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A Practical Approach for Personalized Access to Agent-Based Composition of Semantic Web Services for MANET

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Abstract:- Web services are dominating the current web scenario. Web services are independent and autonomous, designed to perform a specific task. Discovery, integration and execution of web services is known as semantic web. Composition of these web services are required complex system. The Composition of semantic Web services (SWS) has received much interest to support business-to-business or enterprise application integration. The Composition way that we used in this paper is the Orchestration which deals with describing how a number of services, two or more, cooperate and communicate with the aim of achieving a common goal. The proposed technique considers complex composition by including web services with multiple inputs in composition process. In this paper, we propose an ontology-based framework for the automatic composition of Web services. JADE is an agent development environment where Web services and agents can be linked together to enable semantic Web applications.

Keywords:- Semantic Web Service, JADE Agents, Composition Web Service, Integration Gateway.

I. INTRODUCTION

JADE is a FIPA compliant agent development environment which facilitates the implementation of multi-agent systems. Since Web services middleware has been integrated into JADE, agents implemented in JADE can exploit Web services as computational resources. A Web service can be published as a JADE agent service and an agent service can be symmetrically published as a Web service endpoint. Invoking a Web service is just like invoking a normal agent service. In addition, Web services' clients can also search for and invoke agent services hosted within JADE containers.

The Web Services Integration Gateway (WSIG) uses a Gateway agent to control the gateway from within a JADE container. Interaction among agents on different platforms is achieved through the Agent Communication Channel (ACC). Whenever a JADE agent sends a message and the receiver lives on a different agent platform, a Message Transport Protocol (MTP) is used to implement lower level message delivery procedures [2]. There are two main MTPs available today to support this inter-platform agent communication - CORBA IIOP-based and HTTP-based MTP. The MTP which we used in this paper is the HTTP-based MTP. The Web service published as a JADE agent service and an agent service symmetrically published as a Web service endpoint. In other words, the JADE agents interact with Web services and produce the output. The WSIG is used as a means to encapsulate and automate the functionality required to connect the two domains, while ensuring minimal human intervention and service interruption. This Gateway is controlled by a software agent, capable of connecting Web Services and software agents, i.e. a Web service becomes able to invoke a registered agent service and vice versa. Once this interconnection is established, software agents capable of comprehending ontology (that contains the semantic) can use the Gateway to enable advanced operational and usage modalities of Web services.

Web services can be divided into two types; *simple* and *composite*. A simple service is an independent unit, which performs at its own and not uses any other service to produce results. For example, a temperature conversion service, it converts temperature between Fahrenheit and Celsius scale. A composite service is combinations of services, which are grouped together to perform a single task. As a result of composite execution, single result will be achieved by execution of a set of services. For example, an auto sale agent is dependent on Financing Company, Insurance Company and Auto Company. He uses services from these three to offer a complete auto sale solution [10]. Thus, it is not a simple task to integrate web services to achieve a one composite web service. Automating web services composition is a challenging task. Automating web services

composition requires extracting the meanings from user inputs and then finding initial and intermediate services involved in designing a complete solution. This can be easy in a system that is a defined and has few number of web services. Decision making is easy as many factors in this case are known: like possible paths, how input is analyzed and each services contribution in total processing. However, designing system for automated discovery on a search engine is very difficult. Web is becoming a combination of distributed computing devices, where various services are designed to perform some tasks. Also, it is expected that ubiquitous computing will dominate the society in coming times.

Mobile agent technology provides a new way of communication over heterogeneous network environment. A number of advantages have been proposed and identified which includes: efficiency and reduction of new traffic, asynchronous autonomous interaction, interaction with real-time entities, local processing of data, support for heterogeneous environment and having robust and fault tolerant behaviour.[11]

II. BACKGROUND AND RELATED WORK

A. Background

A number of web services exist on the internet. However, in real world, it is often seen that user's request for a purpose is fulfilled by combination of many web services. For example, a user wants to come to Delhi from Mumbai for some official work. He requires to book flight, reserve hotel room, local travelling taxies or other option and more. It should be good if user can search for best possible combination of these web services. Like user while booking the flight ticket get full information about the ticket price of all the airlines from where Mumbai to Delhi flight is available and so on for other services also. Thus user gets his desired output by just giving the input parameters. Web services search, execution, composition and interoperation are an area of research known as "Semantic web".

