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Improved Service Selection Algorithm in Heterogeneous Cloud Network

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ABSTRACT: Today's recent advances in technology It is possible to utilize cloud computing to address the problems of resource usage, extendibility and flexibility for managing large scale workflow applications worldwide. Therefore, the inspection of workflow systems based on cloud computing, basically cloud workflow systems is a timely issue and worthwhile for increasing efforts. Now a day the technology and smart application of workflow in cloud computing environment also becomes a research focus.

The paper firstly proposes a brief introduction to the cloud workflow system. Followed by, based on cloud architecture, the paper presents the advance architecture of cloud workflow system. Then, as the key content of the dissertation, it considering the service selection strategy based on constraint, this thesis presents a new service selection algorithm– SSA. The simulation results shows that SSA algorithm further decreases the total cost of execution and total time of execution in comparison with other algorithms.

KEYWORDS: Cloud computing, Software as a Service, Platform as a Service, Hypervisor, Service proximity,

I. INTRODUCTION

The term "cloud computing" has at its core a single element: computing services are delivered over the Internet, on demand, from a remote location, rather than residing on one's own desktop, laptop, mobile device, or even on an organization's servers. For an organization, this would mean that, for a set or variable, usage-based free or even possibly for free it would contract with a provider to deliver applications, computing power, and storage via the web. Cloud computing is a combination of software and computing delivered as a networked service that provides a model for enabling anytime access to a shared pool of applications and resources. These applications and resources can be accessed using a simple front-end interface such as a Web browser, and as a result enables users to access the resources from any client device including notebooks, desktops and mobile devices.

In plain English Cloud Computing can be defined as the ability to use computing resources whether it is applications, or storage or processing entities, over the internet. The National Institute of Standards and Technology defines cloud computing as "Cloud Computing is a model for enabling ubiquitous, convenient, on-demand network access to a shared pool of configurable computing resources, for example networks, servers, storage, applications, and services) that can be rapidly provisioned and released with minimal management effort or service provider interaction. Cloud computing is an emerging concept. It has many names, including: grid computing, utility computing, and on-demand computing.

Cloud Computing refers to both the applications delivered as services over the Internet and the hardware and systems software in the datacenters that provide those services. The services themselves have long been referred to as Software as a Service (SaaS). The datacenter hardware and software is what we call a Cloud. When a Cloud is made available in a pay-as-you-go manner to the general public, we call it a Public Cloud; the service being sold is Utility Computing. We use the term Private Cloud to refer to internal datacenters of a business or other organization, not made available to the general public. Thus, Cloud Computing is the sum of SaaS and Utility Computing, but does not include Private Clouds. People can be users or providers of SaaS, or users or providers of Utility Computing Virtual machines are run over the available hardware to address the user needs. So, virtual machine management forms an important part of this concept, and is performed by a dedicated part called the hypervisor. The selection of virtual machines whenever

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the workload is encountered is done by the load balancer, whose aim is to distribute the load in such a way that no virtual machine is flooded by requests at one time, while remaining idle at other times. Above this level lies another abstraction called the service broker, which is the intermediary between the users of the cloud and the cloud service providers. It makes use of the existing service broker policies in order to rote the user .

Job scheduling: In cloud computing, an Infrastructure as a Service (IaaS) provider divides its physical resources (such as CPU, memory disk) into different types of virtual machines (VMs). These Virtual Machines types may have distinct sizes and features, and are offered as services to the general public[15]. A Virtual Machine is an efficient and independent substitute for a real machine.

A Virtual Machine is an efficient and independent substitute for a real machine. A particular service is chosen and the client issues its ob requests to that service. The service is selected on the basis of unit price, distance, response time, trafficc volume, storage space, processor of nodes/VMs (VM stands for Virtual Machine), etc. The VM we refer to acts as a system virtual machine providing a complete system platform which supports the execution of a complete operating system.Now once a service is selected, the service implements an algorithm to allocate servers and VMs to the jobs requested by its users. Now this algorithm has to efficiently manage the allocation so that it ultimately aims for fastest execution time Virtualization along with proper usage/management of resources.

- Static job scheduling algorithms

Static Load balancing algorithms assign the tasks to the nodes based only on the ability of the node to process new requests. The process is based solely on prior knowledge of the nodes' properties and capabilities [7].

