

Web Service Composition Using Multi -Agent System

Rajesh A and Rajalakshmi S

¹Computer Science and Engineering,
SSN College of Engineering, Anna University,
Chennai, TamilNadu, India

²Computer Science and Engineering,
SSN College of Engineering, Anna University,
Chennai, TamilNadu, India

Abstract

Web service is a method of communication between two electronic devices over the internet. It describes a standardized way of integrating web based application. In web service technology the most important thing is the composition of web services to create a value added service. In manual web service composition, the composite service is done manually, so user should have well domain knowledge and also some error may occur in composed web service. Hence the result of such composite services may not satisfy the user requirement. Intelligent agents are problem solving, autonomous, computational that are capable of effective proactive behavior in open and dynamic environments. In Agent Based Web Service Composition, the composition of web services are composed by the service agent with other agents based on the requirement of the user. Use of Agent based web service composition helps to reduce the time complexity and providing optimal solution to the user.

Keywords: Web Service, Composite Web Service, Agent.

1. Introduction

Web service is a software function provided at a network address over the web, it is a service that is "always on" as in the concept of utility computing. The W3C defines a "Web service" as "a software system designed to support interoperable machine-to-machine interaction over a web". It has an interface described in a machine-process able format (Web Services Description Language, known by WSDL). Other systems interact with the Web service in a manner prescribed by its description using SOAP messages, typically conveyed using HTTP. With which an XML serialization in conjunction with other Web-related standards. There are two classes of Web services can be identified, they are REST-compliant Web services and Arbitrary Web services, in which the primary purpose of REST-compliant Web services is to manipulate XML representations of Web resources using a uniform set of

"stateless" operations and arbitrary Web services to expose an arbitrary set of operations.

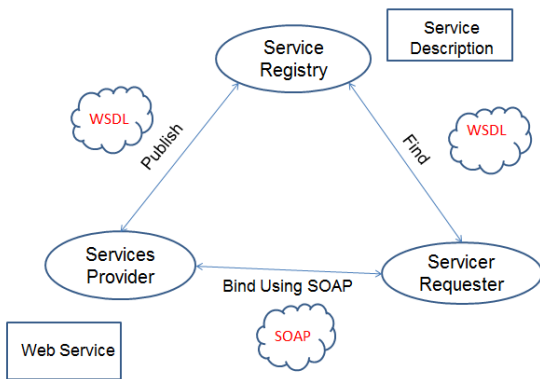
1.1 Web Service

Web Service can convert an application into a Web application, which can publish its function or message to outside world. Web Services allows different applications talk to each other, share data and services among themselves. Other applications can also use the services of the web services. For example VB or .NET application can talk to java web services and vice versa.

The Web Services are categorized to perform three basic roles:

- The service provider
- The service requester
- The service registry

Service provider will publish (or unpublished) their service to a registry. Service requester can find the desired Web Services by searching for their descriptions at the service registry. Once the requester locates the desired service, it binds with the service at the service provider and then invokes the service.



1.2 Web Service Composition

Web Service Composition provides an open and standards based approach for connecting web services together and to create higher-level business processes. Standards are designed to reduce the complexity required to compose web services, hence reducing time and costs, and increase overall efficiency in businesses.

1.3 Agent

Agents are heterogeneous, autonomous, distributed systems. The environment in which agents present may be static or dynamic. Agents are entities which perceive the environment by sensors and act upon that environment using actuators. For example, humans have eyes as sensors and hands as actuators. Software agents have user interface as sensors and actuators. Robots have cameras as sensors and wheels as actuators. The environment where a group of agents are interacting with one another is called a Multi-Agent System (MAS).

1.4 Multi-Agent System

A multi-agent system (MAS) is a system composed of multiple interacting intelligent agents within the same environment. Multi-agent systems are used to solve problems that are difficult or impossible for an individual agent or a monolithic system to solve. Intelligence may include some functional, procedural search, find and processing approach.

2. System Architecture

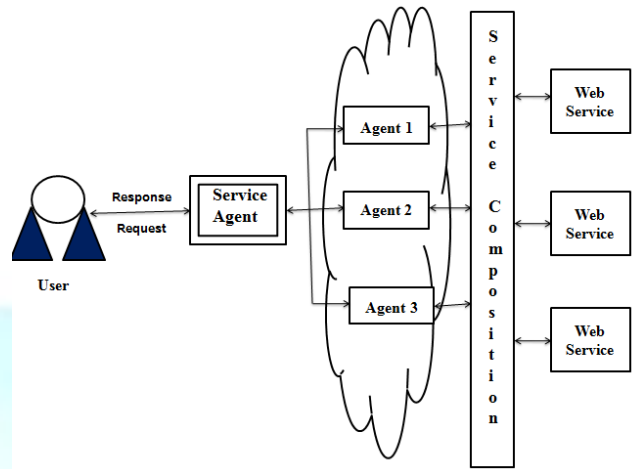


Fig. 2. Web Service Composition based on Multi-Agent System Architecture

Architecture diagram of Web Service Composition using Multi Agent system consists of three entities. They are User, Service Agent and other Agents.

1) USER

User may be an individual who requests the service Agent for service.

2) SERVICE AGENT

The Service Agent may contain service registry where the abstract details of all the agents and the web service associated with each agent.

3) Other Agents

There are several other individual agents where each agent may contain one or more web services.

