A SECURE AND FAULT TOLERANCE JOB SCHEDULING STRATEGY IN GRID ENVIRONMENT

C.Sathya [1] S.R.Janani [2] Dhivya.P [3] Dr.S.Karthik[4]
[1,2,3] Assistant Professor, Department of Computer Science & Engineering(UG&PG)
SNS College of Technology, Sathy Main Road, Coimbatore-641035
E-Mail: dhivyasnsce@gmail.com ,sathyajayaprakasham@gmail.com,jananiselvaraj.mit@gmail.com
[4]Professor and Dean, Department of Computer Science & Engineering (UG&PG)
SNS College of Technology, Sathy Main Road, Coimbatore-641035

Abstract

A job scheduling and resource allocation is great challenge in grid environment. In case of job scheduling a secure data transmission and fault tolerance is more important. Because of dynamic and distributed nature of grid, the traditional methodologies of scheduling are inefficient for effective utilization of resources. Most of the job scheduling algorithms focuses on fault tolerance or secure data transmission for the entry level user. It prevents the data from malicious users entering into the grid environment. In our proposed strategy, we implement secure data transmission in the entry and exit level with fault rectification .It schedules the job securely and reduces the execution time in computational grid environment.

Keywords: *Fault Tolerance, QoS, Grid Environment, Resource Broker, Job Schedular, Cipher Code.*

1. Introduction

Grid is a type of parallel and distributed system that enables sharing at run time based on their respective efficiency, capability and performance selection and aggregation of distributed autonomous resources [2].The resource sharing is the extracted view of the grid computing, where there are many virtual organizations interconnected various form of resources and services. The capabilities of resources vary each other and the jobs to the resources arrive dynamically. The effective job scheduling strategies the performance of the grid is improved. Distributed and dynamic nature of grid causes the probability of failure is great in such systems. So the fault tolerance has become a crucial area in computational grid [3].If a fault occurs at a grid resource, the job is rescheduled on another resource which eventually results in failing to satisfy the users QoS requirement's deadline. So the job is re-executed, it consumes more time [5]. A failure occurs when an actual running system such as in the grid environment deviates from this behavior [2]. We can improve the efficiency of the grid environment by reducing the transmission time and increasing the CPU utilization. As like all other computing environments, grid computing is also affected by the curse of many security issues. There are many ways to access of a computational grid, each with unique security requirements and implication for both the resource user and the resource provider. So the security and fault tolerance are important issues in job scheduling in grid environment.

2. Related Work

A computational grid is a hardware and software infrastructure that provides dependable, consistent, pervasive and inexpensive access to high end computational capabilities [1]. In related work, the authentication in grid environment to allow the authenticate user to access the grid resources in

secure manner. But in our proposed strategy, we explained the authentication in the entry and exit point. It can be used to validate the user in all entry and exit point. At the end point user needs efficient result within minimum time.

A check point manager act as good fault tolerance to reduce the response time and mainly used to fault rectification [2]. As the job is re-executed it consumes more time. The checkpoint is mainly used to resumes its execution of tasks from the point of failure. The checkpoint manager receives the scheduled job from the scheduler and sets checkpoint based on which it is scheduled. If the checkpoint manager receives job completion message or job failure message from the grid resource and responds to that accordingly [1].Then the job is rescheduled from the last checkpoint with the help of checkpoint setter algorithm. A Fault is rectified by using checkpoint manager to manage the rate of failure and the total number of failure occurred in the system. In grid computing environment there are certain aspects which improve the efficiency of the system. So the fault rectification will improve the performance of the overall computational grid environment. In our proposed strategy the fault rectification and secured data transmission can yield the efficient result and reduced response time to the user.

3. Proposed Work

The numbers of jobs send to Resource Broker (RB). The resource broker split the number of jobs into tasks. The entry level security is taken place [1]. Then the tasks are sent to the job scheduler.

Step 1:

An entry level security has been taken place. The job scheduler has a Checkpoint manager to maintain a Checkpoint manager table

Step 2:

The number of tasks status reported in the checkpoint manager table.

The following figure1 explain the proposed strategy.

