



## A study of Grid Computing for Financial Management

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**Abstract:** In today's commercial environment, it is very important to manage the financial resources efficiently and effectively because it involves various complex computing tasks such as sharing, allocation and coordinating the financial resources, risk management (portfolio of stock and bonds), determining the payoff, credit rating, interest rates, raising the finance for the business, determining the investment policies, time horizon of the financial plan, determining the present financial situation, determining the best path for analyzing the trading, data mining, secrecy, knowing the customer requirements etc. In these entire situations grid computing is very useful architecture because grid computing means multiple computers are connected to grid and servers through the network and all work like on big computer and all computers in the grid can serve equally according to our need. So in this paper I explore the various uses of grids in financial sector.

**Keywords:** Grid Computing; Scheduling; Financial Sector; Grid Analysis; Resource Allocation; Resource broker; GIS,ACO,PSO.

### I. INTRODUCTION

At the earlier grid computing concept mainly used in high level scientific applications like weather forecasting, astronomy etc. Grid computing is wide spread architecture and all nodes in grid are dynamically connected because grids are having so many administrative domains. Nodes in grid computing need not have to be in same physical location because these are distributive in nature, independent and it can be run on different operating system and they may have different hardware platforms. Each system in a grid works as an independent resource manager, jobs can be managed and scheduled independently. Resources can be shared by any business organization to other organization according to their demand and need. Grids can be distributed over LAN, man and also WAN. So millions and millions of resources can be shared[11]. In grid computing grids are interconnected. So even if the network is limited in one Grid, we can explore more information through interactive grids. Grids can be controlled by central node but we can get information in a decentralized manner.

If the user is a authorized person in the grid, he can get variety of information apart from his need and demand. So it is not highly abstracted. Eg. Of grid tools are Nimroid-G, Grid bus, legion etc [1] . Now a day grids are used in business applications also to develop their business using this powerful technology. This technology is useful for getting much grateful information related to organization and used to prepare models of that information and also used in time critical mathematical calculations also. The main need of Financial Management is high computing power which is provided by this technology. A grid infrastructure offers various resources for financial decisions. Using these resources we can reduce the risk in our financial management. Grid computing is a very important technology in distributed computing because it involves sharing, storage and allocating the resources. So it is the greatest technology for large distributed system integration. It is one of the concepts of parallel computing

also because in grid computing various jobs are allocated to different persons and they can work simultaneously and send their work. So allocating the resources optimally is a very important task and we have to calculate the cost of grid because financial sector includes so many different computing methodologies is spread over a long distance[7].

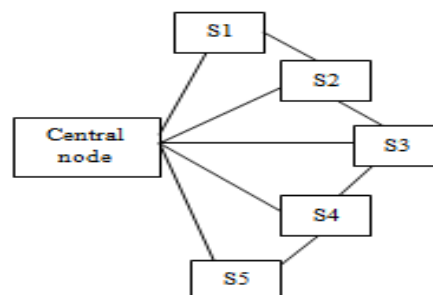


Figure:1

So in grid computing each system connected together and they will communicate all the information and all system will share and balance their work. Central Node is useful to control all the system in the grid infrastructure. Suppose if we have so many calculations we can add more nodes to the grid[2] .

### II. TYPES OF GRID

#### A. Computational Grid:

Complex financial structures need lot of CPU time, lot of memory and it will need the ability to communicate in real time. For example if a financial advisor needs to make some very CPU consuming calculation, he can borrow CPU time from a grid in a much lower cost.

#### B. Information Grid:

These grids mainly used for the purpose of collaborative computing, information handling, manipulation of information, file system, file sharing and

data sharing etc. Financial sector needs massive data for all activities.

### C. *Service Grid:*

Using this service grid, various different types of computers with different operating system, speed etc. can be connected for various financial operations.

### D. *Utility grid:*

This is an important grid which is useful to the organization employers for sending their works on the main machine and it can be processed to that main node and all their works can be consolidated using this grid.

## III. USAGE OF GRID IN FINANCIAL SECTOR

### A. *Getting the Solution:*

Using grid computing, we can get ideas and solutions for solving various financial problems from experts, multiple organizations and volunteers. They all can be connected through the network [4].

### B. *Secured:*

Using grids financial managers can get and communicate secured information because only authorized persons can access the various financial resources and they can get information from authorized persons using well secured transactions.

