

ON THE INTEGRATION OF QOS MANAGEMENT IN WEB SERVICE ARCHITECTURE

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Abstract: The web service consumer requires sometimes a service provider which gives functional and non-functional requirement especially in e-business domain. In this paper, an overview on web services and their qualities are described. We propose a new architecture which permits the management of QoS, by integrating a new layer in the web service architecture.

1 INTRODUCTION

During the last decades, the access to web has increased exponentially. Thus, the need to invoke a service by a client application through network became evident and important. This urged the enhancement of the web services.

In addition, the value of web services increased since they allow the connection to heterogeneous applications. As a result, they became a very powerful technology for building service oriented architectures and have standardized access to legacy services.

Such increasing value was reinforced by several research activities which objective is to deploy an architecture that integrates QoS management.

This domain is critical for the e-business applications where the service consumer demands some QoS requirements from the provider before service performing.

This paper introduces an architecture model of web service which insures the quality of the invoked services. This model proposes a new method for publication and discovery of the web service integrating QoS criteria and also the functional requirements.

2 DEFINITION OF WEB SERVICE

In the literature, the most used definition of the web service is as follows: «Web service is a software application identified by a URI, whose interfaces and bindings are capable of being defined, described, and discovered as XML artifacts. A Web service supports direct interactions with other software agents using XML-based messages exchanged via Internet-based protocols » (Jeffrey, 2002).

The web services are applications that connect programs, object, databases or business processes using the XML language and standard transport protocols. They are complements of existing programs and applications and have the function, like a middleware, to make communication between them. They assure not only the interoperability between applications, but also the interoperability between different operating systems and hardware.

The call of a distant object method is performed through a transport web protocol (generally HTTP) and XML for the exchanges format. While, the classic middleware use specific network protocols to each application, the data encapsulation in the XML documents allows the web service (client and server) to dialogue with environments and heterogeneous information system.

3 ARCHITECTURE MODEL FOR WEB SERVICE

The actual and well established model of service web architecture (figure 1) is composed of three principal entities (Guruge, 2004):

- The service provider: it answers to the demand and return the request results. The provider describes the service by a WSDL file which represents the provider interface and must be published in registers of type UDDI;
- The registers UDDI: they permit to reference the service. The register is organized according to six types of data;
- The service consumer: basing on the WSDL file, the service consumer invokes the service provider.

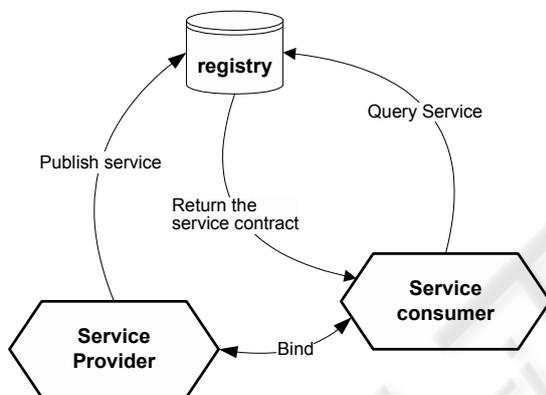


Figure 1: Web service architecture.

A service provider publishes a service description to a registry. A service consumer then finds the service description via the service registry (UDDI), the services description contains sufficient information for the service requestor to bind to the service provider to use the service.

4 QUALITY OF SERVICE CONSTRAINT

The user's requirements enlarge with the need of applications which increase constantly. It becomes necessary to focus perfect information.

For the web services, it's important to be able to specify the request of the QoS before the invocation of the web service mostly for the applications in the domain of E-business. These requirements of QoS can be classified under many themes according to their context.

The quality of service covers many functions for the working of web service such as the execution time, availability, security and the transactions. In the following section, we will define the different aspects of QoS by arranging them by theme.

The first one concerns the quality of service attached to the execution time. Many studies have been interested to this type of quality of service (Ran, 2003 – Mani, 2002 – serhani, 2005). These qualities act directly on the operations progress and determine the execution time. They include availability, accessibility (it can be expressed like a probability measure denoting the success rate or the chance of a successful instance of service to a point in time), the treatment capacity, the performance (it is evaluated by a measure of the execution speed of a request from the service which depend on the execution time, the latency time and the bitrate) and the robustness.

The second theme treats the quality attached to the cost and the management of the configuration (Serhani, 2005). The provider must assure the transactions and guaranty the operations.

The last theme is related to the security. This theme evaluates the reliability and the security of mechanisms used like authentication, confidentiality and data encoding (Beznosov, 2005). The security aspect is a quality aspect for web services; since it is invoked on public networks, like internet. The provider can take many degrees of security according to the service consumer and his requirements (Mani, 2002).

5 BACKGROUND AND RELATED WORK

Several research studies have treated the topic of the QoS for the web services (Menasce, 2004 – Diamadoupoulou, 2006). These studies focused, in most cases, on the enhancement of the present traditional architecture by the addition of different supplementary entities and the extension of the present standards as the SOAP protocol and the UDDI.

The users expectations are very various with regards to the adequacy of a web service to their needs and to their requirements concerning QoS.

These requirements complicate the management and slow down the process of services selection. The users expect from the services to be adapted to their needs and to guaranty the QoS of the operations.

