



A REVIEW: VARIOUS SCHEDULING TECHNIQUES FOR CLOUD PERFORMANCE OPTIMIZATION

Jaspreet Kaur
M. Tech (Student)

Department of Computer Science
Doaba Institute of Engineering and Technology,
Kharar

Harpreet Kaur
Assistant Professor

Department of Computer Science
Doaba Institute of Engineering and Technology
Kharar

Abstract - Cloud computing consists of computing resources and provide services to the users with the help of Internet. It provides service to consumers as per their requirements. Job scheduling plays an important role in cloud computing systems. This paper present a study on service model and various scheduling types of cloud computing. The paper also specifies the pros and cons of service model of cloud computing.

Keywords: Cloud Computing, Job Scheduling, Service Models, Scheduling Types.

I. INTRODUCTION

In present scenario, Cloud computing is most interesting technology among all other technologies because of its less cost of executing jobs with more flexibility and scalability for processes. In last few years, cloud computing has developed fastly in the business world of the IT industry.

This is a network based technology which concentrates on sharing of computer resources. Actually, it is Internet-based and it always try to remove complications for clients. Cloud computing refers to combination of the applications provided as services over the Internet and the hardware and software in the data centres that provide that services.

Cloud computing is a technology which is network-based that concentrates on sharing of computations or resources. In other words , cloud is Internet-based and it tries to remove complications for users. Cloud computing refers to combination of apps that runs as

services on the internet and s/w and h/w which provides that services.

By using cloud, clients only pay for the services which are used by them. There are three categories of cloud environments: Public, Private, and Hybrid clouds.

A public cloud is a model whose resources, such as applications and storage, available to the public and these services can be free or not. Public clouds has better performance than Private clouds.

Private Cloud specifies the business services that are not publically available. Basically, Private clouds are a marketing term which is used to provide the services to particular group of people. In other words, the grouping of private and public clouds is known as Hybrid cloud . “Cloud computing is a technology that provides many computer resources like networks, server, storage according to the requirement of user and with a very little management effort [1].



Figure No-1 Cloud Computing



Job scheduling is a method in which different tasks are assigned with the system resources by an operating system (OS) in which jobs are executed according to their priority that is waiting CPU time and other resources.

SERVICE MODEL OF CLOUD COMPUTING

Cloud service model can be defined into 3 different class according to their abstraction level and resources provided.

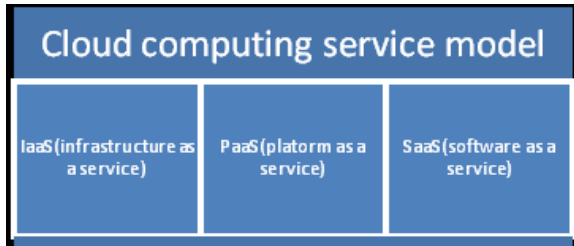


Figure 2- Cloud computing service model

I .SaaS-Software as a service In SaaS model a software provides a license for a software application to be used and purchased on demand. Applications can be accessed through network from various client(web browser, mobile phone etc) by application user[2].

Advantages:

- 1.Communication on via APIs
2. Stateless
3. Avoid capital expenditure on software and development resources.

Disadvantages:

1. Application Security
2. Multi-tenancy
3. Data security

II. PaaS-Platform as a Service The difference in PaaS from SaaS is that SaaS only host completed cloud application where PaaS provides a development platform for both completed and inprogress cloud application . Paas model offer higher level of abstraction[3].

Advantages:

- 1.Consumes cloud infrastructure.
2. Underlying infrastructure security

Disadvantages:

1. Centralization requires new/different security measures.
- 2.Data security

III. Infrastructure as a service (IaaS)

The services providers of IaaS offers computers-physical or virtual and other resources in cloud. IaaS provides infrastructure as a service. Client is the permitted to install applications software and operating system but users do not have any knowledge of basic architecture. As we know cloud pay according to the service it provides due to this an organization will save great amount of money. [4]

Advantages:

- 1.Reduce cost on hardware and human resources.
2. Minimize the risk of ROI (return on investment.
3. Usually platform independent.
4. Infrastructure costs are shared and thus reduced.[5]
- 5.Cost saving
6. Scalability and flexibility[6]

Disadvantages:

1. Centralization requires new/different security measures.[5]

II. LITERATURE SURVEY

Alaka Ananth et.al,2014 [7] In this paper they focus on game theory based methods for job scheduling in cloud. Review of existing approaches and numerous issues in game theory based job scheduling is the main objective of this paper. They study the existing methods for job scheduling converging game theoretic approaches and analyse the open issues for research in this area.