### C. *Time sharing:*

Time will be reduced and we can get the anticipated end result in financial ethics because we are going to use highly sophisticated resources and we can analyze all the calculations. Mainly, we can do millions of calculations in seconds.

### D. *Services:*

It gives services to financial managers, advisors and in various financial activities and also useful for the users who worked as an auditor, accountant and all the persons who involved in various financial computations [10].

### E. *Excellent infrastructure:*

Grids provide excellent infrastructure for all financial problems with greater robustness and flexibility.

### F. *Recent Development:*

Sometimes we may face lot of trouble in solving some financial problems. In such a case grids useful in open source applications then we get advanced and recent developments to solve problems in our application.

### G. *Reduce Complexity:*

Financial calculations need huge amount of processing power and wide range of variable being calculated to support complex derivate simulations. In such a case grid engines can provide greatest processing power quickly with cost effectiveness. Complex computing works can be split into a large number of smaller jobs and form the jobs through network connectivity.

### H. *Research:*

Grid computing is very useful for various scientific and financial researchers in all financial activities, finding the new one, and they can share their knowledge.

### I. *Reliability:*

In Grid there are so many computers are interconnected and Grid architecture relates to RAIC (Redundant Array of Inexpensive Computers) mechanism. If one system is failed it can be replaced without terminating our process[6].

### J. *Decision-Making:*

Grids needed for various financial decision making process and these processes would be scheduled, distributed and can be broken into various pieces.

### K. *Integration:*

Grids are very useful to integrate high capacity computers, databases, resources, financial advisors etc. So we can use this facility in a low cost rather than using a super computer.

## IV. GRID ANALYSIS IN FINANCIAL DECISION MAKING

Grid Analysis is a best methodology to take various financial decisions. In Simon's "Intelligence Design Choice" we have three phases. They are

### A. *Intelligence Phase:*

Actual problem should be clearly identified without ambiguous.

### B. *Design Phase:*

After defining the problem the organization will move to the second phase that is designing the solution based on that problem. In this phase using Grid Computing we have to conduct the detailed feasibility study from large sum of data and analyze various possible solutions against that problem. So finding the various important alternatives for problem is a very important set. Alternative solutions may be excellent, very good, good, satisfactory, bad etc.

### C. *Systematic decision making process:*

In this phase we have to find out the decision based on that various possible solutions.

#### a. *Grid Analysis:*

Grid analysis involves various steps.

##### a) *Find out the problem.*

Eg. Buy a Machine.

##### b) List all the options as a row in the table, and then we have to list the factors as columns then put weight for all the factors.

For our problem we may take factors like Cost, Reliability, Quality, Company Goodwill etc.

Table: 1

Factors	Quality	Cost	Reliability	Payment Options	Company Goodwill
Weights					
Supplier1	2	3	0	0	2
Supplier2	4	3	3	2	2
Supplier3	4	2	1	1	3

(0-Poor, 1-Ok, 2-Satisfactory, 3-Good, 4-Very Good, 5-Excellent)

##### c) Determine the weight according to the importance of various factors. Then multiply your scores of

step 2 in weights of step3. Finally add all the scores. Whichever is higher that option can be chosen as a best option.

Table: 2

Factors	Quality	Cost	Reliability	PO	CG	Tot
Weights	5	4	3	1	2	
Supp 1	10	12	0	0	4	26
Supp 2	20	12	9	2	4	47
Supp 3	20	8	3	1	6	38

In our example accurately and clearly we can choose the SUPPLIER 2 for purchasing a machine.

PO-Payment Options

CG-Company Goodwill

Tot-Total

Supp –Supplier

## V. GRID COMPUTING IN RESOURCE ALLOCATION

Normally, organization needs so many resources like well equipped processors, high memory capacity, excellent network facility, fast access of information, service providers etc. Enterprises have so many applications which need various resources. So allocating the resources for these applications is a major task [3].

Applications in the organizations are divided into so many tasks and we have to find the optimum resource allocation to minimize the cost and execution time. Resources in grid are dynamic in nature[5]. If organization need is whether static or dynamic, we have to calculate according to the nature of the grid environment. So in grid computing a problem is decomposed into so many partitions which are interactive with each other. Then grid infrastructure will do scheduling that is time allocation for solving each part of the problem.

