A New Approach to Survey on Load Balancing in VM in Cloud Computing: using CloudSim

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***Abstract* – “Cloud Computing” is a technique which content software and web-services. We use it on pay-per use demand services. Central to all issues related to Cloud service lies under the establishment of an effective load balancing algorithm in a dynamic session.**

In this paper, we propose an approach of Round Robin technique in a circular way and by this method we try to clarify the load balancing scenario of a cloud server during its execution. It will help to get an effective and fast execution environment of task assigned by the user which helps in to create an effective communication framework between broker and virtual machine (VM) to optimize the time and minimize the cost. We implement it over CloudSim 3.0 under VM scheduling (Space and Time sharing) policies. Scheduling over Virtual Machine and Cloudlets are being analyzed over Round Robin and FCFS scheduling policy.

Keywords - Virtual Machine; Datacenter; CloudSim; FCFS; RoundRobin; Cloudlets; Cloud Coordinator; Resource Cloud Provisioner

I. INTRODUCTION

In Current Scenario, with an environment of cloud the task is divided and disseminated into same size of small jobs i.e. Cloudlets. These Cloudlets as well as Virtual Machines are scheduled according to the various scheduling policy for e.g. FCFS, RoundRobin etc. Generally in Cloud Computing scenario user submit the task to be performed / executed. Cloud Coordinator (CC) [2] divides the task into equal sized cloudlets and passes it to DataCenter (DC).Normally it takes a lot of time because the cloudlets are processed one at a time in FCFS manner as and when they reach to VM. VM executes the cloudlets present in the queue as they reach the VM’s. Basically this default job scheduled policy is extremely Time-Consuming, Cost insensitive and inefficient. Here using Cloudsim3.0 we implemented FCFS and RoundRobin scheduling policy for VM. In CloudSim3.0 [2] normally overriding two classes VmSchedulerSpaceShared and VmSchedulerTimeshared we can implement FCFS and RoundRobin scheduling policy respectively. But here we may do same thing using overriding few Classes like Datacenter, DatacenterBroker, Host, Cloudlet, CircularHost, RoundRobin, VmAllocationPolicyetc [2].

Cloud computing is a vast concept. Many of the algorithms for load scheduling for e.g. FCFS, RoundRobin etc. in cloud computing have been proposed. The whole Internet can be considered as a cloud of many connections less and connection oriented services. The above stated two algorithms have been studied and applied to study the performance of VM using CloudSim 3.0 and find out which VM undergoes low performance based on finishing time and start time of each cloudlet because here configuration of each VM is same as well as configuration of each cloudlet is also same [2].

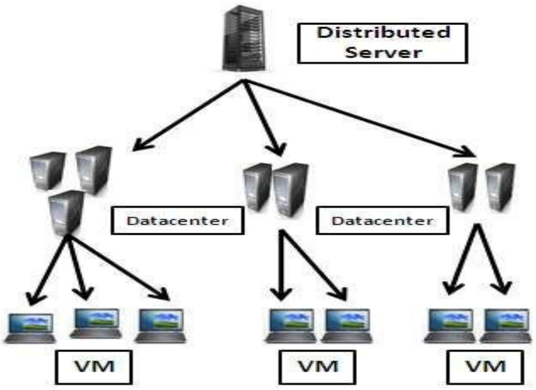


Fig 1: Cloud System Model

II. RELATED WORKS

In this section, we describe the related works where the author of paper presented a brief description of Cloud Sim toolkit [2] and its mechanism. We get the all related documents and brief idea about the research paths of CloudSim [1]. We get an idea for task scheduling algorithm based on load balancing [3] [5] in dynamic as well as static environment in cloud computing. We get another idea about the new simulation toolkit CloudAnalyst [4] which is working under static environment of cloud computing. In static and dynamic manner the incoming jobs or cloudlets (small tasks in cloud) scheduled in static and dynamic manner respectively. These types of task scheduling cannot only meet user’s requirement but also provide high resource utilization in a virtualized way [8]. In paper [6] we get an idea about the cloud network most commonly known as federated cloud network and its approach towards tasks scheduling in cloud computing.

