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A Customized Ranking Procedure for Selecting Federated Cloud Provider

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Abstract
Cloud automation delivers report automation belongings in varied sorts of function, and the outburst of Cloud employments networked brings new demanding situations in Cloud benefit result and choice. The state of the art Cloud benefit draft programs, that are analyzed of your audience quintets perspectives: answerable techniques; testimony depiction models; parameters and characteristics of Cloud employments; contexts, purposes. We test this person combo within a unique distort brokering program which optimizes deployment of tacit roots crossed more than one showers and likewise abstracts the lineup and supervision of base components in the particular perplexes. Experimental results ensure which multi-shower stationing provides enhance appearance and decrease costs when compared with using a particular perplex only.

Key terms: Cloud Computing, Selection Process, Decision Making, Virtual Infrastructure

1. Introduction

Cloud computing is an emerging paradigm that deliver resources on demand and pay per use approach. Cloud computing offers more business benefits due to that reason many organizations have started developing applications on the cloud infrastructure and making their business more profits and flexible. Some cloud service providers guarantee the quality of their services by defining a set of Service Level Agreements (SLAs) with their customers. These SLAs typically lack any technical means of enforcement which leaves the customer's data and software processes under the total control of the cloud service provider. Any failure to meet the SLA terms and obligations have disastrous effects on the cloud customer and provider, such as losing reputation and client trust and legal or financial penalties that may lead to putting an end to the entire business. This fact put pressure and responsibility on the customers when selecting a particular cloud service provider for running their service [1].

It difficult to evaluate service levels of different Cloud provider on their user and QoS requirements on some attributes such as quality, reliability and security of an application. Hence, it is a challenging task to measure the performance of the cloud providers. Cloud Service Measurement Index Consortium (CSMIC) [2] has identified metrics that are combined in the form of the Service Measurement Index (SMI), offering comparative evaluation of Cloud services. These measurement indices can be used by customers to compare different Cloud services. Several challenges are attempted in understanding a model for evaluating QoS and ranking Cloud providers. The following are the task of evaluating the providers is how to measure various SMI attributes of a provider and how to rank the providers based on the SMI attributes [3]. In this paper, classical probability ranking principle technique is applied to rank among the shortlisted providers, select and assign the optimum to the service.

2. Proposed Work

The classical Probability Ranking Principle (PRP) is used to select the matched providers, rank it and choose the optimal provider for the service in federated cloud [4]. In each situation, federated cloud presents to the user a list of providers, about which system to decide and assign the best to the user. Each provider is associated with the SMI attributes, based on these attributes, an optimum ranking of the choices can be derived using CPRP. The concept of PRP was founded by William Maron, William Copper and Steve Robertson. This concept was used in ranking of the documents in order of decreasing probability of relevance in Information Retrieval System (IRS). Even though the evaluation and comparative ranking of various Cloud services is quite new in the Cloud computing area, it is an old concept in other areas such as web services [5]. In this chapter, PRP concept is used for ranking the providers based on the SMI attributes that will be satisfied the requirements of QoS and user.

This proposed paradigm helps the users to compare different offerings according to their priorities, performance and select whatever is appropriate to their needs based on the Service Measurement Index (SMI) suggested by Cloud Service Measurement Index Consortium (CSMIC). Measurements such as response time, security, assurance, agility, suitability, interoperability, availability, reliability and cost considered by the users to compare different cloud providers in Federated Cloud [7]. In this model, historical measurements are combined with promised values to find out the actual value for each measurable attribute. The value of each attribute plays a vital role in the selection of the providers and its impact on overall ranking of the provider also.