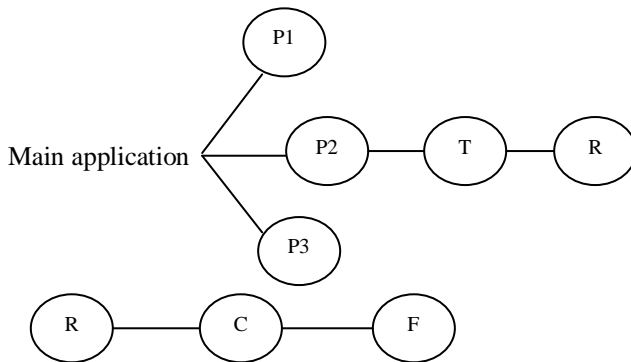


Figure: 2

- (a). P1,p2,p3 --- Partitions
- (b). T- Time Management
- (c). R- Resource Allocation
- (d). C- Configuration Management
- (e). F- Finding solution for the main problem

For that it will use so many decision making algorithms which are also useful to configure and allocate the resources according to our request for corresponding actions and get proper solution for the application. For resource allocation grid computing will use resource broker which acts intermediate between the user and the grid server. The resource broker will collect the information about availability of resources, prices, validity etc.

## VI. GRID COMPUTING IN JOB SCHEDULING

In grid computing jobs in an application can be scheduled very effectively and efficiently because grids are distributive in nature and grids can allocate the exact resource to the particular job[9]. For this we have to balance the load on various processors. But it is a very tedious task to find out the resource for various jobs. For that we are using some algorithms like ACO (Ant Colony Optimization), PSO (Particle Swarm Optimization). These algorithms are used to find out the resource for various jobs and reduce the execution time. ACO mainly find out the best path between the nest and food source. At first ants run around the nest randomly to find out the food source and leave the pheromone on their path. These pheromones are attractive nearby the ants and they will follow the route. Then if we have two routes to reach the destination ants will easily follow the shortest route quickly based on the random pheromone value of various paths[12][13]. PSO based on particle speed which is calculated in every step to assume the distance. It is a metaheuristic approach and this will find the solution in very large space[14]. These algorithms should be a secured one and should face so many risks in network. Scheduling the job mainly depends upon quality of service (QOS). So we have to map the jobs and resources proved to be NP complete. For job scheduling we have two schedulers. One is grid scheduler which selects resources in grid environment and it cannot control local resource. Another one is Local scheduler which controls local resources. Normally we have to use simulation method for the above algorithms to identify the performance.

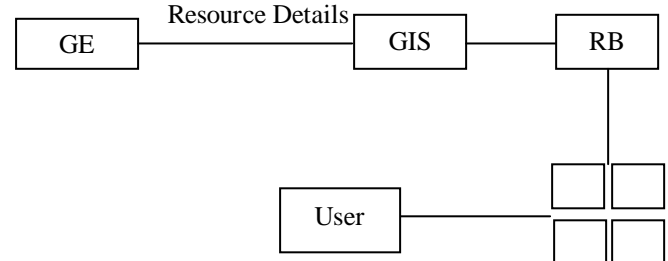


Figure: 3

GE- Grid Environment; GIS – Grid Information Service  
RB- Resource Broker

In the above diagram, Grid Environment is having the details about resources. These details will be sending to the Grid Information Service. Then Resource Broker will get the information from GIS and it will use various job scheduling algorithms to make the resources available for various numbers of tasks according to the user need. Here when we submit the job to allocate the resources, jobs will be evaluated first and resources are allotted by grid schedulers based on SLA (Service Level Agreement) which will be validated by grids. According to SLA resources will be reserved in advance based on cost constraints. If we need any rescheduling process, that also will be done by schedulers. Grid schedulers are very useful to balance the load among the resources for various jobs in an application[8]. Hence it will reduce the processing time for various jobs with resource managers. For that it will check the availability of resources and schedule the job based on queuing of jobs if we have so many jobs to run concurrently.

## VII. CONCLUSION

Using grids we can greatly improve the capacity of our business and overall efficiency with greater security. In all fields we need advancement in this competitive world. Mainly in customer satisfaction there is no compromise and all financial computing needed greater accuracy, high speed and all financial calculations should be performed with specified condition within a specified period of time. Uniqueness achieved through large volume of data, real-time information, databases etc. So if we give improvement in the grid system we can provide the flexibility, reliability of all the activities in a financial sector and it is very important for rapidly changing technologies and in the fast growing world. In this paper we restricted our study on some topics only. Grid analysis not only useful for financial decision, resource sharing, job scheduling but also can be extended in price decision, integrity control, interactivity, capital budgeting etc. All the calculations are number crunching and very tedious algorithms are used for that.

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