

A Study on Web Service Analysis and Bio-information based Web Service Security Mechanism

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Abstract

As the Internet has been growing, WWW(World Wide Web) based services were popularized and users using the service were increased excessively. Web service is a software system designed to support interoperable machine-to-machine interaction over a network. Currently, it has been emphasized quality and security of web services. Therefore, in this paper, we described standard trends such as SOAP, WSDL, UDDI for web services and the security policies to protect user information. Eventually, we described a mechanism to use bio information for protection of user information.

Keywords: *Web service, Bio information, SOAP, WSDL, UDDI*

1. Introduction

Currently, various information systems of organizations are being linked and integrated in software infrastructure building to be applied in web service technology providing high mutual operation. A web service is a software system designed to support interoperable machine-to-machine interaction over a network [2]. It has an interface described in a machine-processable format (specifically WSDL). Other systems interact with the web service in a manner prescribed by its description using SOAP messages, typically conveyed using HTTP with an XML serialization in conjunction with other web-related standards [2, 3, 8].

Web services provide a standard means of interoperating between different software applications, running on a variety of platforms and/or frameworks. The WSA(Web service architecture) provides a conceptual model and a context for understanding web services and the relationships between the components of this model. Figure 1 shows the web service architecture. It is composed of three components such as XML web service broker (UDDI), XML web service consumer, XML web service producer.

A service provider makes a service specification, and it publishes the service specification to service registry. The service provider receives web service call message from service consumer, and it returns the result after the corresponding service was done.

A service consumer finds a service specification published in service registry. And service consumer calls or binds the corresponding service after it searches a service specification provided by service provider.

A service broker manages such as directory to use and to search easily service consumer the provided service

The WSA describes both the minimal characteristics that are common to all web services, and a number of characteristics that are needed by many, but not all, web services. The web service architecture is interoperability architecture: it identifies those global elements of the

global web services network that are required in order to ensure interoperability between web services.

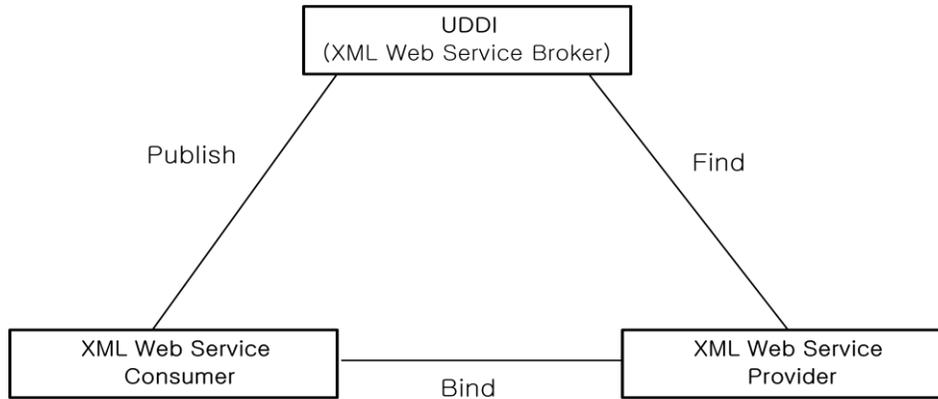


Figure 1. Web Service Architecture

To implement the above described web service architecture, it needs three technology elements such as UDDI, WSDL, SOAP.

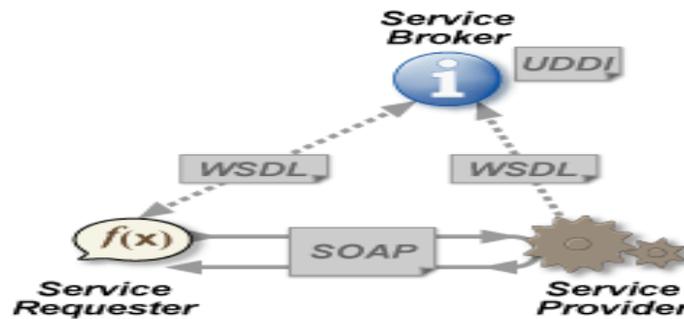


Figure 2. 3 Standard Technology Elements for Web Service

Domestically, convergence of IT839 is planned to be chosen and used. Application can be developed by appropriately combining individual elements of business logic opened to the public through web pages and various operations with same functions can be composed by combining and realizing many web services with small functions.

