Improving the Efficiency of Tasks Scheduling in Grid System

Virgie Condello

Abstract: *This study aims to assess the ways, which may help in improving the efficacy or efficiency of tasks scheduling, in order to enhance the overall functionality and operations of the grid systems. In this regard, this research study will assist in examining and analyzing the integrated approach, which may help in enhancing the task scheduling within any grid system. It has been established that the modification of the scheduling algorithm may play an inevitable and incredible role in improving the functionality and performance of the task scheduling; hence increasing the veracity of the grid system. It is significant to notice that appropriate simulations as well as their analysis has also been provided in this study, in order to analyze the reliability and authticity of the proposed technique.*

Key words: Grid system, algorithm, task scheduling, nodes, Moab workload manager (MWM), queues, modification.

1. INTRODUCTION

The purpose of this paper is to present the illustration of different features, which may help in improving the efficacy of task scheduling in grid systems. It has been revealed from the analysis of researches and studies, which were conducted by [6] that task scheduling is considered as one of the most essential aspect of distributed and parallel computing. It has been observed that the demands of advanced and integrated scheduling algorithms have been increased with the emergence of computational grid. In the current era, different software and hardware infrastructures have been incorporated within the grid systems, in order to attain predetermined objectives. It is significant to notice that the advanced and modern infrastructure of grid systems incorporate wide range of computer resources. Some of the most prominent components may include processors, memory capacity, etc.

In accordance with the views and perceptions of [1], all of these elements have played a major role in increasing the resources of computing systems; hence efficient task scheduling techniques are required. It has been documented in the researches, which were carried out by [8] that contemporary mechanisms have played a significant role in enhancing the heterogeneity of the working environment. In this regard, well-designed and appropriate grid systems are needs, in order to control environment's heterogeneity. Currently, grid systems are composed of different computer systems, having different power and operating systems. Contemporary grid systems are found to be responsible of spatial distribution of computing resources and information.

According to [3], contemporary grid systems mainly utilize three main methods of planning, including hierarchical, decentralized, and centralized. These parameters inevitability controls the functionality and operations of any working environment. In this account, [5] has asserted that contemporary grid systems utilize different types of task scheduling approaches. One of the major objectives of task scheduling approaches is to ensure the performance and efficacy of grid systems. The proceeding paper will help in understanding and examining appropriate techniques of improving the efficiency of task scheduling in grid systems. In this regard, highly integrated scheduling technique will also be discussed in the paper, which may play a tremendous role in enhancing the efficiency of task scheduling in grid system.

2. AIMS OF THE PAPER

This research aims to assess appropriate techniques of improving the efficiency of task scheduling in grid system. Grid systems are found to be most integrated ways of exchanging resources and workload amid clusters in a systematic and established manner. In order to ensure flawless operations of grid systems, it is essential to utilize suitable task scheduling, which can be easily attained by adopting different techniques and paradigms. This research study will considerably help in recognizing the most apt method of improving the efficacy of task scheduling in grid system. In this account the study will assess the role of MWM (Moab Workload Manager), in terms of improving the performance of task scheduling within the grid systems.

3. METHODOLOGY OF THE RESEARCH

This study has adopted qualitative secondary method of research, order to gather ample amount of relevant and credible information. One of the major objectives behind the adoption of this research study is to accumulate the required information in a well-timed and cost effective manner. It has been claimed by [2] that secondary method of data collection enables the researcher to review wide range of literatures, in highly feasible and convenient manner. It has also been recognized that secondary research method also allows to compare different approaches and studies, which are presented by different researchers; hence results in the establishment of more credible and reliable research study. It is significant to bring into notice that different online libraries have been accessed in order to collect information on the given topic of research. Some of the most prominent online libraries, which have been

used in this study, may include IEEE and EBSCO Host. Different journals, text books, and published articles have also played a commendable role in the successful accomplishment of this research study.

