Application of online scheduling: A Heuristic algorithm approach to the stochastic cloudlet request growth for the load the balancing in cloud computing environment

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***Abstract*—Cloud computing is a new service made available to the end user with pay-and -use type, which are provided using the data centers, and with internet for providing different cloud based applications to the end users using subscription based, that are provided using sharable distributed computing resources concept. Generally these data centers are located at different locations and different end-users needs different requirements at the same time may get overloaded which is a challenging task. Quality of cloud service gets decreased due to the reason at the level of resources it is not possible to make decisive decision to provide better services. It is a study to declining the application of Queuing Theory to the cloud computing. Aimed to study the Stochastic Cloudlet user requests which arrive at the Data centers, and the study of its growth. Application of online scheduling using heuristic algorithm approach for the load the balancing in cloud computing environment is observed improved results in terms of parameters- Processing Time, Throughput and Network Delay.**

***Index Terms*— Cloud computing, pay-and -use, Data center, Sharable Distributed Computing Resources Concept (SDCRC), End-users, Cloud resources, Heuristic algorithm.**

I. INTRODUCTION

In the recent days the cloud computing has shown a predominant growth in the area of internet based network technology. It is possible due to the reason of growth of communication technology. Cloud technology uses 'Sharable Distributed Computing Resources' (SDCR) which is also called as virtualization. SDCR Concept can be used for the massive usage of large scale internet based applications. These applications are available to the end users because of sharable resources such as servers, storage of data, services. Amazon, Apple, Google, HP, IBM, Microsoft, Oracle are a few examples of cloud service providers. Cloud computing systems are generally established in bigger data centres. These data centres would be hosted by a company. The hosting company provides the services to the customers or the end users. Before the cloud computing technology came in to existence, the traditional business applications were existed. They are very complicated. They needed different types of Hardware, and Softwares to be installed, configure, test, run, secure and update periodically by a group of experts. Cloud computing is a distributed computing facility [1]. Distributed computing facility is provided to the third party. John McCarthy is the father of this model of computing. Today cloud computing is a common and major computing resource. Cloud computing tremendously changed the technology aspects worldwide. Cloud computing provides a way to rent the infrastructure, run the environment and to have the services on pay and use model. Cloud style of delivering the services is defined by 'Reese'. The digital revolution started in late 1950s and continued to till today.

Execution time is an instance, used up by the job actively utilizing the processor resources and response time is a time in which the job becomes active and completes. The task is a piece of code which will be

used inside a single thread execution. Here a time trigger interrupts. This time trigger interruption is called as an external event. As a result response time is longer than execution time. In 1990s programs are executed in a network. This requires the resources to be utilized by sharing and optimization[12]. In a computer operating system has to perform a variety of functions towards software subsystems and hardware subsystems. Generally, the operating system manages the following resources (i) Processor (ii) Memory (iii)Input Output Devices and the (iv)Files.

II. CLOUD COMPUTING WORKING MODELS FROM USER POINT OF VIEW

Cloud computing Deployment model refers to the way cloud computing is made available to the end user. Generally Cloud computing Deployment model is a control based infrastructure mode provisioning the services to the end user [2].

