

# Reusability of WSDL Services in Web Applications

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**Abstract** - Software engineering deals with the development and modeling of windows and web applications. These applications have been used by various companies to provide different solutions. In this paper, web application for ticket booking system has been designed that uses different components like ticket booking, ticket cancelation, view booking etc. These components can be used for booking a ticket by the user. In the web application, web services have been used with the help of web services description language (WSDL). These web services have been published on the server and can be reused in various web applications. It can be designed for air ticket booking system and later on reused in the movie ticket booking system also. All these web services have undergone regression testing to validate the availability of web service in the web application. By reusing the web services in similar web application and performing testing on new web application, this approach provides better reusability of the modules. The reusability reduces the effort of designing and coding for a software development organization.

**Keywords** - SDLC, SOAP, Web Services, WSDL.

## 1. Introduction

### 1.1 Software Development Paradigm

Software engineering is an engineering approach for the software development. Software is considered to be an executable code through which computational needs must be fulfilled[1].It consists of libraries and documentations. Software product is the development of software for any specific requirement and engineering is related to developing software products using well defined scientific principles, standards and methods. Thus, software engineering deals with the advancement of software product utilizing scientific standards and techniques. The

objective of software engineering is to produce an efficient and reliable software product[2].There are various definitions of software engineering proposed by IEEE. One common definition by IEEE about software

engineering as: It is the application of a systematic, disciplined, quantifiable approach to the development, operation and maintenance of software that is the application of engineering to software [3].A German computer scientist, Fritz Bauer, defines software engineering as: "It is the establishment of productive software and the utilization of sound engineering standards to acquire great software that is reliably working on real machines". Fig.1 represents basic steps to be followed in software engineering.

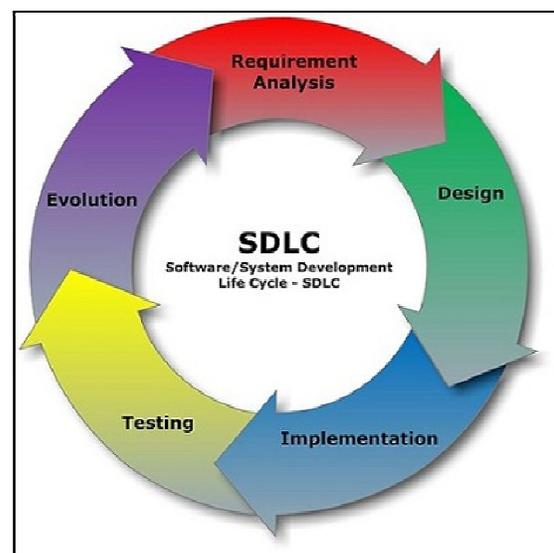


Fig.1: Software Engineering

The development of a software product with the help of software engineering principles and methods is known as Software Evolution. It concludes initial growth of the software, its modification and updates till the whole software product is developed and fulfills the expected requirements[7]. Evolution initializes from the process known as requirement gathering.

After that developers build up a prototype of the required software and then show it to the users. User gives the feedback of the software product development at the early stage. The users suggest changes, according to that changes takes place and maintenance work is going on. Re-creating software or product from scratch and to go one to another with the requirement is not feasible in all situations. The only feasible and economical solution is to update the already established software so that it matches to the latest requirements[1].

## 1.2 Need of Software Engineering

Software engineering is required due to frequent change in user requirements and environment in which the software is working. Following are some of the needs stated:

- Large software
- Scalability
- Cost
- Dynamic Nature
- Quality Management

## 2. Web Services

The ability to exchange information between different clients, business units and accomplices is prerequisite for the success of the organization but most of the organizations uses a variety of applications that store and exchange data in dissimilar ways thus they cannot talk to each other productively[2]. Web services is considered as cost effective solution for uniting information which is distributed between critical applications over different operating system, platforms and language barriers that was previously impossible. The development of web based API leads to simple representational state transfer (REST) based communications. [4].

### 2.1 Web Services Description Language

WSDL (Web Services Description Language) is a document written in XML. It specifies a web service by providing the specification of the location and operations or methods of the service. It also describes how services can be bound to a specific network addresses[12]. WSDL consists of three parts:

- Definitions
- Operations
- Service bindings

Definitions are expressed in XML which specifies both data type definitions and message definitions. These definitions are developed based on some agreed upon XML vocabulary. This type of agreement can be within an organization or between different organizations. Vocabularies which are designed for specific organization or within an organization may or may not be based on industry-oriented vocabulary. But, industry oriented vocabulary is required if data type and message definitions need to be used between different organizations.