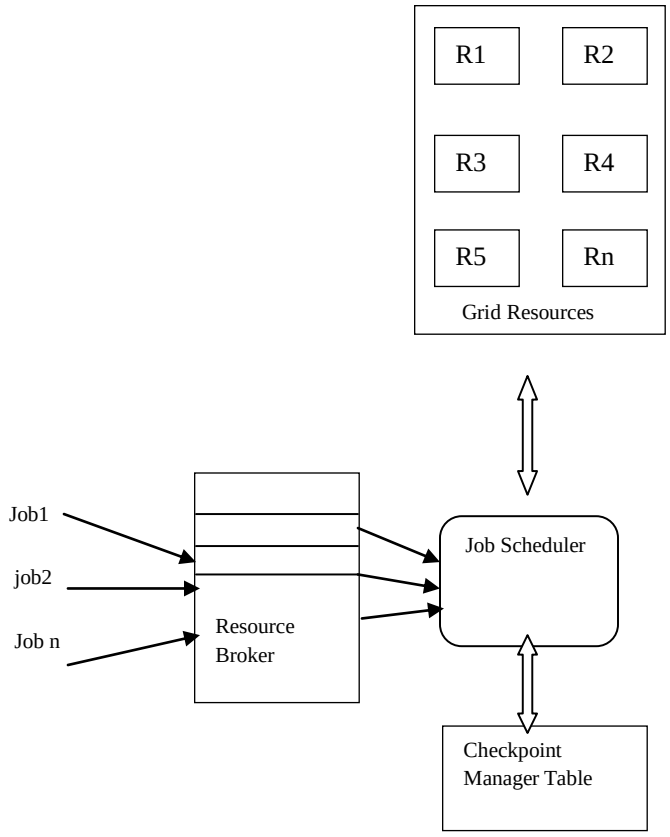

Fig .1 A secure and Fault tolerant grid model

Step 3:

The example for checkpoint manager table as follows

Table 1: Checkpoint Manager Table

Number of tasks	Resources allocated	Number of Failure task	Failure Resource	Reschedule Resource
10	R1,R3,R4	3	R3	R5
7	R3,R4,R5	2	R4	R1
8	R1.R2	-	-	-

A Job scheduler assigns the number of task to the resources. The number of resources is also allocated dynamically according to the check point manager table. For example R1, R3, R4 are less fault occurred resources that executing 10 number of tasks. In case of failure, the tasks resume its execution from the point of failure and allocated to another resources.R3 is a failure resource and rescheduled resource is R5 which is next less fault occurred resource.

Step 4:

The main use of checkpoint is resuming the flow of execution from the point of failure. So the checkpoint manager selects the resources based on the checkpoint manager table. It means successful completion of tasks.

Step 5:

In case of job/task failure, it returns back to the checkpoint manager.

Step 6:

So the checkpoint manager selects another one resource which has fewer loads and successful.

An algorithm for job scheduling as follows

INPUT:

1. Valid user(Set user id & password)
2. Number of jobs

ALGORITHM:

Do

1. Convert each alphanumeric code into cipher code
2. Checkpoint manager check the manager table
3. Identify resource which has less failures in the manager table
4. Allocate tasks to resources
5. In case of failure

   Assign task to fewer load resource by checkpoint manager
6. Send request message to user
7. If (keyword code==cipher code)

   Allocate result to authorized user

   Else

   Wait for correct keyword.
8. Do the steps until there is no jobs

After successful completion of all the tasks/jobs, the checkpoint manager returns the job to user.

Step 8:

In the related work an entry level security has been applied and there is no exit level security [1]. A secure data transmission can be possible to the end user by using Robust Authentication.

Step 9:

When the user sends the jobs to resource broker a cipher code was created for corresponding user keyword. After completion of job, the resource broker requests the keyword from the user. If the keyword matches then it will send the result to particular user.

4. Conclusion

A secure data transmission with fault tolerance performs efficient and effective job scheduling in grid environment. Though, there are many jobs scheduling algorithm in grid computing. Most of them concentrate on fault tolerance or security based job scheduling. But the proposed job scheduling algorithm states that the security taken place in the entry and exit level with fault rectification in dynamic grid environment. It reduces the total execution time and assigns all jobs effectively in the grid environment.

References

[1] AvijitBhowmick,NirmalyaMukhopadhyay,Abhishek Bandyopadhyay"A proposed robust authentication approach for secure data transmission in grid computing environment",International Journal of Computer Applications vol 50-No.22 july 2012.

[2] S.Gokul Dev "An Adaptive job scheduling methodologies with fault tolerance strategy for computational grid environment",International Conference on Computing and Control Engineering 12&13 april,2012

[3] Leyli Mohammad Khanli, Maryam Etminan Far, Ali Ghaffari ―Reliable Job Scheduler using RFOH Volume NO. 1. JULY 2010, ISSN 2079-8407, Journal of Emerging Trends in Computing and Information Sciences.

[4] Foster and kesselman, ―The grid blueprint for a future computing infrastructure mateo, CA: morgan kaufman, 1999.

[5] Yeqing Liao and Quan Liu, ―Research on Fine-grained Job scheduling in Grid computing and information engineering and Electronic Business, 2009, 1, 9-16, October 2009.

[6] Hesam Izakian, Behrouz Tork Ladani, Ajith Abraham and Vaclav Snasel, ―A DISCRETE PARTICLE SWARM OPTIMIZATION APPROACH FOR GRID JOB SCHEDULING International journal of Innovative Computing, Information and Control ICIC International, 2010 ISSN 1349-4198 Volume 6, Number 9, September 2010 pp. 1{09-0370}.

[7] Rajkumar Buyya, Steve Chapin, and David DiNucci ―Architectural models for resource management in the grid international workshop of grid computing, 2009.

[8] I.Foster, C. Kesselman & S. Tuecke. GRAM: Key concept [Online]. http://www.unix.globus.org/toolkit/docs/3.2/gram/key/index.html

[9] I.Foster, C. Kesselman, Globus: " A metacomputing infrastructure toolkit", International Journal of Supercomputer Application, Vol. 11, No. 2, 1997,