S.K.Aparnaa et.al,2014 [8] described as, the area of grid job scheduling is to achieve high system performance and match the job to the suitable available resource. Due to dynamic nature of grid, the traditional job scheduling algorithms First Come First Serve and First Come Last Serve does not adapt to the grid environment. In order to utilize the power of grid entirely and to schedule jobs competently many existing algorithms had been implemented. However the existing algorithm does not contemplate the memory condition of each cluster which is one of the main resources for scheduling data intensive jobs. Due to this the job disaster rate is also very high.



AV.Karthick et.al,2014 [9] offered as, methodology depicts the perception of clustering the jobs based on burst time. During the time of scheduling the traditional methods such as First Come First Serve, Straight Job First, EASY, Combinational Backfill and Improved backfill using balance spiral method are creates fragmentation. The planned method overcome this problem and reduces the starvation with in the process. This paper also attention some existing scheduling algorithm and issues related to them in cloud computing.

Dazhao Cheng et.al,2015 [10] in this paper, they proposed, a Resource and Deadline-aware Hadoop job Scheduler that takes coming resource availability into consideration when minimizing job deadline misses. They formulate the job scheduling problem as an online optimization problem and solve it using an efficient receding horizon control algorithm. To aid the control, they design a self-learning model to estimate job completion times and use a simple but effective model to predict future resource availability.

Abhishek Gupta et.al,2015 [11] intended to present the performance comparison analysis of various pre-existing job scheduling algorithms considering various parameters. This paper discussed about cloud computing and its constructs in section (i). In section (ii) job scheduling concept in cloud computing had been elaborated. In section (iii) existing algorithms for job scheduling are discussed, and were compared in a tabulated form with respect to various parameters and lastly section (iv) concludes the paper giving brief summary of the work.

Daochao Huang et.al,2015 [12] reviewed job scheduling proportional fairness and utility function, the multi-resource job scheduling algorithm which fulfils capacity constraints of virtual machines is conducted. Comparative analysis illustrates scheme improved average job completion time by preferentially grouping jobs that has different resource requirements.

III. SCHEDULING CRITERIA AND TYPES

Job scheduling is the term used to allocate system resources to many different tasks by an operating system (OS). The system handles prioritized job queues that are waiting CPU time and for other system resources . It should determine which job to be taken from which queue and the amount of time to

be allocated for the job. The criteria used for scheduling jobs is given below:

Scheduling Criteria

Scheduling criteria is also known as scheduling methodology. Scheduling is a key in multiprogramming. Different CPU scheduling algorithm have different properties .The criteria used for scheduling as follows:

CPU Utilization:

Utilization means keep the CPU as busy as possible. It range from 0 to 100%. Practically , this range is from 40 to 90%.

Throughput:

Throughput can be defined as the rate at which processes are completed per unit of time.

Turnaround time:

This is the time taken by a process to complete its execution. It can be calculated as the time gap between the submission and completion of a process.

Waiting time:

Waiting time is the time spent by a job for waiting in ready queue.

Response time:

It is the time taken by the job to start responding from submission time.It is calculated as the amount of time it takes from when a request was submitted until the first response is produced.

Fairness:

Fairness can be defined as the proper utilization of CPU.

There are various types of scheduling depends upon different criteria, such as static ,Dynamic, centralized , Distributed etc are defined below:

1)Static Scheduling: It is also called Pre-Schedule jobs, all information is known prior about available resources and tasks. In static scheduling , task is assigned only at one time to a resource, so it's easier to adapt based on scheduler's perspective [13].

2) Dynamic Scheduling: Jobs are dynamically available for scheduling over time by the scheduler. It is more flexible than static scheduling. It is more



difficult to include load balance as a main factor to obtain stable, accurate and efficient scheduler algorithm [14].

3) Centralized Scheduling: As discussed in dynamic scheduling, it's a responsibility of centralized / distributed scheduler to make global decision. The main advantages of centralized scheduling are easy implementation; efficiency and better control and monitoring on resources. There are some disadvantages such as scheduler lacks scalability, fault tolerance and efficient performance. Because of this drawback it's not recommended for large-scale grids [14].

4) Distributed / Decentralized Scheduling: Distributed/Decentralized scheduling is more realistic for real cloud still its weak efficiency compared to centralized scheduling. There is no central control entity, here only local schedulers requests to manage and maintain state of jobs' queue [16].

5)Pre-Emptive Scheduling: Pre-Emptive scheduling allows each job to be interrupted during execution and another resources which are available for other jobs can be allocated to the job leaving its originally allocated. If constraints such as priority are considered, this type of scheduling is more helpful [15].In this type of scheduling the resources are allocated to the process having highest priority after the executing process.If the equal priority process is in running state, the CPU is allocated to this after the completion of the present running process.