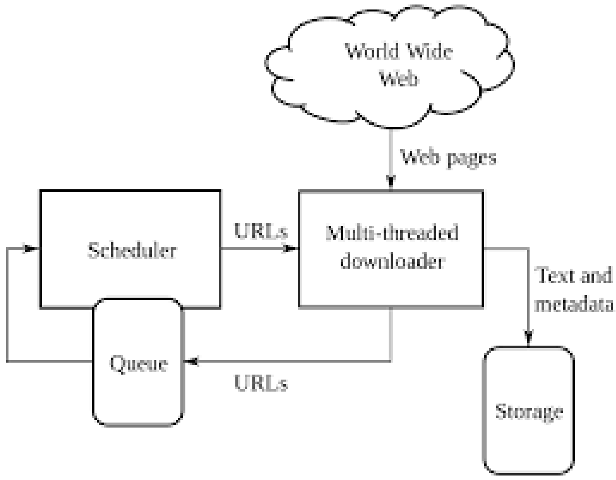


Figure 1: Customized Ranking Federated Architecture

The customized ranking federated architecture is shown in Figure 1. Brokers are interconnected with providers, collect the status of the provider and update in the broker manager registry using valid authentication procedure. For user submitted service request, appropriate providers are shortlisted based on the information in the broker registry and apply ranking mechanism to select the optimal provider for the service. User set the preference to QoS parameter and highest ranked provider is assigned to the user. Broker Manager selects the list of matched provider from the registry information, selects the best from the shortlisted provider using probability principle ranking approach. Identifying the desired providers based on the user and QoS requirements is a difficult task [8]. There are many providers selected, then the ranking approach is called to pick up the optimal provider for that service at that time.

PRP based ranking is working on three stages such as (i) calculate the relevance of the attributes for the specific service (ii) Computation of relative weights of each QoS service and (iii) relative value based weights for ranking cloud providers. In first phase, user indicates the importance/preference of the attribute over another using standard method. In second phase, weight is assigned for each attribute based on the importance to the service. It is shown in the table -1.

Equal importance/quality	1
Somewhat more important/better	3
Definitely more important/better	5
Much more important/better	7
Extremely more important/better	9

Table 1: Relative Importance Calculation

It is normalized using the historical value of the attribute. PRP ignores there is uncertainty in the calculated relevance score. In third phase, the relative value based weight for ranking the providers using table -2. The following assumptions considered in this ranking model are given as follows. Focus on the functional level of dependency: The same function may require different effort, depending on the situation. This aspect may affect the values of certain attributes in the model. Users evaluate choices in linear order: This means that there is a linear order in which providers are assigned for service. In some case, user interested provider may also occupy the top slot.

QoS Parameters	Higher the better	Lower the better
Security	√	×
Integrity	√	×
Capacity	√	×
Scalability	√	×
Response Time	×	√
Mean Time Between Failure	×	√
Exception handling	√	×
Failure masking	√	×
Accountability	√	×
Failure semantics	√	×
Latency	×	√
Incomplete Transactions	×	√

Table 2: Category of QoS parameters

2.1 Algorithm for Provider Selection:

Step1: User submits the service and QoS preference to the Broker Manager, based on the requirement, the matched profile of the providers are extracted.

Step 2: Shortlisted providers are considered as input for the ranking model using CPPR. CPPR considered relative importance schemes; user's preference and feedback are used of.

Step 3: If user's required QoS parameters are not specified then rank the providers on standard weighing schemes and calculate ranking using CPPR.

Step 4: The best provider is selected using

$$\sum \quad \Box \ \Box\Box \ \Box \ \Box$$

Q_i represents the performance, availability, reliability, feedback and security is normalized value of considered QoS parameters and W_i is relative importance of selected QoS parameter.

