Web Service Composition By Using Broker

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ABSTRACT

A web service is a technique of communication over the World Wide Web. It is a service that is always on as in the concept of utility computing. Web Service can publish its function or message to the rest of the world. It is collected by combine of individual services to constitute complex business processes. On the World Wide Web, the number of web services provider increases, the more web services exist having same functionality. Hence, the work of web service discovery becomes difficult and challengeable. The solution to this, the broker is to implement for compose web services according to security constraints and selecting the best web services to execute a business process.

Keyword:

Broker, Service Composition, web services, QoS

1. INTRODUCTION

A web service is software application to present business services over the internet by exchange of messages. [1][2] The basic Web services platform is XML and HTTP. The HTTP protocol is the most used Internet protocol. Web services platform elements:

- SOAP (Simple Object Access Protocol)
- UDDI (Universal Description, Discovery and Integration)
- WSDL (Web Services Description Language)

Web Service Level Agreement (WSLA) has been provided for quality of web service. A web service is described using a standard, formal XML notion, called its service description. The web services-based applications to be loosely coupled component-oriented, cross-technology implementations. They can be used alone or with other web services to carry out a complex aggregation or a business transaction [2].

Simple Object Access Protocol (SOAP)

SOAP is an XML-based protocol to exchange information over HTTP. In other word, SOAP is a protocol for accessing a web service. SOAP is a W3C standard. It is used for the communication and designed to communicate via internet. It is a format of sending messages and platform independent as well as language independent. [3]

Web Service Description Language (WSDL)

WSDL is an XML-based language for locating and describing Web services. WSDL is based on XML used to describe Web services. WSDL is a W3C standard. [4]

Universal Description Discovery and Integration (UDDI)

UDDI is a directory service where companies can register and search for web services. It is platform independent, Extensible Markup Language (XML)-based registry by which businesses worldwide can list themselves on the internet, and a mechanism to register and locate web service applications. UDDI was originally proposed as a core web service standard. UDDI is a directory of web service interfaces described by WSDL. It is communicate via SOAP messages and to provide access of Web Services Description Language (WSDL) documents describing the protocol bindings and message formats required to interact with the web services listed in its directory. [5]

It is also defines a data structure standard for representing service description information in XML. An important aspect of an IT services is the set of Quality-of-Service (QoS) guarantees. This is commonly referred to as a Service Level Agreement (SLA). [6]

The three rolls are service provider, service registry and service requestor. The interactions involve the publish find and bind operations. Together these roles and operations act upon the web services. [2]

2. RELETED WORK

XML provides a different platforms and programming languages and still express complex messages and functions, such as Business Process Execution Language for Web Services (BPEL4WS) [7], Web Services Business Process Execution Language (WSBPEL) [8] and Business Process Modeling Language (BPML), [9] XML languages designed for the execution of business processes, such as Business Process Execution Language for web services (BPEL4WS). These languages have been proposed for workflow specification. BPML supports advanced semantics such as processes and complex compensated transactions that are not addressed by BPEL4WS. The languages such as BPML and BPEL4WS define a model and a grammar to specify a business process behavior, which is based on interactions between the process and its web service. Each of the activities in a flow model must be executed by an appropriate web service. In these circumstances, selecting an appropriate web service for each activity where the assignment process is called *matchmaking* [10].

The DAML-S is a process model which is developed separately from the BPEL4WS so that it different. But it does not have a formal semantic even though it is widely supported in industry. Other work has been done for web service composition by AI planning techniques. And also some other work i.e. METOR project [11] has been done on QoS the parameter such as time, cost, reliability and fidelity. But the project was focus on analyzing and verifying a workflow rather than the constructing QoS. Here, this entire scenario can't give the web service which is concerned about the selecting best web service by composition with security authentication methods and QoS parameter.

Hence, propose the Broker for selecting best web service by composition with securely and QoS.

3. PROPOSED RESEARCH WORK

A Web service is a software system designed to support interoperable application-to-application interactions over the Internet. Many web services published by provider having same functionality. So that, web service discovery to services becomes a challenge. [1]

If we are finding the web service on the internet it will not return the composite web service on the basis of specified security authentication methods and QoS parameter of the requestor. Since, we think of the broker as a middleware. The broker registers and edits values of web service quality properties. The registry provides facilities to search security and information of QoS of web services. The below figure 2 shows the Broker architecture for considering security and QoS parameter.

In figure 1, the request sends to the provider by using broker. Since, the the broker will evaluate and composite the best web service with security constraints and QoS parameter. It means that, it will be executed simultaneously until obtain the best web service.

The Broker has three important component i.e. security, composition and selection. Each component having it's own functionality for the selection of best web service.

Security:

This component checks the security authentication of every web services. Here, considering SAML authentication under this, Basic Authentication, Lightweight Third Party Authentication (LTPA), Digital Signature Authentication and Identity Assertion Authentication. It checks all the security and encrypts values of web services which is available in database against the requesters security constrains and QoS parameter. If both are same then it takes for compatibility with the corresponding QoS values. After composition security analysis performs and removes the uncompleted path between composition and security component.

