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Research Article

CSP Scheduling on basis of Priority of Specific Service using Cloud Broker

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Abstract

That paper focus on how to select cloud service provider (CSP) for the user which provide the best service to the user. Selecting of proper CSP depend on the rating of CSP. If rating of CSP is higher than CSP would be select for the first user and so on. Paper has focused on both rating of CSP and rating of particular attribute of CSP. In this Paper selection of CSP depend on both rating of CSP and rating of particular attribute of CSP. Now a day's lot of cloud service provider present in the market and day by day these number are being exceed. These are following CSP example Amazon elastic computing (EC2) cloud offers virtual machine0.1$ per hour, Google compute cloud offer virtual machine 0.5$ and so on. This is being hard for user to select the proper CSP for the service which provide the best service in low cost and effective quality. Cloud Broker work behalf of user. Users send his requirement and budget to Cloud Broker than its deal with the Cloud Service Provider and select it for user. In this paper Rough set model is being use for selecting the optimal CSP.

Keywords: *Cloud Service Provider, Cloud Broker, Rough set Model , Cloud Computing, CSP Scheduling .*

1. Introduction

Cloud computing has made revolution in computing as a service. With the ability to provide on-demand computing resources dynamically, with this new way of computing technology there are lots of benefits for the users such as User centric access On-demand service provisioning, QoS guaranteed offer, Autonomy , Scalability & flexibility . Cloud computing utilizes massively scalable computing resources delivered as a service using Internet technologies. Cloud computing allows computational resources to be shared among a vast number of consumers to allow for a lower cost of ownership of information technology. (Ashish Tiwari *et. al* 2012).

A computing Cloud is a set of network enabled services, providing scalable, QoS guaranteed, inexpensive computing platforms on demand, which could be accessed in a simple and pervasive way (Baomin Xu *et. al* 2011).

The cloud functionalities available to the consumer are SaaS: Software as a Service, HaaS: Hardware as a Service, DaaS: Data as a Service, PaaS: Platform as a Service, laaS: Infrastructure as a Service. There are four major services that compose cloud computing to a new era in computing technology, they are Virtualization services, storage services, security services, application service.

The SLA (Service Level Agreement) plays important role in scheduling the service request from the users, as per the priorities set in the SLA the services are scheduled and executed, which give better response time and throughput.

Cloud Service Provider: The cloud contains resource table. The available resource and details of each resource such as power consumption, memory available, the number of services running currently. The scheduled services from the scheduler are send to the cloud service provider, based on the SLA the user request is processed.

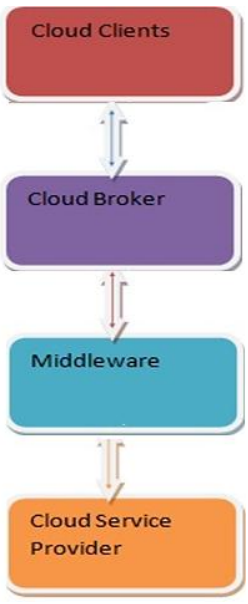

Figure:1 Flow of service between client and CSP

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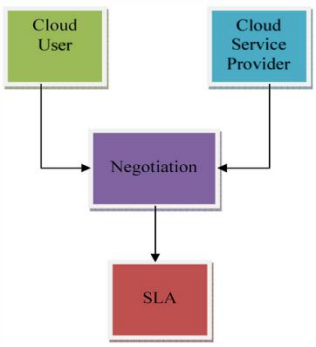

Figure 2 SLA Creation

2. Problem statement

The origin of problem, CSP don't count on behalf of service duration and quality of service. Some Cloud service provider limited time duration service and service is not as better as customer requirement. That thing volute the use of Cloud computing. That problem is faced by both customer and cloud service provider. Proposing model provide the solution of that particular problem. By using this model user overcome the problem of assigning the CSP. This paper use the rough set model for eliminating the undesired list of CSP.