B. Related Work

There are several articles related to automated Web service composition. Ontology-based Web Service Composition [3] aims to generate a composite service out of semantically described existing services. In this work, the possible automatic compositions are obtained through interface-matching, which checks semantic similarities between interfaces of individual services. Different services can be integrated to satisfy user requirement.

Rao et al. [4] Propose GraphPlan algorithm for generating a composite web service. But he uses a lot of interaction from user which drifts his project towards manual composition. His approach does not consider input and output schema. This schema is important in ontology mapping. Also, some services can be compatible without having input and outputs. His approach uses one input to a service. However, in our approach, a service can get input more than one service.

SWORD[5] proposed a rule based system for composition of web service. His approach is not suitable for heterogeneous and changing web services. He emphasizes on composition and did not take into account input and output mismatch. In our technique, system checks the input parameters and more than one parameter can be accepted by a service. Like, input and output mismatch can also detected and provide error report.

Thakkar et al[7] consider dynamic composition of Web services using mediator-based agent system architecture. The mediator takes care of user queries, generates wrappers around information services and constructs a service integration plan.

Paolucci et al[6] evaluate a broker for constructing OWL-S Web services. They also identify some drawbacks of the current OWL-S specification and propose a workaround for the problem. Sycara et al [8] describe a methodology for constructing composite services written in DAML-S.Similarly, the preceding article view ontology-based technique which describe the inputs/outputs and conditions or effects of particular services.

III. AGENT-BASED WEB-SERVICE COMPOSITION

In real world, it is often seen that user's request for a purpose is fulfilled by combination of many web services. So, multi-agent environment is required. For example, let us assume that there are three agents TrainNameService, TrainNumberService and CompositeTrainService in the agent system.
TrainNameService has Web service W1 which provide Train detail when Train Name as provide input to the web service W1. TrainNumberService has service W2 which provide Train detail when Train Number as input provided to the web service. CompositeTrainService is the main web service W3 which takes input either Train Number or Train Name and provide output to the user. The composition of web service W1 and web service W2 is done in web service W3.

The composition technique aims to find the optimal composition of service considering semantic matching of parameters. Generally, our agents-based Web services composition mechanism consists of three sequential phases[1],[9]:

1) Service registration

This is the way to register the agent service.

```
try {
                    DFService.register(this, dfad);
            }
        catch (Exception e)
            {
                    log.error("Problem during DF registration", e);
                    doDelete();
             }
```