For the present architecture, we pointed out the following two questions:

- Can the service satisfy the user requirements concerning QoS and performance?
- Is the system reliable in the realization of the critical operations essentially in the domain of the E-business?

It is therefore necessary to build an architecture model that supports the management of the QoS and the discovery of the services according to the needs of the users especially those non functional requirements.

Our approach supports various QoS aspects including performance, security and transaction. The communication between different layers ensures an efficient utilization of the underlying resources as well as a better support of application-dependent requirements.

In the next section, we describe the design of the proposed architecture and we explain the new processes of publication and of selection that supports QoS.

6 A NEW SOLUTION FOR QOS INTEGRATION IN WEB SERVICE ARCHITECTURE

The model of web service architecture described previously present several drawbacks.

In the domain of the e-business, the current researches on the services are only based, in most cases, on the functional requirements of service invoked by the client.

Another drawback is that some UDDI registers contain non functional links, and incorrect information that lead, in most cases, non functional operations.

The performance and the quality of service are primordial for e-business applications. This non-functional requirement depends on the logic of the applications, networks, the transport protocols, and also the used standards.

The control and the management of the attributes of the service quality help to assure the good progress of the operations, and to reach the levels of QoS required by the consumers and consequently, we maximize the profits.

Besides the traditional functionalities of services, the description and the publication of QoS, allows the consumer to choose the more suitable provider.

We propose a web service architecture that takes into account the management of the service qualities based on the present functional standards.

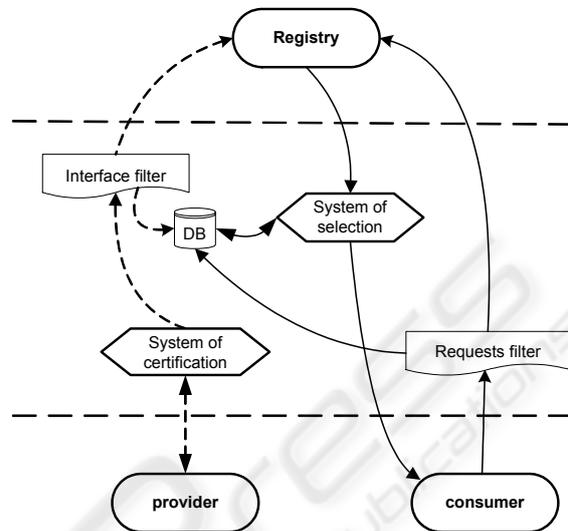


Figure 2: New model of web service architecture.

The addition of a new layer between the classic registers UDDI on the one side and the supplier and the consumer of service on the other side, permits the management of the qualities and improves the process of web services selection.

This new layer allows keeping the present registers UDDI. This layer contains four systems to communicate with the three entities which are the provider, the client and the registers. A more detailed description on the functionalities of these systems will be provided in section 6.1.

We will choose between the two following scenarios:

- The publication of the web services and thereafter the discovery and the invocation according to the classic methods using the present standards but without assuring the QoS;
- The publication of the service with the proposed QoS and the discovery according to the functional and non functional aspects of the services.

For the present web services architecture, the problem resides in the difficulty to modify this architecture to support the QoS. We propose to add a system that will communicate by itself with the different entities (supplier, consumer and UDDI registers) by assuring the QoS management while keeping the functional present methods.

It allows publishing the web services with or without the management of QoS in the same UDDI register.

6.1 Publication, Discovery and Invocation

The proposed architecture present new entities:

- The system of selection: a list of services will be received by this system from the UDDI registers; the role of the selection system is to classify the services according to their qualities asked by the consumer.
- The system of certification: its role is to verify the QoS declarations given by the supplier.
- The requests filter: it analyses the received requests and extracts all tags of the document.
- The interface filter: it examines the received files WSDL and extracts all QoS tags of the document.

6.2 Description

By exploiting the studies of Chan (Chan, 2005), the service supplier sends the WSDL file for his publication to the UDDI register. This WSDL file contains in addition to the basic tags, a new tag describing the features and the specifications of the QoS offered. Before treating this by the interface filter, the system of certification verifies the declarations of QoS given by the supplier.

Once the service is registered, it can be invoked by all the clients.

On the other hand, the SOAP request sent by the customer is a request proposed by KangChan Lee and al (kangchan, 2003). It integrates requests concerning quality in addition to functionalities. This request will be analysed and sent to the UDDI register that answers by a file containing the list of the services without any classification.

Next, the system of selection makes an association between the requests concerning quality of service and the available demands.

Such analysis will be made in the database using XQuery requests (Boag, 2006). It classifies the services found according to an order: The services that answer the user's requirements better will be classified as the first. The services that don't assure the quality of service or that doesn't answer to the required demands will be eliminated. Finally, the system sends a SOAP answer to the consumer.

7 CONCLUSIONS

Web service is an application component accessible over open protocols. Web service has supported interoperable machine-to-machine interaction over the Internet.

Researches are focused on how to improve the present architecture in order to support the quality of service.

In this paper, we have proposed an extension of the web service architecture. We have added a new layer between the classic registers and the two entities (provider and client) of service.

This layer supervises the management of the QoS and ameliorates the process of web services selection and keeping functional of basic methods of discovery and publication.

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