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A Novel Approach for Web Service Selection

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Abstract— *Now a day, Web Services have emerged as a popular research field. But web services are unable to represent the non-functional features of WSs, i.e. their Quality-of-Service. This paper presents an approach for efficient web service selection. A web service negotiator has been incorporated for selecting the appropriate web service based on the report of QoS authenticator. After that the ranking of web services has been done by the web service negotiator and the appropriate web service has been presented to the consumer which perfectly satisfies the consumer need.*

Keywords— *Web service; QoS;UDDI; RA.*

I. INTRODUCTION

The growth of the information technology has put a significant impact on everybody life. Information technology is used in offices, homes and businesses in a wide way. Today, numbers of web services are available for satisfying the user needs. But, due to the increasing number of available web services there is a large amount of information is available for the user .But due to the accessibility of huge number of web service providing the similar functionality it is very difficult for the web user to select the appropriate information. So it is necessary to consider not only the functional requirement of the web service but also the nonfunctional requirements of the web services. The nonfunctional requirement of the web services includes response time, throughput, availability, reliability etc. The Web service framework is generally divided into three areas [1] Service provider: The service provider implements the service and makes it accessible on the Internet. Service requestor: The service requestor is any end user of the web service. The requestor utilizes the already existing web services returned by the service provider. The service registry is a logically centralized directory of services. This centralized directory maintains the information about the existing web services and also for new ones. The current UDDI only support the functional aspect of the web services. It does not incorporate any mechanism to store the non functional requirement of the web services. If the web service provider provides the QoS information then there should be a need of verifier that verifies the published web service information.

In the proposed work the following issue has been taken under the consideration*:* As the many web services are available that provide the same functionalities, it is very difficult to find out the web service that best meet the consumers need. To find out the best service, the discovery agent can use the non functional requirements of the service. But the problem is that the UDDI registry does not provide any mechanism for the service provider to publish the QoS information about the web services. Sometime it may be possible that service provider can provide incorrect information about the QoS parameters, or the available QoS information may be stale. So there should be some mechanism for the correct rating of web services. It may be possible that the web service performance goes down after some time, so there should be some mechanisms that also keep track of the stability of the web service. So, the services which always provide good quality as advertised in the QoS information can be assigned a high stability score otherwise the low stability score can be assigned to that service.

The rest of the paper is organized as follows. Section 2, reviews the techniques proposed by the different researchers. Section 3, describes the proposed model. In section 4 experimental analysis and simulation is presented with the help of suitable example. At last, the conclusion of the paper is presented in section 5.

II. RLEATED LITERATURE REVIEW

Generally the classification of the web services is done by the QoS parameters such as response time, cost, and reputation. To find the best service [12-14] has done their current work based on the quality of service. This approach has included QoS computing to measures, technical standards and numerical calculations to determine the maximum or minimum of an objective function that is used to find the better service. Ganden *et al.* [15] has focused on the to consider the knowledge of user preference .For this their approach is based initially on a server context that contains information about user preferences, and secondly, the access rights of a user. Mallick [17] proposed efficient web service architecture based on x-SOA. This architecture organized the method of web service discovery by using an intermediately, requester friendly layer called the request analyzer (RA) between the service requester and the service broker. The RA processes the plain text request query to finally being resolved to a most appropriate web service. It uses a cache based service broker approach to consume lesser time towards discovery path. It also uses a reputation based mechanism for keeping the track of the trustworthiness of web services. This paper does not provide any interface for specifying the user preferences. T. Rajendran and P. Balasubramanie [6], [7] proposed a framework for agent-based Web services discovery with QoS to select the most suitable Web service from the UDDI that satisfies the client's preferences and QoS constraints. It provides an extended UDDI that can accommodate the QoS information.. Khorshand [8] proposed a reputation model for web service discovery. In this paper a reputation administrator has been used to allocate the reputation marks to the services based on the customer

feedback. This model also uses a service level agreements (SLA).The discovered web services has been ranked on the basis of both the reputation ranks generated by the administrator system and their nonfunctional QoS attribute value. The top ranked services then sent back to the consumer. As, customer feedback has been considered as an important remark for calculating the ranking of the web service. Sometime incorrect information given by the customer can lead to the web service as high or low ranked web service.

Web service selection based on quality of service plays an important role because the consumer always wants those services that satisfy their requirements. Generally web service selection is based on the reputation mechanism where customer provides the feedback for the services. But Quality of service plays a significant role in automatic web service selection. QoS is an important factor to establish legitimate and reliable web services and identify the best web service systematically from a set of functionally similar services. QoS parameter gives requester assurance and confidence to use the services. Karpagam [2] considered seven parameter execution time, response time, throughput, scalability, reputation, accessibility and availability to access the Quality of service. But it has not considered the security as QoS parameters. QoS broker based architecture has been proposed by [9], [10] for dynamic web service selection. It also provides a mechanism for clients to specify the non-functional requirements like QoS along with functional requirements. The basic components of web service model are web service provider, web service consumer and the UDDI registry. The QoS information can be stored in the UDDI registry; By using tmodel data structure in UDDI registry QoS information can be stored. On the Basis of QoS parameter the WS-QoS Broker help clients for selecting appropriate web services. The limitation of the architecture was the cost of the implementation. In fact, the broker should be fully operational and its interface has to be known in advance to the providers and clients. So, Negi [16] had used AHP to assign the weight age to the different QoS parameters. A web service negotiator had used for the efficient selection of the web services. For selection of the web service TOPSIS algorithm had been used which ranks the web service and provide the efficient web service to fulfill the consumer need. Web service selection based on quality of service plays an important role because the consumer always wants those services that satisfy their requirements.