Computer systems of public institutes and companies must be controlled, but control on the 3rd supplier supplying service is difficult when building application based on web service that assessment on web service quality is essential to provide predictable possibility based on QoS [1, 6, 8]. Also, integration of dual service modules composed by several forms and research on policies, methods to provide consistent security interface is needed. To increase electronic commerce reliability in web service security, providing authentication, authorization, and digital signature functions is very important. Resources such as web service environment is distributed and remote operation, forwarding environment have high risk in various frauds with exposure of personal information. To build trustworthy system access, service request, identity check for service requests or commerce, it is essential to link technology of user awareness including body information.

Following propagation of web pages, service quality is becoming an important standard of selection to users as assessment on quality on web service is demanded [1-3]. Standardization

models for assessment on web service quality based on OASIS is in progress and WSQM TC being operated as a result. WSDL is providing only functional information of web service to service users [4] and studies on information on QoS of timeout, response time of service specification through expansion of WSDL is in progress as elements on web service performance and stability has become significant.

2. Review on Web Service

2.1. SOAP Model

SOAP(Simple Object Access Protocol) is used as a mechanism to logically deliver messages between described services by WSDL interface. As seen in Figure 3, it is a simple architecture in concept to deliver SOAP messages through transport protocol that is set between web services.

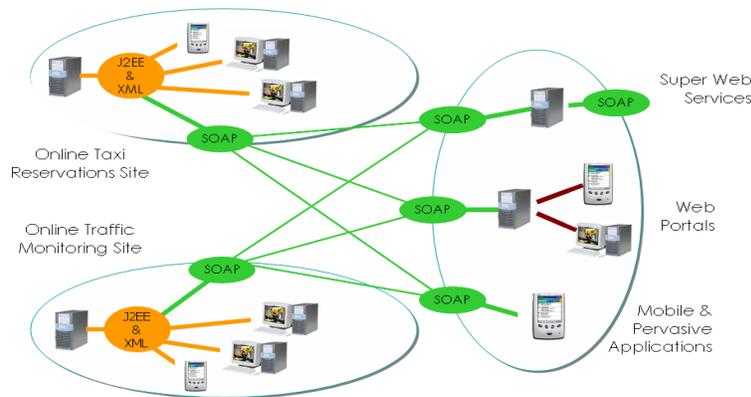


Figure 3. SOAP Transfer Model

SOAP is the oldest, most mature, and most important protocol in web services [3, 5, 7]. SOAP messages are XML documents with route element of envelope. There are two knowledge elements of header and body in the envelope in which there is an application payload in the body and the header block generally has data from several web service protocols expanding basic SOAP based structure.

SOAP messages provide conceptual basic based on all SOAP models. Application payload are mostly saved and moved to the body part of messages as additional protocol messages(random matter or unnecessary to be marked when delivering only application data) are saved and moved to header blocks. This is saved in application level messages and SOAP header space in SOAP processing level that makes web service protocols of higher levels(Ex, transaction process or security) separated.

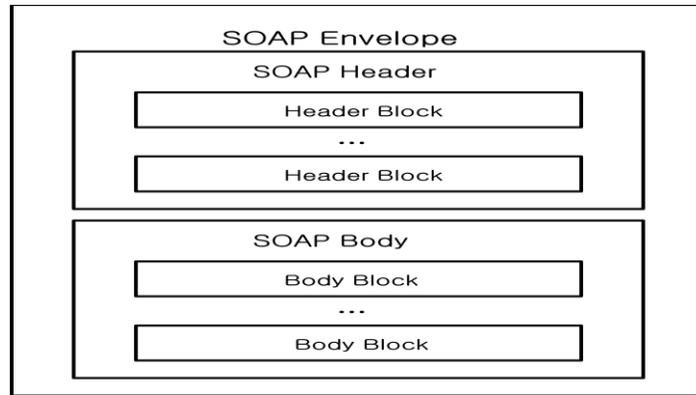


Figure 4. SOAP Message Structure

SOAP is a standard protocol defining certain method of delivering encoded data to XML as a binding protocol. Function to call web service method using XML format is provided. SOAP uses XML as a protocol that is text based of lightweight using information exchange in distribution environment to have the advantage not to be dependent on hardware platform, OS, programming language, and network hardware platform.

