

# A Literature Survey On Resource Scheduling In Cloud Computing

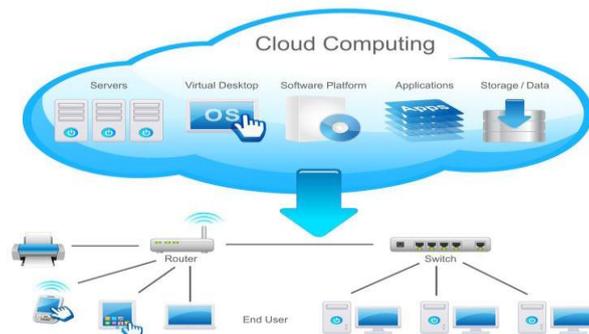
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**Abstract-** A cloud computing is a fast growing area in computing research and industry today. Three main services provided by the cloud are Infrastructure as a Service (IaaS), Software as a Service (SaaS) and Platform as a Service (PaaS). Private Cloud is restricted to a particular organization and data security risks are less compared to the public cloud. Hence, private cloud is built by exploiting the commodity machines within the organization and the important data is stored in it. It is found from literature that Scheduling refers to the set of policies to control the order of work to be performed by a computer system. There has been various types of scheduling algorithm existing in cloud computing and resource scheduling is one of them. The main advantage of resource scheduling algorithm is to achieve a high performance computing and the best system throughput. Scheduling manages availability of response time, processing time and good scheduling policy gives maximum utilization of resource. Equally Spread Current Execution and Throttled algorithm are studied thoroughly with its comparison with other scheduling algorithms and a complete system is prepared to apply proposed algorithm to optimize the throughput of INSAT-3D images.

**Index Terms-** Cloud Computing; Opennebula; Resource Scheduling; INSAT-3D

## I. INTRODUCTION

Cloud computing is a model for enabling ubiquitous, convenient, on-demand network access to a shared pool of configurable computing resources (e.g., networks, servers, storage, applications and services) that can be rapidly provisioned and released with minimal management effort or service provider interaction.<sup>[14]</sup>



**Fig.1.1 Cloud Computing<sup>[15]</sup>**

Some common services that are hosted in the cloud are hosted desktop, provided by companies like AT&T; hosted email like Gmail, provided by companies like Google; cloud storage, provided by companies like Dropbox; and streaming music, provided by companies like Spotify. These services, applications and files are stored in the cloud and can be accessed by users via any device.

There are a wide range of companies and industry verticals that use cloud computing such as Amazon and Google. Small, medium, and large size public and private companies alike use cloud computing to reduce technology acquisition costs.

### 1.1 Cloud Deployment Models

There are mainly 4 types of cloud deployment models.

**(1) Public Cloud** Public clouds are owned and operated by companies that use them to offer rapid access to affordable computing resources to other organizations or individuals. With public cloud services, users don't need to

purchase hardware, software or supporting infrastructure, which is owned and managed by providers.

**(2)Private Cloud** A private cloud is owned and operated by a single company. All virtualized resources and automated services are customized and used by various lines of business and constituent groups. Private clouds exist to take advantage of many of cloud's efficiencies, while providing more control of resource.

**(3)Hybrid cloud** A hybrid cloud uses a private cloud foundation combined with the strategic use of public cloud services. Most companies with private clouds will evolve to manage workloads across data centres, private clouds and public clouds—thereby creating hybrid clouds. By utilizing "hybrid cloud" architecture, companies and individuals are able to obtain degrees of fault tolerance combined with locally immediate usability without dependency on internet connectivity. Hybrid cloud architecture requires both on-premises resources and off-site (remote) server-based cloud infrastructure.

**(4)Community cloud** A community cloud in computing is a collaborative effort in which infrastructure is shared between several organizations from a specific community with common concerns (security, compliance, jurisdiction, etc.), whether managed internally or by a third-party and hosted internally or externally.

### 1.2Cloud Service Models

Service means different types of applications are provided by different servers across the cloud. There are 3 types of services in a cloud given as:

**(1)Software as a Service(SaaS)** Software-as-a-Service provides complete applications to a cloud's end user. It is mainly accessed through

a web portal and service oriented architectures based on web service technologies.

