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# Empirical Evaluation of Grid Computing Emerged Resource Scheduling Algorithms

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***Abstract***

*Grid computing is a group of computers, which are physically connected over a network or with Internet to perform dedicated tasks together, such as analyzing e-commerce data, solve a complex problem and may other complicated jobs. Previously many industries and additionally research institutions are working in this emerging sector to overcome the existing issues and also in process to enhancing the existing working methods to get the better performances. In this paper, the authors suggested an enhanced model in the resource scheduling algorithm to enhance the performance of the some existing methods. In comparison segment, it shows that the proposed model was provided better results than the some existing models. The grid computing must be enhanced with certain limit of interval to maintain the performances which are required for the real time scenarios.*

***Keywords:*** *Grid Computing, Resource Scheduling, Local Scheduler, Global Scheduler, Resource Allocation.*

## I. Introduction

"Grid computing is a group of computers physically connected (over a network or with Internet) to perform a dedicated tasks together, such as analyzing e-commerce data and solve a complex problem. Grid computing is the form of *super virtual computer* that designed to solve or perform a particular application requirement" [1].It provides an opportunity for users to access different types of remote resources using communicational substructures of computer networks and distributed systems

### 1.1. Definition of Grid Computing

"A type of parallel and distributed system that enables the sharing, selection, and aggregation of geographically distributed autonomous resources dynamically at runtime depending on their availability, capability, performance, cost, and users' quality-of-service requirements"[2]. Figure 01 illustrates the working and connecting model of grid computing.

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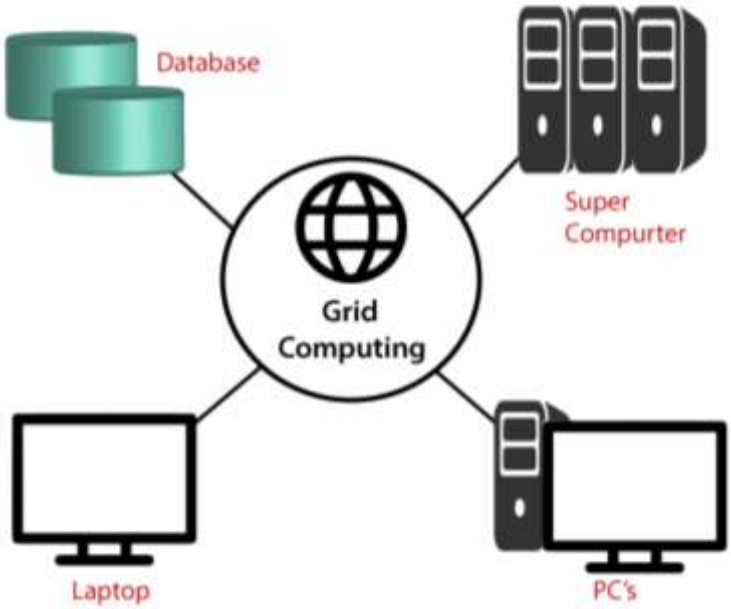


***Figure 01 Grid Computing***

The goal of grid computing is to apply available computing resources easily for complicated calculations vie sites which are distributed geographically.

### 1.2. Applications of Grid Computing

The applications of the gird computing are Scheduler, Resource Broker, load-balancing and Grid portals. They are shortly discussed below:

#### 1.2.1. Scheduler

Schedulers are types of applications responsible for the management of jobs, like allocating resources which are needed for any specific job, partitioning of jobs to schedule parallel execution of tasks, data management, event correlation, and service-level management capabilities.

#### 1.2.2. Resource Broker

Resource Broker provides pairing services between the service requester and the service provider. This pairing enables the selection of best available resources from the service provider for the execution of a specific task.

#### 1.2.3. Load Balancing

The Grid Computing infrastructure load-balancing issues are concerned with the traditional load-balancing distribution of workload among the resources in a Grid Computing environment. This load-balancing feature must always be integrated into any system in order to avoid processing delays and over commitment of resources.

#### 1.2.4. Grid portals

The Grid portals are similar to Web portals, in the sense they provide uniform access to the grid resources.

### 1.3. Types of Resource Scheduling Algorithms

Resource Scheduling refers to the set of actions and methodologies that are used by different organizations to efficiently assign the resources they have to jobs, tasks or projects they need to complete, and schedule start and end dates for each task or project based on resource availability [3].

There are six types of process scheduling algorithms are available, they are:

#### 1.3.1. First Come First Serve

The "First Come First Serve" scheduling algorithm which also known as FCFS, the process which arrives first, gets executed first, or the user can say that the process which requests the CPU first, gets the CPU allocated first.

#### 1.3.2. Shortest-Job-First

Shortest Job Next (SJN), also known as Shortest Job First (SJF) or Shortest Process Next (SPN), it is a scheduling policy that selects for execution the waiting process with the smallest execution time. SJN is a non-preemptive algorithm.