SOAP messages provide delivering function of one-way messages. All basic SOAP coding is composed of XML schema specifications and provides two grammars for data express type.

2.2. WSDL Model

WSDL(Web Service Description Language) is an XML document explaining summary on the service provided by the web service which is made by integrated SDL specification and standardization is leaded by W3C[3, 4].

The basis of all WSDL interfaces is the gathering of messages that send and receive service behind interfaces. Although WSDL allows using other schema language, it is general for one message to use and define an XML schema type and several logical parts are divided to increase access on context. portType is the place thought to start to make shape of the web service. portType is the gathering of calculation that thinks it will become a web service. However, calculation in this point is still defined in abstract language and several message exchange gatherings are bound in this calculation.

The binding part of WSDL interface describes on how abstractly defined messages and calculations are mapped in physical return protocol. Calculation of portType to be bound to a certain protocol(used in the network again in the end) adds binding related information and is expanded. Thus, WSDL supports SOAP, HTTP GET and POST, MIME, and provides a prototype specialized version on the original portType declaration.

Lastly, port composes service elements with accumulated addressing information and information referring to particular binding, and becomes the final form of web service that can be physically connected by network.

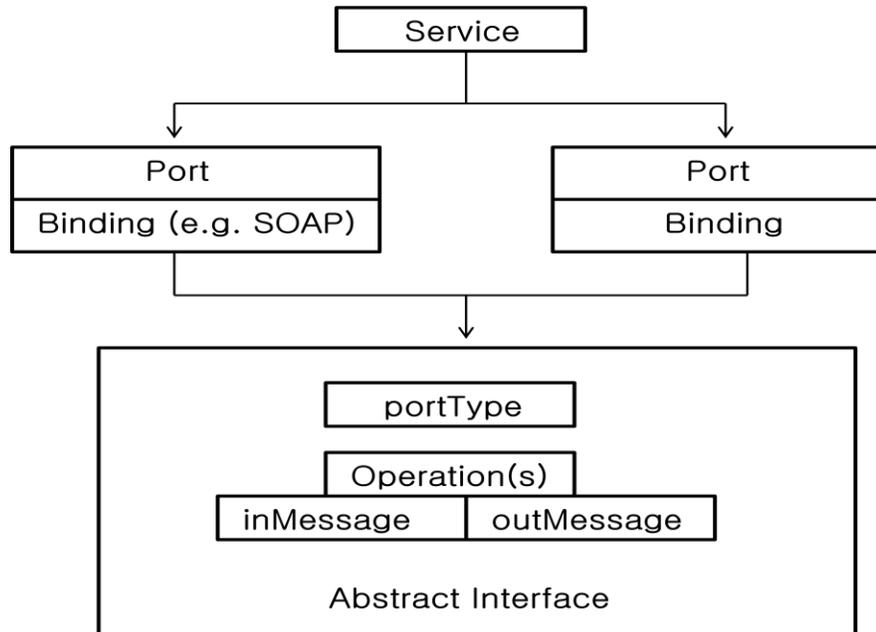


Figure 5. WSDL Architecture

The general structure of WSDL documents is shown in Figure 5. The abstract parts of WSDL description are types, message, portType elements, and the actual elements are binding and service. Separation between abstract and actual parts is a useful concept, and this is because interface design can be separated from the final deployment environment and only uses abstract definition in WSDL.

2.3. UDDI Model

There is a growing need for web service providing companies to maintain, manage, and open registry to register server lists and instructions to conveniently search companies and using companies should find partners to provide needed web services as effective tools to search this has become needed.

UDDI is a registry and protocol of web service to publish and search web services. Because web services are standardized tools to independently access and use software functions provided by other companies in platforms, UDDI must also be open and standardized.

Information within UDDI is composed of instance of data structure expressed by XML. Data saved and managed by UDDI node are the instances created by this data structure. These data structures are called entity and the 4 entities are defined in UDDI specification

3. Needs of Web Service Security

As cases using applications of customers in companies are increasing nowadays, security related non-functional demands are being demanded. These demands are as follows.

- When communication between customers and business partners flows on the internet, third parties cannot see this.
- The origin of messages can be decided and it can be confirmed if the sending person is approved.

- There must be no manipulation of sent data.