2.2 Expected Selection List

Now assume that the set of cloud providers C_i shortlisted for processing the service s_i, the selected providers are given in the list $L_i =< c_{i1}; c_{i2}; : : : ; c_{i;ni} >$.For computing, the expected benefit for the service by assigning the provider in list, Assume that the user considers the choices in the selected order, and the first provider in the list may be choice of assigning to the provider based on PRP.

$$\Box(\Box_{\Box}) = \Box_{\Box 1} + \Box_{\Box 1}\Box_{\Box 1} + (1 - \Box_{\Box 1}) \quad (\Box_{\Box 2} + \Box_{\Box 2}\Box_{\Box 2} + (1 - \Box_{\Box 2})(\Box_{\Box 2} + \Box_{\Box 3}\Box_{\Box 3}) \quad \ldots.. \quad (1 - \Box_{\Box,\Box-1}) \quad (1)$$

$(\square_{\square\,\square} + \square_{\square\,\square}\square_{\square\,\square}) = \sum_{\square=1}^{\square} \left(\prod_{\square=1}^{\square-1} (1 - \square_{\square\,\square})(\square_{\square\,\square} + \square_{\square\,\square}\square_{\square\,\square})\right)$ ………………. (2)

2.3 Optimum ranking from the selected List

For discussing, the optimum ranking of selections from the selected ordered list, the expected benefit for the service by ranking the provider and assign it E(r_i) is given as follows

$\square(\square_{\square}) = \sum_{\square=1}^{\square} \left(\prod_{\square=1}^{\square-1} (1| - \square_{\square\,\square})(\square_{\square\,\square} + \square_{\square\,\square}\square_{\square\,\square}) + \square_{\square}^{\square,\square+1}\right)$ ………………………………………(3)

$\square \neq \square \neq \square+1$

Where

$$\square_{\square}^{\square,\square+1} = (\square_{\square\,\square} + \square_{\square\,\square}\square_{\square\,\square}) \prod_{\square=1}^{\square=1} (1 - \square_{\square\,\square}) + (\square_{\square,\square+1} + \square_{\square,\square+1}\square_{\square,\square+1}) \prod_{\square=1}^{\square} (1 - \square_{\square,\square})$$

In the following, the probability of choice the selected provider accepted is Pij < 1 for j = 1… I-1; otherwise, choices of order of selected providers cil and ci;l+1 would never be reached, and their sequence would not matter. The order of selection between first and second spot in the optimum list is given in the term t_i^(i,i+1) . It shows the difference between the expected benefits of providers in the occupied position in the final ranking list.. In order to simplify the derivation, the difference by the probability that the user did not select any of the providers before the corresponding provider from the ranking list. This simplified difference can be transformed as follows:

$$\square_{\square}^{\square,\square+1} = \frac{\square_{\square}^{\square,\square+1} - \square_{\square}^{\square+1,\square}}{\prod_{\square=1}^{\square-1} (1 - \square_{\square\,\square})}$$

$$= \square_{\square\,\square} + \square_{\square\,\square}\square_{\square\,\square} + (1 - \square_{\square\,\square})(\square_{\square,\square+1} + \square_{\square,\square+1}\square_{\square,\square+1}) - (\square_{\square+1} + \square_{\square,\square+1}\square_{\square,\square+1} + (1 - \square_{\square,\square+1})(\square_{\square,\square} + \square_{\square\,\square}\square_{\square\,\square}) \quad \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots . (4)$$

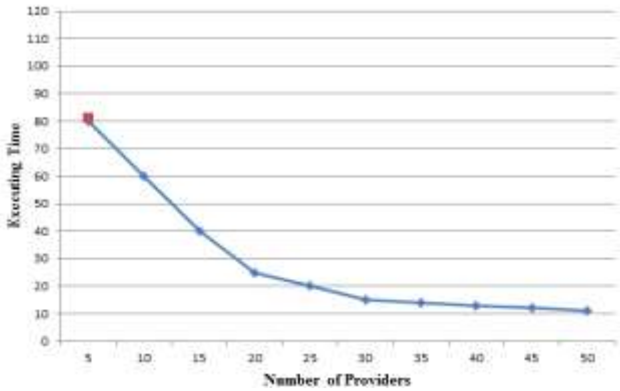
$$\square_{\square,\square+1}(\square_{\square\,\square} + \square_{\square\square}\square_{\square\,\square}) - \square_{\square\,\square}(\square_{\square,\square+1} + \square_{\square,\square+1}\square_{\square,\square+1} \ldots\ldots\ldots\ldots\ldots (5)$$