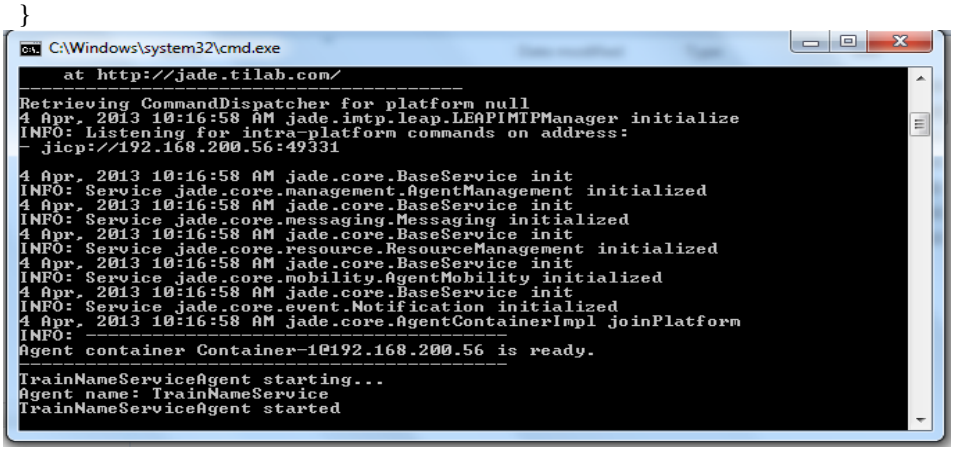

Fig 1. TrainNameService Agent Registered and started

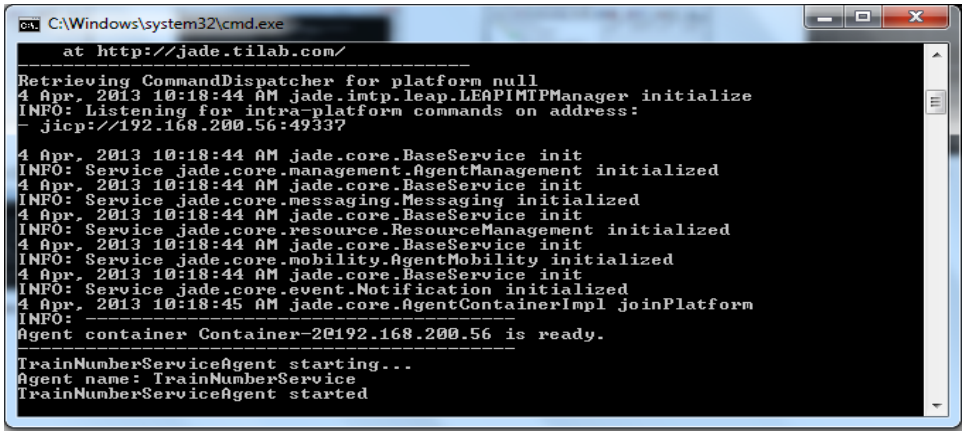

Fig 2. TrainNumberService Agent Registered and started

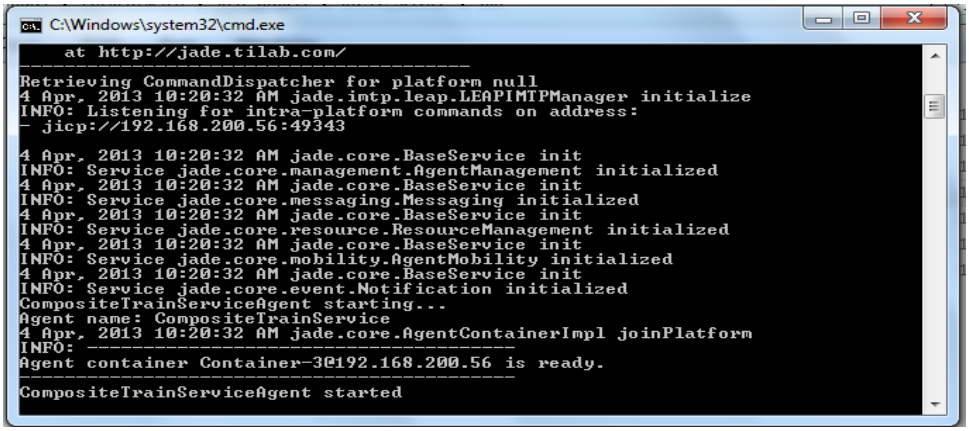

Fig 3. CompositeTrainService Agent Registered and started

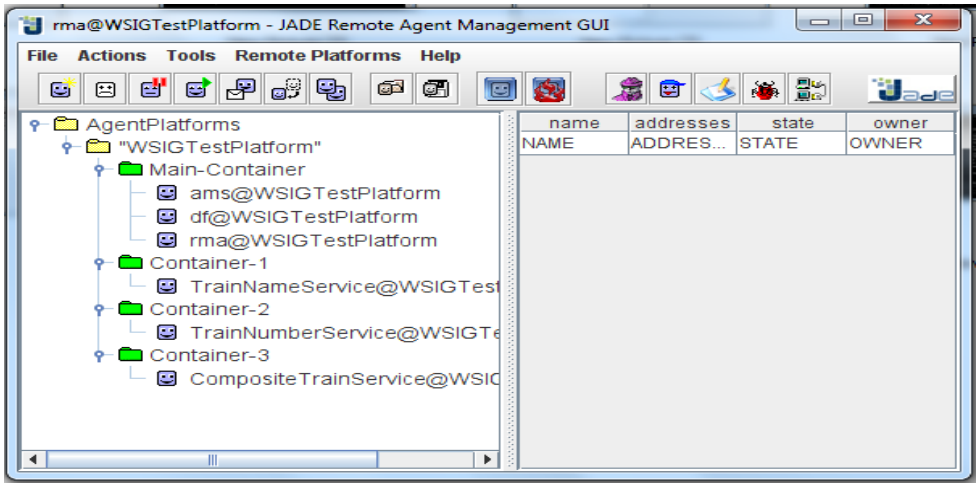

Fig 4. Three Agents are shown as registered

2) Construction of the service graph

In the graph construction phase matching input output of services are logically connected in a way that they form a potential workflow. In our example CompositeTrainService contain the logic how to access the other two web services.

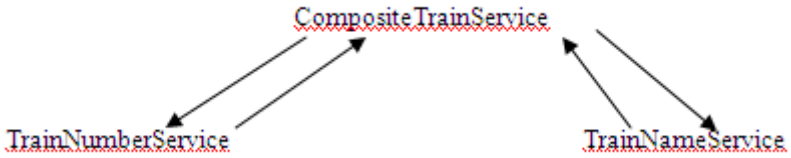

Fig 5. Service integration Graph

3) Service discovery together with composition.

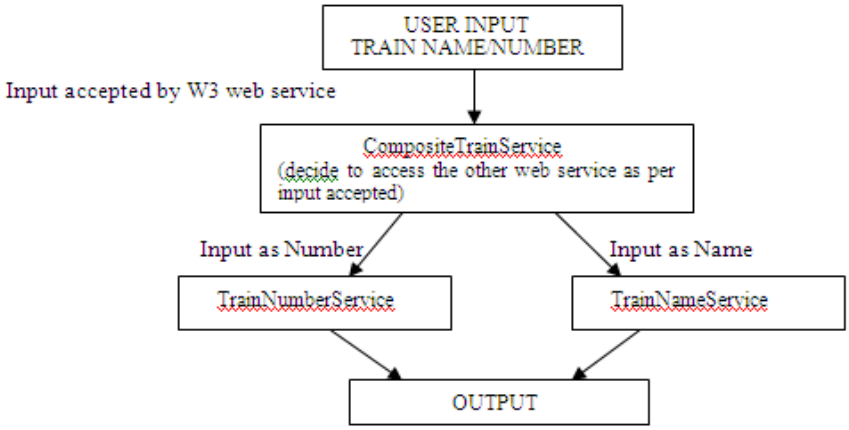

