A Review on Heuristic Based procedures Used in Cloud Scheduling

Alka Vohra[1], Assistant Professor Er. Suchitra[2]

[1]Department of Computer Science and Engineering

Galaxy Global Group of Institution Dinarpur, Ambala, India

[2]Department of Computer Science and Engineering

Galaxy Global Group of Institution Dinarpur, Ambala, India

Abstract: *cloud computing is the delivery of computing services—servers, storage, databases, networking, software, analytics and more—over the Internet ("the cloud").*

Cloud computing is an emerging technology. It process huge amount of data so scheduling mechanism works as a vital role in the cloud computing. There are various techniques used in cloud scheduling. In this paper, firstly we explain the concept of cloud computing after that we reviewed cloud scheduling. There are various scheduling based on Meta heuristic technique like Min-Min, Max-Min, and Sufferage.

Keywords: Cloud Computing, Min-Min, Max-Min, Sufferage, Scheduling.

1.   INTRODUCTION

What is a cloud computing?

Cloud computing is a technique of Internet-based computing which provides shared computer processing resources and data to terminals and other devices on demand. It is a process in which principle for enabling ubiquitous, on-demand usage to a shared pool of configurable computing resources (e.g., terminal networks, servers, storage, applications and services), which can be actively managed and released with minimal management effort. Cloud computing and storage solutions provide.

Users and machines with various capabilities to save and execute their data in either privately owned or third-party data centers that may be located far from the user ranging in distance from across globally. Cloud computing relies on sharing of resources to achieve coherence and economy of scale, similar to a utility (like the electricity grid) over an electricity network.

From where it is originated?

In 2009, the availability of high-capacity networks, low-cost computers and storage devices as well as the widespread adoption of hardware virtualization, service-oriented architecture, service-oriented architecture, and autonomic and utility Computing led to a growth in cloud computing. Companies can scale up as computing needs increase and then scale down again as demands decrease. In 2013, it was reported that cloud computing has become a highly demanded service or utility due to the advantages of high computing power, cheap cost of services, high performance, scalability, reliability and easy to use as well as availability. Some cloud sellers are experiencing growth rates of 50% per year, but being still in a stage of infancy, it has pitfalls that need to be addressed to make cloud computing services more reliable and user friendly.

1.1 CHARACTERISTICS OF CLOUD COMPUTING:

Utility-based pricing: Cheaper the cost because it provides services on pay per use model. The consumption for the service changes from one perspective to another e.g. one provider may purchase services from another on the hour basis pay model and it further provides these services to another customers on the basis of number of client it can serve various clients at the same time.

Broad network access: Cloud services are made available via internet. If any device having internet connection such as mobile phones, laptops, and tablet etc. can use these services. Also these service providers have their data centre location at different hops

Shared resource pooling: The necessary resources are provided automatically to numerous consumers by using virtualization, duplication and multi-tenancy technologies.

Dynamic resource provisioning: Resources are easily available for the demand of user in the form what they want without requirement of any manual involvement.

Measured service: The resources provided measured in terms of customer demand and usage of these resources billing is measured by "pay-peruse- model."

Self-organizing: Cloud service providers have to manage the resources according to their own needs. Consumption

of these resources are managed according to the demand of the user.

1.2 DEVELOPMENT MODEL OF CLOUD COMPUTING:

Cloud computing services can be of three types' public cloud, private cloud and hybrid cloud.

Private cloud: Private cloud services are delivered from a business' data center to internal users. This model offers versatility and convenience, while preserving the management, control and security common to local data centres. Internal users may or may not be billed for services through IT charge back.

Public Cloud: In the public cloud model, a third-party provider delivers the cloud service over the internet. Public cloud services are sold on demand, typically by the minute or hour. Customers only pay for the CPU cycles, storage or bandwidth they consume. Leading public cloud providers include Amazon Web Services (AWS), Microsoft Azure, IBM SoftLayer and Google Compute Engine.

Hybrid cloud: Hybrid cloud is a combination of public cloud services and on-premises private cloud -- with orchestration and automation between the two. Companies can run mission-critical workloads or sensitive applications on the private cloud while using the public cloud for bursting workloads that must scale on demand. The goal of hybrid cloud is to create a unified, automated, scalable environment that takes advantage of all that a public cloud infrastructure can provide while still maintaining control over mission-critical data.