Operations specify actions for the messages supported by a Web service. Operations can be classified into four types:

- One-way: Messages sent but reply is not required
- Request/response: The sender sends a message and the receiver sends a reply.
- Solicit response: A request for a response.
- Notification: Message is sent to multiple receivers.

Service bindings describes the message format and protocol details for a particular web service. It can connect port types to a port. A port can be defined by associating a network address with a port type and the collection of ports specify a service. This type of binding can be created using SOAP (Simple Object Access Protocol), Java Message Service (JMS), .NET, etc.

### 2.2 WSDL Document Structure

A WSDL document describing a web service consists of following major elements[11]:

**Table 1:** Description of WSDL Document

Element	Description
<types>	A container for data type definitions used by the web service
<message>	A typed definition of the data being communicated
<portType>	A set of operations supported by one or more endpoints
<binding>	A protocol and data format specification for a particular port type

The main structure of a WSDL document will look like this:

```
<definitions>
<types>
  data type definitions.....
</types>
<message>
  definition of the data being communicated....
</message>
<portType>
  set of operations.....
</portType>
<binding>
  protocol and data format specification....
</binding>
</definitions>
```

### 2.3 Advantages of WSDL

WSDL provides various benefits to the clients. Some common advantages are:

- WSDL provides a structured approach for defining web service interfaces.
- It describes the contract between a service provider & the client.
- WSDL reduces the amount of code needed to access a service by the clients.
- It supports dynamic upgrades by making changes to an existing WSDL description at runtime.
- Web services can be easily integrated into an information system with a little effort.

### 3. Benefits of Web Application

A web application is the software which runs in a web browser. It is designed in a browser-supported language that may be combination of JavaScript, HTML, CSS and depends on a browser to support the application. Web applications are popular due to the convenience of using a web browser as a thin client. The web applications can be easily updated by the server and install software on thousands of client computers. It supports cross-platform compatibility. Web applications include webmail, online retail sales, online apps, online banking and many other functions [1].

The benefits of web application are:

- Web applications only requires a compatible web browser for its deployment in any organization.
- A browser application requires very small amount of memory on the client.

- It requires no updating procedure because all new features are implemented on the server and automatically delivered to the users.
- Web applications can be easily integrated with other server-side applications such as email and searching.
- It provides cross-platform compatibility i.e. Mac, Windows, Linux, etc.
- With the development of HTML5, programmers can easily create highly interactive environments within browsers. It includes new features like audio, video and animations as well as improved error handling.
- The development of AJAX technologies leads to web applications support for greater interactivity and improved usability that can efficiently exchange data between the browser and the server.
- Web applications can easily run in new user devices (e.g. smart phones, tablets) because they have built-in support for browsers.

### 4. Software Reusability

Organizations are facing many problems in software development due to increased cost, delayed schedules, unsatisfied requirements of the customer and shortage of skilled software professionals. This type of situation is generally called as software development crisis. The productivity of software development & quality must be improved in order to increase the return on investment in information technology [9]. Software reuse has been considered as a solution to the software development crisis. Developed application software and its components by one programmer can be helpful for other programmers. Reusability is considered as a key for improving the software development productivity and quality. By reusing high quality software components, software developers can simplify the product development and make it more reliable. Frequently, fewer total subsystems are used and less time is spent on organizing the subsystems. Thus, the proper reuse of software process leads to increase the quality of product, increases reliability, productivity improvement and reduces time to market, reduces the cost of developing the product.

Clients of reusable software resources can be ordered into three groups:

- The actual developers
- Individuals in the same organization
- People in distinctive organizations

Reuse-based software engineering consist of following types [10]:

- Application system reuse*

In an application system reuse, the whole application may be reused either by incorporating it without change into

other systems or by developing application families. It is widely used as software systems are implemented in terms of application families.

- *Component reuse*

In component reuse, the components of an application can be reused from sub-systems to single objects.

- *Object and function reuse*

It involves reuse of objects and functions for an application. It is useful in application domains where domain-specific libraries of reusable functions have been established.