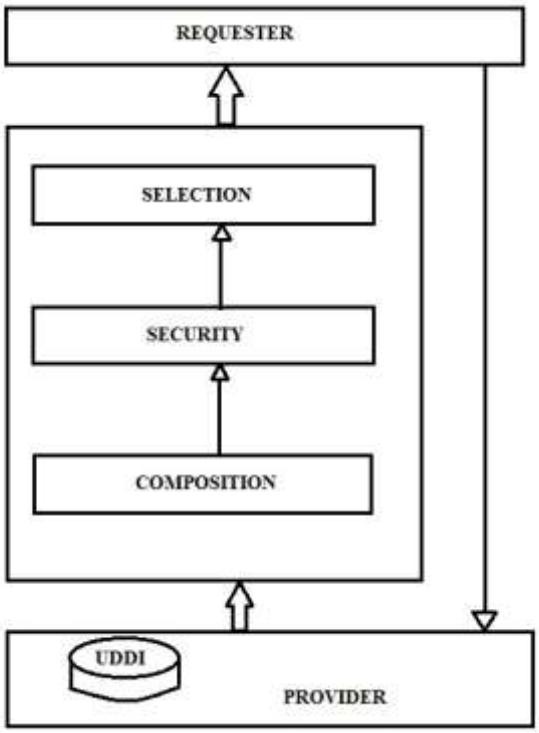


Figure 1: Broker Structure for secure composition

Composition:

This component checks all the web services of different service class (Service class means web services having similar functionality) with other service class web services. If it is compatible with other service class with respect to security and encrypt parameter.

Selection:

After the security and composition, this component plays an important role for selection of best web service. It finds out the minimum and maximum values of QoS of each web service from the different service classes, those who has a complete path according to the security and encryption values. The minimum and maximum values of QoS will be calculated of each web services. That is web service having minimum values of response time, cost, availability and reliability and this is similar to the maximum values of QoS. Response time and cost be in decreasing order means having minimum value. And reliability and availability has maximum values because it is in increasing order. Since take the minimum/maximum value among them. It can be calculated by using following way and then it will be normalized.

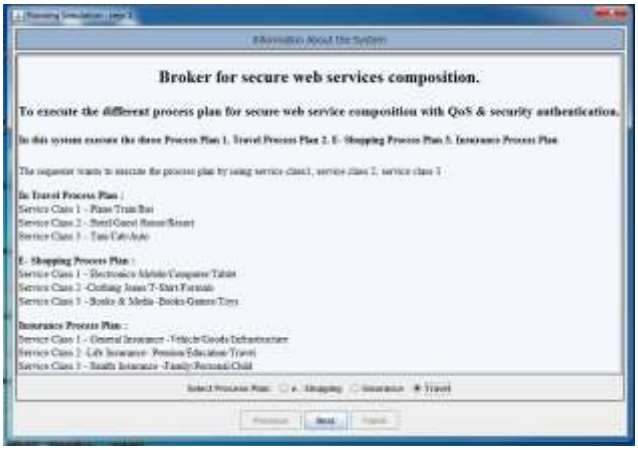
The calculated QoS parameters of each web service by function F(Sj) are summed. For decreasing quality attributes, the calculated values are subtracted from 1 before summing.

$$F(s) = \sum_{n=1}^{m} \left(\frac{Max(QoS) - QoS}{Max(QoS) - Min(QoS)} \right)$$

Where, QoSMax and QoSMin is a maximum and minimum values of the web service for the service class. F(s) is summed function. In this way final selected web service sent back to the requester.

Experimental Result: The broker, located between web service client and provider, for facilitating construction of a secure composition. It takes the requests from the requestor by considering security constrains and QoS parameter. The following figure represents the GUI of Broker.

This broker application is developed in the Java by using database which is created into the MySql. Here, taking the three process plan 1. Travel process plan 2. E – Shopping and 3. Insurance process plan for the Broker, when we execute this it extract the values of QoS and specified encrypt parameter as well as security authentication methods.



Screenshot 1: Main window of Broker

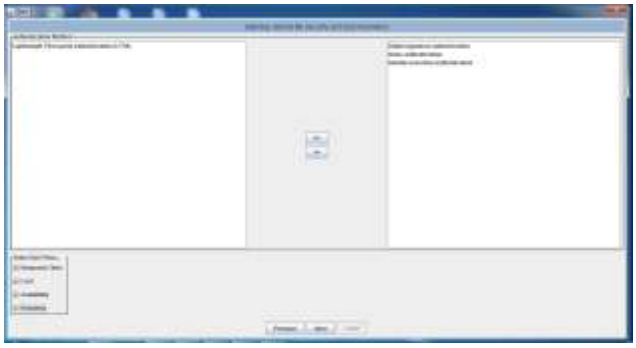
Now, If we are request to requestor for secure web service composition, We can select the web service from the service class1, service class2 and service class3 then select the security constraints and specified QoS parameter i.e. response time, cost, availability and reliability.