1.3 SERVICE MODEL:

There are basically three main types of services used in cloud. Infrastructure as a service (IaaS), Platform as a Service (PaaS), and Software as a Service (SaaS). Different types of services are provided by cloud providers. In general these services are known as XaaS (everything as a Service). These service provider, provides services as "black boxes" and only tells about how can these services be offered and how can these services be accessed but the internal working detail of the service is hidden from the end user. In the following section these services are described in detail with their benefits:

Infrastructure as a Service–IaaS is the delivery of computer infrastructure because of the fluctuations in market demand of hardware and software resources. To fulfill constantly changing demand, infrastructure is provided as a service on cloud. Customer uses the resources as they need and return them back to the provider when their goal is achieved. One of the examples for IaaS is Amazon EC2 which provides services for computing power and S3 for storage capacity. Benefits of IaaS are:

- It match the power consumption according to demand.
- It reduces the cost by providing hardware.
- Higher returns in terms of higher resource utilization.

Platform as a Service – Platform as a service provides a complete set of tools and technologies which are required to develop deploy and operate SaaS applications. This Application Development is mostly done by with the help of Web Browsers. PaaS examples include Microsoft Azure Services Platform, Google App engine and Amazon S3 etc. The benefits of PaaS are:

- Pay per use model for development, test and operate SaaS environment
- Developers just need to focus on application code

Software as a Service–SaaS is a multitask platform. In this, multiple clients get the services from common resources and same infrastructure for both the application and underlying database is provided at the same time to multiple customers. Cloud computing provides software as a service on internet. Individuals don't need to buy the copy rights of software they want to use. They can borrow that software from cloud providers according to their need. Some of the biggest name in market that provide SaaS are salesforce.com providing it's CRM application as service, Google web based calendar application, and Microsoft online SharePoint etc. These services are charges as per the usage on monthly basis. The benefits of SaaS are:

- Elimination of licensing and version compatibility
- Reduced upfront cost and hardware cost

2. LITERATURE SURVEY

Kobra Etminani and M. Naghibzadeh [1] numerous research group in institutions, labs and industries around the world are working on new type of grid, that grid is called computational grid. That enables distributed resources for solving large-scale data problems in engineering and commerce. Two algorithms Min-Min and Max-Min are used.

It select between two algorithms. That based on standard deviation of expected completion time of task on resource. We evaluate heuristic scheduling and the selective algorithm, within the grid simulator called GridSim. We compare this approach to its two basic heuristic. The experimental result shows that the New heuristic lead to significant performance.

Juefu Liu and Gang Li, [2] Depend upon the existing researches on grid scheduling algorithm, a model that improves the Min-Min algorithm that is based on the Qos constraint is introduced and there is a condition that the higher priority tasks can be implemented on the condition

that the high Qos task get high Qos resources, so that the shortage of task with special requirement on resources can be made and customer need could be satisfied completely.

S. Selvarani and G. S. Sadhasivam [3] the main objective of this paper is to schedule task group in cloud computing environment, where all the resources have different cost and computation performance. Due to task grouping, communication of coarse-grained task/jobs and resources optimizes communication ratio.

T. Kokilavani and Dr. D.I. George Amalarethinam, [4] in this load balanced Min-Min algorithm (LBMM) is used. That reduces the makespan and increases the resources utilization. This method has two-phases. In first phase in-Min algorithm is used and in second phase unutilized resources uses the reschedule tasks

Elzeki, O. M., M. Z. Reshad, and M. A. Elsoud[5] a new unique modification of Max-min algorithm is proposed. This algorithm is built based on study of the impact of RASA algorithm in performing tasks and the atom concept of Max-min strategy. An Improved version of Max-min algorithm is proposed to outperform scheduling map at least similar to RASA map in total complete time for submitted jobs. Improved one is based on the expected execution time instead of complete time as a selection basis. This results show the availability of load balancing in small cloud computing environment and total small make span in large-scale distributed system; cloud computing. In turn performing tasks within cloud computing using Improved one demonstrates achieving schedules with comparable lower make span rather than RASA and original Max-min.