**(2)Platform as a Service(PaaS)** Platform -as-a-Service provides environment for developing and provisioning cloud applications. The principal users of this layer are developers seeking to develop and run a cloud application for a particular platform.

**(3)Infrastructure as a Service (IaaS)** Infrastructure -as-a-Service provides essential IT resources include services linked to computing resources, data storage resources, and the communications channel.

## II. BACKGROUND THEORY

### 2.1 INSAT-3D

INSAT-3D is a meteorological, data relay and satellite aided search and rescue satellite developed by the Indian Space Research Organisation and was launched successfully on 26 July 2013 using an Ariane 5 ECA launch vehicle from French Guiana.INSAT-3D is designed for enhanced meteorological observations, monitoring of land and ocean surfaces, generating vertical profile of the atmosphere in terms of temperature and humidity for weather forecasting and disaster warning. The meteorological payload features an imager and a sounder. <sup>[16]</sup>

### 2.2Resource Scheduling

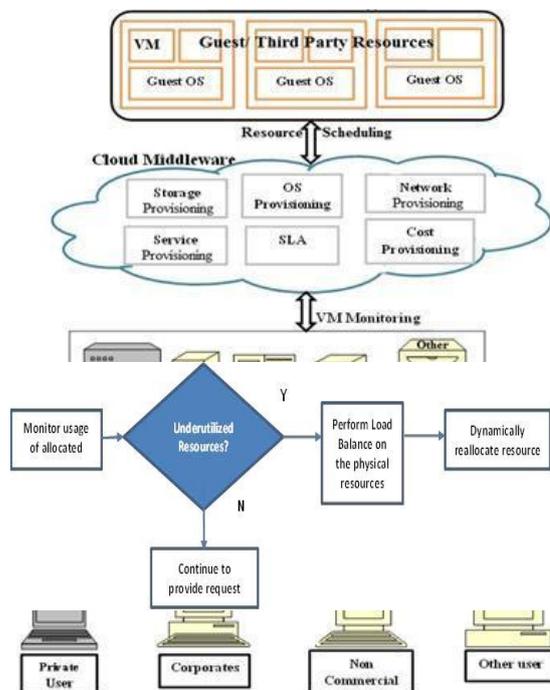
Resource scheduling is the process of mapping tasks to available resources on the basis of tasks' characteristics and requirements. It is an essential aspect in efficacious working of cloud as many task parameters need to be considered for proper scheduling resources scheduling strategy is the key technology in cloud computing. The available resources should be utilized efficiently without affecting the service parameters of cloud.

Resource Scheduling process in cloud can be generalized into three stages namely–

**(1)Resource discovering and filtering** – Data Center Broker discovers the resources present in the network system and collects status information related to them.

**(2)Resource selection** - Target resource is selected based on certain parameters of task and resource. This is deciding stage .

**(3)Task submissions** - Task is submitted to resource selected.<sup>[1]</sup>



**Fig.2.1 Resource Scheduling In Cloud Computing Environment<sup>[2]</sup>**

**2.3Resource Monitoring**

Resource monitoring is an important part of resource management under the cloud computing environment which provides a better reference for resource allocation, task scheduling and load balancing.

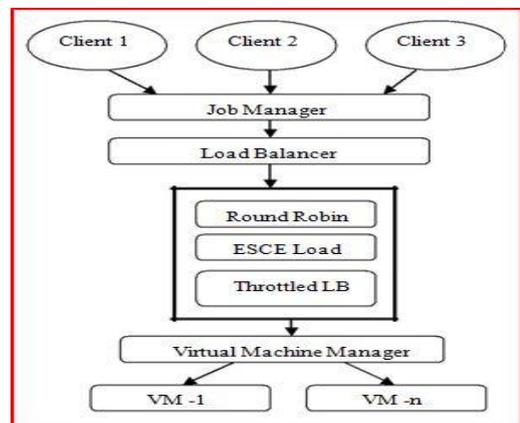
**Fig.2.2 Resource Monitoring With Load Balancing Approach<sup>[2]</sup>**