Fig 6. Service Discovery and Composition.

IV. WEB - SERVICE ACCESSED IN MANET

The Web Service can be access by the client using the web access pages. The composite web services are running on the server side and the client use the web site or web page to access the web service over the network. The http protocol is used to access the web service and the port number on which the server running. The Agent based Mobile Ad-hoc Networks architecture which was already proposed has been taken as base to test the agent- based web services whether these are working properly or not. As the result, these web services providing the correct result in the Agent Based Mobile Ad-hoc Network architecture.

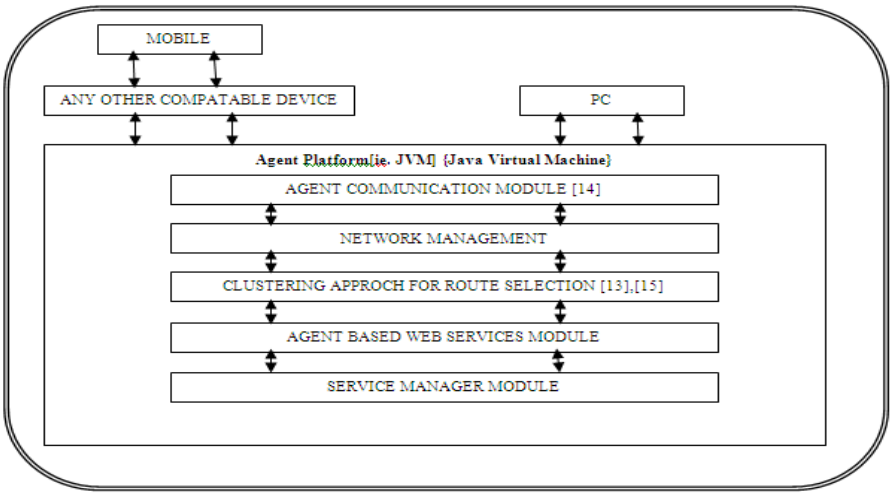

Fig. 7 Architecture for Agent Based Mobile Ad-hoc Network.[12]