Amandeep Kaur Sidhu, SupriyaKinger [6] Cloud Computing is a computing paradigm. Its main function is to share data, calculations, and service transparently over scalable network of nodes. Since Cloud computing stores the data and disseminated resources in the open environment. So, the amount of data storage increases quickly. In the cloud storage, load balancing is a key issue. It would consume a lot of cost to maintain load information, since the system is too huge to timely disperse load. Load balancing is one of the main challenges in cloud computing which is required to distribute the dynamic workload across multiple nodes to ensure that no single node is overwhelmed. It helps in optimal utilization of resources and hence in enhancing the performance of the system. A few existing scheduling algorithms can maintain load balancing and provide better strategies through efficient job scheduling and resource allocation techniques as well. In order to gain maximum profits with optimized load balancing algorithms, it is necessary to utilize resources efficiently.

Huankai Chen, F. Wang, N. Helian and G. Akanmu [7]inthis papercloud computing is used. Cloud computing used as a new paradigm of large scale distributed computing. To utilize the power of cloud computing completely, we use an efficient task scheduling. The Min-Min algorithm is very simple and efficient algorithm. The main drawback of it is load imbalanced, which is the main issue for cloud provider. This paper used improved load balance algorithm using Min-Min algorithm. It reduces the makespan and increases the resource utilization. Cloud provider offers Pay-per-use computer resources. In this context the cost of the computer resources depends upon the services selected by user.

N. Chopra and S. Singh, [8] this is the technology provides on demand resources for Compute and storage requirements. Particular Private Cloud is a good option for cost saving for executing workflow applications but when the resources in private cloud is not enough to meet storage and Compute requirements of an application then public clouds are the option left. While normal public clouds charge users on pay-per-use Basis, private clouds are owned by users and can be utilized with no charge. When a public cloud and a private cloud are mixed, we get a hybrid cloud. In hybrid cloud, task scheduling is a Complex process as jobs can be allocated resources either from Private cloud or from public cloud. A fix target based scheduling is the main focus in many of the workflow applications. In the amended, we have developed a level based scheduling algorithm which executes tasks level wise and it uses the concept of sub-deadline this is helpful in finding best resources on public cloud for cost saving and also completes workflow execution within deadlines. Performance analysis and comparison of the proposed algorithm with min-min approach is also presented.

S. Devipriya and C. Ramesh [9] this paper works on the technique called cloud computing. Cloud computing is a techniques that uses the computing resources that are delivered as a service over the network. In this paper Max-Min algorithm is proposed and the algorithm is built based on RASA algorithm. Max-Min algorithm that is used in this paper is based on the expected execution time instead of completion time. So the tasks that are used in scheduling environment using improved Max-Min can achieve lower makespan rather than original Max-Min.

Upendra Bhoi, Purvi N.RamanuJ[10] Cloud Computing is the use of computing resources that are delivered as a service over network. It supplies a high performance computing based on protocols which allow shared computation and storage over long distances. In cloud computing, there are many tasks requires to be executed by the available resources to achieve best performance, minimal total time for completion, shortest response time, utilization of resources etc. Because of these different intentions, we need to design, develop, propose a scheduling algorithm to outperform appropriate allocation map of tasks on resources. A unique modification of Improved Max-min task scheduling algorithm is proposed.

The algorithm is built based on comprehensive study of the impact of Improved Max-min task scheduling algorithm in cloud computing. Improved Max-min is based on the expected execution time instead of completion time as a selection basis. Enhanced (Proposed) Max-min is also based on the expected execution time instead of completion time as a selection basis but the only difference is that Improved Max-min algorithm assign task with Maximum execution time (Largest Task) to resource produces Minimum completion time.

Ms.K.Sathya, Dr. S.Rajalakshmi [11] the major issue in cloud computing environment is cost provisioning. That's why a new method called Location based Minimum Migration in Cloud (LBMMC). This new method monitors all the virtual machine in all cloud location. It also identifies the state of virtual machines whether it is sleep or idle state it also checks the number of tasks able to run or check number of tasks running.

Santhosh B and Manjaiah D H [12] in this scenario a unique modification to the Improved Max-min algorithm is proposed. In Improved Max-min algorithm largest job is selected and assigned to the resource which gives minimum completion time. Here two algorithms are proposed on Improved Max-min where instead of selecting the largest task, a task just greater than average .applied time is selected and assigned to the resource which gives least completion time. The experimental result shows the new algorithms schedules jobs with lower makespan.

