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A STUDY ON REPRESENTATION AND SUPPORT OF QOS IN UDDI

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ABSTRACT

With increasing popularity of e-business, large number of Web service applications is available for the same service. An important issue is how to retrieve services from largescale and expanding service repositories conveniently, accurately and efficiently. QoS has become one significant concern in service selection. The inclusion of QoS in UDDI enables the consumers to differentiate among the services.

KEYWORDS:.

INTRODUCTION

Web service technology enables ebusiness and e-commerce to become a reality. It has become a competitive tool of companies, by reducing cost through fast, effective, and reliable services to Customers, suppliers, and partners over the Internet. It enables more efficient business operations via the Web and enhances business opportunities to companies.If multiple Web services provide the same functionality, then Quality of Service(QoS) Requirements can be used as secondary criteria for Web service selection. QoS is a set of non-functional parameters like service price, response time, throughput, reliability, and availability. The current Universal Description, Discovery and Integration (UDDI) registries only support Web services discovery based on the functionality of services. Hence, it is required to publish the QoS information in the UDDI.

Communication among consumers and providers or services typically happens in heterogeneous environments, with little or no knowledge about the provider. Applications can look up the services in the registry and invoke the service. Web services are self-described software entities which can be advertised, located, and used across the Internet. Several Web services may share similar functionalities, but possess different non-functional properties. When discovering Web services, it is essential to take into consideration, the functional and non-functional properties in order to render an effective and reliable service selection process.

Both Web Service providers and clients are concerned with the QoS guaranteed by Web services. From the client point of view, Web service based QoS discovery is a multi-criteria decision mechanism that requires knowledge about the service and its QoS description. However, most of clients are not experienced enough to acquire the best selection of Web service based on its described QoS characteristics. They simply trust the QoS information published by the provider; however most of Web services providers do not guarantee and assure the level of QoS offered by their Web services. A Web Services discovery architecture that contains an extended UDDI to accommodate the QoS information and WS-QoS Broker to facilitate the Web Service discovery has been proposed.

RELATED WORK

A number of research works have been done on the methods of representing and describing QoS for Web services. Adam Blum and Fred Carter [5] present four different QoS storing methods in UDDI by utilizing tModels. The first method [8], employs a QoS InformationtModel which refers to a QoS file. The overwiew URL field of the QoS Information tModel provides the access to the file. The tModel is stored in an XML file. Each bindingTemplate contains one QoS Information tModel and adds the QoS Information tModel to the tModel Instance Detail. The second method creates many different QoS tModels for various QoS information. These categories are added to the binding Templates. Each category Bag has multiple keyed References, which represent different types of QoS. Each QoS value is stored in the key Value of the keyed Reference. The third method is a combination of the first and second. It contains one QoS Information tModel and the categoryBag of this has many key References which represent various types of QoS. The APIs supported by this method is similar to the second approach. The fourth method [9] stores the

QoS values in the categoryBag of business Service in UDDI. The method needs save_business, save_tModel and Save_service to store QoS values.

Jiuxin Cao, Jingyu Huang, Guojin Wang, Jun Gu present an extended architecture which could co-exist with current Web service publication and discovery model, and implement a prototype to enhance function of UDDI registry that not only meets functional requirements of users but also the non-functional requirements. They have introduced preference model into QWSEM that can make the evaluating results meet user individual preference more efficiently. These studies have provided the researchers with better understanding and the usage of UDDI to manage Web Service QoS. However, the QoS information cannot be directly accessed via UDDI APIs, complex queries are needed to locate the appropriate service. Hence, the time required on service discovery is long. This could lead to the system inefficiency or have scalability problem.