In Figure 2.2 is the ongoing monitoring process done by the service

provider. This process is being done to optimize the resources available. If there is underutilized computing power, the service provider will perform a load balancing exercise that will result a better utilization among the available resources.<sup>[2]</sup>

**2.4 Load Balancing**

Load balancing is the technology to distribute workload across multiple computers or a computer cluster, central processing units, disk drives, RAM, or other resources, to achieve optimal resource utilization, maximize throughput, minimize response time, avoid overload.<sup>[3]</sup>



**Fig.2.3 Load balancing Algorithms Execution<sup>[6]</sup>**

**2.4.1 Goals of Load Balancing**

The goals of load balancing are:

- To improve the performance substantially
- To have a backup plan in case the system fails even partially
- To maintain the system stability
- To accommodate future modification in the system

**2.4.2 Types of Load Balancing Algorithm**

Depending on who initiated the process, load balancing algorithms can be of three categories as given in.

**(1)Sender Initiated:** If the load balancing algorithm is initialised by the sender

**(2)Receiver Initiated:** If the load balancing algorithm is initiated by the receiver

**(3)Symmetric:** It is the combination of both sender initiated and receiver initiated

Depending on the current state of the system, load balancing algorithms can be divided into 2 categories as given:

#### **(1)Static Load Balancing**

It doesn't depend on the current state of the system. Prior knowledge of the system is needed.

#### **(2)Dynamic Load Balancing**

Decisions on load balancing are based on current state of the system. No prior knowledge is needed. So it is better than static approach.<sup>[3]</sup>

### **2.4.3 Load Balancing Algorithms**

#### **(1) Random Scheduling Algorithm**

Randomly distributes load across the available servers. It has Random no generation and sending the current connection to it .Load that is distributed among the nodes but there is no guaranties that load will be distributed equally.

#### **(2)Round Robin Algorithm**

It passes each new connection request to the next server in queue, distributing connections evenly across the array of machines being load balanced .It could be more effective if the equipment that we are load balancing is roughly equal in processing speed, connection speed, and/or memory. It will not check whether the server is heavy loaded or not, it will directly assign the request whenever its turn comes so that is the reason, some server are heavy loaded while some are lightly loaded.<sup>[1]</sup>

#### **(3)Dynamic Round Robin Algorithm**

Dynamic Round Robin, strategy, weights assignments is based on continuous monitoring of the servers and is therefore constantly changing. The distributions of

connections is done on the basis of server performance analysis such as the current number of instances i.e. connection per node or the response time of a fastest node.

#### **(4)Weighted Round Robin Algorithm**

The circular queue is rebuilt with new (dynamics) weights whenever it has been fully traversed.

#### **(5)Equally Spread Current Execution Algorithm**

A load balancer monitors the jobs which are asked for execution. The balancer looks over the queue frequently for new jobs and then allots them to the list of free virtual server. The balance also maintains the list of task allotted to virtual servers, which helps them to identify that which virtual machines are free and need to be allotted with new jobs. It works on equally spreading the load on different virtual machine.<sup>[10]</sup>

#### **(6) Throttled Algorithm**

Throttled algorithm is completely based on virtual machine. Here the client first requests the load balancer to check the right virtual machine which access that load easily and perform the operations which is given by the client. The client first requests the load balancer to find a suitable Virtual Machine to perform the required operation.<sup>[7]</sup>

### **III. LITERATURE SURVEY**

In [4],authors have discussed open source with its architecture, features. Comparison of open sources is shown in Table 1.In [11],Lunar Images have range from a few gigabytes to hundreds of gigabytes in size with new data arriving daily. In this paper, authors have built hybrid cloud to give facility to users over the internet and authenticate some recent data.

