network bandwidth has highest communication or transmission rate. But, the strategy does not ensure that the resource having a sufficient bandwidth will be able to send the job group within required time [5]. The job grouping approach is used in the framework where the scheduler retrieves information of the resources processing capability. The scheduler selects the first resource and groups independent fine-grained jobs together based on chosen resources processing capability. These jobs are grouped in such a way that maximizes the utilization of the resources and reduces the total processing time. After grouping all the jobs sent to the corresponding resources whose connection can be finished earlier which implies that the smallest request issued through the fastest connection giving best transmission rate or bandwidth. However, this strategy does not take dynamic characteristics of the resources into account, pre-processing time of job grouping and resource selection is also high [4]. The Scheduling Model in [6] is a grouping based job scheduling strategy that has taken into account memory constraint of individual jobs together with expected execution time at the job level rather than at the group level. The grouping algorithm improves the processing of fine-grained jobs. Experimental result demonstrates efficient and effective of our algorithm. Though the proposed algorithm can reduce the executing time, its time complexity is high.

In the [7] model, the grid resource is reserved by an advanced prediction mechanism and then scheduled properly by an ant colony scheduling algorithm. This enhances better QoS constraints, ability to handle multiple jobs, job contention is removed and resources are properly utilized to
complete jobs. The above analysis of various grouping based job scheduling strategy presents some of their advantages and disadvantages. To solve the problems mentioned above, job scheduling mechanism based on advanced reservation is presented in this paper.

3. Advanced Reservation Mechanism

In the advanced reservation architecture shown in fig 1, proposed in [7], two main steps are carried out. First creation of group of k jobs based on the type of job is done, then sending the job towards resource managers for reservation of resources. In the first step Admission Control Manager is present who decides acceptance or rejection of user request when it arrives in the queue. Once queue index is full ACM stops accepting the jobs until some jobs get executed & it sends the jobs which are present in a queue toward resource manager. QoS, bandwidth, processing capabilities and memory size are the parameters which are used to decide the similar type of jobs.

Resource Manager keeps information about the entering & leaving resource into the grid environment. Based on entering resource advanced reservation can be made. The group of jobs thus rescheduled will made available to the number of resources in parallel using parallel Dijkstra’s algorithm. If there is processor p which can process r numbers of resources, then the jobs within the group can be diverted to the resource using parallel Dijkstra’s algorithm which finds the shortest distance between the job sender & resources. Jobs that require resource processing may be put on cycle till it finds a suitable resource entering into the grid [6].

As processing power of grid resources is high, reservation can be done by sharing the resources. Due to this most of the job has get chances of advanced reservation for completing their task. Also the time of executing each job is got minimized which results in increase in probability of job completion.

![Figure 3.1: Advanced Reservation Architecture](image-url)
4. Experimental Setup And Analysis

Grid computing environment can be created using GridSim [2] toolkit. In this simulation, each resource is characterized by its memory size, MIPS, and bandwidth required. The jobs are characterized by their amount of computations time, expected transfer time, expected execution time, and memory-size requirement. In this experiment, resources and jobs are generated randomly and the number of jobs varies from 100 to 500. Different execution time is provided to the Jobs which are present in different group.

The Performance of this advanced reservation algorithm can be reviewed by comparing with other advanced reservation algorithm. By comparing the result with the exiting advanced reservation algorithm it was found good and also it provides guarantee to the job having much for similar request from different user. The response time of the request is also had reduced with less delay compared to other algorithm.

5. Conclusion

Advanced reservation plays very important role in Optical Grid. It allows applications to request resources for use at a specific time in the future. An advanced reservation mechanism was developed to test the simulation of grid environment. Experiment results evince its real potential for grid computing. This study is a good attempt to support improved advanced reservation algorithm in grid environment. In the proposed model QoS factors were concerned and similar request are processed in an efficient manner.

REFERENCES


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