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A New Approach in Web Service Discovery based on QoS Parameters

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Abstract

Web Service is now a popular method to provide varios service functions for Internet users. Nowadays, complicated service requirements, which must be solved by different online web services, fource the user to ask for collaborative service application to web service provider. As the Internet expands the diversity of its applications, these issues become increasingly critical and it is now necessary to distinguish services and selet the proper service.

QoS has been the distinguishing aspect in the works addressing quality aware composition and selection of web services.

Web services are evolving as an innovative mechanism for rendering services to arbitrary devices over the WWW. As a consequence of the rapid growth of web service applications and the several number of service providers, the consumer is faced with many services with similar functionality that selecting the "right" service among them become difficult or maybe impossible.

The selection of web services is typically based on both functional and non-functional attributes of the service, such as the Quality of Service (QoS) levels.

Key words: Web Service, Service Discovery, QoS Parameters, Validation.

1. Introduction

With the growing trend in web services, the World Wide Web is shifting from being merely a data repository to being an environment in which web users or other applications can automatically invoke other web services. We define a web service as a self-describing software application that can be advertised, located, and used across the web using a set of standards.

Web services provide a flexible way for applications to interact with each other over networks. A typical architecture of web services uses a central UDDI server for service providers to publish their services and for service consumers to search services.

In an open environment like WWW, many providers exist with a large varity of services, users often have insufficient knowledge about the web services. So many users often need to accept the service provider's conditions of paying for web services before making use of them. This means user even has no opportunity to experience the service himself before getting it.

Because the rapid development of web services and abundance of service providers, consumers will face with a number of services wit similar functionality, but differ in quality of services that they offer. In such conditions, quality of service (QoS) serves as a benchmark to differenciate service providers and comprises of techniques that aim to provide a balance between the needs of service requester and service providers while being constrained by the limited network and server resources. QoS has typically been associated at a network/server level rather than the user level. As the Internet expands the diversity of its applications, these issues become more and more important.

In this thesis, moreover, UDDI stores non-functional (QoS) information indeed of functional information.

2. Research Methodology

Efficient service discovery is vital for improvement web service technology. Nowadays problem is not related to providing information, but in quality and verity of the information. With increasing number of web services in WWW, consumers would face a number of services with similar functionality, but differ in quality. In fact, today, a proper service discovery among many services is an important problem. Service discovery only based on functional properties is not efficient, so, we should use both functional and non-functional properties in service discovery, especially in a condition that services provide similar functions.

In such a condition with QoS properties, a right service can be selected according to QoS requirements.

Because the information that providers publish, may not be always true and validate, to verify and validation these information, its good to evaluate these information. In this way consumers can rely to publishing information, and select a service with assurance.

QoS enabled web services are typically associated with a service level agreement (SLA), which is used to guarantee quantifiable performance. It is a formal binding defining the relationship between the service provider and the customer often envolving a third party to support the contraction between them. It consists of descriptions of the parties involved, the service definitions, quality of service parameters and their service levels and possible penalties in the face of failure to comply with the agreed levels.

In this thesis, we introduce a model that includes a new extended UDDI, which can maintain non-functional properties indeed of functional properties.

In addition,we introduce an evaluate and discovery engine that trying to find a proper service for consumers according to the non-functional and reputation requirements. In this way we can give an assurance to consumers about quality and validation of services.

We also use monitor and evaluate modules, these modules collect publishing service properties and consumer's reques, then get them to evaluate module to process and calculate validation of the service. In this model QoS properties is maintain in QoS DB, and validation information is maintained in rating DB. These information will offer to evaluate and discovery engine when required. This model is intended to encourage trustworthiness and

