

A Framework To Optimize Task Scheduling in Cloud Environment

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Abstract-Cloud computing is a type of computing that facilitates sharing computing resources rather than having local servers or personal devices to handle applications. In cloud computing user can make use of different services – like as servers, storage and applications. The focus is on maximizing the effectiveness of the shared resources. Cloud resources are usually not only shared by multiple users but are also dynamically reallocated on demand. Applications are delivered to organization's computers and devices through the Internet. Task scheduling challenge is to find the best or optimal resource in order to minimize the computational time of task. Task scheduling being an NP-complete problem becomes a great focus for research in cloud computing area to improve the scope and performance of scheduling algorithms. This paper presents a framework to optimize task scheduling in cloud environment to improve the makespan and availability.

Keywords: Cloud Computing, Task, Scheduling, Virtualization, Optimization, Makespan.

1. INTRODUCTION

Earlier in grid computing also workflow scheduling was done. As Cloud Computing performs this workflow scheduling with an increased performance, with the emergence of 4G technology and the convergence of handheld devices and desktop devices, cloud is a platform to provide, Computing power, Storage, Software and Data Streaming. When computing resources are needed by user, cloud computing dynamically provides user applications with as many resources as required. Task is a unit of work which is to be processed. Scheduling of task is mapping set of tasks to a set of machines. Task scheduling problem is considered to minimize the total execution cost on the resource provided by Cloud Service Providers (CSP). And as we know that task scheduling is a well known Non-deterministic Polynomial time complete (NP-Complete) problem. Consider a set of cloud customer (business) tasks, each with a need for cloud resources like CPU, memory, network, storage, and a set of virtualized servers, each with its own capacity. Each task may be served by n servers. This general problem of determining whether there exist assignment of tasks to servers so that each tasks demand may be satisfied by the available resources, is a NP-complete that is unlikely to be solvable in an amount of time that reflects a polynomial function [1]. As we know that cloud computing is developed from distributed parallel and grid computing. One of the most important and unique feature of cloud computing is virtualization. With the help of virtualization, all physical resources are virtualized and user can have their own virtual device based on their

requirements. Virtualization enhances the availability of service [2].

This paper explains the various task scheduling mechanisms and optimization techniques. Section 2 briefs the aim of task scheduling, Section 3 gives a brief note on related works in scheduling, Section 4 covers work related to task scheduling and optimization, Section 5 describes a framework to enhance scheduling. We conclude on Section 6 along with references.

2. AIM OF TASK SCHEDULING

The goal of cloud computing is to provide an optimal scheduling of the tasks, to provide the users, and the entire cloud system with optimal operation time, improved QoS at the same time and load balancing. Load balancing and task scheduling are closely related with each other in the cloud environment. Task scheduling is for the optimal matching of tasks and resources [3]. The cloud is mainly to provide users with a Quality of Service (QoS). When task scheduling management comes to task allocation, it is necessary to guarantee the resources Quality Of Service (QoS). This will improve the QoS of task scheduling indirectly in a cloud environment. The main aim of task scheduling algorithms is to achieve two main objectives namely, to run user task within dead line and to maintain load balancing. Also task scheduling helps to minimize the makespan [4].

3. RELATED WORKS

Task scheduling is a known NP-complete problem. Also task scheduling is a famous combinatorial optimization problem. As we know task scheduling is the main goal of cloud computing which helps to achieve with an optimal results as more and more applications are migrated onto them. As new cloud providers emerge there is a natural tendency towards choosing the best service provider and thus multi-cloud scenarios emerge from this situation. But a multi-cloud resource provisioning is complex and costly [5].

A goal-oriented workflow scheduling in heterogeneous distributed systems has been proposed using hybrid meta heuristic method based on Genetic Algorithm. Response obtained through the proposed strategy is quick and goal oriented [6]. It combines the Best-Fit and Round-Robin methods and the main objective is to optimize the make span and reliability. Selvarani and Sadhasivam [7] proposed an algorithm based on both costs with user task grouping to schedule task groups in cloud computing platform, where resources have different resource costs and computation performance. The proposed scheduling

approach shows an improved cost-based scheduling algorithm for making efficient mapping of tasks to available resources in cloud. Bessai *et al.*[8]proposed three complementary bi-criteria approaches for scheduling workflows on distributed Cloud resources, taking into account the overall execution time and the cost incurred by using a set of resources.

