



## A Review on Web Service Composition Techniques

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**Abstract**— *Web services are an emerging technology for design of complex business applications. Today's business requires quickly adaption of customer needs and market conditions. Web service composition provides an open, standard-based approach for connecting web services together to create higher-level business processes. In this paper, we studied different web service composition techniques based on currently existing composition platforms and frameworks. Also we compare these techniques based upon the merits and demerits and also these techniques. Also discussed what makes web service composition so special and derive challenges for business community.*

**Keywords**— *Web Services, Composition, Review, Composition Techniques, Survey.*

### I. INTRODUCTION

Web service composition is the process of composing existing Web Services to satisfy our need. The composition process is very tedious. Before understanding about Web Service composition techniques we need to understand about Web service, Web service composition and need for composition. It is discussed in following sub sections.

#### A. What is Web Service?

There are many definitions available for web service. An interface that describes a set of operations which are accessible using standardized XML messaging is called as web service [2]. An URL (Universal Resource Locator) is used to identify a web service. Web service model consists of three entities called service provider, service registry and service consumer. It can be depicted in Fig. 1. Service provider is the owner of the web service. Service provider will publish the web service in central registry so that users (consumers) can find it easily. Consumers are the person who is going to use this Web service.

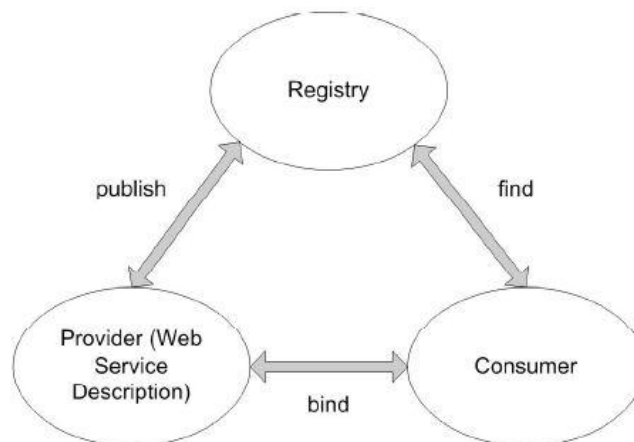


Fig. 1 Web service model

Core structure of web service is called as web service stack and it is accepted by almost everyone. It is structured around SOAP (Simple Object Access Protocol), WSDL (Web Service Description Language) and UDDI (Universal Description Discovery and Integration) (i.e. XML based standard). These three standards are used in web service model for entities service provider, service registry and service consumer.

#### B. What is Web Service composition?

If one web service involves use of another web service, then it becomes necessary to combine those web services. It is referred to as composite web service [1]. Composite web service is the service which satisfies the customer need using more than one web service. It composes the web services based on business logic for customer requirements. As there cannot be one web service which satisfies the customer needs, we need to go for composition of more than one web

service and make new service which combine satisfy the customer need. As composition involves two or more different vender's services to be combined, the composition becomes very complex task [3]. There are lot many composition techniques available for web service composition. In this paper, we have discussed some of them. To understand the web service composition, we need to understand the issues involved in web service composition. The issues are as follows: [4]

1. Co-ordination: In the process of web service composition, in order to combine two or more web services, we need to make some co-ordination amongst the web services.
2. Transaction: It is very important to add transaction protocol in co-ordination to provide atomic transaction. Sometimes we need to add the Atomicity, Consistency, Integrity and Durability (ACID) properties to ensure the safe transaction.
3. Context: It is very important issue which needs to take care. Context can be defined as the information used by the web service during composition to provide output and execution results.
4. Selection: The selection process of a proper web service plays a vital role in web service composition. There are lot many web services available with the same functionality and same characteristics. Based on QoS (Quality of Service), how we can select a proper web service is also a major issue. Whenever we talk about web service composition, we look for the word web service selection as without web service selection, we cannot go for composition.