III. RELATED TERMS OF CLOUDSIM 3.0: SIMULATORTOOLKIT FOR CLOUDS

- Cloudlets: It relates with cloud-jobs.
- Clients: They generally fall into three categories such that Mobile, Thin and Thick etc [1].
- Datacenter: It is nothing but a collection of virtual servers

hosting different applications.

- Distributed Server: It is the host which is the part of a cloud which is present throughout the Internet hosting different applications [1].
- Virtual Machines (VM): A system which processes the cloud job. Before scheduling the Job Datacenter creates it on the basis of parameters [4]. The parameters or attributes are image size, VM memory, MIPS rate, bandwidth, number of cpus, virtual machine monitor [2].

  Here the figure stated below show the internal architecture of CloudSim 3.0 where the fields are represented the entities which we implemented in various prospect to get the result [2].

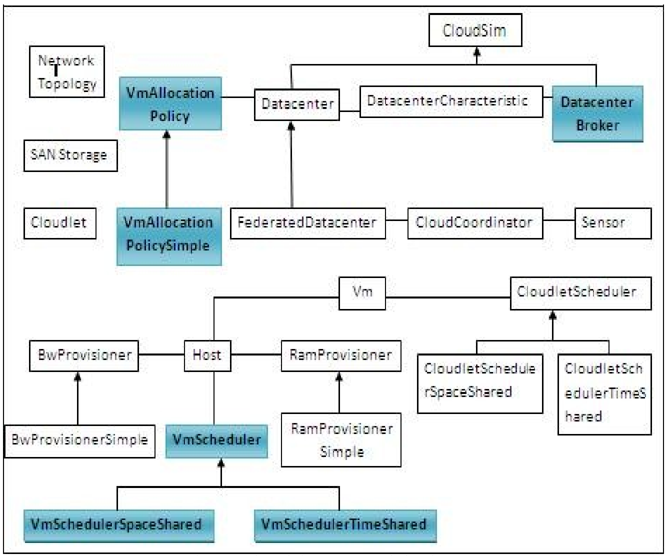


Fig 2: Cloudsim3.0 Model Diagram

Algorithms

A. First Come First Serve (FCFS) VMScheduling in CloudSim 3.0

```
        FCFS Scheduling
        For every cloudlets received
 Executed_list [cloudlets] <- Execution [Actual_cloudlet]
 VMM [executed_cloudlet_list] <- Executed_list[cloudlets]
        Goto Step3
```

B. Parameter or Variables used in Algorithm[2]

- User
- Cloud Coordinator (CC)
- Virtual Machine Manager or VM Manager (VMM)
- Virtual Machine (VM)
- Resource Provisioner (RsP)
- Resource Provider or Resource Owner(RP)

C. *Steps of FCFS*

- Creates same size of Cloudlets.
- CC divides the assigned Cloud task into same size of cloudlets.
- Create DataCenters(DC).
- Create Broker and User assigns the task to Cloud Co-ordinator(CC).
- CC sends the cloudlets to VMM and VMM sends the list of the needed resources to the RsP.
- RsP requests the resources from RP.
- RP provides the access to use resources of DC.
- RsP grants the access to VMM.
- VMM creates the VM on the basis of resources and parameters.
- VMM sends the cloudlet ID list to VM by BindCloudletToVmId ().
- VMM sends the actual cloudlet to VM.
- VM matches the Cloudlet ID with the sequence of Cloudlet list.
- If both ID matches then, VM sends the acknowledgement to VMM. Or, VM sends Retransmit message or shows SUCCESS.
- Request for the execution of the Cloudlet is sent to the VM by VMM from the Host.
- Cloudlet scheduling is done in VM according to FCFS scheduling policy.
- VM sends the executed job as Cloudlets in a wrap file to the VMM.
- VMM further passes the executed Cloudlets as wrapped file format to CC.
- CC combines all executed Cloudlets in wrapped file form combine to form the whole task.
- CC sends the executed task in authenticated file format to the user/client.
- PRINT the Result.