The requestor wants a web service containing SAML authentication and QoS values such as the response time, cost, availability and reliability. Here we are executing process plans for composite the web services of different service classes with the security constraint and QoS values. Here selecting different web services from service class then select the security authentication and also take the QoS values. Now execute this, the Broker return a secure web service composition result.

Consider, in this travel process plan, first service class is plane second is hotel and third is taxi. If user wants a secure composite travel plane with QoS parameter, then selecting service candidate from service class plane i. e. S1 as, http://localhost/WS/plane/1, plane/2, plane/3, plane/4, plane/5, plane/6, plane/7, plane/8 and plane/9. Select http://localhost/WS/hotel/5, hotel/7, hotel/8, hotel/11, hotel/13, hotel/15 from hotel i.e. S2 as well as from taxi i.e. S3, http://localhost/WS/taxi/1, taxi/2, taxi/3, taxi/4, taxi/5, taxi/10. Next to select security authentication methods such as Digital Signature Authentication, Basic Authentication & Identity Assertion Authentication and QoS parameter of corresponding web services. Then execute it, the window will be appear as.

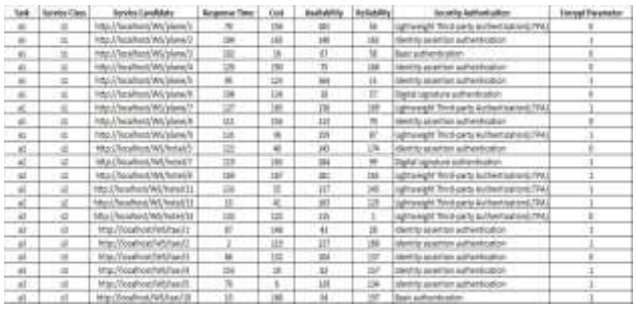
Screenshot 2: Selecting web service

Now, execute it, It check the Security Compatibility through the Service classes S1 - S2 - S3. It means that we are taking Security Authentication methods Digital Signature Authentication, Basic Authentication & Identity Assertion Authentication. It checks which web service having same through S1- S2- S3 service classes.



Screenshot 3: Selecting Security Authentication & QoS

The selection of different web services from S1,S2 and



S3 as shown below.

Screenshot 4: Showing selection of service candidate

Now, the job of security component is to analysis the security authentication with considering the encryption

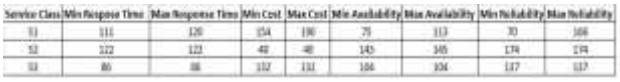
parameter of web services for the compatible web services.

Screenshot 5: Security analysis of service candidate

After this the broker generates the all complete path of the service candidate through S1-S2-S3. Since, there are only two complete paths available.

http://localhost/WS/plane/4 - http://localhost/WS/hotel/5-| http://localhost/WS/taxi/3 and http://localhost/WS/plane/8 - http://localhost/WS/hotel/5 - http://localhost/WS/taxi/3

The selection component selects the best path among these two paths. By calculating Max and Min QoS values and these values are then normalizing by using above formula. Here the screenshot of Min and Max values of parameter.



Screenshot 6: Calculate Min/Max values of QoS

The last part of selection component is to normalized the QoS as explain above the response time, cost are in decreasing and availability, reliability are in increasing so that total QoS as shown below.

Service Class	Service Candidate	Response Time	Cost	Availability	Reliability	Total QoS
S1	http://localhost/WS/plane/4	0.0000	0.0000	1.0000	0.0000	1.0000
S1	http://localhost/WS/plane/8	1.0000	1.0000	0.0000	1.0000	3.0000
S2	http://localhost/WS/hotel/5	1.0000	1.0000	1.0000	1.0000	1.0000
S3	http://localhost/WS/taxi/3	1.0000	1.0000	1.0000	1.0000	1.0000

Screenshot 7: Normalize values of QoS

The above two complete path having total QoS. http://localhost/WS/plane/8 - http://localhost/WS/hotel/5 - http://localhost/WS/taxi/3 having high QoS i.e. Highest total QoS: 5.0 i.e. by summing Total QoS of complete path service candidate. From this , we can say that we obtained the best web service complete paths as per the requestor security authentication and QoS parameter.

4. CONCLUSION

The broker on client and provides a facility of secure composition of web service by considering security authentication methods and QoS parameter. By executing the different process plan the broker returns a composite path with high quality values of composition. The components of the broker implemented a dynamic service selection and matchmaking in order to compose and adjust the business process. The composition was intended to meet both requester and provider security requirements with a suitable performance. The proposed approach optimized the composition by considering QoS parameters.

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