Since $\prod_{\square=1}^{\square-1} (1 - \square_{\square\,\square})$ is positive, the expected benefit of the original list is not less than that of the modified list iff $\square_{\square}^{\square,\square+1} \geq 0$. Formulate the effort of probability ranking principle for ranking and assign the providers is given as below. The effort of this ranking is between the average benefit if the provider is selected and the ratio between the users accepted provider and probability of the provider selected.

$$\square(\square_{\square,\square}) = \square_{\square\,\square} + \frac{\square_{\square\,\square}}{\square_{\square\,\square}} \qquad (6)$$

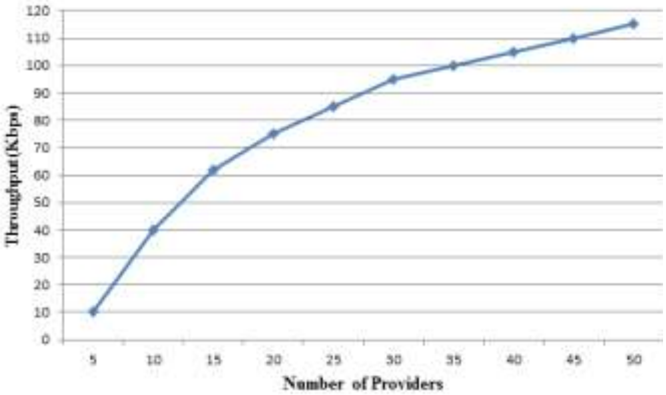
3. Simulation Result and Discussions:

With the increasing popularity of Cloud computing, many researchers studied the performance of Clouds for different types of applications such as scientific computing, e-commerce and web applications. Simulation experiments were implemented on the JADE 4.3.0 platform and on a computer whose configuration was an Intel Core i5-3337UCPU 1.80 GHz, 4.0GB RAM, Windows 7 (64 bits) operating system, Service Pack 1.Average response time and throughput was computed and the performance was also analyzed. The parameters considered for the simulation are number of users, number of cloud service providers, deadline of tasks etc. The execution time for each task is assigned randomly between 0.1ms to 0.5ms. Number of users considered are 1000, 5000 and 10000 at a time. Number of service providers available is fixed as 100, and deadline for each request is fixed as 0.5ms. Every cloud service provider has 50 computing hosts and a time-shared VM scheduler. Cloud broker on behalf of user request consist of 256MB of memory, 1GB of storage, 1 CPU, and time-shared Cloudlet scheduler. The broker requests instantiation of 25 VMs and associates one Cloudlet to each VM to be executed. There are two experiments were conducted and performance is analyzed with existing approaches. To rank the matched providers using PRP algorithm and the performance is revealed using throughput and execution time.



Graph 1: Execution time of the ranking mechanism

Execution time of the ranking mechanism depends on its implementation and the overhead of the ranking mechanism is considerably reduced if the number of providers increased. Execution time denotes in Seconds. 1000 requests are submitted at time for testing the simulation. Result shows that the execution time is decreased when the number of providers increased.



Graph 2: Analysis the throughput of the ranking model

Throughput is defined as the number of messages exchanged between users and providers per second. Throughput performance is linear propositional to the number of providers.

4. Conclusion and Future Work

It has also becomes challenging for users to find the best Cloud services which can satisfy their user and QoS requirements in terms of SMI parameters such as performance and security. To choose appropriately between different services, users need to have a way to identify and measure key performance criteria that are important to their applications. This chapter is discussed the new ranking mechanism for ranking the providers using classical probability ranking on the basis of the SMI parameters. All the shortlisted providers are examined and then ranking is done on the basis of the present and past values of SMI. The future work on ranking cope with variation in QoS attributes such as performance by adopting evolutionary algorithms. This work also extends the quality model to non-quantifiable QoS attributes. It is planning to implement the SMI framework and deploy on infrastructures provided by Amazon EC2 and Microsoft Azure.

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