The first demand will be solved by using HTTPS/SSL delivery security. SSL(Secure Sockets Layer) is a technology using encryption of web sites to encrypt messages for web server request and response, and this is used by descrambling. SSL protocol is provided by dot by dot data between two users, but has the following disadvantages.

- End-to-end data protection is not supported between several users.
- Messages cannot be selectively encrypted in segment unit.

The danger of losing information or data in web service based application always exists when it moves from the origin to destination. Like this, security threats are also applied in web service transaction. HTTP security was enough for SOAP in the initial time of SOAP development because SOAP was indicated by HTTP based protocol, but expansion of security has become needed as web services operated by several intermediaries are being used. Complete security of reliability of the current SOAP model is difficult and has security vulnerability between the terminals when either communication link is not safe.

Figure 6 shows vulnerability of web service security of having the risk of exposure of personal information in Business Protocol Validation Service or XML Validation Service on verification on data types for elements within messages of XML messages that are receiving SOAP message requests.

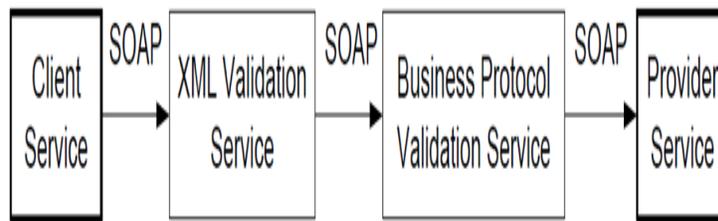


Figure 6. Weakness of Web Service Protection

To solve this vulnerability of web service security, security on application hierarchy applying security service only on sensitive information demanding security is needed. Not providing security in comprehensive aspect between several users is the disadvantage of SSL in web service environment related with several entities.

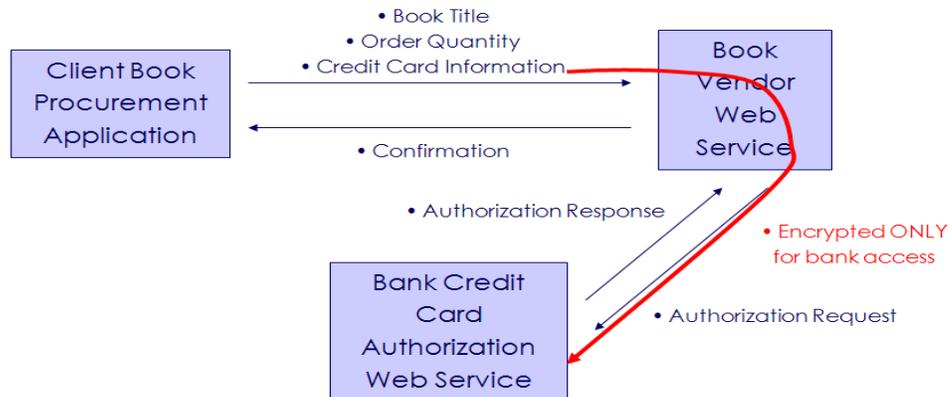


Figure 7. Case on Weakness of Web Service Security

4. Use Bio-Information for Security

Lastly in this chapter, study on the necessity of user recognition using bio-information is looked into. Existing user recognition can be largely categorized into two items. User recognition based on password and card certification is not safe from the risk of hacking, loss, and robbery. Also, card changing and forge by users with malicious intension are threatening factors [9, 10]. Therefore, study on convenient user recognition with high security is needed as user recognition method using inherent bio-information is being studies as the main alternative.

Biometric recognition means the method to recognize inherent bio-information of individuals which is the technology of comparing data that is extracted and registered beforehand such as fingerprints, veins, iris, retina, face, sign, voice, and other information. Therefore, it is used for purpose of individual identification and verification, and can be furthermore used as access control.

Bio-information used in biometric recognition must satisfy the following demands. Table 1 shows the features of each demand that bio information has.

Table 1. Features of Bio Information

Biometric identifier	Univer sality	Distincti veness	Perman ence	Collectabil ity	performa nce	Acceptabili ty	Circumven tion
DNA	H	H	H	L	H	L	L
Ear	M	M	H	M	M	H	M
Face	H	L	M	H	M	H	L
Facial themogra m	H	H	L	H	M	H	L
Fingerpri nt	M	H	H	M	H	M	M
Gait	M	L	L	H	L	H	M
Hand geometry	M	M	M	H	M	M	M
Hand vein	M	M	M	M	M	M	L
Iris	H	H	H	M	H	L	L
Keystroke	L	L	L	M	L	M	M
Odor	H	H	H	L	L	M	L
Palmprint	M	H	H	M	H	M	M
Retina	H	H	M	L	H	L	L
Signature	L	L	L	H	L	H	H
Voice	M	L	L	M	L	H	H

These elements of biometric recognition system conduct the following roles. Figure 8 shows the biometric recognition system organization.