D.RoundRobin (RR) VMScheduling in CloudSim3.0

- Creates same size of Cloudlets.
- CC divides the assigned Cloud task into same size of cloudlets.
- Create DataCenters.
- Create Broker and User assigns the task to Cloud Coordinator (CC).
- CC sends cloudlets to VMM and VMM sends the list of the needed resources to the RsP.
- RsP requests the resources from RP.
- RP provides accessibility of resources of DC.
- RsP grants the access to VMM.
- VMM creates the VM on the basis of resources and parameters.
- VMM sends the cloudlet ID list to VM by BindCloudletToVmId ().
- VMM sends the actual cloudlet to VM.
- VM matches the Cloudlet ID with the sequence of Cloudlet list.
- If both ID matches then, VM sends acknowledgement to

VMM. Or VM sends Retransmit message or shows SUCCESS.

- Request for execution of the Cloudlet/Cloud job is sent to the VM by VMM from the Host.
- Cloudlet scheduling is done in VM according to RR in circular fashion.
- VM sends executed Cloudlets to the VMM.
- VMM passes the executed job to CC.
- CC combines all the executed cloudlets in wrapped file form, together to form the task.
- CC sends the executed task in authenticated file format to the user/client.
- PRINT the Result.

IV. EXPERIMENTAL RESULTS

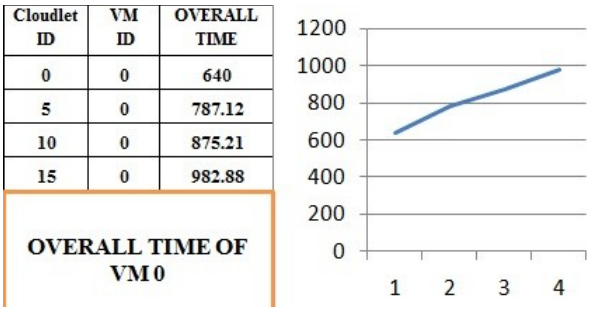
TABLE I. VM NO. 5 CLOUDLET NO. 20

Cloud let /Job ID	Status	Data Center ID	VM ID	Overall time	Start time	Finish time
0	SUCCESS	0	0	640	0	640
1	SUCCESS	0	1	644.19	4.19	648.38
2	SUCCESS	0	2	671.51	31.51	703.02
3	SUCCESS	0	3	666.88	26.89	693.77
4	SUCCESS	0	4	827.11	187.12	1014.23
5	SUCCESS	0	0	787.12	147.12	934.24
6	SUCCESS	0	1	750.94	110.95	861.89
7	SUCCESS	0	2	761.09	121.1	882.19
8	SUCCESS	0	3	862.14	222.14	1084.28
9	SUCCESS	0	4	863.44	223.44	1086.88
10	SUCCESS	0	0	875.21	235.21	1110.42
11	SUCCESS	0	1	857.45	217.45	1074.9
12	SUCCESS	0	2	904.46	264.45	1168.91
13	SUCCESS	0	3	916.5	276.5	1193
14	SUCCESS	0	4	938.83	298.84	1237.67
15	SUCCESS	0	0	982.88	342.88	1325.76
16	SUCCESS	0	1	958.34	318.34	1276.68
17	SUCCESS	0	2	1061.25	421.25	1482.5
18	SUCCESS	0	3	1002.02	362.02	1364.04
19	SUCCESS	0	4	1057.9	417.89	1475.79

V. ANALYSIS OF SIMULATION RESULT

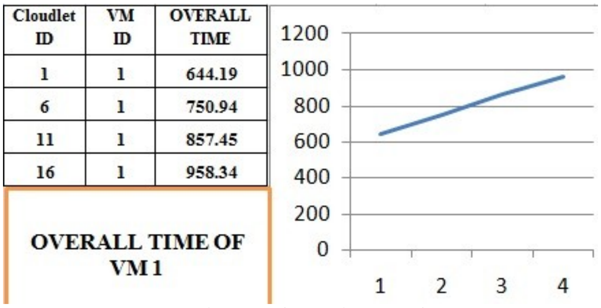
Number of VM: 5 Number of Cloudlets: 20

Analysis of simulation results in RoundRobin scheduling with comparison of Overall Time Execution for each VM:



