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Research Article

Analysis and Enhancement of Service Discovery Framework

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Abstract: Web service is a software system designed to exploit the internet and its infrastructure for interacting with application available in remote machine in any corner of the world. Standard web protocols and XML coding are made use of .Large number of services are available on the web which can be composed to form a new useful service .Since more than one service might suite for our business application, discovering and selecting appropriate service is an challenge in e-business .We provide a spectrum of work investigated by researchers and suggest a framework which considers the QoS factors required by the clients and provide the suitable service to the client.

Keywords: Composite service, QoS, registry, service discovery, UDDI, web service

INTRODUCTION

Web services are application components maintained by different service providers, always accessible and application independent. In loosely coupled system they play an important role. Distributed environment aims to design, develop and implement system using different techniques. Application development starts with object oriented design aspect proceeds with component and then SOA. The applications interact with one another using technologies as socket programming, RMI, CORBA and XML. Among above techniques to build a loosely coupled system we use component based model. Components running in a machine can be accessed by remote application running in different language through interfaces provided by interface (Nadia *et al*., 2005).

The Services are independent of the state or context of other services. They communicate with each other requesting execution of their operations to collectively support a common business task or process (Mydhili and Gopalakrishna, 2010).

The W3C defines a "Web service" as "a software system designed to support interoperable machine-to-machine interaction over a network" (Frank, 2010). Web services are defined as standards, SOAP, UDDI and WSDL which enable the applications to interact with each other across networks. All are XML based no matter what languages and platform they use (Steve *et al*., 2004).

Web service discovery is a process of discovering service that most suitable to users request. Main challenge is that service registries do not provide enough query elements for clients. Only little textual information is offered in interfaces. So we provide a framework that considering the QoS parameters that enhance the service discovery.

WEB SERVICE ARCHITECTURE AND DISCOVERY

Data and messages are exchanged as XML over HTTP: A service provider creates a Web service (Fig. 1). The service provider uses WSDL to describe the service to a UDDI registry. The service provider registers the service in a UDDI registry and/or ebXML registry/repository. Another service or consumer locates and requests the registered service by querying UDDI and/or ebXML registries. The requesting service or user writes an application to bind the registered service using SOAP in the case of UDDI and/or ebXML.

QoS based web services-survey: Qos is a combination of several qualities or properties of a service (Menasce, 2002). QoS properties describe the non functional aspect of web service and they are used to evaluate the degree that a web service meets specified quality requirement in service request. Laprie *et al*. (2004) classifies it into two types as technical quality and Managerial quality. Technical qualities consist of QoS properties related to operational aspect as usability, efficiency, reliability, performance etc. Managerial quality consists of capturing service management information such as ownership, provider, contract and payment. QoS requirement is important because the number of web services has increased tremendously. WSDL and UDDI are web service technologies which considers only customer functional requirement, support design time or static service discovery. Non

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Fig. 1: Typical web service architecture

functional requirement is not supported by UDDI registers (Maximilien and Singh, 2004).

Ziqiang *et al*. (2007) worked on web service discovery model that extends UDDI with QoS information. Service matching selection and ranking was developed but there was no certification or verification for that model. Demian and Ananthanarayana (2008) has proposed a broker based architecture and QoS broker is responsible for selection and ranking .The ranking is done based on level of satisfaction of requestor. Eyhab and Qusay (2007) used external resource approach which used t model called QoS metrics which contains information to external reference. An URL points to XML based file generated by WS-QoSMan and contains QoS metrics for specific service.

Hongan *et al*. (2003) developed broker based architecture for controlling QoS of web services. It acts as an intermediately third party to make web services selection and QoS negotiation on behalf of client. But performance was not considered. If client doesn't get the reply within specified time he will switch to another user. Tian *et al*. (2004) focused on QoS specification using XML schema and dynamic mapping between server and network performance. Adam and Fred (2004) present four different QoS storing method in UDDI by utilizing tmodels.