#### 1.3.3. Scheduling Shortest Remaining Time

Scheduling Shortest Remaining Time (SSR) is also known as Shortest Remaining Time First (SRTF). It is a scheduling method that is a preemptive version of shortest job next scheduling. In this scheduling algorithm, the process with the smallest amount of time remaining until completion is selected to execute.

#### 1.3.4. Priority Scheduling

Priority scheduling is a method of scheduling processes based on priority. In this method, the scheduler chooses the tasks to work as per the priority, which is different from other types of scheduling, for example, a simple round robin.

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#### 1.3.5. Round Robin Scheduling

Round-robin (RR) is one of the algorithms employed by process and network schedulers in computing. As the term is generally used, time slices are assigned to each process in equal portions and in circular order, handling all processes without priority (also known as cyclic executive). Round-robin scheduling is simple, easy to implement, and starvation-free.

#### 1.3.6. Multilevel Queue Scheduling

A multi-level queue scheduling algorithm partitions the ready queue into several separate queues. The processes are permanently assigned to one queue, generally based on some property of the process, such as memory size, process priority, or process type. Each queue has its own scheduling algorithm.

Section one started with the introduction section which includes the definition and its related information. Section two explains the literature review of the existing methodologies and present working models in the proposed methodology segment. Section three discussed briefly about the proposed methodology with the procedure and flow chart of the methodology. Section four illustrated the results and discussion with comparison part. And this research paper ends with the final section of five as conclusion of this paper and provides a lead to the future scope of this research.

## II. Literature review

*Massimiliano Caramia, Stefano Giordani* [4, 5]proposed a tender/contract-net model for Grid resource allocation, showing the interactions among the involved actors. They consider two different scenarios for the Grid system. Scenario 1 considers the case where tasks are mono-thematic applications and their requests are submitted to the same External Scheduler (Grid Resource Broker).Scenario 2 considers heterogeneous tasks and there are as many GRBs as many tasks.

While in Scenario 1, there is a single GRB that interacts with the GSPs (Grid Service Providers) considering one task at a time according to a given task ordering. In Scenario 2, there are many GRBs interacting at the same time with the GSPs. The performance of their proposed market-based approach is experimentally compared with a round-robin allocation protocol. In the round-robin protocol, incoming task queries are matched with the next available resource offer which meets the task requirements.

*G. Murugesan, Dr. C. Chellappan* [6, 7] introduced a new resource allocation model with multiple load originating processors as an economic model. Solutions for an optimal allocation of fraction of loads to nodes

obtained to minimize the cost of the grid users via linear programming approach. They found that the resource allocation model can efficiently and effectively allocate workloads to proper resources.

Their experimental results showed that their proposed model is capable of producing almost optimal solution for multiple sources scheduling with static and dedicated resources and also obtained the better solution in terms of cost and time.

*Harshadkumar B. Prajapati, Vipul A. Shah* [8, 9] stated that there is a need of concise understanding of scheduling in Grid computing area and presented concise understanding of scheduling and related understanding of Grid computing system. They described overall picture of Grid computing and discussed important sub-systems that enable Grid computing possible. Moreover, they also discussed concepts of resource scheduling and application scheduling and also present classification of scheduling algorithms.

Furthermore, they presented methodology [10, 11] used for evaluating scheduling algorithms including both real system and simulation based approaches. Scheduling in Grid is involved at two levels: individual site level (resource scheduling) and application broker level (application scheduling) for which they provided evaluation metrics for both resource scheduling algorithms and application scheduling algorithms.

## III. Methodology

Methodology is the systematic, theoretical analysis of the methods applied to a field of study. It comprises the theoretical analysis of the body of methods and principles associated with a branch of knowledge [12]. The proposed methodology named as Semi – Global Scheduler.

The objective of the proposed methodology is:

- The problem of allocating resources in Grid scheduling requires the definition of a model that allows local and external schedulers to communicate in order to achieve an efficient management of the resources themselves.
- In order to rectify the allocation problem, this research work proposed new resource scheduling and resource allocation model to overcome the disadvantages.

