

NEGOTIATOR LEARNING AND GROUPING BASED RANKING MODEL IN FEDERATED CLOUD

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Abstract— Federated cloud architecture is heterogeneous and distributed model that provides infrastructure related to cloud by aggregating different IaaS providers. In this case, it is an exciting task to select the optimal service cloud provider for the customer and deployed it. In this research work, new broker or negotiator learning and grouping algorithm is proposed to shortlist the providers and fuzzy logic 1 type and 2 type set ranking model is proposed in the modified federated architecture and the performance is evaluated. Proposed discovery method shortlists the provider based on the Quality of Service (QoS) indicators suggested by SMI with SLA that provides improved performance. Ranking mechanism based on Fuzzy logic set approach having three general phase such as problem decomposition, judgement of priorities and aggregation of these priorities. Fuzzy set may be combined QoS indicators with some simple rules. Weighted Tuned Scheduling Algorithm proposed to resolve the issue of starvation in the existing architecture and manage the requests effectively. Experimental results show that proposed architecture have better successful selection rate, average, response time and less overhead compared to the existing architecture that supported cloud environment.

Index Terms—Cloud, ranking model, SLA, QoS

I. INTRODUCTION

Cloud computing is a promised paradigm that offers simple, flexible, scalable and cost effective outsourcing type of services such as application development and hosting to the customers on demand and pay per utilization. Service Level Agreement (SLA) is an agreement that illustrates the level of performance assured by the provider at the user side. In current scenario, SLA technique plays a major role that brings the confidence to the user, prompt business policies and ensuring Quality of Service (QoS) at user side. Cloud provider commits to the user in terms of QoS is called as SLA establishment whereas the user discuss with the provider for the required level of services called as SLA negotiation.

Services consumed by the user are monitored by the provider and detecting any abnormality is remarked as violation. SLA is implemented between cloud member and

cloud service provider for efficient processing of federated cloud. SLA management is maintained in the proposed architecture by discovering and ranking the service providers for the user based on fuzzy logic sets. Cloud Service Measurement Index Consortium (CSMIC) has identified some metrics in the form of Service Measurement Index (SMI) that helps to evaluate and compare the services of different cloud providers.

Ranking the cloud service providers based on the SMI metrics is a challenging task because the value of the metrics determined and selected the algorithm used for ranking in the performance of the selected provider. In the proposed architecture, cloud broker Manager is responsible for selecting the best cloud providers, in addition, performing QoS monitoring, SLA verification and ranking the matched service providers. SLA is encompassed for the user by discovering appropriate service provider, describe and define their services properly, negotiate and delivers the services as per in the agreement.

SLA level policies are monitoring by the Broker Manager for the specific user, if there is any violation found, the penalty will be imposed. Cloud Broker Manager (CBM) is responsible for resource provisioning in proposed federated cloud. Each provider has interconnected with broker. SLA is verified with the information available in broker registry for the user. A new selection method is suggested that combines Quality of Service (QoS) indicators with SLA that provides better performance, with minimum cost desired by the end user. It also describes how the SLA management is effectively and integrates the service levels and efficient interoperability is achieved using brokers.

II. RELATED WORKS

Rajkumar Buyya describes market based provisioning policies for flexible allocation of resources to applications in cloud. Resource allocation was carried out based on customer profiles, Quality of Service requirements. This work was effectively implemented using the Aneka platform. Resource manager is the component that allocates the resources on demand even the cloud is overloaded. The rule based resource manager was proposed to utilize the private cloud resources, considering the security requirements of applications and

data.

A. Related Work – I

In the proposed approach, the user request is categorized into critical data processing and security. Based on the type of requests, priority is assigned and redirected the requests to the suitable cloud. In this work, Dr.Rajkumar Buyya discussed the framework which measures the quality, prioritizes and selects the cloud services based on SMI metrics and ranking the services using Analytic Hierarchy Process(AHP).AHP model has three phases such as forming hierarchy structure, pair5 wise comparisons and find aggregated value to generate ranking of the services. Authors proposed service mapper that contains a technique called Singular value decomposition which is used for ranking the services in statistical manner.

B. Related Work – II

Dr.M.Aramudhan proposed a new framework for cloud that maintains the SLA by means of distinguished the incoming requests either SLA based member or SLA based non member. This policy brings starvation that avoids by introducing a new algorithm called Distributed Loose Priority Scheduling. In addition to that the cloud providers are ranked based on plot care method and the average response time of the requests were calculated, analyzed and compared with existing method. Praveen Ganghisheti used the concept of rough set theory to allocate the best service provider with minimum Searching time.

Cloud broker was used in this architecture that helps to allocate resources based on service level Agreement between users and providers for Infrastructure as a service. Cloud Providers publish their service along with all types of QoS parameters in cloud registry and later the MCQoS algorithm used to invoke it.

C. Related Work – III

Dr. Choudhury proposed a system called Service Ranking System (SRS). This system has two type ranking: 1. Static and 2. Dynamic. In Static ranking, all available cloud service providers SRS ranked without considering user requirements. Where as in Dynamic ranking in which suitable services ranked based on user requirements. A modified Federated resource provisioning model consists of three phases namely 1.Discovery of service providers. 2. Rank the selected service provider using Fuzzy logic sets. 3. Assigning the service to the best service provider.

III. CUSTOMIZED FEDERATED ARCHITECTURE

Broker Manager (BM) collects the various levels of services offered by cloud service providers based on their different performance through broker learning algorithms. Brokers manage the cloud service resources, BM communicates with brokers and short list the providers. Broker based Learning Algorithm (BLA) is used to study the workload of the providers, necessity tasks of users and requirements of resource.