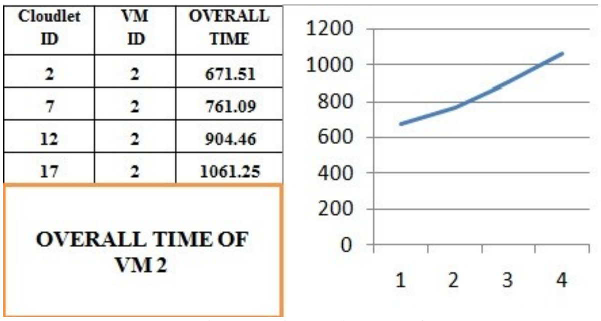
Cloudlet ID	VM ID	OVERALL TIME
0	0	640
5	0	787.12
10	0	875.21
15	0	982.88

Fig 3: Perform Diagram of VM 0



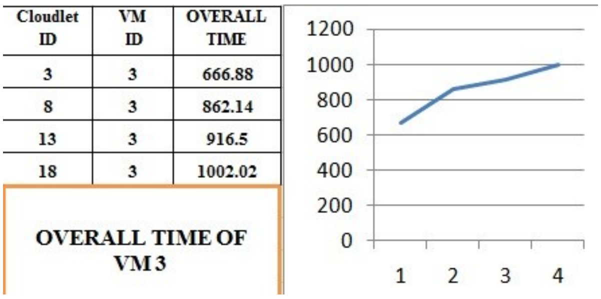
Cloudlet ID	VM ID	OVERALL TIME
1	1	644.19
6	1	750.94
11	1	857.45
16	1	958.34

Fig 4: Perform Diagram of VM 1



Cloudlet ID	VM ID	OVERALL TIME
2	2	671.51
7	2	761.09
12	2	904.46
17	2	1061.25

Fig 5: Perform Diagram of VM 2



Cloudlet ID	VM ID	OVERALL TIME
3	3	666.88
8	3	862.14
13	3	916.5
18	3	1002.02

Fig 6: Perform Diagram of VM

Cloudlet ID	VM ID	OVERALL TIME
4	4	827.11
9	4	863.44
14	4	938.83
19	4	1057.9

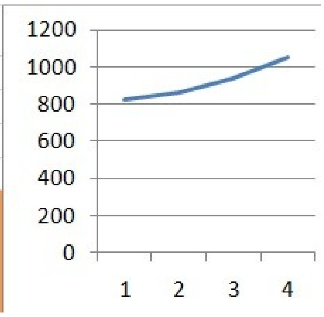


Fig 7: Perform Diagram of VM 4

VM0	VM1	VM2	VM3	VM4
640	644.19	671.51	666.88	827.11
787.12	750.94	761.09	862.14	863.44
875.21	857.45	904.46	916.5	938.83
982.88	958.34	1061.25	1002.02	1057.9

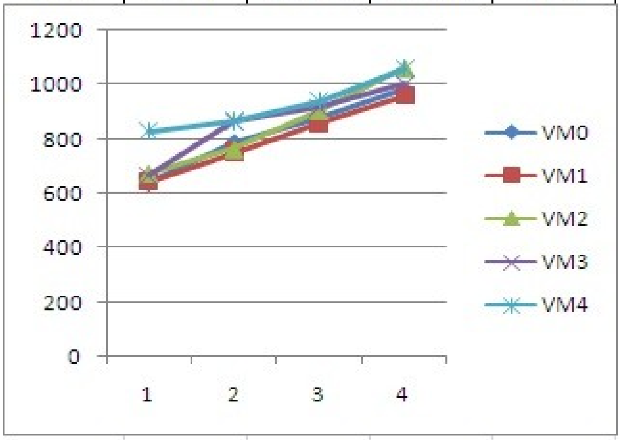


Fig 8: Comparison of Perform Diagram of all VMs

FCFS and RoundRobin algorithms in CloudSim3.0 for optimized allocation of jobs to VM, scheduling the VM and scheduling the cloudlet through FCFS and RoundRobin. Under circumstances of CloudSim3.0 the whole proposed scenarios in which the executions of cloud tasks are performed. The proposed techniques help in the execution due to RoundRobin scheduling policy applied on the equally sized cloudlets where each VM has equal resources. The execution times of cloudlets or jobs are in ascending order as per their start time in each VM. Here all the jobs are executed in a periodic manner so we use an iterative policy where the jobs/cloudlets allocated iteratively in the VM. All cloudlets will execute as after each and every successfully received cloudlet VM sends the acknowledgement and for the unsuccessful cloudlets sends the retransmit message.