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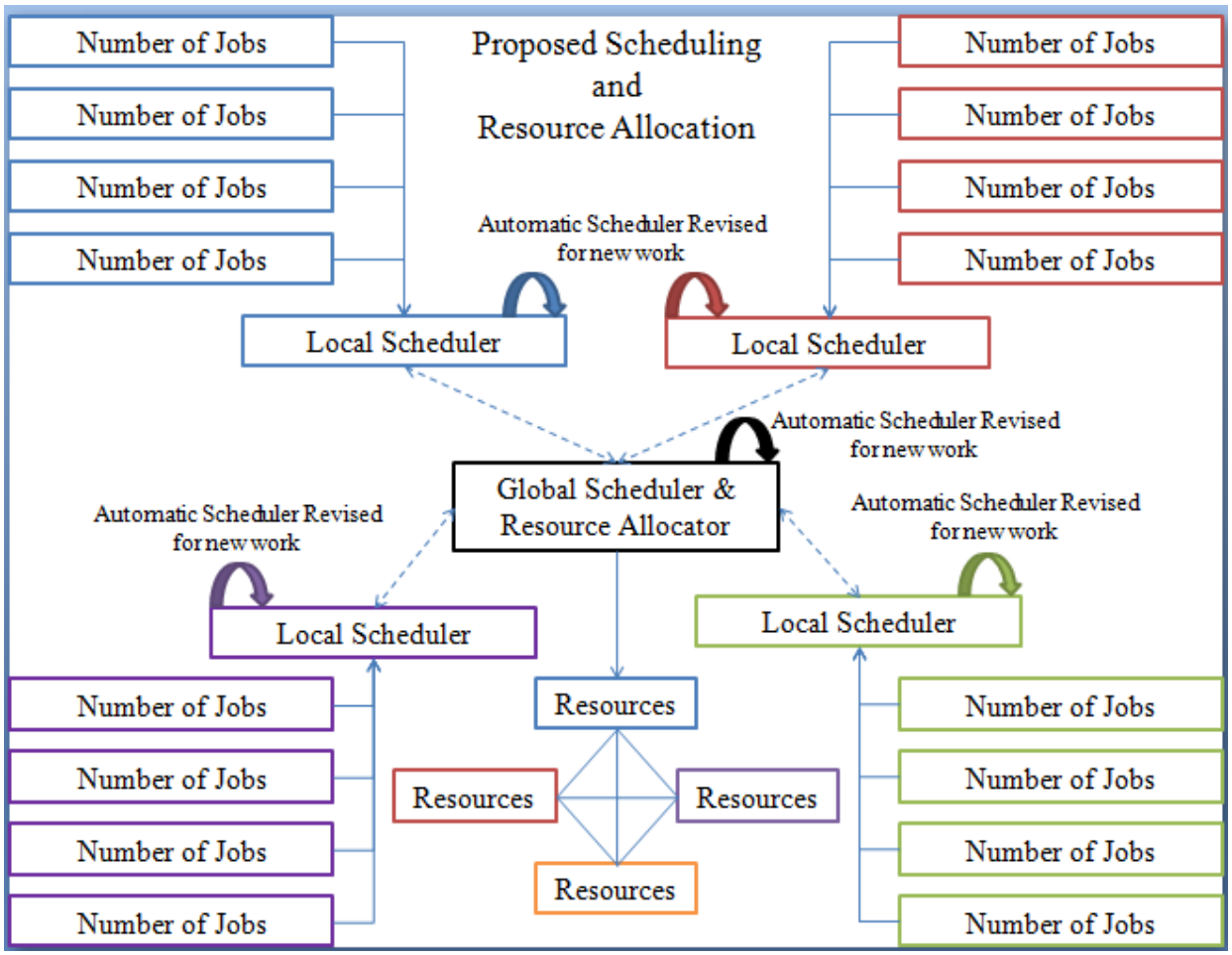


***Figure 02 Work Flow of Proposed Methodology***

The methodology related workflow diagram is illustrated in the figure 02. It explains the proposed methodology in graphical manner.

***Procedure of the proposed methodology***

The working model of the proposed methodology is explained in the form of step by step procedure method. That procure of the proposed methodology is listed in the table 01. In this proposed model the four local schedulers are placed to explain the proposed methodology.

***Table 01 Proposed Methodology Procedure***

| | | |
|---|---|---|
| Step 01 | | Start the process |
| Step 02 | : | Create the local scheduler and assign the local scheduler name as LS1, LS2, LS3 and LS4 |

| | | |
|---|---|---|
| Step 03 | : | Create a global scheduler and assign the name as GS, then interlink the LS1, LS2, LS3 and LS4 in to the GS |
| Step 04 | : | Generate the resources which are named as R1, R2, R3 and R4 with interconnection method and then linked that generated resources R1, R2, R3 and R4 to the GS |
| Step 05 | : | Collect the jobs from the required persons under the LS1, LS2, LS3 and LS4 |
| Step 06 | : | Apply the load balancing method into the LS1, LS2, LS3 and LS4 to make that in balancing order |
| Step 07 | : | Refresh the LS1, LS2, LS3 and LS4 in permitted interval period to verify where there is any new job is assigned into those above mentioned Local Schedulers |
| Step 08 | : | Refresh the GS in permitted interval period to verify where there is any new job is assigned from the LS1, LS2, LS3 and LS4 Local Schedulers to GS |
| Step 09 | : | Verify that the refreshing method of the Local Schedulers and Global Scheduler into automatic way or not. It must be in automatic manner |
| Step 10 | : | Based on the job nature and also the Local Schedulers nature, the jobs allocated to the available resources by the GS in the utilization manner |
| Step 11 | : | Confirm the above mentioned working procedures and processes again |
| Step 12 | : | Continues the process up-to the jobs turned into zero in the LS1, LS2, LS3 and LS4 |
| Step 13 | : | Finalize and confimed that the LS1, LS2, LS3 and LS4 are Nil |
| Step 14 | : | Stop the process |

## IV. Results and Discussion

The table 02 and figure 03 show and illustrated the Comparison between proposed methodology with existing methodologies by using the common job allocation method.