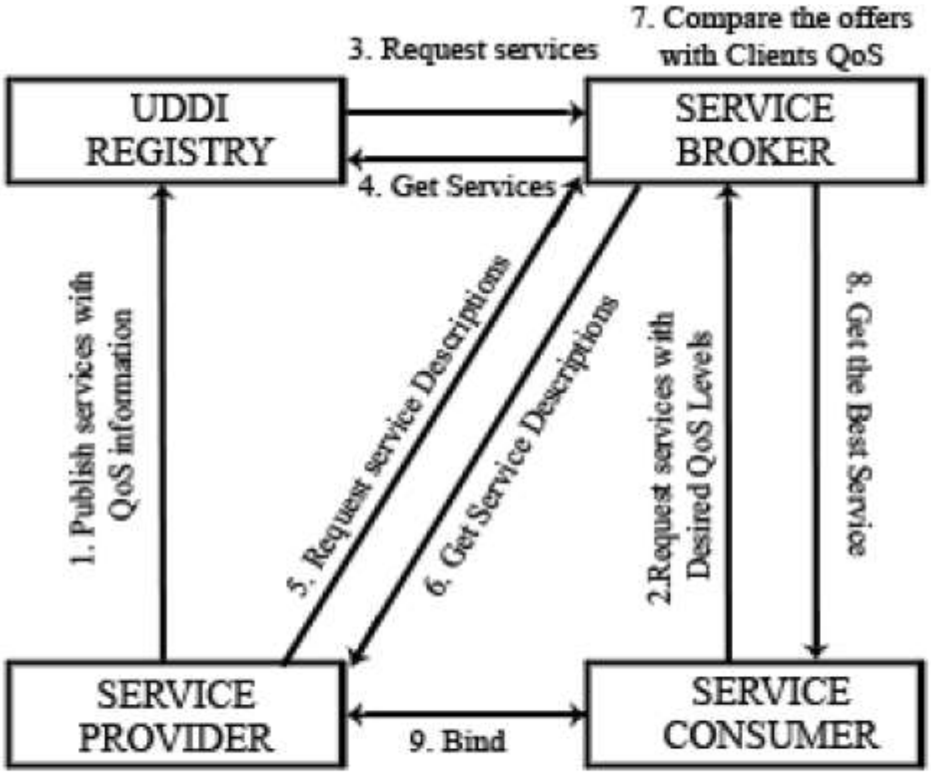

7. Compare the offers with Clients QoS
3. Request services
UDDI REGISTRY
SERVICE BROKER
4. Get Services
1. Publish services with QoS information
5. Request service Descriptions
6. Get Service Descriptions
2.Request services with Desired QoS Levels
8. Get the Best Service
SERVICE PROVIDER
9. Bind
SERVICE CONSUMER

Figure 1. QoS aware Web Service operations

QOS REQUIREMENTS FOR WEB SERVICES

The service providers of QoS-aware Web services extend their service descriptions with comprehensible statements pertaining to QoS associated with the entire interfaces or individual components. For a service requestor, these statements are the required QoS from the client's perspective for a service provider. They describe what are the QoS levels offered by the server object. Figure 1. gives the sequence of events and communication between the entities involved for QoS-aware Web services. The service requestor requests the binding information with the QoS it requires.Depending on the QoS requirements, the broker searches the UDDI for the listed services available and while performing the QoS negotiation by comparing the required and offered QoS, the broker finally determines a QoS that is acceptable for both parties. In this manner, the binding is built and the communication between the service provider and service requestor eventually starts. To support QoS, the developers should be willing to incorporate major design changes to the system, because certain QoS attributes cannot be utilized independently over the existing components.

WS-QOS BROKER ARCHITECTURE

The architecture consists of the basic Web service model components like the Web service provider, Web service consumer and the UDDI registry. In addition, UDDI registry has the capability to store QoS information using tModel data structure and a WS-QoS Broker component. The Broker assists clients in selecting Web services based on a set of QoS parameters. The WS-QoS Broker has four components: Service Publisher, Verifier, Certifier, and Service Selector [7] and Web Service Storage (WSS) [8]. Broker services may be used to facilitate service registry access. The broker performs the interaction with the UDDI. It provides the QoS management operations. The broker is also a Web service. This enables the architecture deployment in restricted and open environments. The service publisher component facilitates the registration, updation and deletion of Web service related information. It gets the business specific and performance specific QoS property values of Web services from the service providers. The service provider publishes its service functionality to the UDDI registry through the service publisher after certification and verification. For every service or group of services there exists a service publisher that handles all communication with registries, bindings, negotiations, requests and responses for that service. The service consumer can search the UDDI registry for a specific service through the service selector. The main functionality of the service selector component is to select the most suitable Web service satisfying requester's QoS constraints and preferences, along with service functionality. The WS-QoS broker performs the verification and certification tasks. QoS verification is the process of validating the correctness of information described in the service interface as well as the described QoS parameters. The verification will be used as input for the certification process that will be issued when the verification succeed. The QoS property values obtained from the service providers are verified and certified before registering them into the UDDI registry. The Verifier and Certifier component is implemented within the WS-QoS Broker. The Web service consumer can verify the advertised QoS with the service selector before binding to a Web service. The QoS information is represented in UDDI registry by a tModel, which allows specification, standardization and reuse of QoS related concepts. This extension allows the use of brokers to facilitate service selection according to functional and non-functional requirements, and monitors to verify QoS attributes.