Figure No-3 Pre-Emptive Scheduling

Advantage

Very good response for the highest priority process than non-preemptive scheduling.

Disadvantage

The problem of Starvation may be possible for the lowest priority processes.

6) Non Pre-Emptive Scheduling: In Non Pre-Emptive scheduling , resources are not being allowed to be re-allocated until the execution of running and scheduled job is completed[15]. In this kind of scheduling the CPU and other resources are allocated to the process with the highest priority after completing the present running process.

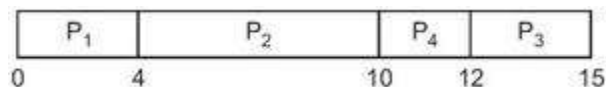


Figure No-4 Non Pre-Emptive Scheduling

Advantage

Better response for the highest priority processes.

Disadvantage

The problem of Starvation may be possible for the lowest priority processes.

IV. CONCLUSION

Job Scheduling is used to assign certain jobs to particular resources in specific time. In cloud computing, job scheduling problem is a biggest and challenging issue. In cloud computing job scheduling is mainly focuses to improve the efficient utilization of resource that is cost, memory and reduction in completion time. An efficient job scheduling strategy must have less response time so that the execution of job takes place within a possible minimum time. In this paper we have discussed cloud computing , job scheduling and it's criteria and types. Based upon these criteria we will introduce new scheduling algorithm to minimize the energy and time consumption over cloud network.

V. REFERENCES

[1]. Peter Mell, Timothy Grance , “The NIST Definition of Cloud Computing”, Recommendations of the National Institute of Standards and Technology, September 2011, Special Publication 800-145

[2] Scott Paquette, Paul T.Jaegar, Susan C.Wilson. Identifying the security risks associated with governmental use of cloud computing, Journal of Government Information Quarterly 27, pages 245-253, April, 2010.

[3] Arnon Rosenthal, Peter Mork, Maya Hao Li, Jean Stanford, David Koestar, Patti Reynolds. “Cloud Computing: A new business paradigm for biomedical information sharing”. Journal of Biomedical Informatics 43, pages 342-353, August, 2008.

[4] Kuyoro, S., Ibikunle, F., & Awodele, O. (2011) ”Cloud Computing Security Issue and Challenges”, International Journal of Computer Networks , 3 (5), 247-255.

[5].<http://www.ibm.com/developerworks/cloud/library/clcloudserviesliaas/>.

[6].<http://www.statechmagazine.com/article/2014/03/5-important-benefits-infrastructure-service>.

[7]Ananth, Alaka, and K. Chandra Sekaran. "Game theoretic approaches for job scheduling in cloud computing: A survey." Computer and Communication Technology (ICCCT), 2014 International Conference on. IEEE, 2014.



[8]Aparnaa, S. K., and K. Kousalya. "An Enhanced Adaptive Scoring Job Scheduling algorithm for minimizing job failure in heterogeneous grid network." Recent Trends in Information Technology (ICRTIT), 2014 International Conference on. IEEE, 2014.

[9]Karthick, A. V., E. Ramaraj, and R. Ganapathy Subramanian. "An efficient multi queue job scheduling for cloud computing." Computing and Communication Technologies (WCCCT), 2014 World Congress on. IEEE, 2014.

[10]Cheng, Dazhao, et al. "Resource and deadline-aware job scheduling in dynamic hadoop clusters." Parallel and Distributed Processing Symposium (IPDPS), 2015 IEEE International. IEEE, 2015.

[11]Gupta, Abhishek, et al. "A theoretical comparison of job scheduling algorithms in cloud computing environment." Next Generation Computing Technologies (NGCT), 2015 1st International Conference on. IEEE, 2015.

[12]Huang, Daochao, et al. "Multi-resource packing for job scheduling in virtual machine based cloud environment." Service-Oriented System Engineering (SOSE), 2015 IEEE Symposium on. IEEE, 2015.

[13]. Thomas A. Henzinger , Anmol V. Singh, Vasu Singh, Thomas Wies, "Static Scheduling in Clouds".

[14]. T.Casavant and J.Kuhl, "A Taxonomy of Scheduling in General Purpose Distributed Computing Systems", "IEEE Trans. On Software Engineering", vol.14, no.3, February 1988,pp.141-154.

[15]. Fatos Xhafa, Ajith Abraham, "Computational models and heuristic methods for Grid scheduling problems", "Future Generation Computer Systems 26", 2010, pp.608-621.

[16]. M.Arora, S.K.Das, R.Biswas, "A Decentralized Scheduling and Load Balancing Algorithm for Heterogeneous Grid Environments", "Proc. Of International Conference on Parallel Processing Workshop (ICPPW'02)", Vancouver, British Columbia Canada, August 2002, pp.400-505.