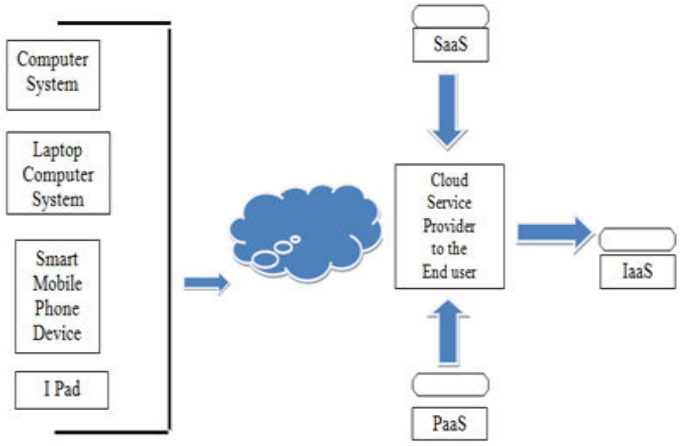

Fig.1 Cloud computing working mechanism from user point of view

III. CLOUD COMPUTING PROTOCOLS

A protocol is a set of rules that allow two or more electronic devices like personal computers or sophisticated gadgets to connect and exchange the information one to another. These protocols are used for the storage, communication and many other requirements [3]. The below are some of the cloud protocols used. i).Gossip Protocol (GP): uses peer-to-peer communication. ii).Connection-less Network Protocol (CLNP): is a datagram network protocol[11], uses connectionless protocol. iii).State Routing Protocol (SRP): is a protocol which each router keeps track of every neighboring routers, using a link state information and applies shortest path algorithm. iv).Internet Group Management Protocol (IGMP): is a communication protocol used by hosts and adjacent routers on IPv4 networks(internet protocol version 4 for packet switched networks which uses 32 bit address space to group the data into packets and send over the network), to establish multicast group memberships [4]. v). Secure Shell Protocol (SSP): provides strong authentication and encrypted data communications between two computers connecting on the open network such as internet. vi).Coverage Enhanced Ethernet Protocol (CEEP): is an enhanced single interconnecting Ethernet technology developed to converge different types of applications in data centers. It focuses to consolidate the number of cables and adapters connected to the servers. vii). Media Transfer Protocol (MTP): is an extension to the Picture Transfer Protocol (PTP), which allows the media files to be transferred automatically to and from portable devices [5].

IV. CLOUD COMPUTING APPLICATIONS

The cloud applications are two types. They are (i) Web applications and (ii) Resource intensive applications. Web application is an application program that is stored on a remote server and delivered

over the internet with the help of a browser interface. In the web applications services are combined into Service Oriented Architecture (SOA)[6].SOA is a style of software design where services are provided to the other components by application components through a communication protocol. In case of resource intensive applications, a large number of computing resources are required for a long time and these applications are two types. They are (i) data intensive applications and (ii) compute intensive applications.

V. ONLINE SCHEDULING AND ITS ADVANTAGES

Online scheduling is an alternative approach to dynamic scheduling problems, different from both classical combinatorial scheduling and queuing theory. The online scheduling literature focuses on competitive analysis, proving worst-case bounds on how much worse deterministic and randomized online algorithms are, compared to a full- information algorithm [7]. As with queuing theory, the rigorous mathematical approach of online scheduling tends to limit the combinatorial structure that is addressed. However, unlike queuing theory, it is uncommon to assume knowledge of stochastic distributions from which job arrivals and characteristics are drawn [8]. Indeed, often the results showing differences between deterministic and randomized online algorithms arise from the analysis of systems where an adversary has full knowledge of the online algorithm and can manipulate job characteristics arbitrarily [9]. It is important to understand how results and insights of this area can be integrated with the work in order to obtain an even deeper understanding of dynamic scheduling problems [10].

Step 1: The scheduler maintains a queue of ready processes and a list of blocked and swapped out processes.

Step 2: The Process Control Block of newly created process is added to end of ready queue.
The Process Control Block of terminating process is removed from the scheduling data structures.

```
Start with an Initial Flow as 'O' ,
Let Source (Starting Point) be 'i'
Let the Sink(Ending Point) be 'j'
Let the Position Matrix be Matrix(i,j) which is an Augmented Path
i=1;i< n;i++
{
j=1;j< n;j++
{
k=1;k< n;k++
{
([i][j]<[i][k]+[k][i])  ((i,j)=[i][k]+[k][j])
}
}
}
Add Path to the Flow
Return Flow
```

Step 3: The scheduler always selects the Process Control Block from the head of the ready queue.