## 5. Proposed Methodology

The main significance of web services is that it is used to develop various technologies that are embedded using various applications. In the proposed work, the web service which is developed is used in various applications in various ways. Hence, it supports the feature of reusability. In other words, once a web service is developed, it is used in different applications which results in saving time and resources.

Regression testing is done for the confirmation of the particular code that is going to be used in the new system works properly i.e. the new and the old code conforms to the changes in the requirement or not. The resulting system thus results in:

- Application and data integration
- Cost effectiveness
- Code re-use
- Versatility

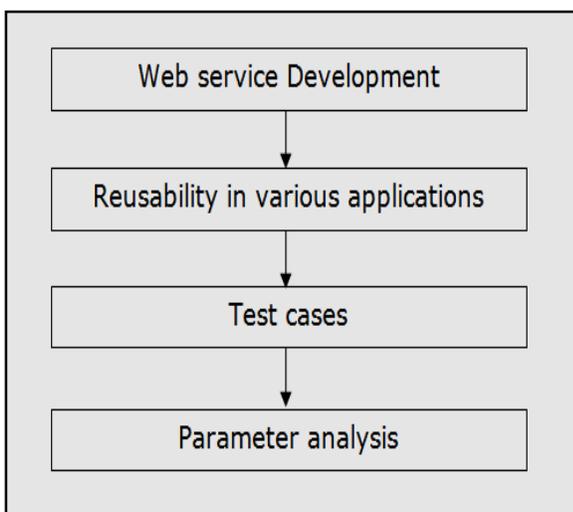


Fig 2: Flow of Work

- Applications which are developed for academic and industry purposes are the combination of various web services. These web services has been developed by combining the other web services utilizing component based system.
- Web applications are developed using different types of connectors. These connectors depend on the functionality of application that has to be performed. These web services are developed using WSDL.
- The major issue in the web services is reusability.

To implement purposed work various steps has to be carried out. These steps are essential for the development of web services for various applications.

### Phase 1

Web services have to be developing by using WSDL (Web Service Description Language). These services have to be embedding in the various applications.

### Phase 2

In this phase, a web service has to be embedded in the application by using various types of connectors like sequential, condition & loop connector. These connectors have to be implemented according to the functionality that has to be performed.

### Phase 3

The connected web services has to undergo regression testing to validate modifications that has been made by combining various web applications. Regression testing has to be performed using different algorithms for web testing.

## 6. Results and Discussion

A web service has been utilized for software engineering development life cycles. In the process of development of web applications, different components are used and these can be interlinked to perform various actions. The web service has to be published to embed within a web application. These web services can be reused in the various web applications. The reusability of web applications can reduce the efforts to develop similar type of web application.

In the proposed work, a web application has been designed that is used for the reservation of tickets for different platforms. The reservation system comprises details from the user to reserve one seat. These type of applications utilize different reservation forms that can be developed by web service using WSDL. Regression testing is performed to evaluate the effects of web services reusability in different web applications.

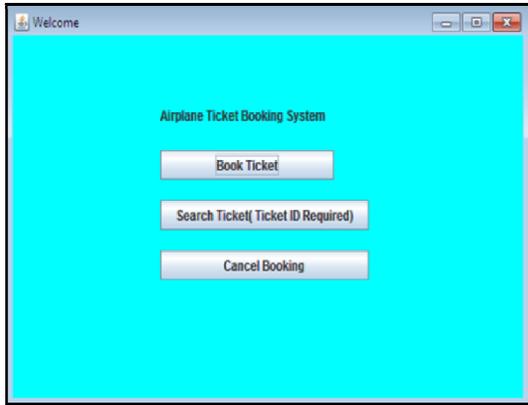


Fig. 3: Home page for Air Ticket booking

Fig.3 is used to represent the home page for air ticket booking system. This page contains various buttons for the user to book ticket for air plane, search ticket and cancel booking.

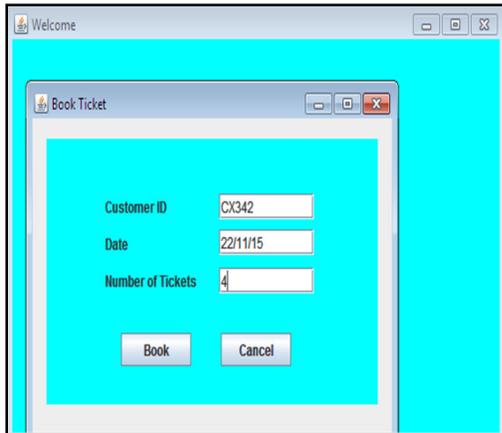


Fig.4: Ticket Booking Pop up window

Fig.4 represents customer ID, date and the no of tickets to be booked.