4. REVIEW OF LITERATURE

Technological developments have played an inevitable and indispensable role in the development of contemporary grid systems. These grid systems support the operations of the organizations, in terms of controlling environment's heterogeneity. The operations of grid systems can be easily managed by using pertinent task scheduling. It is due to the fact that task scheduling helps in aligning the tasks. According to [7], this alignment of tasks eventually reduces the wastage of resources, which is often caused due to malfunctioning of grid systems. It has been revealed from the assessment of research and studies, which were carried out by [3] that different types of task scheduling systems have been utilized within the grid systems. Some of the most common task scheduling systems may include open grid scheduler, Manjarsoft Aneka, platform load facility sharing, Moab grid suit, etc. It has been established from the studies of [1] that amid all other techniques, MWM is found to be most integrated and helpful approach, which supports the performance of task scheduling in grid systems, in terms of its efficacy. The proceeding section incorporate the brief yet in-depth and thorough analysis of most suitable technique and approach, which may help in augmenting task scheduling within the grid system

4.1. Utilization of Moab Workload Manager in Grid Systems' Tasks Scheduling Process

It has been assessed from the analysis of studies, which were performed by [5] that Moab workload manager or MWM can be considered as most appropriate and adequate approaches of task scheduling, within any grid system. It is due to the fact that MWM incredibly assists in managing timely and hassle free access to external shared resources. More so, this tool also supports distributed grid computing, while ensuring massive scalability cluster. It is significant to notice that the basic functions of any planning system, or simply task scheduling system, are mainly based on tasks processing algorithm [3]. It is due to the fact that the algorithm facilitates the assigning and aligning of specific host system to perform desired tasks. It has been observed that, within the MWM, the task processing algorithm includes several activities.

These may include creation of available resources' list, task prioritization, and queuing. According to [8], MWM is found to be the best task scheduling approach, which can be used for any grid system. It is because; MWM aligns all resources in a systematic manner; hence results in better utilization of resources, within the grid system.

According to [5], MWM offers great opportunity to profoundly review the list of all of the resources; hence results in the uniform and even loading of the grid system. [2] has claimed that, ignorance of such parameters often result in disorganized utilization of grid resources, which results in unfavorable and devastating outcomes.

These limitations or drawbacks of this scheduling approach, i.e., Moab workload manager can be managed and increased by integrating the technique of modification. It has been established from the studies of [7] that modification of the scheduling approaches plays a significant role in the uniform loading of grid system, while minimizing idle of the nodes. In contrast, it has also been analyzed that the modification is found to be highly time consuming, which can be considered as one of the greatest disadvantages of modification of scheduling algorithm [4].

4.2. Modification of Scheduling Algorithm to Increase its effectiveness in Grid System

It has been established from the analysis of researches and studies, which were conducted by [1] that the drawbacks or limitations of the scheduling algorithm, which is being used in the grid system, can be easily eliminated by performing suitable modifications in the original scheduling algorithm. In this account, the entire lists of the nodes are examined or viewed through organization cycle. This activity usually results in the formulation of more consistent and standardized loading of the system, i.e., grid system [6]. During these modifications, the task transmission is also organized, which exists within the computing nodes. It usually starts from the data, which has extremely low volume. It has been assessed modification also assists in minimizing the waiting time of other tasks, present within the queue.

In order to modify the basic scheduling algorithm, it is essential to determine the list of all accessible tasks, while prioritizing the tasks [8]. This prioritization eventually helps in formulating the queues of the tasks; hence ensuring appropriate utilization of the grid's resources [1].

During the process of scheduling algorithm's modification, the list of resources is developed, in order to assign the resources to desired places. Afterwards, the selection of groups of tasks is usually conducted, in order to perform planning process. After that, the groups of tasks are arranged or aligned for the amount of data that is needed to be processed. In the next step, the group of nodes is sorted for the connected speed scheduler [4]. Throughout the process of modification, such task is selected, which has smallest amount of data. One of the most important steps of scheduling algorithm's modification is to choose the node, having the most efficient connection speed to scheduler, in order to attain desired outcomes. It has been assessed that the entire process usually results in the increased and improved efficiency of task scheduling, within the contemporary grid stations [7]. It is important to analyze and examine the integrity of the presented

method, which can be used to improve the effectiveness of task scheduling in grid system. In this regard, several simulations were performed, which are presented and elaborated in the proceeding section.

