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Analyzing Effects on Average Execution time by varying Tasks and VMs on Cloud Data Centre

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Abstract— Cloud environment allows us to share the resources like CPU, Memory, etc to multiple tenants. These tenants put their tasks to the cloud server through the cloudlets. These cloudlets are treated as Process Elements (PEs). There are basically three entities Cloud Information Service [CIS], Data Centre, and Broker. All communications takes place between these three entities for executing the jobs or tasks. In this paper, we have created a cloud simulation environments, two sample sets are designed i.e. Table 1 and Table 2 to analyze the impacts of Submitted Tasks, Number of Virtual Machines variations on the Average Execution Time per task and illustrated through Figure 2 and Figure 3. It is observed that if the number of tasks and other environment constraints remains constant, increase in VMs decreases the Average Execution time per task, but limited number of VM can be increased according to the server architecture. If the number tasks are increased by keeping VMs and other simulation environments constant, the Average Execution time per task increases linearly.

Keywords—Cloud Computing, Virtual Machines, Data Centre, Process Elements, Broker, Cloud Informatio Centre.

I. INTRODUCTION

According to the NIST definition, "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".

Cloud computing nowadays becomes quite popular among community of cloud users by offering a variety of resources. Cloud computing platforms, such as those provided by Microsoft, Amazon, Google, IBM, and Hewlett-Packard, let developers deploy applications across computers hosted by a central organization. Developers obtain the advantages of a managed computing platform, without having to commit resources to design, build and maintain the network.

There are numerous advantages of cloud computing the most basic ones being lower costs, re-provisioning of resources and remote accessibility. Cloud computing lowers cost by avoiding the capital expenditure by the company in renting the physical infrastructure from a third party provider. Due to the flexible nature of cloud computing, we can quickly access more resources from cloud providers when we need to expand our business. The remote accessibility enables us to access the cloud services from anywhere at any time. To gain the maximum degree of the above mentioned benefits, the services offered in terms of resources should be allocated optimally to the applications running in the cloud.

In the next section, we have discussed the cloud simulation environment used and the entities used for communication. In the section III, Simulation and Results, the sample data have been shown and the results obtained after execution are listed. The last section IV, is the conclusion from this simulation.

II. CLOUD SIMULATION ENVIRONMENT

Before discussing the case, let us understand the environment of the cloud simulation. There are basically three entities CIS [cloud Information Service], DC [Data Centre], and Broker. These three entities basically communicate with each other. Data Centre first register their resources with CIS. Broker may send the resource requests to the CIS for getting the list of resources for the execution of various Cloudlets. Broker first generates the resource characteristics required for executing the jobs i.e. what and how much resources are required. Then Broker shares its characteristics with the DC [Data Centre], it also send the request for the VM creation to DC and if successfully created DC acknowledge to the Broker. Broker then sends the job for execution to the DC through the Cloudlets and Virtual Machines.

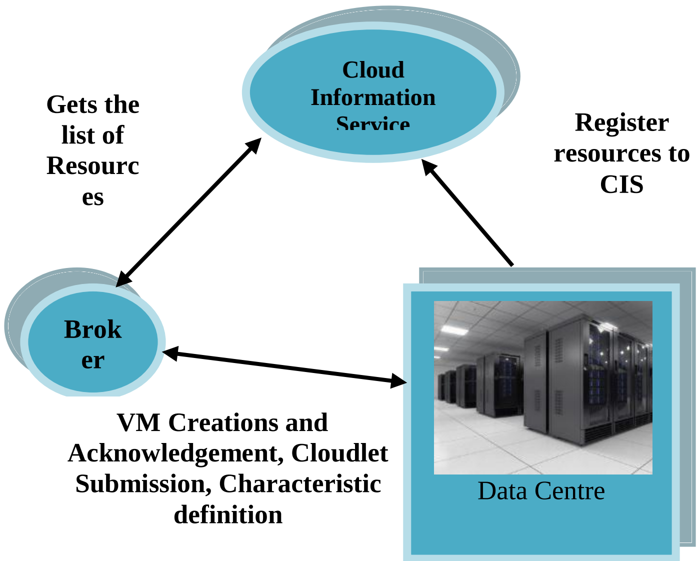

Figure 1: Cloud Computing Environment

DC may have one or many Host Machines and every Host have one or more VMs. First Data Centre will be started and the log will be stored at the CIS. In this process, every participating entity will get an ID. CIS gets the ID 0, and the event Shutdown gets the ID 1, then the Data Centre will get the ID, if there is only one DC it will get ID 2 otherwise further IDs will be given to the DCs. The Broker will then get the next ID i.e. 3 if there is only one DC. There may be multiple Brokers also.

So, a Broker may have multiple VMs and cloudlets, for establishing the communication between Broker and Data Centre. Each VM is created before a process starts and destroyed when the process ends. Broker may have multiple Cloudlets, and the tasks are assigned through these Cloudlets.