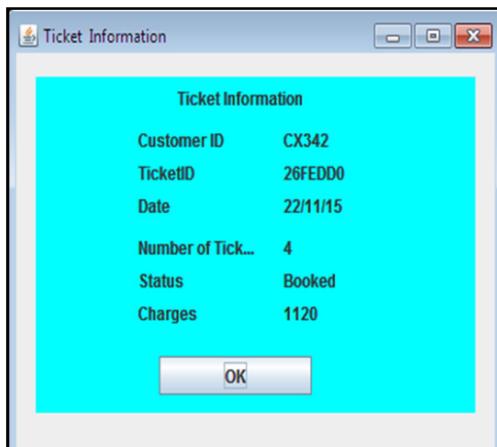


Fig. 5: Ticket Booking Status

Fig.5 shows ticket booking status i.e. customer ID, Ticket ID, Date, No. of Tickets, charges etc.

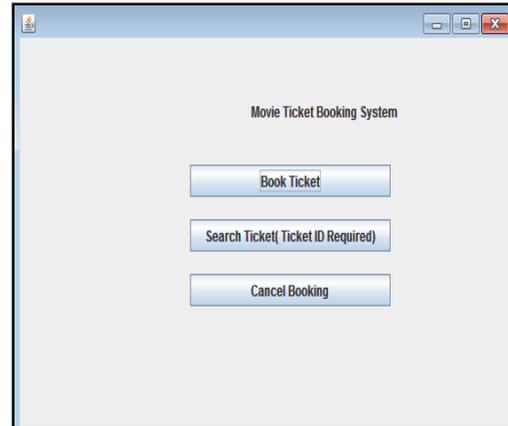


Fig. 6: Reusability of the Web Service for Movie Ticket Booking

Fig.6 represents web service that can be reused for movie ticket booking application.

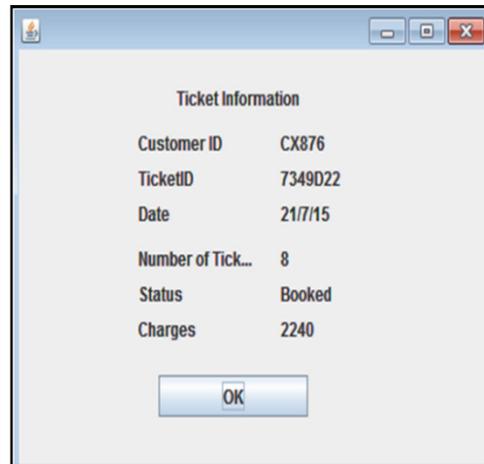


Fig. 7: Movie Ticket Confirmation Status

Fig.7 shows movie tickets confirmation status by using reusability of booking application.

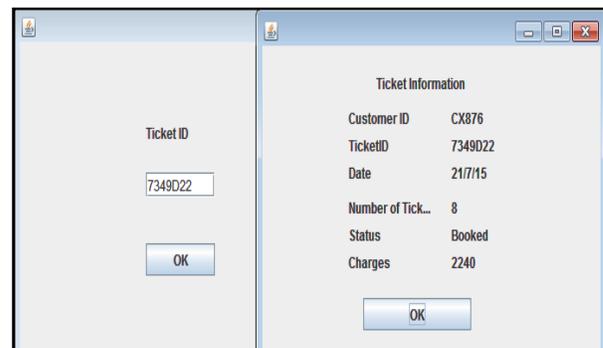


Fig.8: Generation of Ticket Id and Saving in Database  
 Fig.8 shows generation of ticket id and its details.