4.3. Simulation to Assess the Effectiveness of Modified Scheduling Algorithm

It has been established from the analysis of researches, which were performed by [5] that the veracity and reliability of the modified scheduling algorithm can be easily evaluated by conducting different simulations. In the given case of the authenticity of the modified scheduling algorithm can be assessed on different parameters, including task execution time, grid systems' nodes workload, and residence time of the tasks, waiting within the queue [1]. This study has analyzed the effectiveness of the modified scheduling algorithm, by two simulations, which are presented in the proceeding discussion, along with their analysis.

4.3.1 Results of Simulation 1: Assessment of the Residence Time of the Task Waiting in a Queue

The simulation was carried out, in order to assess the total residence time of the task, while waiting in the queue. It has been recognized from the results of the simulations that there is no major changes occurred in the task residence time, while waiting in the scheduler queue. It is because; modifications in scheduling algorithm do not influence the process of forming task queuing.

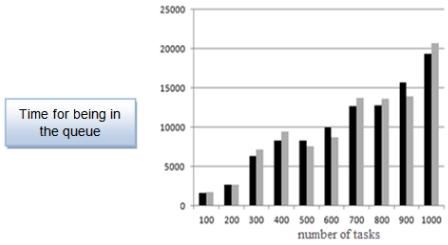

Fig 1a: FIFO/ FA [4]

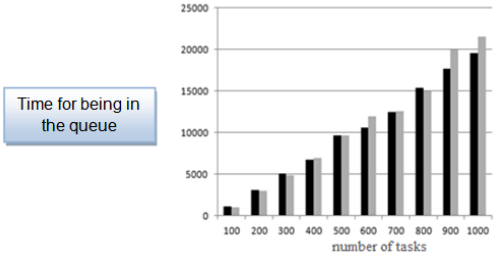

Fig 1b: FIFO/ F [4]

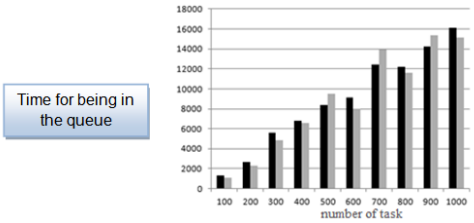

Fig 1c: AVC/ FA

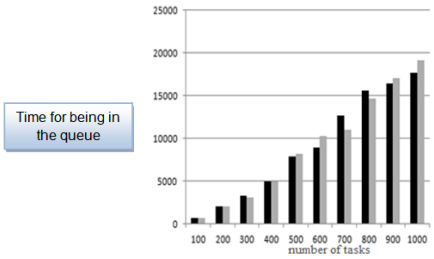

Fig 1d: AVC/ F

Figure 1: The Task Residence time in the Queue [4]

4.3.2 Results of Simulation 2: Assessing the Task Execution Time

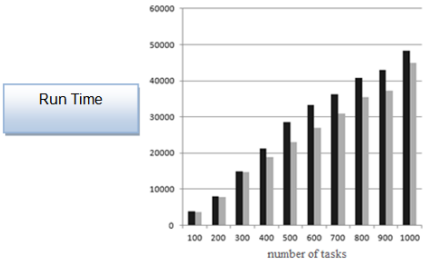

Fig 2a: FIFO/ FA

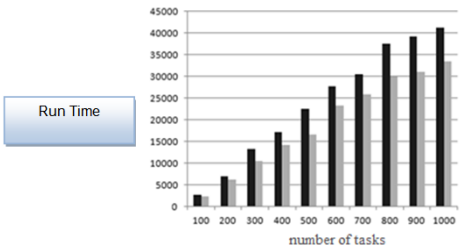

Figure 2b: FIFO/ F

Figure 2: Time of Task Execution at FIFO [7]

Above mentioned diagrams show the reliance of the task execution time for the modified as well as the base algorithms at the configuration of a task queue FIFO. It is quite evident from the diagrams that the task execution time, during the process of planning FIFO/A is greater than in FIFO/F. It has also been observed from the results of the simulations that the time, required for task execution is comparatively

less in modified algorithm, than the basic algorithm. On the other hand, below mentioned diagram, i.e., figure 3 demonstrates the reliance of the task execution time for modified and basic algorithms. It shows that the time, required for task execution is greater with AVC/FA than AVC/F.