### C. Motivating Example

The need for web service composition can be understood by taking an example of “makemytrip” service. The services provided by “makemytrip” are described as follows:

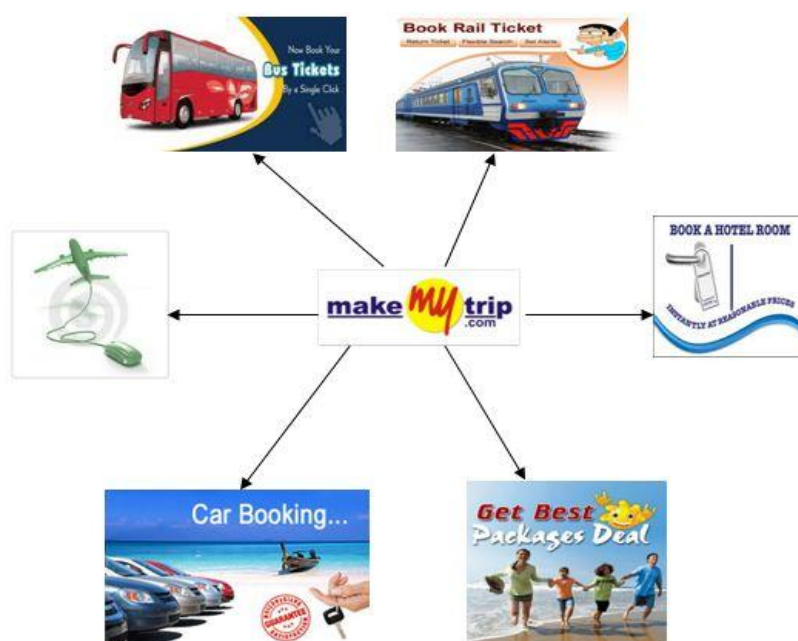


Fig. 2: “makemytrip” as service composition

Using one “makemytrip”, we can have flight booking, bus ticket booking, rail ticket booking, car booking, hotel room booking and also get the packages that includes all of the things. We can find it at a single place and provide multiple functionality at the same time. So, if a person wants to plan any trip from source to destination then he can avail all the needed bookings at one place. As an example, if a person wants to travel from Ahmadabad to Chennai then he can first book the flight ticket using flight reservation system. Then he can book train/car/bus ticket based upon his need. Then he can also book the hotel room using hostel booking. So, the process will become simple by using single service rather than using multiple services.

## II. EXISTING WORK

In this paper, we broadly classify the web service composition techniques in two types:

1. Techniques that uses automated tools
2. Techniques without using any tools

### A. Techniques that uses automated tools

In this subsection, we discuss the available techniques which use the automated tools for process of web service composition. We study tools like Flow Editor, SWORD and LTSA-WS. There are many more tools available for the web service composition process. We will discuss some of them.

1) Flow Editor: Flow Editor is a visual semantic web service composition tool based on OWL-S specification [5]. It is most widely used in creating the on-demand services. It is having visual control construct support by drag-and-drop facility. It can help users to convert a common web service into a semantic web service using OWL-S [6]. Consider the framework of Flow-editor which is shown in below figure.

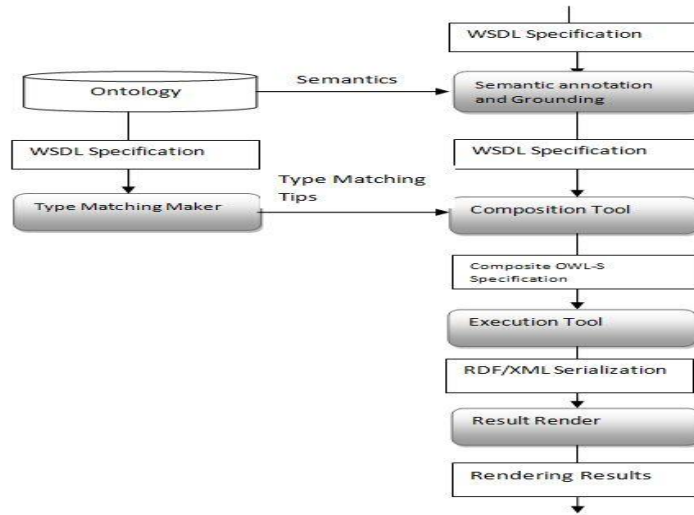


Fig. 3: Flow Editor[5]

In above figure we see the four main components of Flow Editor.

1. Semantic Annotation and Grounding concepts (accepts WSDL as input)
2. Composition Tool (For creating composite web service)
3. Type Matching Maker (Check whether two WS will be connected)
4. Result Renderer (It will render the result into other format to use it)

2) SWORD: SWORD stands for Simple Web service Offering Repository Deposit. It is a tool that is used to make composition of different web services and make new web service from it. The main idea behind SWORD is as follows [7].