3. Literature survey

Cloud computing is an emerging technology in the IT world. Some features of cloud, such as low cost, scalability, robustness and availability are attracting large-scale industries as well as small businesses towards cloud. A virtual machine (VM) is a software that can run its own operating system and applications just like an operating system on a physical computer. As the number of users increases, allocation of resources and scheduling become a complex task in a cloud. In a federated cloud environment when resource requirements of user requests exceed resource limits of cloud provider, to fulfill the requests the cloud provider can out-source to other cloud providers' resources. Under these circumstances it is desirable to minimize the Service Level Agreement (SLA) violations.

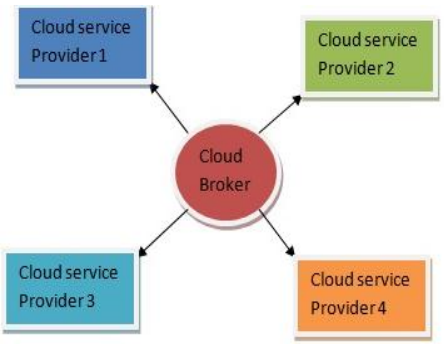

Figure:3 Negotiation of cloud broker with CSP

This can be achieved through load balancing. This paper proposes a load balancing algorithm that is threshold based. We consider two types of pricing models for VMs, on-demand and reserved. Simulation results show that the proposed algorithm reduces the SLA violations (Komal Singh Patel *et. al* 2012).

Infrastructure-as-a-Service, Cloud service providers, such as Amazon EC2 and Rackspace, allow users to lease their computing resources over the Internet, and invest their money into developing and maintaining the infrastructure. Hence, maximizing profit, right pricing, and rightsizing are vital elements to their business. To address these issues, this article an economic model for cloud service providers that can be used to maximize profit based on right pricing and rightsizing in the Cloud data centre. Total cost is a key element in the model and it is analyzed by considering the Total Cost of Ownership (TCO) of the Cloud (Komal Singh Patel *et. al* 2012).

4. Proposed Methodology

We are proposing a similar kind of approach but to a level above that of job scheduling. It is a responsibility of the cloud computing service provider to provide the adequate service level satisfaction, so we are proposing to devise an algorithm which made possible the cloud middleware to determine capability of CSP by using Rough Set analysis on the basis of level of satisfaction of service shown in figure 3. Rough set model can handle with objects and its characteristics. Here there is considering service providers as objects and its characteristics of service providers based on data operations, legal issues, risk management, inter-operability and portability, Data Centre operations identity, protection, virtualization and security. (Ashish Tiwari *et. al* 2012).

4.1 Introduction of Rough set

Rough sets concept was developed by Zdzislaw Pawlak (Z. Pawlak *et. al* 1991 , Z. Pawlak *et. al* 1982) in the early 1980's. It deals with classificatory analysis of data tables. Data which can be acquired from measurements or from human experts. The main aim of the rough set analysis is to synthesize approximation concepts from the actual data. Here we perform classification of objects using mathematical tool rough sets.

A. Information System

The data set are represented as a table where every row represents an object, which is simply a cloud service provider. Each column represents an attribute (a variable, an observation, a property etc...) that can be measured for an object. The properties can be considered depending on the system information. So that the table is called as information table. (Z. Pawlak *et. al* 1991 , Z. Pawlak *et. al* 1982).

Rough Set Theory (RST) is dealing as an extension of the classical set theory. In which it can be represented by pair A = (U, A),

where

U: It is considered as a nonempty set of objects called universe.

A: It is considered as a non-empty finite set of attributes such that a: $U \rightarrow Va$ for every $a \varepsilon A$.
The set Va is called as the value set of a.

B. Equivalence Relation

A binary relation R proper subset of X x X which is reflexive i.e an object is related with itself x R x, Symmetric if x R y then y R x and transitive if x R y, & y R z then x R z is called equivalence relation.

