UACEE International Journal of Advances in Computer Networks and its Security – IJCNS
Volume 3 : Issue 2 [ISSN 2250 – 3757]
Publication Date : 05 June 2013

Multi-Cloud Computing Environment with an Agent Based Efficient Scheduling Method

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***Abstract*—Cloud computing is an alternative way of using Information Technology (IT). These reasons may well change the role of IT in the near future, and some of IT's traditional service delivery models and organizational structures will need to be changed to accommodate the power of computing that can be easily deployed through cloud computing. The practice of computing across two or more data center separated by Internet gaining popularity due to the explosion in scalability and low cost issue. That is further optimized by connecting more than one cloud provider to make the system more flexible. In communication network it is called multi-cloud deployment, where resource scheduling is the key process. The management of globally connected service provider is very much difficult for minimizing the cost. To address this problem we propose an Agent Based Effective Scheduling method for dynamic assignment of service request to Cloud Service Provider (CSP). Taking the security issue, we are also trying to use the Agent based scheduler which is more secure way of implementation. The basic focus of cloud computing is pay-as-you use model and the security concept, both are considered in this paper.**

Keywords- **Cloud Computing; Multi-Cloud Deployment; Quality of Service.**

I.INTRODUCTION

Cloud computing is the most popular term in the world of Information Technology (IT) now a days. The pricing schemei.e pay-as-you-go is the most dominant in today.s business oriented IT market. There are generally three type of service provided by the cloud model i.e Software as a service (Saas), Platform as a service (Paas) and Infrastructure as a service (Iaas). Different cloud service provider, based on different technologies, support a large variant number of cloud services. Cloud service consumer select a particular service vendor
according to the own requirement. This is the common scenario of how cloud computing services managed.

The requirement of multi-cloud infrastructure is generated due to the optimize cost strategy of several organization. The need of large organization can be satisfied by establishment of private cloud infrastructure. But for small organization setting the cloud data center is very much costly. To cope with this situation multi-cloud strategy is the best solution. The benefits of multi-cloud infrastructure are a. Cost effective, b. More reliable, c. Lessoverloading etc. By combining clouds we can form a marketplace of resources [2], which can be consumed by the cloud application. Selecting the best according to the requirement reduce the overall cost of the service for the user. Thus it is possible for business or researcher to be a significant resource consumer owing their own infrastructure. In a cloud computing system, there's a significant workload shift. Local computers no longer have to do all the heavy lifting when it comes to running applications. The network of computers that make up the cloud handles them instead. Hardware and software demands on the user's side decrease. The only thing the user's computer needs to be able to run is the cloud computing system's interface software, which can be as simple as a Web browser, and the cloud's network takes care of the rest. The work of the Agent based scheduler to do all these managerial task dynamically.

Rest of the paper is organized as follow: Section II describes the background of this paper. Section III explains the working model of Multi-cloud system. Section IV presents our Agent Based Scheduling Method with proposed Algorithm for calculation of total cost. Finally, conclusion is drawn in Section V.

II BACKGROUNDS

The cloud computing paradigm appeared on the computing scene in 2005 with Amazon Elastic Computing (EC2) [1]. After this date, a large set of related technologies has been developed. In the academic world, and especially in HPC area, cloud computing is in some way in competition with grid model, which offers middleware based approach.
Since cloud computing is an on-demand computing paradigm, immediate and automated leasing is a favorite scheduling strategy [7]. To achieve an optimal or suboptimal VM

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allocation for immediate cloud services Genetic Algorithm can be a choice [4]. Besides the performance analysis, the cost of cloud resources also has an important impact on the viability of the multi-cloud solution. From this point of view, it is important to analyze not only the total cost of the infrastructure, but also the ratio between performance and cost, in order to find the most optimal configurations. Local data center can be more cost effective than leasing resources to external cloud providers [5].

The cost of using resources is depends on the two factors such as time and type of resource used. To make both the user and SP beneficial the SP try to minimize the service time, so that the user will use the service in future and the revenue will be generated. To perform this task, priority concept was taken by Zhongyuan Lee [3].

III. MODEL

First in this section, we will describe our system concept and working model. Then, formally we will describe our problem statement we are going to state in this paper. Note that, in this paper the term Cloud Service Provider (CSP) and Service Provider (SP) are used interchangeable manner.

A. SYSTEM CONCEPT

We consider the service of cloud service provider having two strategy, firstly pricing strategy and secondly the security strategy. The pricing strategy is mainly depends on the duration of service time and the security strategy is concentrate on the dynamic placement of data center or placing the service request dynamically to different data center.

. We consider „n. number of Service Provider (SP) each with different pricing strategy and quality of service (QOS). The cost of using the service will vary according to the quality of service. This is the source of generation for multi-cloud scheduling concept.

B. WORKING MODEL

The user needs to store the data or use the service of different cloud provider with highly reliable and secure manner. Our model considers both these issues to fulfill all requirements. Cloud computing application often exhibit transient behavior (usage pattern) and have different QoS requirements depending on time criticality and users. interaction patterns (online/offline). Hence, the development of dynamic provisioning techniques to ensure that these applications achieve QoS under transient conditions is required.

. In our agent based model we will take care of all the threats that may arise in the multi-cloud scenario. The agent will store the user data dynamically in different server and the entry will be maintained by the agent to make the system more secure.