1. To define a web service type, we need to look for its input and its output. Based on its input and output we can classify the web service. So, based on the inputs web services, rule (using rule based systems) is generated. So, we can conclude the output based on any input.
2. To get a composite web service, developer need to give just input and output of the composite web service and SWORD will generate the composite web service.
3. If it is possible to realize the required web service then SWORD will generate the composition plan for the composite web service.
4. Now the developer can see the composition plan and he/she can change the representation of the existing plan. This plan will contain the series of steps to get the composite web service.
5. When the originally request comes then the plan is being executed to have a composite web service based on the input and required output.

3) LTSA-WS: It is a tool which stands for Labeled Transition System Approach-Web Service. This approach is de- scribed using Labeled Transition System (LTA)[8]. This tool was basically a plug in for existing LTSA tool [9]. This model uses Finite State Process (FSP) for specification of behavioral model. The Eclipse plug-in architecture for LTSA- WS is shown in Fig. 4. [10]

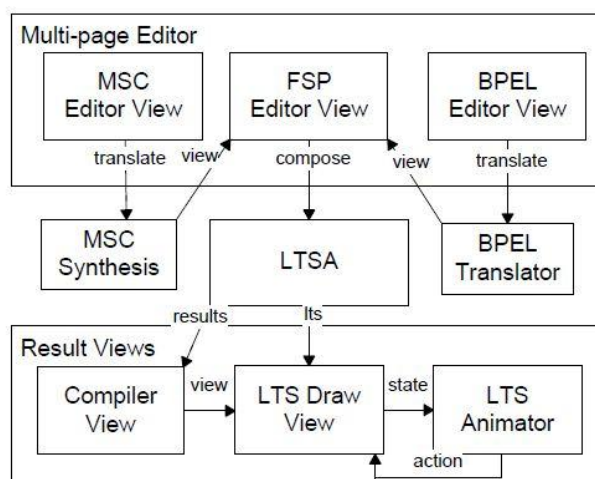


Fig. 4: LTSA-WS plug in architecture [10]

It is the plug in supported by Eclipse and basically for support of BPEL4WS. BPEL4WS is explained in detailed in following sub sections. This plug-in's main aim is to simplify the use of different bespoke tools in Software Engineering [10]. It was used in many case studies like UK police IT organization etc.

**B. Techniques without using any tools**

We discussed the Web service composition tools which can be used to make a new web service by combining two or more web services. While the following subsection will consider some of the languages used for web service composition process.

1) BPEL4WS: BPEL4WS stands for Business Process Execution Language for Web Services, a web service standard for web service composition. It allows you to create a complex process based on the functionalities of different processes. This web service standard came after merging WSFL (Web Service Flow Language) from IBM and XLANG(XML based WSDL extension) from Microsoft. So, we can say that BPEL4WS is combined benefit of Support for Graph oriented process - WSFL and Structural construct for processes- XLANG. It is combined effort from IBM and Microsoft for development of this language. The following figure shows how the web service can be implemented as BPEL4WS process.

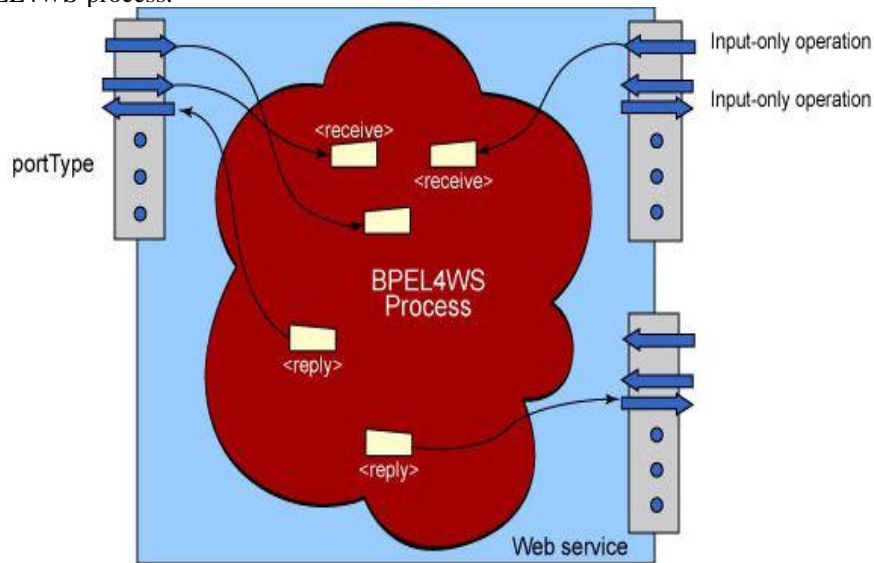


Fig. 5: Web service as BPEL4WS process. [11]