Many researchers work on how to take QoS information for web services into account in service discovery to find services that meet customer requirement. Ran (2003) extends UDDI model with QoS information. But service selection and search is done by human clients. Four roles were introduced in proposed model. Supplier, consumer, QoS certifier and new UDDI registry. QoS certifier verifies the providers QoS claim. New UDDI is a repository of web services and look up facilities. Look up can be made by function description as well as associated QoS registered in repository. Certifier verifies advertised QoS before registration. Although this model incorporates QoS in UDDI it does not provide matching and ranking algorithm and does not incorporate consumer feedback into service discovery process.

Hunaity (2008) proposed a new framework that combines syntactic and semantic matching of services. It proposes a new framework which provides information about the clients. The model consists of basic level service component with capability to store QoS information using t-model data structure. There are three agents Discovery agent, service mediator and reputation manager. The functional and non functional attribute can be described service provider in UDDI directly or through service mediator's agent. Consumer can search for service directly in UDDI or through service discovery agent. This framework does not provide certification or verification process.

QoS can be measured at Web Service, Web Service framework, Application server, Server Network Consumer. The enhancement of service discovery can be implemented at three locations (Ming *et al*., 2008) at Consumer Producer Web service broker UDDI:

At consumer:

- Increases the complexity of the consumer.
- If new selection algorithms should be introduced or old selection algorithms should be updated, all consumers have to be updated.
- Consumer gains inside knowledge of the Web Services and the Web Services network structure.
- Every consumer makes its own decision; therefore, this architecture cannot be used for Web Service load balancing.
- No centralized disqualification of unreliable Web Service providers.

At producer:

- Users cannot trust on the QoS stated by the Producer

At web service broker:

- Introduces Single point of failure.
- Consumer still gains knowledge on Web Services
- Consumer loses control over selection decisions and Web Service discovery.
- Web Service Broker can become a bottleneck

At UDDI:

- Central introduction of new selection algorithms and update of selection algorithms.
- Consumer is eased and their complexity is reduced.
- Existing UDDI registries can be used, by extending them with QoS.
- QoS enhanced UDDI can reuse selection decisions for multiple consumers.
- Central disqualification of unreliable Web Services and Web Service providers is possible.
- Can be used for Web Service load balancing to a certain degree.

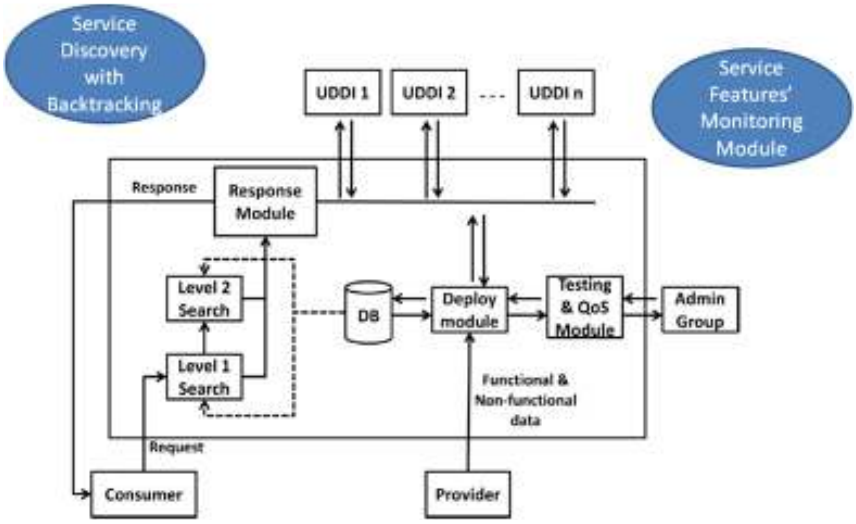

Fig. 2: Framework for service discovery

- QOS requirement of web services (OASIS, 2002)

Performance: It depends on how fast a web service request can be processed and serviced. It depends on throughput and latency. Throughput is measure of number of request serviced in specific amount of time. Latency is amount of delay experienced by client between request submitted and response got.