- Dynamic job scheduling algorithms

Dynamic load balancing algorithms take into account the different attributes of the nodes' capabilities and network bandwidth. Most of these algorithms rely on a combination of knowledge based on prior gathered information about the nodes

II. RELATED WORK

The entire process of serving a client is a part of any one of the services defined in the service model. It begins with a request for a particular resource or application, be it for development, or just accessing the storage of the service provider. The request is serviced by the cloud service provider through a series of steps, the first one passing through a cloud service broker, which acts as the intermediary between a cloud consumer and the cloud service providers. The service broker makes use of any one of the available service broker policies in order to send the request to the most appropriate data centre. The role of a service broker is shown in figure 1.

Selection of Virtual machine

After choosing the data centre that is going to perform computation, the load balancer at the data centre comes into action. It makes use of the implemented load balancing algorithms

(1) Select the appropriate virtual machine to which the request has to be sent for execution. The innermost abstraction layer comprises virtual machine management. The hypervisor

(2) The virtual machine manager is responsible for the management and migration of virtual machines in the cloud data centers. Out of the above tasks, the use of an efficient service broker policy is quite necessary to ensure that the later tasks are carried out with efficiency and least response time. Literature shows that quite a lot of research has been done in this regards.

Closest data centre policy: This policy makes use of the concept of region proximity in selecting the data centre to which the user request has to be guided. A region proximity list is maintained by making use of the "lowest network latency first" criteria to set the order of occurrence of data centers in the list. The data centre that occurs first in the list, i.e., the closest data centre is selected to fulfill the request using this policy.

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Optimal response time policy*:* This service broker first identifies the closest data centre by making use of the network latency parameter, as in the previous policy. Then, the current response time is estimated for each of them. If the estimated response time is the one for the closest data centre, then the closest data centre is selected.

Dynamically reconfigurable routing with load balancing: This broker policy [4] makes use of the current execution load in order to scale the application deployment. It also increases or decreases the number of virtual machines accordingly.

III. PROPOSED ALGORITHM

The proposed algorithm is based on the service broker policy which is selecting the data center on the region. The data center selection algorithm makes use of proportion weights in order to provide an insight into the computation power of the data center. Different data centers may be of the same hardware configuration but they often contain physical machines in varied number. So the data center with more number of physical machine have the capability the process more amount of resource with respect to the data center within which number of physical machine is less.

In the service proximity based algorithm the resource allocation is done uniformly by ignoring the underlying infrastructure of data center. As for example, if more than one data centers are present in a region, one of these data centers may contain one physical machine while the other may contain three physical machines. Though the hardware configuration is the same, but the data centers can handle different amount of workloads because of the provision of larger number of computing elements in the second data center.

The proposed strategy therefore, makes use of this logic to assign workloads to the data centers to consider the underlying infrastructure of the data center. A proportion weight is assigned to both the data centers according to the number of computing elements available. In above mentioned case, the first data center is assigned a proportion of 1 and the second one is assigned a proportion 3. This is used to direct the cloudlets to the data centers in the specified way, i.e., for every burst of cloudlets, the selection of data centers by the ratio of 1:3. This is bound to improve resource utilization of the data centre as well as the disadvantage of random selection and also make a great improvement in overall response time and data center processing time.

The key steps of the proposed algorithm are summarized below:-

i. Calculate the number of data centers present in the region for which the simulation is to be performed.
ii. If only one data centre is present then go to step (vi), else go to the next step for further execution.
iii. For multiple data centers in that region, calculate the resource handling capacity of each data centre.
iv. Assign a proportion weight to the data centre according to the underlying infrastructure to handle the resource.
v. Select the data centre in a circular fashion, followed by the number of resources allocated to each data centre according to their proportion weight.
vi. Send the request to the selected data centre.
vii. Analyses the result of simulation.

This algorithm is implemented using the Cloud Analyst simulation toolkit, to analyze the result graphically. The implemented algorithm is modified with respect to the service proximity algorithm. The changes are done on data center selection process and how the selection process is done according to the proportion weight of the data center.

Step 1: Input no. Of region.
Step 2: Calculate the no. of DC available in region.
Step 3: Check the below condition for each route till no route is available to transmit the packet.
if (R!= $NULL_e$)

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Make the regionalList.size.
else
if (listsize == 1)
data center name ← regionalList.get
END
Assign the weight to the entire data center

end
Step 4: go to step 3. dcName ← regionalList.get(dataCenterID);
return dcName
Step 5: End.