2) WSCI and BPML: WSCI stands for Web Service Choreography Interface (WSCI), it is an XML based interface description language. It shows how the web services operations can be performed by choreograph in context of message exchange [12]. In order to make client understand how to interact with service, it describes independency among the web service's operations. The external architecture of WSCI is shown in following figure.

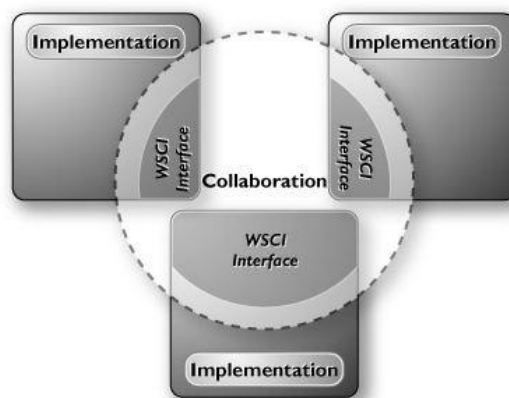


Fig. 6: WSCI external architecture. [12].

BPML stands for Business Process Modeling Language. It was supported by BPMI but after that they have taken support back from it. BPMI had supported BPEL4WS.

3) ebXML BPSS: ebXML BPSS stands for Electronic Business eXtensible Markup Language Business Process Specification Schema. Its main aim is to provide a bridge between e-business process modeling and specification of ebusiness software components [13]. The UMM (UN/CEFACT Modeling Methodology) is for business process and information modeling. It uses choreography based approach for service composition [14].The following figure shows the relationship between ebXML BPSS and UMM.

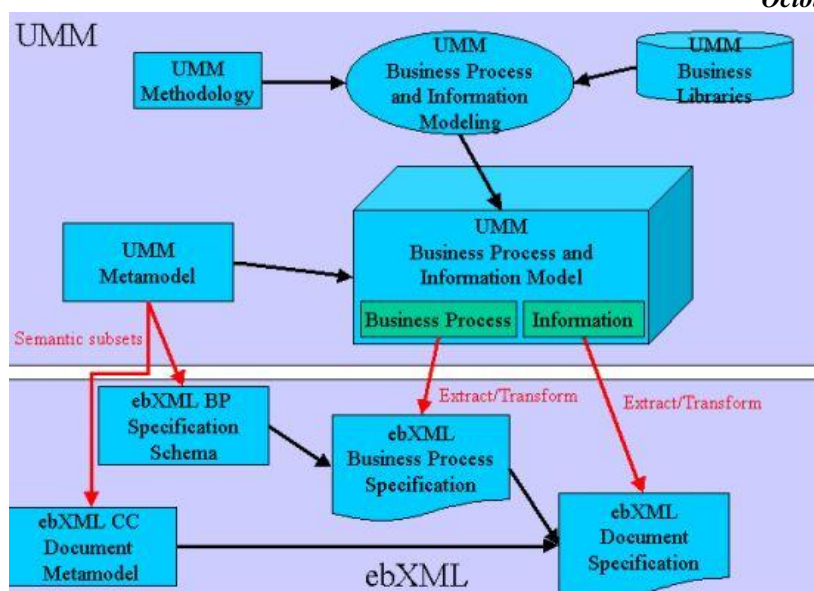


Fig. 7: ebXML relationship with UMM [13].

### III. CONCLUSION

Web service composition process is the process of combining two or more processes to get a new functionality from the combination of those two or more web services. From the above discussion of tools and languages, we can conclude that we can use tools as well as languages for web service composition. The benefit of using tool based composition of web service makes easy for customers or users. While the language based composition is a bit complex for normal users. It can be easier for developers. It requires knowledge of programming of above discussed languages. While tools can be easily used by the user.

### ACKNOWLEDGMENT

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