III. SIMULATION AND RESULTS

The main focus of this study is to analyze the impacts on the average execution time by varying the number of task submitted to the data centre. The sample that is taken here for simulation is as follows:

Table 1 : Simulation Sample 1 and results

Each Host Machine has Quadcore i.e. 4 PE each MIPS=1000, Each task have length=1000 per PE

Data Centre	Host Machine	No. Of VM on DC	Task Submitted	Total Execution Time	Average Execution Time per task
1	2	4	10	25.99	2.599
1	2	4	20	100	5
1	2	4	30	225.82	7.52733
1	2	4	40	400	10
1	2	4	50	625.63	12.5126
1	2	4	60	899.4	14.99
1	2	4	70	1225.17	17.5024
1	2	4	80	1600	20
1	2	4	90	2024.75	22.4972
1	2	4	100	2500	25
1	2	4	200	10000	50
1	2	4	300	22485	74.95
1	2	4	400	40000	100
1	2	4	500	62500	125
1	2	4	600	89940	149.9
1	2	4	700	122395	174.85
1	2	4	800	160000	200
1	2	4	900	202320	224.8
1	2	4	1000	250000	250
1	2	4	2000	1000000	500
1	2	4	3000	2248500	749.5
1	2	4	4000	4000000	1000
1	2	4	5000	6245000	1249
1	2	4	6000	8994000	1499
1	2	4	7000	12239500	1748.5
1	2	4	8000	15992000	1999
1	2	4	9000	20232000	2248
1	2	4	10000	24980000	2498

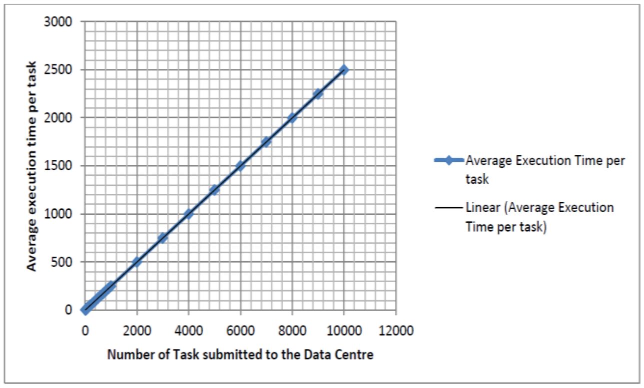

Figure 2 : Average Execution time by varying no of tasks

As the table 1 above shows that we have taken one Data Centre, 2 Host Machines and with each Host Machine has Quadcore Processer i.e. there are Four Processing Elements (4 PEs) each with 1000 MIPS power, No. of VM on Data Centre are 4 (i.e. 2 VMs with each Host Machine). The results are recorded for the Total Execution Time for the varying no. of tasks submitted with each task have length of 1000 units and on the basis of that Average Execution Time per task is computed. The Figure 2 clearly shows that Average Execution time increases linearly with the increase of Tasks, if the rest of environment remains same.

In the another simulation sample, the results are recorded for analysing the impacts on Average Execution time, by keeping the No of Tasks submitted as constant, and varying the No. of VM on DC. The samples taken are as follows:

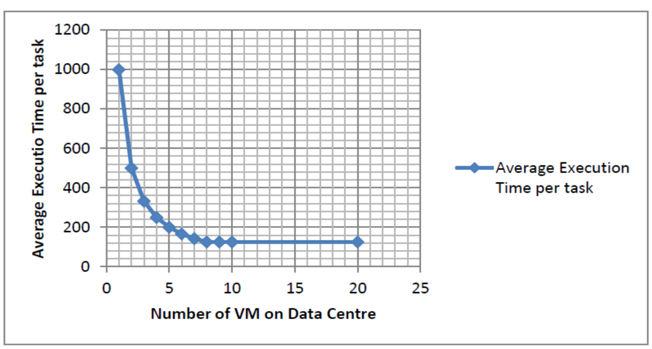

Figure 3 : Average Execution time by varying no of VMs

Table 2 : Simulation Sample 2 and results

As the table 2 above shows that in this sample there is one Data Centre with two Host Machines and with each Host Machine has Quadcore Processer i.e. there are Four Processing Elements (4 PEs) each with 1000 MIPS power. Number of tasks submitted is constant i.e. 1000 and each task have length of 1000 units. The number of VMs on DC varied from 1 to 20 with above mentioned environments and results are recorded accordingly.

Each Host Machine has Quadcore i.e. 4 PE each MIPS=1000

Each task have length=1000 per PE

Data Centre	Host Machine	No. Of VM on DC	Task Submitted	Total Execution Time	Average Execution Time per task
1	2	1	1000	1000000	1000
1	2	2	1000	500000	500
1	2	3	1000	333002.67	333.00267
1	2	4	1000	250000	250
1	2	5	1000	200000	200
1	2	6	1000	166505.34	166.50534
1	2	7	1000	142718.86	142.71886
1	2	8	1000	125000	125
1	2	9	1000	125000	125
1	2	10	1000	125000	125
1	2	20	1000	125000	125

Figure 2 shows the impacts on Average Execution Time per Task on varying the number of VM on Data Centre. It is noted that Average Execution Time decreases with the increase in no VMs on Data Centre. But it is noted that because there are 2 Host Machines and each machine is a quadcore i.e. 4 PE. This case supports only (4 x 2 = 8) VMs and if we assign more VMs it will create only 8 VMs and rest shows fails to create. This is shown in the figure 3 that Average Execution Time per task is not varied (a straight line is shown), when number of VMs increases by more than 8.

IV. CONCLUSION

Hence from the two sample sets, one is presented in Table 1 and another presented in Table 2, it is clear that if the rest of environment remains same, average execution time linearly increases by the increase in the number of tasks. If the number of Tasks and other environments constraint remains same, increase in VMs decreases the Average Execution Time per task, but the number of VMs can be increased upto a limit that is decided on the basis of Host Machines and type of Processor it has i.e. may be dualcore/ Quadcore etc. In table 2, it is shown that when the number of VM on Data Centre increases from 8-20, the Average execution Time per task remains same i.e. 125. If the number tasks are increased by keeping VMs and other simulation environments variables like Host Mchines, memory, Task length, etc. Remains constant, the Average Execution time per task increases linearly and it is illustrated in Table 1 and Figure 2.

Thus these two factors, number of tasks submitted and number of VMs are the two important parameters to set the Cloud Environment according to the need and demand for the Cloud Service Provider.

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