III. PROPORSED OBEJECTIVE

The objective of our work is to provide an efficient mechanism for the selection of the most suitable web service form the vast collection of web services. Generally the web services are selected only on the basis of the functionality but the nonfunctional requirement such as (response time, throughput) also plays an important role in the selection of suitable web service. So, a model has been proposed which also includes the nonfunctional requirements during the selection of web services. The web service publisher publishes its information in the web service registry. To discover the most appropriate web service and to collect the information about web services the service requester's contact the web service registry. The QoS information can also be stored in the UDDI (Universal description, discovery and integration (UDDI) directories with the web service information. A web service negotiator helps the client to select the appropriate web service on the basis of QoS parameter. The web service provider provides the registration, deletion and updating facilities. The service publishers publish its service functionality to the UDDI registry after the QoS authentication process. The web service consumer can search the web service registry through web service selector. It selects the web service from the registry that satisfies the user preferences and QoS constraints. The web service selector also takes the consultation from the reputation Manager to know the rating score of the service. Reputation Manager also includes a component Known as stability analyser to know the stability of the web service .If the web service has good Quality throughout then the web service has high stability score otherwise the web service has low stability score. The QoS authenticator performs the validation and verification process of QoS parameters. After that the validated QoS information can be stored in the web service repository.

This model helps the consumer to select the efficient web service according to his/her requirement. This model helps the consumer to get the best result as the information provided by the web service provider will be judged by the web service negotiator and the services that meet the required criteria will be handover to the web service consumer. This approach will save the time of the web service consumer to navigate the web
The following steps are performed by web service negotiator:
Step 1: Waiting for the query from the consumer
Step 2: Send the request to the web service registry.
Step 3: Extract the services that match the functional requirement.
Step 4: Take the help of web service certifier to know the actual QoS information
Step 5: Filter the services according to the QoS parameter.
Step 6: Apply the ranking algorithm to select the best services
Step 7: Consult the stability analyser and web service repository
Step 8: Return the result to the consumer
Step 9: calculate the feedback given by the user
Step 10: store it in the repository

The following algorithm can be applied to find the desired web service.

Algorithm for web service selection

```
Step1: DiscoverServices (functionalReq, qosReq,
repuReq,userPrefer, maxNoService)
{
Step2:matchService=funcMatch(functioanlReq)
{
Step 3:  if QoS requirements and user preferences specified
{
Step 4: QosMatches = nonfunctMatch (matchedService,
qosReq,userpref); }
Step 5: else {
```

Step 6: return selectedServices (matchedService, maxNoServices, "random"); }
Step 7: if Reputation requirements specified {
Step 8: serviceMatches = RepuRank (QosMatches, qosReq, RepuScore , stabilityScore);
Step 9: return selectedServices (matchedService, maxNoServices,"usingQoS"); }
Step 10: else {
Step11: return selectedServices (matchedService, maxNoServices,"usingOverall"); }}