The simulation results also shown graphically to maintain an order of execution. In these graphs there are two fields one is VM number and other one is Overall execution time. Here if every VMs' are executed in a same interval of time and all loads are equally balance in every VM then we get a plane slope. If there is a break in a line it would be indicate that the particular VM sucessfully finished all the jobs/cloudlets but it could not be balance its load. In this prospect we can maintain that VM for balancing load by distribution its idle job and we can transfer its scheduled tasks to some another VM. In RoundRobin scheduling we also explained the capacity of VM over incoming jobs. Here all proper allocation of jobs those are coming randomly by a host to specific VM in a circular or iterative way.

In fig. 8 we can see that all the comparison of performance of VMs where we have seen the curve relate to VM 4 moves in upward direction. Whereas for VM 3 it moves in upward direction but after certain interval it will moves downward as same as for the case of VM 0 but VM 2 works well and VM 1 works in average manner.

VI. Future Work

Cloud computing is a vast concept and load scheduling plays a very important role in case of Clouds environment. There is a vast scope of improvement in this arena. First Come First Serve (FCFS) and Round Robin(RR) are just giving the framework where most of the scheduling mechanisms can be implemented so as to analyze or optimize the performance of any cloud related job. Security is the major issue in every area and we can also implement various security mechanisms over FCFS and RR. Resources can also be allocated accordingly to reduce the time and cost VM's can save the images in the database so that if the same task is being assigned by the user then we can allocate the same VM with optimal resources. Cost of VM and scheduling time of VM can also include certain other factors on which it is dependent.

We have discussed only two divisible load scheduling algorithms FCFS AND RR those are implemented in clouds, but there are still other approaches that can be implemented to schedule the load in clouds. The performance of any scheduling algorithms can also be increased by varying different parameters.

Load scheduling in Cloud Computing in future the integration of First Come First Serve (FCFS) and Round Robin (RR) i.e. RR-FCFS performs significantly better than RR and FCFS [7].

Acknowledgement

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References

[1] http://www.cloudbus.org/cloudsim/.

[2] CloudSim: A Toolkit for Modeling and Simulation of Cloud Computing Environments and Evaluation of Resource Provisioning Algorithms, Rodrigo N. Calheiros1, 3, Rajiv Ranjan2, Anton Beloglazov1, César A. F. De Rose3, and Rajkumar Buyya1.

[3] Efficient Load Balancing Algorithm in VM Cloud Environment Meenakshi Sharma, Pankaj Sharma, Dr. Sandeep Sharma. ISSN : 0976-

8491 (Online) | ISSN : 2229-4333 (Print).

[4] CloudAnalyst:ACloudSim-based Visual Modeller for Analysing Cloud Computing Environments and Applications, BhathiyaWickremasinghe, Rodrigo N. Calheiros, RajkumarBuyya, 20-23, April 2010, pp. 446-452.

[5] Dynamic Load-Balanced Multicast for Data-Intensive Applications on Clouds Tatsuhiro Chiba, Mathijs den Burger, ThiloKielmann, and Satoshi Matsuoka, 978-0-7695-4039- 9/10 $26.00 © 2010 IEEE DOI 10.1109 / CCGRID.2010.63.

[6] Efficient collective operations for clusters in long-and-fast networks, M. Matsuda, T. Kudoh, Y. Kodama, R. Takano, and Y. Ishikawa, in IEEE International Conference on Cluster Computing (cluster 2006),2006.

[7] Round-Robin with FCFS Preemption: A Simple MAC Scheduling Scheme for Bluetooth Piconet Li-HsingYen , Chi-Hung Liao.

[8] Effective Cost Mechanism for Cloudlet Retransmission and Prioritized VM Scheduling Mechanism over Broker Virtual Machine Communication Framework Gaurav Raj1 and Sonika Setia2 International Journal on Cloud Computing: Services and Architecture(IJCCSA),Vol.2, No.3, June 2012.