Let A belongs to (U, A) be an information system then with any B subset of A where it can form the associated equivalence relation as INDA (B).

$$INDA(B) = \{(p, q) \varepsilon U X U / a \varepsilon B\ a(p) = a(q)\} \quad (1)$$

INDA (B) is called the B–indiscernibility relation. If (p,q) INDA (B) then the objects p and q are indiscernible objects by attributes B. The equivalence class of the B-indiscernibility relation is denoted by [x].

C. Indiscernibility

The decision system always expresses the whole knowledge formed by the model. This table may
be unnecessarily large in part because it is redundant in at least two forms of ways. In which it may be the same or indiscernible objects which may be repeated several times or some of attributes may be superfluous. In Cloud Computing environment concept we must identify the user needs according to these needs we suppose to allocate the service providers. The identification of service providers there have been using rough set model in this research work. Equivalence class identification is very basic method used in the rough set model. This model deals with every object finds the set of equivalence objects. The following method is used to find the equivalence classes.

D. Set Approximation and Rough Set

An equivalence relation induces partitioning of the universe. The partitions may be used for building
the new subsets of the universe. The Subsets which are most often of interest have the same value of outcome of attributes. The Crisp set means whether the element belongs to the set or not, but in some cases crisp always is not possible. Sometimes an object neither belongs to positive nor negatives then it is in the boundary. If the boundary is non-empty then we call it is rough. These are represented in the form of notations as follows.

Let A = (U, A) be an information system and let B subset of A and X subset of U. We can approximate X using only the information which is determined in B by constructing B-lower and B-upper approximations of X which is denoted by BX and BX respectively where $BX = \{x /[x]B \varepsilon X\}$ and $BX = \{ x / [x]B \cap X \neq \varphi \}$ (Z. Pawlak *et. al* 1991, Z. Pawlak *et. al* 1982).

The objects which are present in BX can be exactly classified as members of X on the basis of knowledge in the B, while the objects in BX can only classified as possible members of X on the basis of knowledge in B.

The set BNB (X) = BX – BX is called as the B boundary region of value X and hence consists of those objects that cannot decisively classify into X which is based on the knowledge in B. The set U – BX is called the B-outside region of X and consists of these objects, in which there can be with certainty classified as those, which do not belong to X.

E. Rough Set

A set is said to be a rough set if the boundary region is non-empty. Let $X = \{x / \rho(x) > \text{threshold value}\}$ as per the given example Table 3, it is X = {B, E, F, G}. In the case of cloud environment, there is identification of the decision attributes are: Data related operations which is to be performed on data, security related features see the strength of security on data, virtualization related to allocating memory, Access and Identity management of system, Legal Issues present for agreement, Risk Management related to proper check on time, Compliance and Audit related to Conduct of CSP's, Interoperability and Portability related features, Business Continuity and Disaster Recovery related policies, Data Centre Operations deals with locations, Incident Response related to communication path and Key Management related to effective policies.

All these attributes equally participate when any Tenant (Cloud User) wants to select Cloud Service Provider (CSP) (ZHANG Yan-huaa *et. al* 2011 , Amit Nathani *et. al* 2011).

Since it is not possible to formulate the search on the basis of all these 12 attributes, These are categorized on the basis of relevance to tenant and CSPs. The categorization is done by general survey from existing CSP and cloud users. The resulting set is called as a 'Reduct'. Reduct is a subset of attributes, which is a predominant attribute set. In this phenomenon there is choosing randomly reduct attribute set.

This relevance generates a threshold value γi for each attribute out.

$$\begin{cases} \rho\gamma i \geq 1 \text{ or TRUE} \\ 0, \text{ Otherwise} \end{cases}$$

In rough set model we represent the CSP and their attributes in a tabular form.