***Table 02Comparison between proposed methodology with existing methodologies***

| Algorithm | Task 1 | Task 2 | Task 3 | Task 4 | Task 5 | Task 6 |
|---|---|---|---|---|---|---|
| NG | 934 | 875 | 819 | 756 | 679 | 612 |

| | | | | | | |
|---|---|---|---|---|---|---|
| SGA | 835 | 789 | 736 | 699 | 645 | 590 |
| RQSG | 800 | 760 | 720 | 685 | 632 | 582 |
| RQSG 1 | 790 | 754 | 712 | 678 | 625 | 575 |
| S-GL&RA | 985 | 899 | 855 | 801 | 750 | 700 |

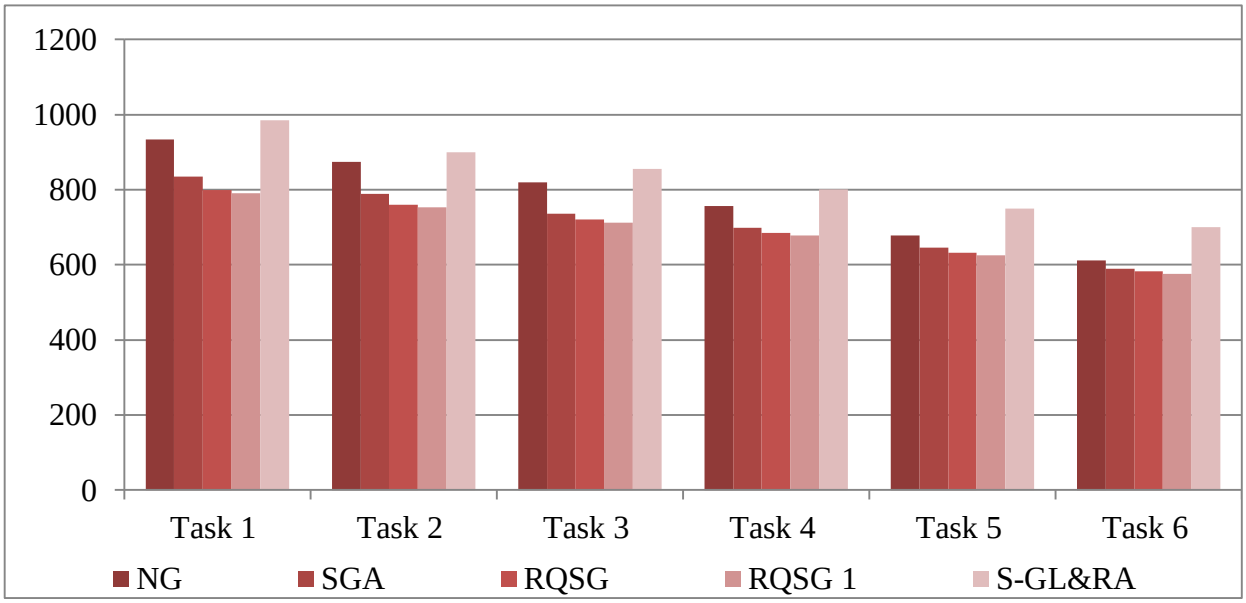


***Figure 03Comparison between proposed methodology with existing methodologies***

The results and discussion is the section where the place to comparing the efficiency and performance of the proposed methodology with some of the existing methodologies by using the common data. To verify the efficiency and performance of the proposed method, the six tasks were taken and applied those six tasks on the proposed and existing methodologies. The comparison stated that the proposed method is performed better than minimum of 5% to maximum 10% than the existing methodologies in an effective manner.

## V. Conclusion and Future Scope

Due to the developmental rate of trade, industry and science world, scheduling is considered as one of the main discussions in grid environment.Grid scheduling system and various types of challenging features in the grid are discussed in this research work to get familiar with scheduling challenges.The Semi – Global Scheduler with Resource Allocation algorithm was removing some of the discussed challenges.The proposed Semi – Global Scheduler with Resource Allocation algorithm was applied and tested in particular sector data purpose only. In future, it will be extended to the remaining different sector data too.

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