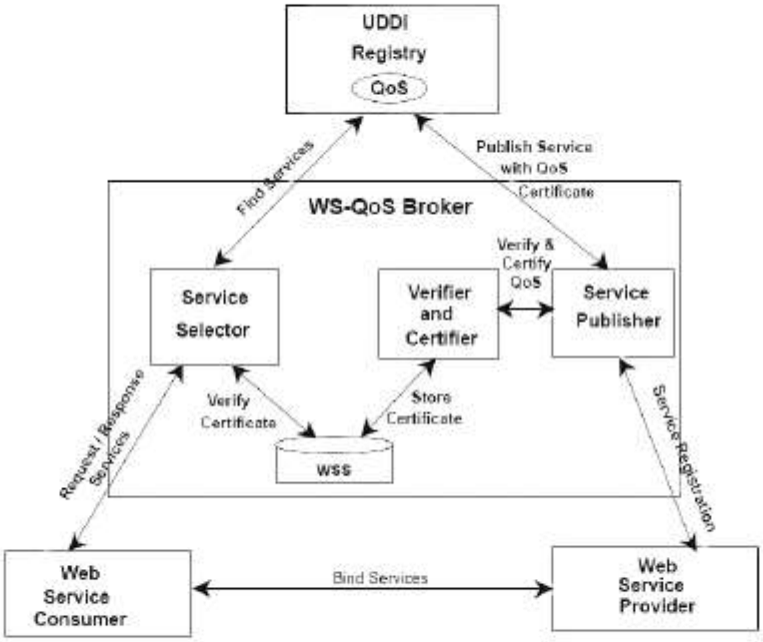


Figure 2. Architecture of Qos Broker

QoS represents the non-functional aspects of the service being provided to the Web service users. The following QoS Parameters are considered:

- **Price**: The cost involved in requesting the service which can be estimated by operation or volume of data.
- **Response Time**: Time taken by a service to respond to the client request
- **Availability**: Percentage of time that the service is operating
- **Throughput**: The maximum requests that can be handled at a given unit of time.

Service Publisher:

The service publisher component, communicates with the service provider and the UDDI registry. The Web service provider registers the business and Web service related information with the service publisher. It also gets the specific QoS property values of Web services from providers. Once the QoS property values and other information are obtained from the provider it is handed over to the Verifier and Certifier component. The QoS information is verified and certified beforepublishing it in the UDDI registry.

Verifier and Certifier:
This is the key component of the WS-QoS Broker that performs the verification of the QoS information supplied by the service provider and issues a certificate to the service provider through the service publisher. This QoS certificate assures that the QoS offered by the provider conform to their descriptions. The service provider initiates the verification process through the service publisher by supplying the QoS property values. The verifier is provided with the WSDL document and additional information about resources available at the provider's platform. The verifier performs the testing of the service URI, the XML schema definition, the service binding information and the availability of all operations described in the service interface. Verifier also performs the verification of the QoS information introduced in the service interface. Once the verification process is completed successfully, the certification process is initiated. The certifier issues a certificate to the service provider. The main responsibility of the certifier is to certify the Web services and their provided QoS. A copy of the certificate sent to the service provider, which is also stored in the WSS for future use. The certificate includes information such as certificate number, certificate issue date, number of years in business and service location. In case, if the certificate cannot be issued, feedback will be sent to the provider. After the QoS certification process, the service publisher can register the functional description of the Web service and the certified QoS information with the UDDI registry.