IV. SIMULATION RESULTS

This algorithm is implemented on CloudSim platform with jdk 1.7 and also Flanagan jar file for internal computation of the workloads given in CloudSim folder itself. Some of the implementation done is on the basis of the firstly the NetBeans 8.0.2 in installed successfully and then the CloudSim is imported into the NetBeans. After that the different jar files are imported into the libraries of CloudSim and jdk used is 1.7. After successful installation the CloudSim will run successfully and finally the algorithm implemented can be run into the cloud. Input to the algorithm can be given from the example workloads given in the CloudSim package itself.

CloudAnalyst Design The CloudAnalyst is built on top of CloudSim tool kit, by extending CloudSim functionality with the introduction of concepts that model Internet and Internet Application behaviours.

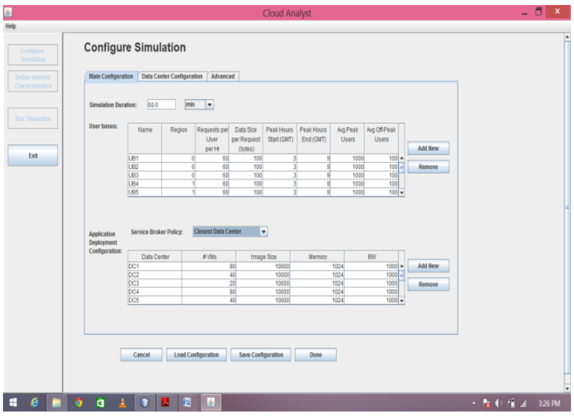

Fig.1 Configure Simulation

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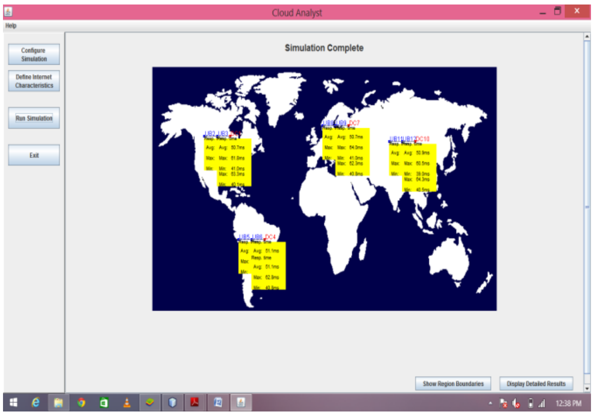

Fig. 2. Simulation result

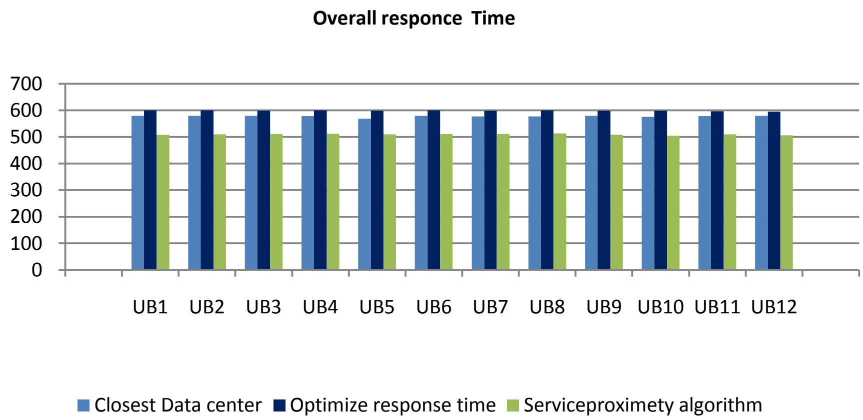

Fig.3 Overall response time for the three Brokers polices

V. CONCLUSION AND FUTURE WORK

The technology and application of this workflows in cloud computing environment becomes a research focus. In this dissertation, we have presented the architecture of cloud workflow system. We discussed the characteristic of e service selection strategy based on constraint. Ultimately, as the focus of this dissertation, we present SSA which has an advantage on execution time and cost compared to other algorithm.

The proposed algorithm considers different data centres that are of the same configuration. The future work in this regards can be done by maintaining a proportion for data centres in such a way that distinct hardware configurations are also considered.

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