X. Li, Y. Mao, X. Xiao and Y. Zhuang [13] in cloud computing, load balancing helps in minimizing resource consumption and avoids bottlenecks. Although many load balancing schemes have been presented, there is no scheme providing the elasticity in cloud computing. A Max-Min task arranging algorithm for load balance in the elastic cloud is proposed in this paper. To realize the Load balancing, the proposed algorithm maintains a task status table to Estimate the real-time load of virtual machines and the expected Completion interval of tasks, which can relocate the workload among nodes and realize the load balance. The excessive experiment shows that the proposed Max-Min task-scheduling algorithm can improve the Resource utilization as well as reduce theresponse time of tasks.

Santhosh B and Manjaiah D H [14] in this concept a new kind of amendment is to be imposed here known as Max-Min algorithm. In the approved new Max-Min algorithm largest feature is selected and assigned to resource which takes minimum completion time. This time two algorithms are proposed on improved Max-Min where instead of selecting the largest task, a task just greater than Average execution time consumer is selected and assigned to the resource which gives minimum completion time. The

experimental results show the new algorithms schedules jobs with lower make span.

Sandeep Singh Brar , Sanjeev Rao [15] In this vital concept we can evaluate this with the up rise of fourth paradigm, that is invention of science over a long interval of time, scientific workflows commence to amend their status amongst in numerous science subject areas indulging physics, astronomy, biology, chemistry, earthquake science and many more. In Scientific form of work, a heavy volume of data processing is required and workflows with up to a few tasks are not undone. With the advent of Cloud Computing as a new model of service in distributed systems, a new way or feature we can say that comes in light for executing scientific applications such as Workflows by deploying resources of Cloud. The arrangement of millions of tasks of workflows, while processing with Cloud resources, in a most profitable manner i.e. minimum computation time is still an attractive research area. The scheduling algorithms are brushing off the individual dependent and independent tasks. In this research paper, Max-Min algorithm is implemented for scheduling of workflow tasks that is focalized on the consideration of dependent and independent tasks and process independent tasks in parallel that directly gives profit in minimizing computation time.

J. Agarkhed and R. Ashalatha [16] Cloud computing is a perfect platform for executing complex applications in any kind of network. Dynamic resource performing for multi objective schedules has economic background process for blinking workload of networks. It takes care of multi objective resource provisioning scheme for handling multiple task classes for various workload facility. The work includes virtual optimization method for multiple workloads in cloud environment.

Mubarak Haladu, Joshua Samual [17] Cloud Computing provides the chance to use computing resources over the internet without owning the infrastructure. The main content of Cloud Computing is to manage Software application, data storage and processing capacity which are assigned to other users on demand through the internet and pay only for what they consume. Task arranging in cloud computing is the biggest overcome because many tasks need to be executed by the available resources in order to meet user's requirements. To achieve best performance, minimize total completion time, minimize response time and maximize resources utilization there is need to allocate these challenges. This paper studies different task scheduling algorithms and an Enhanced Min-min algorithm is developed. The algorithm uses the advantages of Min-min and avoids its drawbacks. The main idea of the proposed algorithm is to schedule

task to resources appropriately in order to achieve an effective load balancing and decrease completion time.

N. Patil and D. Aeloor [18] a very effective and impressive computing environment is provided by cloud computing where the customers or several handlers are in need of multiple resources to be provided as a service over the internet. The utilization of sources is to be scheduled efficiently so that it helps in reducing the time for task completion. This is task scheduling which is most essential and important part in cloud computing environment. In task scheduling allocation of certain tasks to particular resources at a particular time instance is done. There are different techniques that are proposed to solve the problems of task scheduling. This paper discusses about the study of various resource scheduling algorithms in a cloud computing environment.

L. Zuo; L. Shu; S. Dong. [19] A task-oriented multi-objective scheduling is introduced in which method based on colony optimization (MOSACO) to optimize the finite pool of public and private computing resources in a hybrid cloud computing environment according to deadline and cost constraints. MOSACO is employed to minimize task completion times and costs using time-first and cost-first single objective optimization strategies, respectively, and to maximize user quality of service and the profit of resource providers using an entropy optimization model.

3. CONCLUSIONS

One of the biggest security worries with the cloud computing model is the sharing of resources. The advancement of cloud computing is dramatically changing the horizon of information technology and ultimately turns the utility computing into a reality. However, it provides a large array of benefits, but many challenges in this domain, including automatic resource positioning, energy management, information security are only attracted the research community. There are still so many issues to be explored. Opportunities are enough in this arena for some groundbreaking contribution and bring significant development in the industry.

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