Step 4: When a running process finishes its time slice, then it is moved to end of ready queue

Step 5: The event handler performs the following actions:

a) When a process makes an input -output request or swapped out, its Process Control Block is removed from ready queue to blocked/swapped out list.

b)When I/O operation awaited by process is swapped in its Process Control Block or a process

finishes is removed from blocked/swapped list to end of ready queue.

VI. EXPERIMENTAL DETIALS

SL. No	Region Name	R0	R1	R2	R3	R4	R5
1	R0	2000	1000	1000	1000	1000	1000
2	R1	1000	800	1000	1000	1000	1000
3	R2	1000	1000	2500	1000	1000	1000
4	R3	1000	1000	1000	1000	1000	1000
5	R4	1000	1000	1000	1000	500	1000
6	R5	1000	1000	1000	1000	1000	2000

Table. 1. Available bandwidth between the regions measured in Mbps.

SL. No	Region Name	R0	R1	R2	R3	R4	R5
1	R0	20	10	10	10	10	10
2	R1	10	80	10	10	10	10
3	R2	10	10	25	10	10	10
4	R3	10	10	10	10	10	10
5	R4	10	10	10	10	50	10
6	R5	10	10	10	10	10	20

Table. 2. Delay matrix and transmission between the regions in nano sec.

SL.No	Region	Architecture	O.S.	VMM	Cost per VM/Hr	Memory Cost per $/s	Storage Cost per $/Gb	Phys. H/W Units	Remarks
D.C -1	R0	X86	Linux	Xen	0.1	0.05	0.1	0.1	1
D.C -2	R1	X86	Linux	Xen	0.1	0.05	0.1	0.1	1
D.C -3	R2	X86	Linux	Xen	0.1	0.05	0.1	0.1	1
D.C -4	R3	X86	Linux	Xen	0.1	0.05	0.1	0.1	1
D.C -5	R4	X86	Linux	Xen	0.1	0.05	0.1	0.1	1
D.C -6	R5	X86	Linux	Xen	0.1	0.05	0.1	0.1	1

Table.3. Data center configuration details

ID No	Available Memory	Storage Capacity	Available Bandwidth	Number of Processors	Speed of the Processors	Virtual machine policy
1	204800 MB	100,000,000	1,000,000 Mbps	4	10,000	Time-shared Policy

Table.4. Physical hardware details

Name of the Scenario	No. of User bases	Regions	Req. user/ hr	Req. Size	Peak Hr Start at GMT	Peak Hr End at GMT	Avg. No. of Peak User	Avg. No. of OFF Peak User
Scenario_1	1	0	60	20	3	9	1000	100
Scenario_2	3	2,4,5	60	20,30	3	9	1000	100
Scenario_3	6	1,2,4	60	1,100,20, 20	3	9	1000	100
Scenario_4	4	1,3,4	60	1,100,20, 30	3	9	1000	100
Scenario_5	5	1,2,5	60	1,10, 20,30	3	9	1000	100
Scenario_6	3	0-5	60	1,20, 40,50	3	9	1000	100

Table.5. User base properties

Out put

Processing Time	Through put	Network Delay
0.26	3.311	12.67

Table.6. Output of Parameter Values obtained

OBSERVATIONS

For Processing Time it is observed it is consuming more time, Throughput is slightly reduced and Network Delay is increased.

VII. CONCLUSION

The proposed algorithm is stated from the experimental results of online scheduling using the Cloudlet user request growth study and 'Heuristic algorithmic approach' using 'online scheduling approach' for the load the balancing in cloud computing environment. In this environment it is concentrated on the load, to perform the tasks / requirements of the virtual machine. In the cloud environment, the distribution of load between virtual machines is heterogeneous in terms of processing power, so that each virtual machine can have different processing time costs. For efficient load balancing, choose which virtual machines cost the least processing time to assign tasks. It was tested in the CloudSim cloud computing environment and used in the Java programming language. In this article it is used the same schedule as Space shared - Timeshared with virtual machines and tasks. The processing time, Throughput and Network delay is considerably improved in comparison with that of the other researchers.

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