Cloud Service Provider	Virtualization	Application Security	Data Operation	Legal Issues
CSP:0	6.0	5.0	8.0	9.0
CSP:1	6.0	5.0	8.0	9.0
CSP:2	5.0	8.0	9.0	6.0
CSP:3	9.0	6.0	8.0	2.0
CSP:4	8.0	2.0	6.0	5.0
CSP:5	6.0	5.0	2.0	3.0
CSP:6	1.0	5.0	9.0	7.0
CSP:7	7.0	8.0	6.0	3.0
CSP:8	5.0	6.0	4.0	2.0
CSP:9	2.0	4.0	6.0	5.0
CSP:10	9.0	5.0	1.0	3.0
CSP:11	6.0	5.0	6.0	2.0

Figure: 5 CSP's and corresponding attribute value

The rows of the table contain the list of cloud service providers and the columns consist of the attributes of the

respective cloud service provider. This table 1 is converted into table 2 by applying equation 2. As per the rough set analysis processes table 2 is divided into lower and upper approximations. The lower one we cannot consider for assigning to the jobs because these are not suitable according to user standards.

Cloud Service Provider	Virtualization	Application Security	Data Operation	Legal Issues
CSP:0	6.0	5.0	8.0	9.0
CSP:1	6.0	5.0	8.0	9.0
CSP:2	5.0	8.0	9.0	6.0
CSP:4	8.0	2.0	6.0	5.0
CSP:6	1.0	5.0	9.0	7.0
CSP:7	7.0	8.0	6.0	3.0
CSP:9	2.0	4.0	6.0	5.0

Figure: 6 Remaining CSP's after threshold value

4.2 Assessment of Rating

After dividing the cloud service providers into their respective binary ratings, we calculate the membership Value δ : CSP →[0 1]. Table 2 also contains the threshold value for each parameter for their respective CSPs. This value defines the lower bound on the value that we get after dividing the max(value in column) with other values in the column. The value of indicates the capability of the service providers. (Thanadech Thanakornworakij et al 2012).

δ→1 represents threshold acceptance and 0 represents threshold rejection, the simple logical AND will only give those CSPs that are threshold accepted for all parameters/attributes.

In the considered example as per the definitions of lower and upper approximations are: AX = {A, C, D} and AX = {B, E, F, G} [12, 13, 14] In this research work we have been allocating the jobs to the service providers based on the δ value. The table 3 showed the CSP and its Fuzzy cost values. The fuzzy cost of the service provider is the sum of all the membership values of each attribute. Than after the upper approximation find total fuzzy cost of particular CSP. In this paper we focus on the priority of service so we find the average of priority service value and fuzzy cost for the particular CSP.

After these values store in the array in ascending order. Top CSP will assign to the first job that process will do with another jobs.

In this approach workload is distributed to service providers (i.e. VMs) in efficient manner. Let S= {SP1, SP2, SP3…SPn} be the service providers total number of service providers m. Let J = {J1, J2, J3…Jm} be the set of jobs generated by the users.

Matrix 1: Mapping of CSPs with Available Attributes

	a1	a2	a3	a4	a5	a6
A	1	1	1	1	1	0
B	0	1	1	0	1	0
C	1	0	0	1	1	1
D	1	0	0	1	0	0
E	0	1	1	0	1	1
F	0	0	1	1	1	1

The numbers of jobs m and service providers are n. The jobs are having resource requirement vector and service providers have resource available vector. Each service provider have its own capabilities and it is denoted by a matrix SPR of order n x p matrix and each job has certain requirements it is denoted as m x p matrix.

Matrix 2: Mapping of Jobs with Available Attributes

	a1	a2	a3	a4	a5	a6
J1	1	1	0	1	1	0
J2	0	1	1	0	1	0
J3	1	0	0	1	0	1
J4	1	0	0	1	0	0
J5	1	1	1	1	1	1
J6	0	0	1	1	1	1

Priority based Rough set workload allocation algorithm

Input sets of job J, set of cloud service provider S,
Priority for service P, demand vector or threshold value R,
r' is selected CSP
j=0 to number of jobs,
Method :
S'=S
While(S'!= Φ)
{
For all q ε J && r ε R
r' = select(q,S,r,P)
S'=S'-r'
J=J-q
}

Select(q,S,r,P)

{

- Select the cloud service provider in S which provide the service Better than threshold value r.
- Evaluates the fuzzy cost of each CSP
- Find the average of priority service value and fuzzy cost for Particular CSP.
- Arrange it in descending order .
- Assign the top CSP to job1 .
- Return Selected CSP.