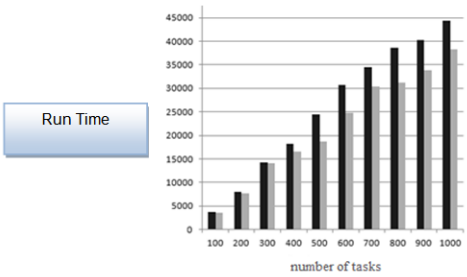

Figure 3a: AVC/ FA

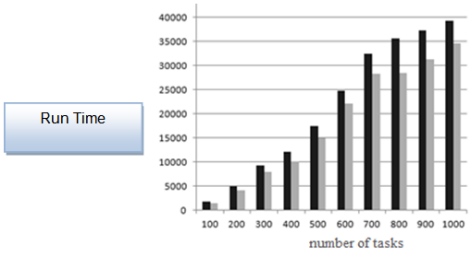

Fig 3b: AVC/ F

Fig 3: Task Execution Time at AVC [1]

5. CONCLUSION

From above paper, it can be concluded that the modification of the scheduling algorithm may play an inevitable and indispensable role in improving and increasing the effectiveness of task scheduling process, within any grid system. It has been established that the emergence of computational or automated grid systems has played a major role in increasing the heterogeneity of the working environment; hence results in the malfunctioning of the grid systems. In this situation, it is essential to have highly efficient and integrated task scheduling mechanism, in order to ensure better performance of the grid system. In this account, the preceding paper has clearly elaborated the fact that the modification of scheduling algorithm may provide highly desirable and advantageous results, in terms of increased performance and effectiveness of task scheduling within the grid system. The proposed idea has also been supported by simulation results.

6. REFERENCES

[1] Augonnet, C., Thibault, S., Namyst, R., & Wacrenier, P. A. (2011). StarPU: a unified platform for task scheduling on heterogeneous multicore architectures. *Concurrency and Computation: Practice and Experience*, retrieved from, http://onlinelibrary.wiley.com/doi/10.1002/cpe.1631/abstract?deniedAccessCustomisedMessage=&userIsAuthenticated=false

[2] Chauhan, P. (2012). Resource Based Optimized Decentralized Grid Scheduling Algorithm. In Advances in Computer Science, Engineering & Applications, *Springer Berlin Heidelberg*, retrieved from, http://link.springer.com/chapter/10.1007/978-3-642-30111-7_102

[3] Dong, F., & Akl, S. G. (2006). Scheduling algorithms for grid computing: State of the art and open problems, *Technical report*, retrieved from, http://research.cs.queensu.ca/home/akl/techreports/GridComputing.pdf

[4] Pop, F., & Cristea, V. (2009). Optimization of Schedulig Process in Grid Environments. *UPB Sci. Bull., Series C*., retrieved from, http://www.scientificbulletin.upb.ro/rev_docs_arhiva/full6540.pdf

[5] Sadasivam, G. S. (2009). An Efficient Approach to Task Scheduling in Computational Grids. *INFOCOMP Journal of Computer Science*, retrieved from, http://www.tmrfindia.org/ijcsa/v6i15.pdf

[6] Xu, J., Lam, A. Y., & Li, V. O. (2011). Chemical reaction optimization for task scheduling in grid computing. Parallel and Distributed Systems*, IEEE*, retrieved from, http://ieeexplore.ieee.org/xpl/login.jsp?tp=&arnumber=5703075&url=http%3A%2F%2Fieeexplore.ieee.org%2Fxpls%2Fabs_all.jsp%3Farnumber%3D5703075

[7] Yu, L., Zhou, G., and Pu, Y., (2011), An Improved Task Scheduling Algorithm in Grid Computing Environment, College of Computer Science, Sichuan University, Chengdu, China, retrieved from, http://www.scirp.org/journal/PaperDownload.aspx?FileName=IJCNS20110400002_39478434.pdf&paperID=4645

[8] Yusof, M. K., & Stapa, M. A. (2010). Comparative Study a Performance and Capability Scheduling Techniques in Grid Computing. *International Journal on Computer Science & Engineering*, retrieved from, http://faculty.utpa.edu/reillycf/courses/CSCI6175-F11/papers/Yusof-2010.pdf