Hu *et al.*presented a scheduling strategy on load balancing of VM resources based on genetic algorithm [9]. Experimental results proved that the proposed method was able to realize load balancing and reasonable resources utilization both when system load was stable and variant.Han *et al.*[10], presented a QoS guided task scheduling model, being composed of some scheduling strategies and a QoS guided scheduling Sufferage-min heuristic algorithm. The proposed model tried to improve the scheduling efficiency by dividing the tasks and resources into two groups of high QoS level and low QoS level and using different scheduling approach respectively.The experiment showed that the make span value,the key performance was successfully being shorten.Karthick *et al.*[11] proposed a Multi Queue Scheduling (MQS) algorithm to reduce the cost of both reservation and on-demand plans using the global scheduler. The proposed methodology depicted the concept of clustering the jobs based on burst time. The proposed method overcome this problem and reduced the starvation with in the process and also gives more importance to select job dynamically in order to achieve the optimum cloud scheduling problem and hence it utilized the unused free space in an economic way.Chen *et al.*[12] introduced an Improved Load Balanced algorithm on the ground of Min-Min algorithm to reduce the Makespan and increase resource utilization (LBIMM). Cost per resource unit depends on the services selected by the user. So the user receives guarantees regarding the provided resources. To observe promised guarantees, user-priority was considered so that user's demand gets satisfied more completely. Finally algorithm was simulated using Mat lab toolbox. The simulation results show that the improved algorithm leads to significant performance gain and achieve over 20% improvement on both user satisfaction and resource utilization ratio.

4.TASK SCHEDULING AND OPTIMIZATION

Song *et al.*[13] proposed an Ant Colony Optimization based job scheduling algorithm, which adapts to dynamic characteristics of cloud computing and integrated with specific advantages of Ant Colony Optimization in NP-hard problems.Pandey *et al.*[14] presented a Particle

Swarm Optimization(PSO)based heuristic to schedule applications to cloud resources that takes into account both computation cost and data transmission cost. The cost savings were compared when using Particle Swarm Optimization(PSO) and existing Best Resource Selection (BRS) algorithm. The results showed that PSO could achieve good distribution of workload onto resources. Li *et al.*[15] proposed a cloud task scheduling policy based on Load Balancing Ant Colony Optimization (LBACO) algorithm. The main contribution of the work was to balance the entire system load while trying to minimizing the make span of a given tasks set. The new scheduling strategy was simulated using the CloudSim toolkit package. Experiments results showed the proposed LBACO algorithm outperformed First Come First Serve (FCFS) and the basic Ant Colony Optimization (ACO) .Zhu and Liang[16] applied the ant colony optimization (ACO) to the cloud resource scheduling to overcome the defects of the cloud computing data centre in resource management, and ensured that the cloud computing can supply better QoS service according to the actual QoS(Quality of Service) parameters requirement of the environment for the cloud computing. The simulation experiment indicated that the method can solve some problems to a certain extent, such as increased the usage of the cloud computing resource and reduced the computing time etc.

5.FRAMEWORK TO ENHANCE TASK SCHEDULING

In general workflow scheduling finds resources and allocates tasks on suitable resources. Performance of the system has great impact and also depends on proper scheduling. Scheduling becomes a very important task in cloud framework. Though various scheduling algorithms have been proposed in literature, scheduling being an NP-hard problem,there is scope for improving the algorithms. The research focuses on improving the existing scheduling algorithms to enhance task scheduling in cloud system.Figure1 shows the work flow in cloud environment between user and cloud service provider.

In general,cloud scheduling goes in 3 stages:

- Resource Identification
- Resource Allocation
- Job Execution

When the user submits the task,the cloud scheduler finds the best resource to fit the task from the available resources (Resource pool). Then,allocation of resource for the submitted is done through the CSP. Finally the task is executed and dispatched. The aim of this research is to minimize the makespan and thereby improve the reliability.

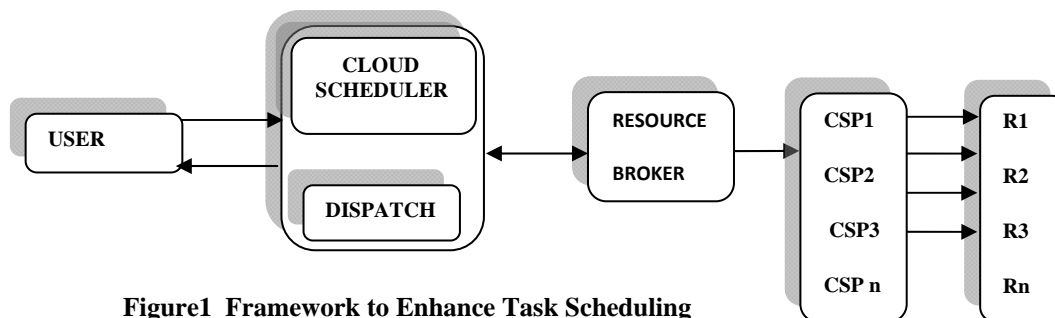


Figure1 Framework to Enhance Task Scheduling

6.CONCLUSION

Cloud Computing technology is increasingly being used in enterprises and business markets. In cloud computing system, an effective resource allocation strategy with Service Level Agreement (SLA) is required to achieve user satisfaction and maximizing the profit for Cloud Service Providers (CSP). This paper summarizes the main types of task scheduling and optimization strategy with its impacts in cloud system. Hence, future research is to come up with a much smarter and secured optimized task to resource allocation algorithms and also a framework to strengthen the entire cloud computing paradigm.