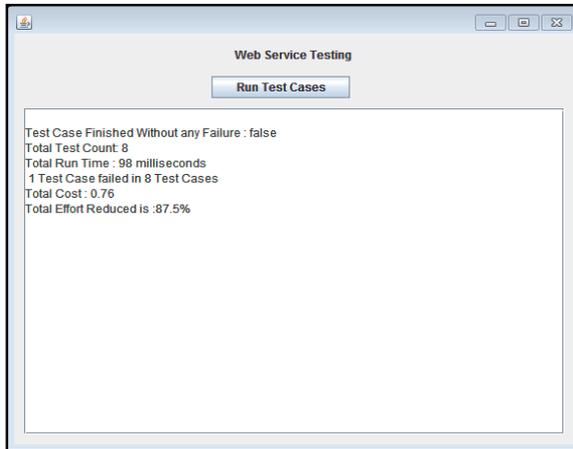


Fig.9: Results of Performing the Reusability of test cases

Fig.9 represents reusability of test cases and effort reduced due to reuse of the components. It is found that total test count is 8, run time is 98 milliseconds and total reduced effort is 87.5%.

## 7. Conclusion and Future Scope

The need of software engineering is increasing due to frequent changes in the user requirements and operating environments in which the software is working. Web services provide cost-effective solution for uniting distributed information between various applications and platforms. In the proposed work, web services is embedded in the application by using various connectors e.g. Loop connector, sequential connector etc. Web service that is designed for air ticket booking system has been reused in the movie ticket booking system. Regression and stress testing is done to determine whether it is feasible for the particular application or not. Thus, reusability reduces the effort of designing and coding for a software development organization. In the future, web services can be reused in the different web applications by designing the mappers. The mappers can be used to convert web service language from one form to other through the step mapping and the web services can be published on the server side to be reused by various clients on different web applications.

## References

[1] Sanjaya, R "Web traffic reduction for infrequent update application using Green Ajax" International Conf. on Information Management and Engineering (ICIME), 2010, pp 170 – 176.

[2] Sharma, K "SWART: Secure Web Application Response Tool", International Conf. on Control Computing Communication & Materials (ICCCCM), 2013, pp 1-7.

[3] Pressman, Roger S., "Software engineering: A practitioner's approach", McGraw-Hill Companies, 5th edition, 2005.

[4] McMaster, S "Developing a Feedback-Driven Automated Testing Tool for Web Applications" ISSN 978-1-4673-2857-9, pp 210 – 213, IEEE, 2012.

[5] Rouached, M" A declarative Web services composition framework", IEEE Conf. on Digital Information Management (ICDIM), 2013, pp 96 – 101.

[6] Vuong Xuan Tran "QoS Based Ranking for Web Services: Fuzzy Approaches" IEEE Conf. on Next Generation Web Services Practices, 2998, pp 77 – 82.

[7] Wu Chou "Web Services for Service-Oriented Communication" IEEE Conf. on Collaborative Computing: Networking, Applications and Work sharing, pp.1–8,2006.

[8] Gharzouli, M "A Generic P2P Collaborative Strategy for Discovering and Composing Semantic Web Services" IEEE Conf. on Internet and Web Applications and Services, 2009, pp 449 – 454.

[9] Wenhong Liu "Research and Application of Regression Test Case Design Methods Based on the Analysis of the Relationship" ISSN 13874437, pp 233 – 236, IEEE, 2013.

[10] Sommerville, Ian. "Software Engineering", Addison Wesley, 9th edition ,2011.

[11] [www.w3schools.com/webservices/ws\\_wsdldocument.s.asp](http://www.w3schools.com/webservices/ws_wsdldocument.s.asp)

[12] <http://www.w3.org/TR/wsdld>

[13] Chaturvedi, A. "A tool supported approach to perform efficient regression testing of web services", ISSN 2326-6910, IEEE, pp 50 – 55, IEEE, 2013.

[14] Prajapati, H.B "High Quality Web-Application Development on Java EE Platform" IEEE Conf. on Advance Computing Conference, 2009,pp 1664 – 1669.

[15] Belqasmi, F. "RESTful web services for service provisioning in next-generation networks: a survey" IEEE Conf. on Communications Magazine, 2011, pp 66 – 73.

[16] Benharref, A "Online monitoring for sustainable communities of Web Services", IEEE Conf. on Integrated Network Management (IM), 2011, pp 702 – 705.

[17] Alexey G. Malishevsky, Gregg Roethermel and Sebastian Elbaum, "Modeling the Cost-Benefits Tradeoffs for Regression Testing Techniques", Proceedings of the International Conference on Software Maintenance (ICSM'02), 2002.