	Eucalyptus	Open Nebula	Nimbus
Disk Image Options	Options set by admin	In private cloud, most libvirt options left open	Depends on configuration
Disk Image Storage	Walrus, which imitates Amazons S3	A shared file system, by default NFS, or SCP	Cumulus (recent update from <a href="#">GridFTP</a> )
Hypervisors	Xen, KVM (VM Ware in non-open source)	Xen, KVM, VMware	Xen, KVM
Unique Features	User management web interface	VM migration <a href="#">Supported</a>	Nimbus <a href="#">context</a> broker

**Table 1: Comparison of Open Sources**

In [8], authors have done experiment using Round Robin, Equally spread current execution load, Throttled Load balancing algorithms in cloud analyst. The request time for the three policies applied are same which means there is no effect on data centers request time after changing the algorithms. Below is the Cost estimation and average Requesting table. The cost analysis showed for each algorithm is calculated in the experimental work. The cost calculated for virtual machine usage per hour is same for two algorithms

Parameters	Load Balancing Algorithm on Cloud Analyst		
	Round Robin	ESCE	Throttled
Data Centres	2	2	2
UB	5	5	5
H/W Unit	2	2	2
V.M	20	20	20
Avg (ms)	0.28	0.28	0.28
Min (ms)	0.02	0.02	0.02
Max (ms)	0.64	0.64	0.64
Total \$ (Cost)	1.83	1.83	1.82

**Fig 3.1: Results Of Load Balancing Algorithm In Simulator<sup>[6]</sup>**

Round Robin, Equally spread current execution load but Throttled Load balancing algorithm reduce the cost of usage, so Throttled Load balancing algorithm works more efficiently in terms of cost for load balancing on cloud data centers. In [7], authors have done experiment on six different continents are considered i.e. six user bases and peak and non peak users are given in the table. Authors have considered internet users at different continents from the month of June

2012. The same data is experimented with three different scheduling algorithms and response time of each algorithm is also considered for the result analyses. Throttled algorithm with better response time than Round -Robin failed to distribute load uniformly, overloading initial VMs and leaving others underutilized. Authors have mentioned that to be focused on changing the data structures used for maintaining index table and by incorporating on the paradigms of parallel and high performance computing the response time and resource utilization. In [8], authors have used round robin and throttled algorithm on like average response time, data center request service time. They have verified total cost of different data centers. Throttled load balancing when taken in a combination with optimize response time service broker policy has the best integrate performance in heterogeneous cloud environment. Authors will focus on real time environment for evaluating the performance. In [9], authors have used round robin and throttled algorithm on Response Time By Region, Data Center Request Servicing Times, Data Transfer Cost. The requested time for the two policies applied (Round Robin, Throttled Load balancing) are the same which means there is no effect on data centers request time after changing the algorithms. The cost analysis showed for each algorithm is calculated in the experimental work. The cost calculated for virtual machine usage per hour is not same for two algorithms, Throttled Load balancing algorithm reduce the cost of usage, so Throttled Load balancing algorithm works more efficiently in terms of cost for load balancing on cloud data centers. In [5], the response time and data transfer cost is a challenge of every engineer to develop the

products that can increase the business performance in the cloud based sector. The several strategies lack efficient scheduling and load balancing resource allocation techniques leading to increased operational cost and give customer satisfaction. Author has applied development of enhanced strategies through improved job and load balancing resource allocation techniques. Equally spread current execution algorithm and Throttled algorithm dynamically allocates the resource to the job in a queue leading reduced cost in data transfer and virtual machine formation.

#### IV. CONCLUSION

Scheduling is one of the most important tasks in cloud computing environment. Scheduling manages availability of CPU memory, processing time and good scheduling policy gives maximum utilization of resource. In this thesis, analysis of various scheduling algorithm efficiently schedules the computational tasks in cloud environment. From literature survey it is found that equally spread current execution algorithm and throttled algorithm does not improve overall response time and data center processing time. Proposed algorithm will use for large datasets in private cloud to optimize the throughput.