REFERENCES

- [1] K.Sunitha and Sudha.P.V, "An Efficient Task Scheduling In Distributed Computing Systemsby Improved Genetic Algorithm",*International Journal of Communication NetworkSecurity*, Volume 2, Issue2,2013,ISSN: 2231 – 1882.
- [2] R. Buyya, C. S. Yeo, S. Venugopal, J. Broberg and I. Brandic,"Cloud computing and emerging IT platforms: vision, hype, and reality for delivering computing as the 5th utility", *Future Generation Computer Systems*, Vol. 25, Issue 6, 2009, pp599-616.
- [3] PaulRani.A and GomathyNayagam,"Multiobjective Qos Optimazation Based On Multiple Workflow Scheduling In Cloud Environment",*International Journal of Innovative Research in Computer and Communication Engineering*, Vol. 1, Issue 2, April 2013.
- [4] Li.Q, and Guo.Y.,,"Optimization of Resource Scheduling in Cloud Computing", *In SYNASC*, 2010, September, pp315-320.
- [5] Delavar and ArashGhorbannia,"A goal oriented workflow scheduling in heterogeneous distributed systems",*International Journal of Computer Applications(IJCA)*, August 2012,Vol.52,pp 27-32.
- [6] Selvarani S and Sadhasivam G. S, "Improved cost-based algorithm for task scheduling in cloudcomputing",*International Conference on Computational Intelligence and Computing Research (ICIC)*, December 2010,IEEE,pp1-5.
- [7] Elghoneimy.E,Bouhali.O and Alnuweiri.H,"Resource allocation and scheduling in cloud computing",*International Conference on Computing, Networking and Communications (ICNC)*, January 2012, IEEE,pp 309-314.
- [8] Han H, Deyui Q, Zheng W, and Bin F,"A Qos Guided task Scheduling Model in cloud computing environment",*Fourth International Conference on Emerging Intelligent Data and Web Technologies (EIDWT)*, September 2013, IEEE,pp72-76.
- [9] Karthick A. V, Ramaraj E, and Subramanian R. G, "An Efficient Multi Queue Job Scheduling for Cloud Computing", *World Congress on Computing and Communication Technologies (WCCCT)*, February 2014, IEEE,pp164-166.
- [10] Mu F, Yuan, X. H, Wang, C. G, and JING. Y, "Ant-colony-genetic algorithm with adaptive parameters based on grey prediction and normal cloud", *Control Theory and Applications*, Vol-6,2010.
- [11] Chen H, Wang F, Helian, N, and Akanmu G,"User-priority guided Min-Min scheduling algorithm for load balancing in cloud computing", *National Conference on Parallel Computing Technologies (PARCOMPTECH)*, February 2013, IEEE, pp1-8.
- [12] Song X,Gao L, and Wang J,"Job scheduling based on ant colony optimization in cloud computing". *International Conference on Computer Science and Service System (CSSS)*, June 2011, IEEE, pp 3309-3312.
- [13] Pandey S, Wu L, Guru, S. M, and Buyya R,"A particle swarm optimization-based heuristic for scheduling workflow applications in cloud computing environments", *24th International Conference on Advanced Information Networking and Applications (AINA)*, 2010, IEEE, pp400-407.
- [14] Chen C.Y, and Tseng H. Y,"An Exploration of the Optimization of Executive Scheduling in the Cloud Computing",*26th International Conference on Advanced Information Networking and Applications Workshops (WAINA)*, 2012,IEEE, pp 1316-1319.
- [15] Li K, Xu G, Zhao G, Dong Y, and Wang D,"Cloud task scheduling based on load balancing ant colony optimization", *InChinagrid(ChinaGrid) Sixth Annual Conference*, August 2011,IEEE,pp3-9.
- [16] Zhu Y and Liang H, " Research for the virtual machine-oriented cloud resource scheduling algorithm",*6th International Conference on Information Management, Innovation Management and Industrial Engineering, (ICIII)*, 2013 November.Vol-1,IEEE,pp133-136.