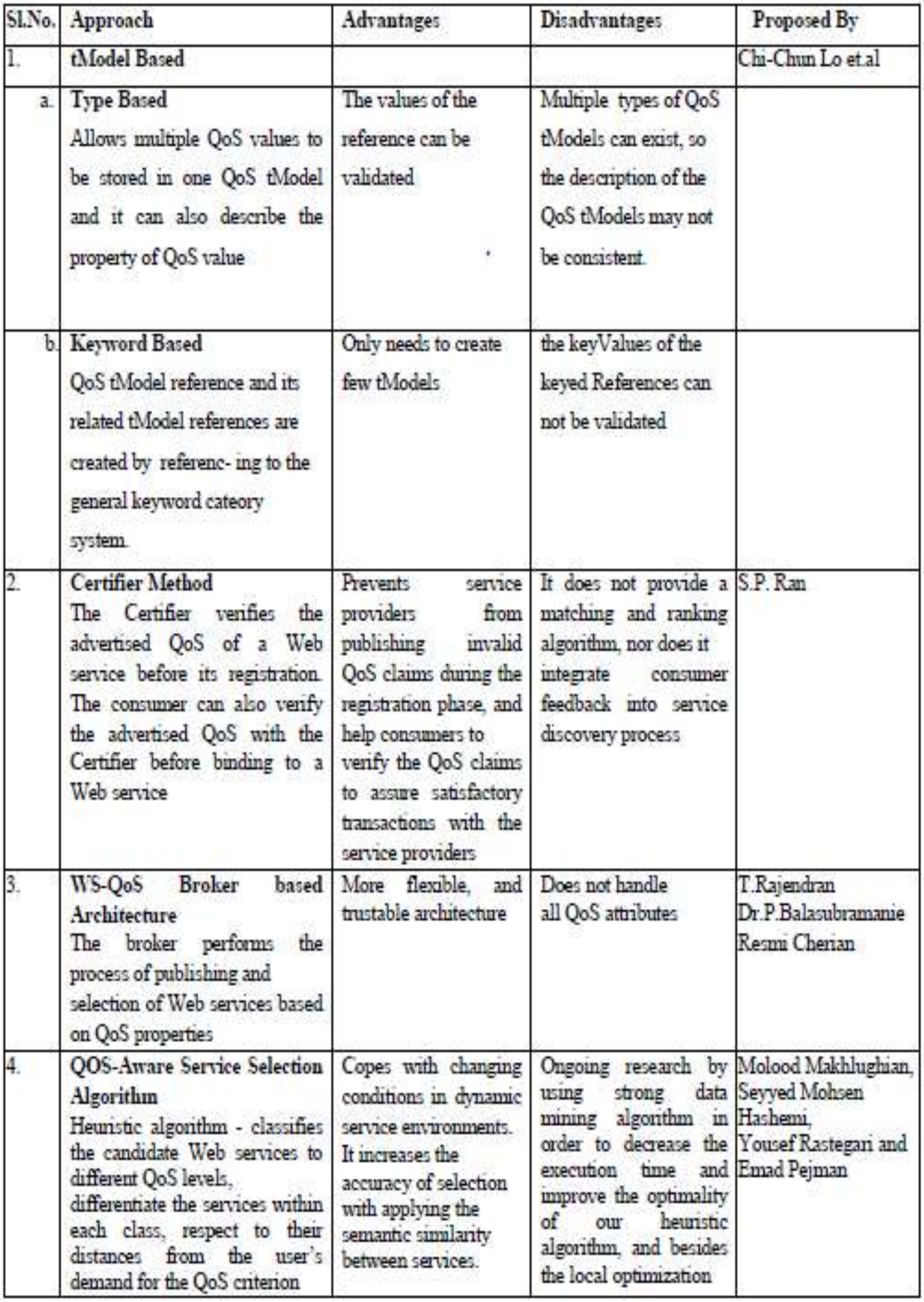
Service Selector:
The service selector component is concerned with selecting the most suitable Web service satisfying the consumer's QoS constraints and the specific service functionality. It receives messages from the Web service consumer, specifying the service functionality along with the QoS constraints. Based on the received requirements specification, it discovers functionally similar Web services from the UDDI registry. The service selector can check the validity of the QoS information in the UDDI registry by comparing the QoS certificate provided by the Verifier and Certifier with the one stored in the WSS.

CONCLUSION

QoS plays an important role in Web service selection in order to evaluate and rank, the candidate Web services that are able to provide expected functionality. The important issue to have the efficient QoS tModel composition in Web service depends on a number of aspects. These are, consistent QoS model representation, efficient acquisition and storage of QoS values.

In this paper, we have studied mechanism for Web service discovery based on QoS and various existing approaches for storing and representing QoS in UDDI.

Table 1. Proposed methods with their pros and cons



Sl.No.	Approach	Advantages	Disadvantages	Proposed By
1.	**tModel Based**			Chi-Chun Lo et.al
a.	**Type Based** Allows multiple QoS values to be stored in one QoS tModel and it can also describe the property of QoS value	The values of the reference can be validated	Multiple types of QoS tModels can exist, so the description of the QoS tModels may not be consistent.	
b.	**Keyword Based** QoS tModel reference and its related tModel references are created by referenc- ing to the general keyword cateory system.	Only needs to create few tModels	the keyValues of the keyed References can not be validated	
2.	**Certifier Method** The Certifier verifies the advertised QoS of a Web service before its registration. The consumer can also verify the advertised QoS with the Certifier before binding to a Web service	Prevents service providers from publishing invalid QoS claims during the registration phase, and help consumers to verify the QoS claims to assure satisfactory transactions with the service providers	It does not provide a matching and ranking algorithm, nor does it integrate consumer feedback into service discovery process	S.P. Ran
3.	**WS-QoS Broker based Architecture** The broker performs the process of publishing and selection of Web services based on QoS properties	More flexible, and trustable architecture	Does not handle all QoS attributes	T.Rajendran Dr.P.Balasubramanie Resmi Cherian
4.	**QOS-Aware Service Selection Algorithm** Heuristic algorithm - classifies the candidate Web services to different QoS levels, differentiate the services within each class, respect to their distances from the user's demand for the QoS criterion	Copes with changing conditions in dynamic service environments. It increases the accuracy of selection with applying the semantic similarity between services.	Ongoing research by using strong data mining algorithm in order to decrease the execution time and improve the optimality of our heuristic algorithm, and besides the local optimization	Molood Makhlughian, Seyyed Mohsen Hashemi, Yousef Rastegari and Emad Pejman

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