Algorithm Name	Parameters Used	Type Of Algorithm	Merits	Demerits
Round Robin <sup>[13]</sup>	Completion time	Static	Every process get equal weight age so no process will go under starvation.	Most of the time processor remains idle
Equally Spread Current Execution <sup>[14]</sup>	Response time,	Dynamic	Maximize throughput	Less priorities process need to wait too long.
Throttled Load Balancer <sup>[8]</sup>	Communication cost, Load Movement Factor	Dynamic	High Load Movement Factor	High communication

**Table 2: Comparison of Various Load Balancing Algorithms**

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#### REFERENCES

**Papers**

[1] Dr Ajay Jangra and Tushar Saini, “ Scheduling Optimization In Cloud Computing”, International Journal Of Advanced Research In Computer Science and Software Engineering, April 2013, ISSN: 2277-128X,Page(s): 62-65

[2] Mohd Hairy Mohamaddiah, Azizol Abdullah, Shamala Subramaniam, and Masnida Hussin , “A Survey On Resource Allocation And Monitoring In Cloud Computing” International Journal Of Machine Learning and Computing, 2014 ,ISSN:2010-3700,Page(s):31-38

[3] Amandeep Kaur Sidhu, Supriya Kinger, “A Sophisticate Approach For Job Scheduling In Cloud Server”, International Journal Of Computer Trends And Technology,July,2013,ISSN:2231-2803,Page(s): 2055-2058

[4]Peter Sempolinski, Douglas Thain, “A Comparison And Critique Of Eucalyptus, Open Nebula And Nimbus”, Cloud Computing Technology And Science (CloudCom),DOI 10.1109/CloudCom.2010,Page(s):417-426

[5]Ms.NITIKA, “Comparative Analysis Of Load Balancing Algorithms In Cloud Computing ”, International Journal Of Engineering And Science, 2011,ISSN:2319-1813,Page(s): 34-38

[6]Dr Hemant Mahalle,Parag R Kaveri, Dr. Vinay Chavan“ Load Balancing On Cloud Data Centers”, International Journal Of Advanced Research In Computer Science & Software Engineering, January,2013,ISSN:2277-128XPage(s):1-4

[7]Shridhar G.Domanal and G.Ram Mohana Reddy “Load Balancing In Cloud Computing Using Modified Throttled Algorithm”, IEEE International Conference on Cloud Computing in Emerging Markets, Oct, 2013,Page(s): 1-5

[8]Hamid Shoja ,Hossein Nahid, Reza Azizi “ A Comparative Survey On Load Balancing Algorithms In Cloud Computing”, International Conference On Computing, Communication And Networking Technologies, July,2014 , Page(s):1-5

[9]Veerawali Behal, Anil Kumar, “Cloud Computing: Performance Analysis Of Load Balancing Algorithms In Cloud Heterogeneous Environment”, 5th International Conference Confluence The Next Generation Information Technology Summit, Sept,2014,Page(s): 200-205

[10]Subasish Mohapatra, K.Smruiti Rekha, Subhadarshini Mohanty, “ A Comparison Of Four Popular Heuristics For Load Balancing Of Virtual Machines In Cloud Computing”, International Journal Of Computer Applications, April 2013, ISSN:0975-8887,Page(s):33-38

[11]George Chang, Shan Malhotra, Paul Wolgast, “Leveraging The Cloud For Robust And Efficient Lunar Image Processing”,IEEE, 2011, Page(s):1-8

[12] Pooja Samal,Pranati Mishra ,“Analysis Of Variants In Round Robin Algorithms For Load Balancing In Cloud Computing” International Journal Of Computer Science And Information Technologies, 2013,ISSN:0975-9646,Page(s): 416-419

[13]Akshay Daryapurkar, Mrs. V.M. Deshmukh, “Efficient Load Balancing Algorithm n Cloud Environment ” International Journal Of Computer Science And Applications,2013, ISSN:0974-1011,Page(s):308-312

#### Websites

[14]<http://www.nist.gov/itl/csd/cloud-102511.cfm> Date:10/11/2014, Time:6.00 P.M.

[15]<http://outshineworld.com/technology/benefits-and-challenges-of-cloudcomputing-applications-for-smbs.html> Date:10/11/2014, Time:6.05 P.M.

[16]<https://directory.eoportal.org/web/eoportal/satellite-missions/i/insat-3d> Date: 15/11/ 2014 Time:11:00 P.M.