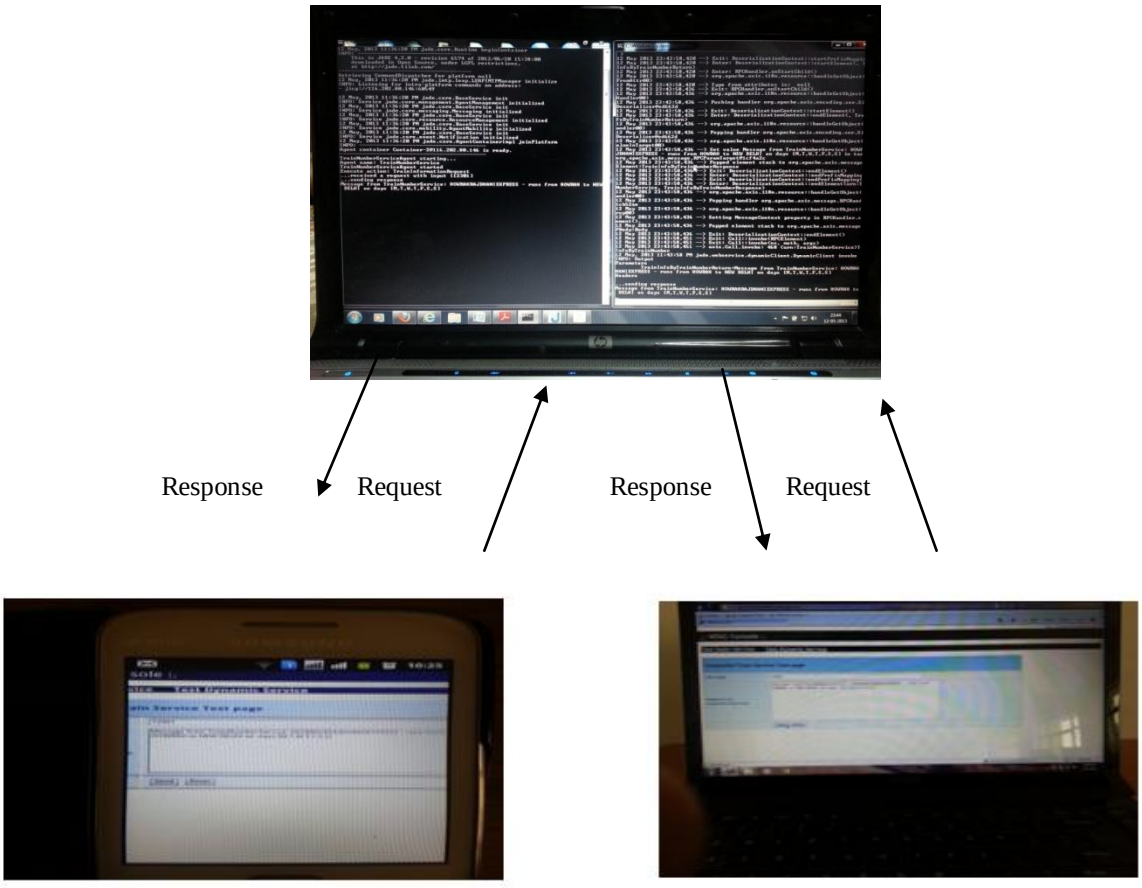

Fig 8. Web Service Access

V. CONCLUSION

In this paper, automatic composition of web service is explained. Composition of web services from same ontologies, composition of web services with inputs and at the execution time. Semantic web services area is still under continual research and development. Challenges lies in composition and integration of web services. Data flow, accurate data translation and data transformation among services become important. Role of user is still present in the automatic composition of web services. We think in coming times, systems need be developed that provide flexibility of user interaction in composition.

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