}

5. Result and Simulation

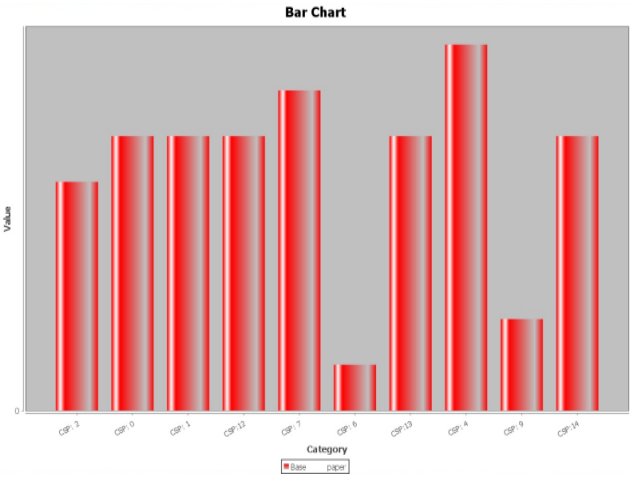

Figure 7: CSP selection on basis rough set workload allocation algorithm

As per our Algorithm which we have designed is working for the number of Cloud Service Providers which may contain the number of Datacenters and there are some parameters by which we have found out the Services and then the Matrix created which is a information matrix of CSPs and Parameters which has been mentioned above

In our Simulation we have used some of the packages of Cloud Simulator and Our own packages in the J2EE environment and one of the tool is used by us in this J2EE is the NetBeans and Implemented our Algorithm in the J2EE environment and Run Successfully. The Screen Sots are mentioned below in Fig 5 and the rest of the implementation is mention in the Fig 6 and gives output successfully as per our algorithm which we have prepared.

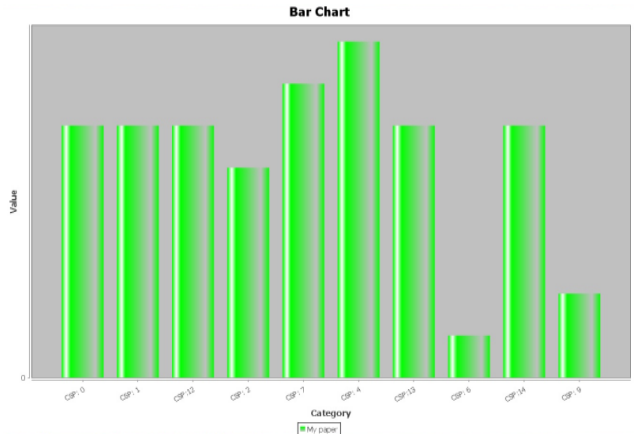

Figure 8: CSP selection on basis Priority based rough set workload allocation algorithm

Future work and Conclusion

In our research field goal is based to propose the scheduling for cloud service providers. After identifying the service requirements, the user can submit their job to the cloud and there the middleware can implement this mathematical model to rate CSPs and on the basis of their capabilities. Any existing cloud simulators (CloudSim, Gridsim etc.) can easily implement this model. The scope of this research can be endless in further,

Allocation of task basic on both rating of CSP and workload on the CSP. Any cloud service provider has best rating but it has more work load in this case , if cloud broker has selected that type of CSP than differently it will give response late . This is future work that focus on both rating of CSP and work load of CSP.

To optimize the value of δ we can also use some factors such as Cohesion ρch, coupling ρco etc. We can assign these values on the basis of performance of cloud on the worst case. Higher the value of ρch, and ρco, higher the chance of that CSP to get selected by the model

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