Agent management system is responsible of creation, Registration, communication, migration and retirement of Agents. The workflow for implementing this task, is clearly depicted in fig 3

2.1 Application Scenario

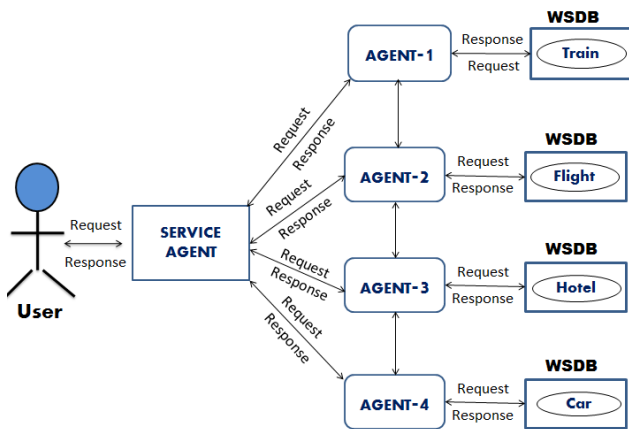


Fig. 3. Application Work Flow

The effective communication between the Customer and the Travel Agent is for providing optimal service to the end user. In manual web service composition user should have well domain knowledge about web service and their functionality. The problems with this kind of communications are,

- Possibility of occurrence of error will be more in the composed web service.
- The result of such composite services may not satisfy the user requirement.
- In static web service composition, since all available web services should be invoked and hence it may take more execution time.

In order to provide effective communication between the customer and the travel agent, Agent Based Web Service Composition has been introduced.

2.2 Architectural view of the application

Set of modules are identified in building the application are Web Service Creation, Web Service Composition using agents, Providing Optimal Solution

2.2.1 Web Services creation: The following are the list of services that need to be created for the application:

i) Train Service

Gives details about all the trains that are running between the particular source and destination. Which includes their arrival and departure time, seats availability and their fare.

ii) Flight service

Gives details about all the flights that are running between the particular source and destination. This includes their arrival and departure time, seats availability and their fare.

iii) Car service

Gives details about the cars that are running in the particular destination. Booking will be done on the basis of the package criteria chosen by the passenger.

iv) Hotel Service

Gives details about all the hotels in the particular destination. Booking will be done on the basis of the package criteria chosen by the passenger.

3. Implementation

3.1 Services Created

Some of the Services considered in Courseware application are

- Train
- Flight
- Car
- Hotel

3.2 Combinational Approach

3.2.1 Algorithm

- Construct all web service as a graph.
- Find the all execution path using DFS algorithm.
- Store the execution path into Web service database.
- User gives the request to the agent.
- Retrieve the WSDL from WSDB depends upon the user requirements.
- Compose the web service using WSDL.

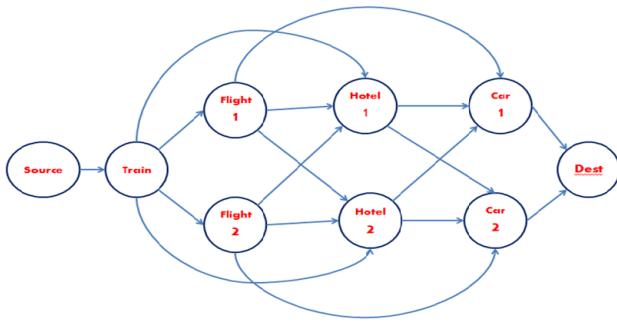


Fig. 4. Web Service Structure

This approach is used to find the execution path in a composite service. In order to find the optimal path in a Web Service structured composite service we need to run the services several times, one for each possible execution path. We then choose the one with the highest utility as the best solution.

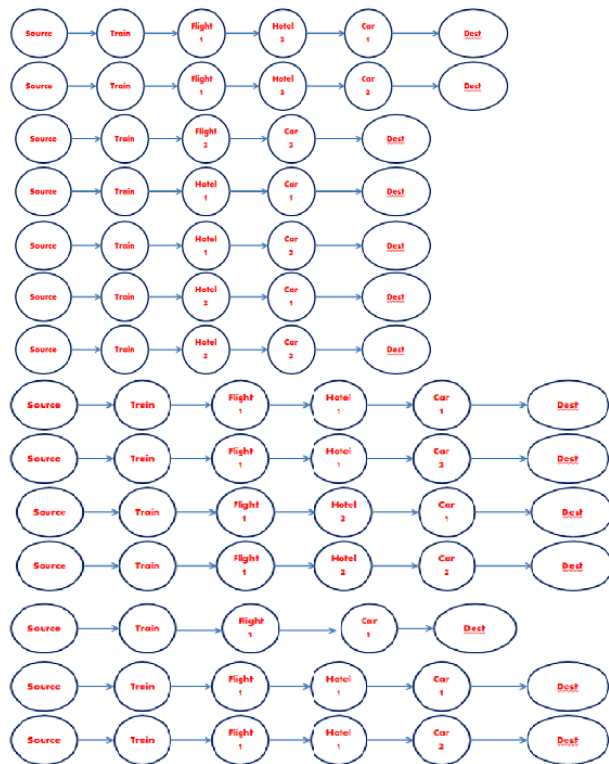


Fig. 5. Execution Path

4. Conclusions and Future Work

In this project different Web services which were mentioned for the E-Travelling service system were created. These Services are made to run on different

machines with different operating systems to achieve platform independence. A self adaptive Web Service Composition model based on Multi- Agent Systems for selecting an optimal service dynamically. Our system aims to support the design, deployment and maintenance of distributed systems by allowing the combination, reorganization and adaptation of services. We encapsulate the Web Services with Agents to make them to be more autonomy, reliability and robustness in response to the dynamic environments

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