help users choose the right system for service request. We also should validate the QoS properties and verify their claims in service execuation.
Our model consist of four parts:
-) Service provider: In this model provider should not only describe the functional information about the service offered, but also make a specification about its QoS information and publish it into UDDI registry. Meanwhile, the provider must accept the monitor and measurement of the monitor and evaluate modules according to the request of the consumer.
-) Service consumer: the consumer queries the validation broker to find the matching services and measure the performance of the services. During the measurement, it creates QoS reports to record the performance data and send them back in batches to the monitor module of validation broker. Consumers looks for a service in UDDI that satisfy his functional and non-functional requirements.
-) Extended UDDI: this UDDI can maintain non-functional properties indeed of functional properties. During processing of the requests, the validation broker acts as a client to query the UDDI registry for information.
-) Validation Broker: Validation Broker is the main part of our model. This part consist of six modules: publish, monitor, evaluate, lookup, QoS DB and Validation DB. service requests from consumers are forwarded to this part, then Validation Broker search in QoS DB and Validation DB and looks for services that can meet consumer's requirements, finally Validation Broker return the matched services to consumers. Our model is shown in Fig.1.

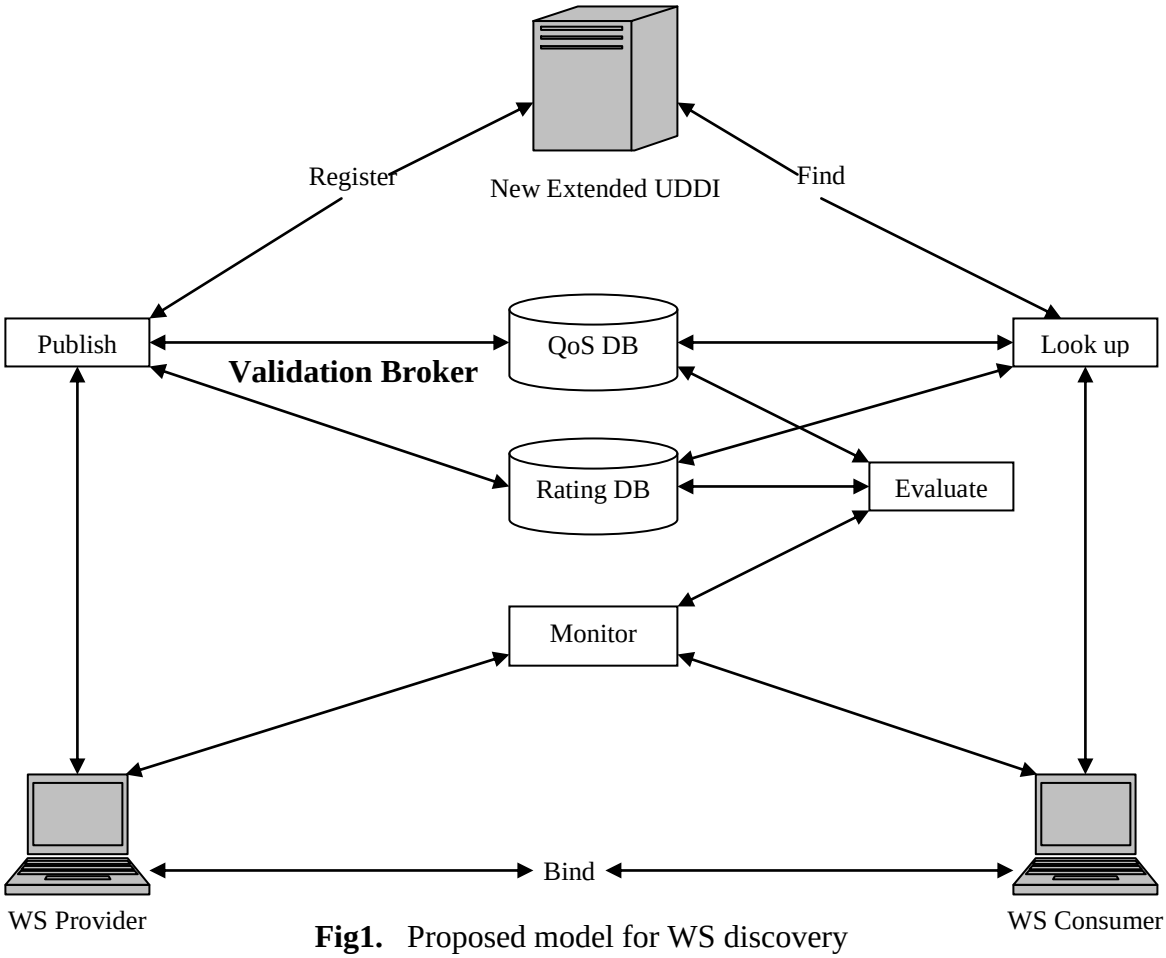

Fig1. Proposed model for WS discovery

4. Results

The validation broker is the core component in our model and plays a very important role. When the validation broker receives an inquiry from the WS consumer, it searches the UDDI registry for related results. After collecting these results, validation broker filters and merges these results and Sorts the results based on QoS properties. During the invocation of service, the validation broker receives the provider and consumer's QoS reports, and updates actual QoS information in QoS database according to these reports.

The QoS database is used to record QoS attributes of web services by maintaining two kinds of table. One records the QoS information published by WS provider, and the other records the periodically modified QoS information, which is offered by monitor and evaluate modules.

The publish module picks up QoS information in UDDI registry and forward them into QoS database, and send validation information to validation database.

We define the validation in form of this: validation refers to the service provider's ability to meet the service level of each QoS parameters, and we define the validation of a QoS parameter for an especial consumer. The consumer specific data will be verified against the system measurement that were claimed while forming the contract. The contract is evaluated and the validation results are presented for each consumer.