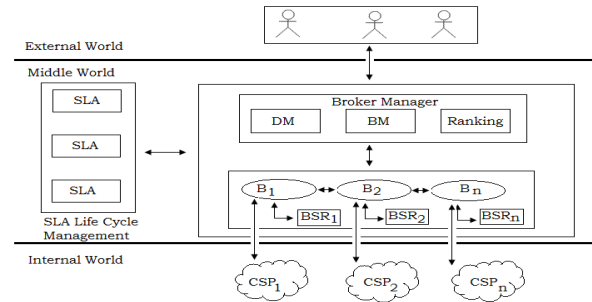


Figure 1

Differential service module in federated architecture helps to identify the category of the user accessing the service either belongs to SLA or non- SLA with the help of the information available in Profile Manager. Instead of using this strict differential treatment, weighted turned Queuing scheduling (WTQS) is proposed for differentiating and managing the requests fairly without starvation.

IV. WEIGHTED TURNED QUEUEING SCHEDULING

Two queues are maintained at the application level and initially weight is assigned for the queue based on the priority. (weight denotes the number of requests that considered for computation later, the next queue requests are computed and vice versa). Cloud traffic is unpredictable and hence, the value of the weight assigned may be turned dynamically either increased or decreased. The weighted turned queuing scheduling is given as below

Step 1: compute the number of requests in the queues.

Step 2: calculate the deviation (D) of the queues using the formula $D_i = (n * R_i) / N$

'n' refers the number of queues. N denotes the total number of requests in the queues. (R_i refers the number of requests in that queues)

Step3: Calculate the new weight for the queue as $New_weight = Old_weight * D_i$

V. CLUSTER BASED RANKING

Cloud provider selection algorithm uses the quality metrics according to the service measurement index (SMI), short list the matched providers depends on the SLA and functional Requirements. Cloud broker considers the list of QoS indicator $Q_i = \{Q_1, Q_2, Q_3, \dots, Q_N\}$ for the service requests submitted by the user, broker initiated the processing and short listed the providers based on the quality indicators assured. The apply ranking on the short listed providers using Fuzzy based logic approach.

The matching of provider is identified by the representation of the

$$\text{given set } M_p = \{QI, FA, RCP, CCP, SLAF\} \dots (1)$$

MP-Matching provider for the service.

QI- List of quality Indicator by the SMI.

FA-is the functional requirements.

RCP-Resource demand by the service released by the provider

SLAF (Service Level Agreement Factor)it is computed from the RCP

Information such as user desired performance, corresponding price are registered in the profile manager and broker calculates the ratio of the desired performance to price and update the value in the registry of broker manager.

User layer consists of user accessing the cloud services. Broker layer performs the selection of providers for the user. (it consists of broker manager, brokers connected with providers are clustered based on the service levels, performance and costs).

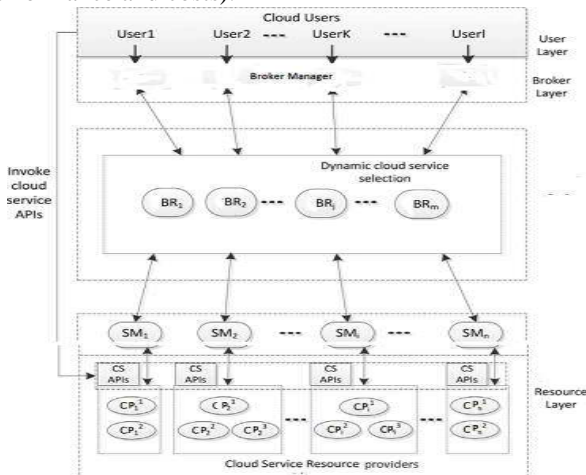


Figure 2

Broker registry in broker manages information about the provider and helps to select the matching provider based on the equation

1. Broker manager shortlisted the cloud providers and rank it using Fuzzy Logic set

2. Resource layer comprises of cloud providers, mapping with broker using service mapping (SM). SM can help the respective broker register the status of its connected provider in its registry including the failures of some services.

3. Each provider defines API (Application Programming Interface) as Means invoked by broker and used after finishing the process of cloud service selection. Cloud providers are clustered based on the level of service group, the number of available and matched providers are shortlisted for ranking using fuzzy logic set.

VI. RANKING BASED ON FUZZY LOGIC SET

To propose ranking mechanism based on fuzzy set approach having three general phases such as problem decomposition, judgment of priorities and aggregation of these priorities. Fuzzy set may be combined by some simple rules. To rank the service providers, the service functionality attributes are classified into three. Categories such as class A, Class B, and class C. Class A refers high level attributes.

Accountability, assurance, security, and privacy. Class B Refers next level attributes such as usability, reliability and interoperability. Class C denotes low level attributes such as user interest, stability, cost, throughput and efficiency. Broker is responsible for interaction with users and understanding their

Request needs Ranking system considered two aspects such as (i) the service quality ranking based on fuzzy set and (ii) the final ranking based on the cost quality ranking. Cloud

provider selection model is based on three steps evaluation. Step-1 is to identify the suitability of each service provider for the service render by the user. Suitability evaluation carried out by considering to reducing the effect of any particular measure in class A. Step -2 Confirms that provider can extend service providers. Cloud providers are selected based on the overall and individual cut off threshold values of the attributes considered for evaluation.

VII. CONCLUSION

Cloud computing has become an important technology for outsourcing various resource needs of organizations. Proposed federated cloud mechanism helps to resolve the difficulties of selecting the optimal cloud provider for the service. The issue of starvation is resolved by introducing a scheduling algorithm called WTSQ

The shortlisted providers are ranked based on fuzzy logic set and depends on the availability, the top ranked provider is assigned for the tasks. The performance was compared and found that it is better than the existing federated cloud architecture.

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