C. PROBLEM STATEMENT

In this section, we formally defining our problem that we have considered in our study. Consider „n. number of cloud service provider (SPi: i€ 1,2,3,…n). Each CSP associated with a QOS factor QSi and the cost of storing data CSi, cost of using the resource Cri.
As we are considering the Multi-cloud scenario data security is the primary issue and secondly managing the service request among several CSPs. Our Agent Based Effective Scheduling Method (ABESM) is used to provide high security with optimize cost.

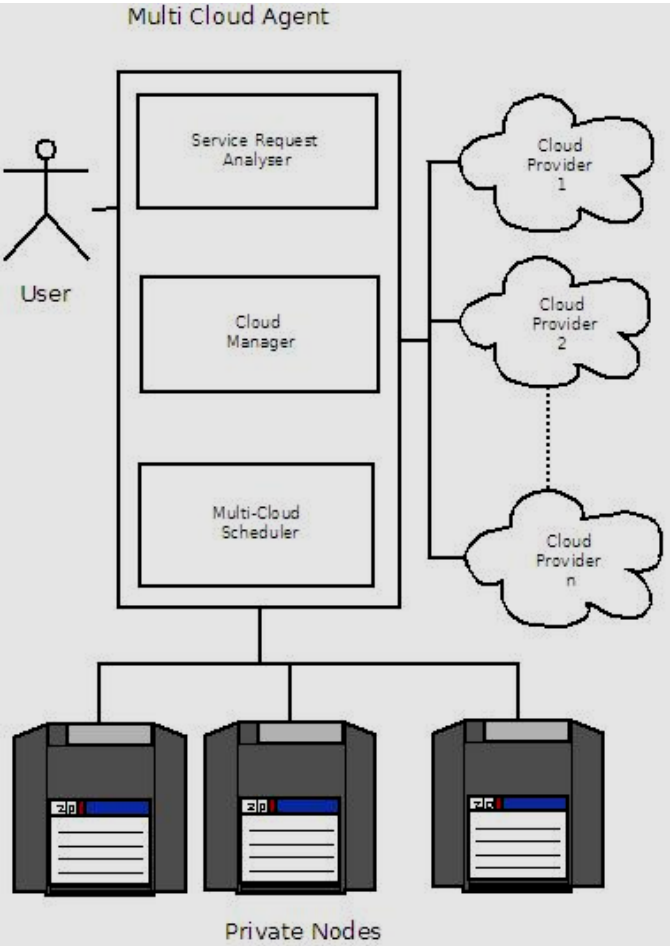

Figure.1 Agent based Multi-cloud Architecture

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IV AGENT BASED EFFECTIVE SCHEDULING METHOD

In this work, to make the cloud System more secure with optimize cost we have considered this new agent based approach for scheduling. The motivation behind this work is to make the cloud computing system more familiar with our daily work with secure data storage. The security concept is maintained by dynamic allocation of service requests to the different service providers.

Following are the notations used in our paper:
N = Number of service request
Ty=Type of request (Storing data request Ts or resource request Tr)
n = Total number of cloud service providers
CSi=cost of storing data
SPi= Cloud service provider
QSr= quality of service parameter with time bound
Ctot= Total cost of storing and using the resources
I= 1,2,3…n
Ai,j=Assignment of jth request to ith service provider
a= Number of data unit
t= time of using the resources

A. DYNAMIC ASSIGNMENT PROBLEM

The major objective is to minimize the cost with securing the data. That is why we are focusing on the dynamic allocation, so that no individual service provider will keep track of the service requests. If „a. is the number of unit of data and „t. is the time unit for which the service provider will serve the request, the total cost of assignment is given in eqn.(4.1)

$$Ctot = t * \sum_{i=1}^{n} a * CSi + CRi \qquad (4.1)$$

In our paper, we have taken Ai,j as the assignment parameter where jth request is assigned to ith service provider. QSr is the quality of service parameter with time bound i.e if the requested service successfully completes its task in the corresponding SP then it will be reliable. Total quality of service is calculated by taking the average of all the quality of service of different SP with the number of SP used

$$QStot = \left(\sum_{i}^{n} * \sum_{j}^{a} Ai,j * QSi\right)_{/r}$$

Where „r. is the total number of service provider used in the process of assigning the jobs. The quality of service will be maintained by the Service Level Agreement (SLA) assigned during the communication.

Proposed Algorithm: (Dynamic Scheduler)
Data : N list of service request submitted initially
Result :Ctot . Total cost of data and resource assignment

1. For i=1 to |N|
2. If type is service request
3. Ctot=Ctot + t*a*CSi
4. Else
5. Ctot=Ctot + Cri
6. End
7. i=i+1
8. End

The above algorithm can successfully assign the service request and calculate the total minimum cost of the multi-cloud system in iterative manner. The Require and Ensure shows the input and output of the algorithm. The will continue till all the service request is being calculated i,e up to „N..

V. CONCLUSION AND FUTURE WORKS

In this paper, we proposed an agent based scheduling method with a new algorithm for total cost calculation for assigning the user request to different CSPs. For maintaining the security issue we focus on dynamic allocation of service request into consideration. The information about the assignment is maintained by the Agent based scheduler. The quality of service of the system is calculated by taking the average of all the values from different CSPs.

The work can be further extended with considering the Service Level Agreements (SLA) as the Scheduling criteria. This can be the real time parameter for scheduling.

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