Reliability: Reliability depends on how it performs for a given time maintains the service quality. It also depends on number of failures per day. It is the percentage of times an event is completed with success.

Scalability: Newer interfaces and techniques are introduced everyday and the system should be capable of supporting this.

Accuracy: It's the measure correctness delivered by a web service. The number of errors, fatal errors and frequency determine the amount of accuracy.

Integrity: It assures that data is not corrupted during transfer. Integrity is ratio of number of successful transactions to total number of transactions

Availability: It is the probability that web service is up and in readily usable state.

Accessibility: It's the measure of the probability that client request to a web service will be served. It's the ratio of number of acknowledgements received to total number of request sent.

Interoperability: Web service can use any system irrespective of operating system. It's the total number of environments in the web service runs to total number of possible environments that can be used.

FRAME WORK FOR SERVICE DISCOVERY

The consumer puts the request and the appropriate service is found from the service registry. The service registry responds by providing more than one service which matches with the client request. The UDDI registry has no guarantee that it meets the client's request. So we propose an architecture that enhances the service discovery. The service requests are sent to the UDDI registry. T he enhanced UDDI first checks the functional data and some services are identified. Then further refinement is done in level 2 where the non-functional information is also considered. Reliability, Availability and access time are the Qos metrics considered. Figure 2 shows the framework

IMPLEMENTATION

The proposed framework is implemented in java language deployed in sun application server. Reliability and availability have values in range 1 to 10.
Reliability has the values mentioned in Table 1.

Similarly availability is also measured. Let Sr be the service reliability Cr be the client's reliability requirement Sa be service availability. Level 1 filtering is done and after that the non functional information are compared based on condition (Table 2):

Table 1: Assigned reliability values

Reliabilbity %	Value
90-100	10
80-90	9
70-80	8
60-7	7

Table 2: Non functional data given by clients and services selected

Keywords	Reliability	Availability	Total serviceslevel-1	Total serviceslevel-2	Services at level 1	Services at level 2
Phone	7	5	5	1	1 2 3 5 6	3
Phone+price	8	6	4	2	3 5 6 2	6 2
Car	6	4	3	1	1 3 8	3
Phone+price+model	5	3	5	3	1 6 5	6 5

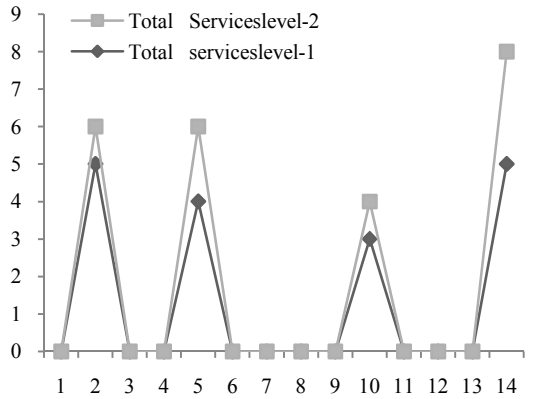

Fig. 3: Non functional data and service discovery

Cr< = Sr and Ca< = Sa

Services discovered based on functional information is given as input to the level 2.

The graph in Fig. 3 depicts clearly that level 2 services are better than level 1 service.

CONCLUSION

Initially the web services were very few. Finding the relevant services within the UDDI was done. But in 2006 UBR closed. WSDL is abundant scattered across www. So there araise a need for efficient service discovery methods that is required by the customers. In E-business both clients and providers are benefited by providing QoS aware services. Optimal web service must selected for a particular task. The web services should be ranked according to functionality and QoS plays an important role in it. A number of QoS broker based web service discovery framework has been developed recently. This study gives a literature survey of the past works and framework that provide efficient service discovery is suggested. We have demonstrated that the framework considering the QoS metrics for service selection and discovery produces most accurate results that satisfies the customers.

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