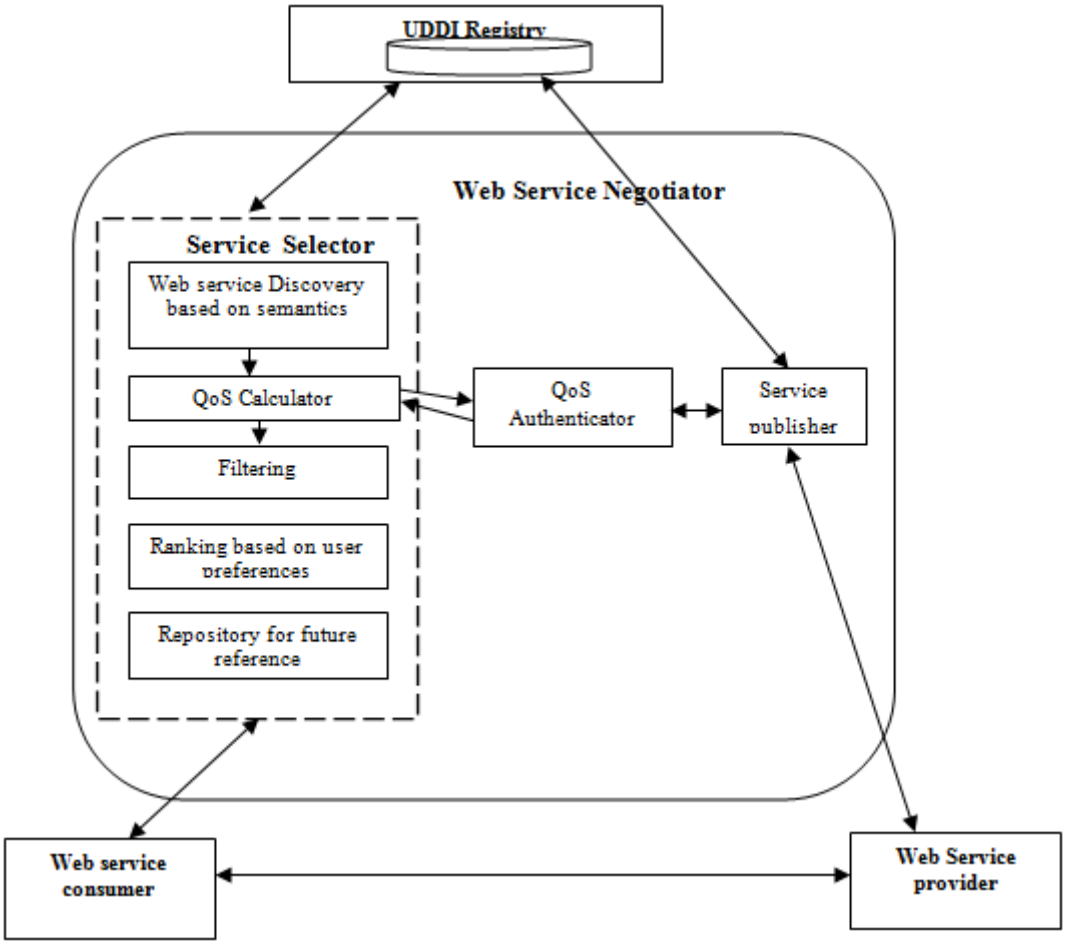

Fig. 1. Efficient web service framework with web service negotiator.

IV. Experimental Simulation and Result Anaysis

The experiment has been done using the dataset on the basis of QWS [11]. A Server has been implemented which accept the request from the user and search the desired result according to the query. After that the selected service has been selected out. For the selection and the ranking of the web services a MCDM techniques (AHP and WASPAS) has been used. AHP and WASPAS techniques have been implemented in java. The AHP has been used to find the weight value of the QoS parameters. After that WASPAS has been applied to rank the web services according to the user preferences [11], [12]. The table 1 is used to show the web services according to their nonfunctional attributes value. Four parameter has been considered as a base for non functional parameters: Response time, Availability, Reliability, and Latency.

TABLE 1. Decision matrix.

Criteria Alternatives	Response time	Availability	Reliability	Latency
WS1	96	100	94.1	68.75
WS2	225.36	100	62.6	225.36
WS3	119.33	88	76.5	65
WS4	123.5	60	78.6	41
WS5	409	100	67.6	409
WS6	544	100	70.5	492
WS7	281.07	68	8.7	250.73

By using AHP the weightage value of each parameter is calculated as:

W1=0.36, W2=0.28, W3=0.15, W4=0.20

After that apply WSPAS method on table 1.

WASPAS method is a combination of two model: Weighted sum and weighted product model

Step1: First of all find the normalized matrix based on their positive and negative selection criteria of the parameter.

For Positive criteria

$$norm_{ij} = \frac{dm_{ij}}{\max_i dm_{ij}} \quad (1)$$

For negative criteria

$$norm_{ij} = \frac{\min_i dm_{ij}}{dm_{ij}} \quad (2)$$

Where $norm_{ij}$ is the normalized value of dm_{ij}
Total relative importance=

$$Q_i = p\sum_{j=1}^{n} norm_{ij}\ w_j + (1-p)\prod_{j=1}^{n}(norm_{ij})^{w_j} \quad (3)$$

Where value of p is 0.5

After applying the above step we can get the rank of the web services.

TABLE 2. WASPAS rank.

Web Services	WASPAS Rank
WS1	0.909979977
WS2	0.531147046
WS3	0.789444452
WS4	0.774838891
WS5	0.423804368
WS6	0.391452305
WS7	0.328366101

Fig. 2. Web service ranking.

According to the user requirement the following services have been selected out in the following order: WS1, WS3, WS4, WS2, WS6, WS7, WS3, So, WS1 is the most suitable service as compared to the other services. The ranking order of the web services has been shown in the graph fig 2. So, the web service that is close to the user expectation has been selected out as the best service. After that the reputation score calculated by the QoS authenticator can be added to know the actual result.

V. Conclusion

Web service selection based on quality of service plays an important role because the consumer always wants those services that satisfy their requirements. Generally web service selection is based on the reputation mechanism where customer provides the feedback for the services. But Quality of service plays a significant role in automatic web service selection. QoS is an important factor to establish legitimate and reliable web service and identity the best web service systematically from a set of functionally similar services. So ,QoS parameter gives requestor guarantee and confidence to use the services .This paper has used a efficient approach for the selection of best web service.

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