- 1) Sensor: Sensor is used to capture bio-data of users and save as digital images.
- 2) Feature extraction: In image processing, manufacturing modules, sensor input far image noise is removed, fingerprint ridges are restores, and thinning is conducted. Features with grids and angle information from manufactured images are extracted. For fingerprints, features are composed of endpoint of fingerprint ridges and dividing junction.

3) **Matcher:** Matching score is calculated by comparing saved templates(features) and features of users to be certified. User certification and identification is conducted based on matching score.

4) **Stored templates:** Bio-information of users is input to be save templates composed of features and used for searching.

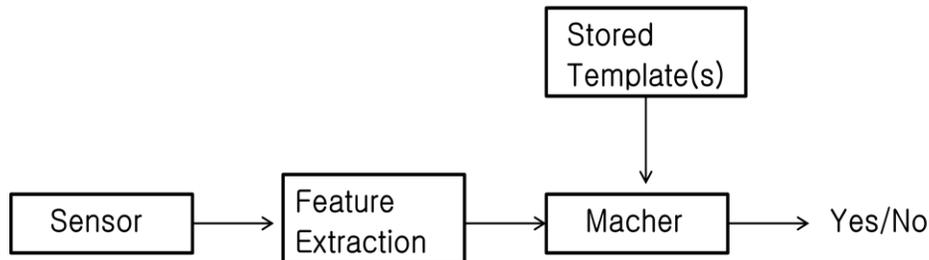


Figure 8. Biometric Recognition System Organization

Bio recognition is classified by two classes such as verification and identification by usage purpose. Figure 9 shows user enrollment, verification and identification processes.

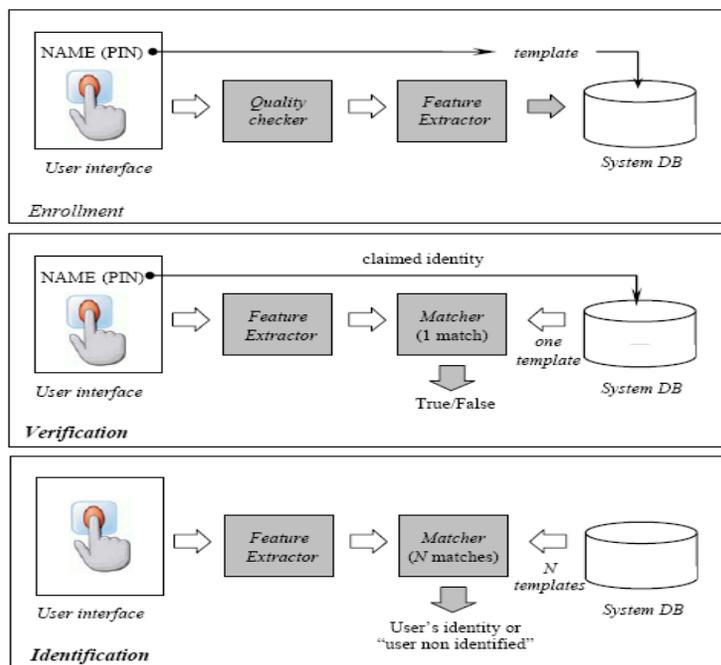


Figure 9. User Enrollment/Verification/Identification Process using Bio Information

5. Conclusions

Currently, web service technology providing high mutual operation in software infrastructure linking and integrating various information systems is being applied in organizations and the convergence of IT839 to web service is planned to be used domestically. Especially, resource such as web service environment is distributed and remote

operation, forwarding environment has high risk in various frauds with exposure of personal information. To build trustworthy system access, service request, identity check for service requests or commerce, it is essential to link technology of user awareness including body information.

For this, this study describes a standard on web service and security trend to describe plans to use bio-information related on web service security matters.

Acknowledgements

This paper was supported by Baekseok University Research Grant of 2014.

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