In this thesis the validation value essentially capture the difference in the projected and the actual values of QoS attribute. The difference in the actual and projected values is ideally zero and is best kept to a minimum to achieve high validation levels.

We define the validation in equation (1).

$$L_{valid}^{a_i} = \frac{\sum_{j=1}^{m} ND_{a_i}^{j}}{m} \quad (1)$$

$$ND_{a_i}^{j} = \frac{a_i^{pj} - a_i^{dj}}{a_i^{pj}} \quad (2)$$

Where m is the number of times the service was invoked by a particular user and $ND_{a_i}^{j}$ is the difference of projected and delivered values of attribute a_i when the service was invoked the j^{th} time.

3. Comparision

We would compare three models of web service discovery in this section:

1) service discovery based on functional properties.

In this type of service discovery, only functional properties is considered in discovery, so the returning services is so far from the consumer's opinion, also the returning list is too large, therefore consumers should look in that list to select the proper service.

2) service discovery based on non-functional properties.

In this type of service discovery, QoS parameters are considered in service discovery indeed of functional properties, so the returning services is closer to consumer's opinion, but consumers can not rely on publishing information.

3) proposed method for service discovery.

In this approach, indeed of functional and non-functional properties, also the validation and reputation of information are considered in service discovery, so the resulting services are so closer to consumer's opinion. Table 1 shows the results of precision and recall in three method in service discovery.

	Functional-Based Discovery Model	**Non-Functional-Based Discovery Model**	**Proposed Discovery Model**
C1			
Precision	20	28.5	39.3
Recall	33.3	30.9	29.7
C2			
Precision	20	33.1	40
Recall	50	47.5	47.5

Table1. result comparision of the three service discovery method

4. Conclusions

This paper especially aimed at the low rate of utilization of web service technology and discussed that QoS is one of the issues contributing factors. In the other hand, a number of similar web services are also emerging on the Internet, and they are competing to offer services. Mechanisms are required to efficiently discover and select such services. We propose a QoS-aware model for web services discovery, by introducing Validation Broker (including QoS database, Validation database, Publish, Lookup, Monitor and Evaluate modules). Validation Broker works as a third part coordinating on measurement, monitoring and updating QoS database in time to guarantee that discovered services based on QoS is reliable.

In addition, we have established that validation sould reflect the behavioural aspects of the provider along with the user perception. We have defined validation of a service based on QoS metrics which reflects the performance of a service. The validation expresses how consistent the provider has been in delivering the projected quality levels.this allows validation to become the desired attribute for quality driven selection and composition of web services and providers.

5.References

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