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Survey on Semantic Web Services and its Composition Algorithm

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Abstract— Service Oriented Architecture (SOA) is a collection of services. The correspondence of these services takes place with one another. In SOA, Web Services are the most important & promising part. Web services, adopted by Service Oriented Architecture (SOA), are loosely coupled reusable software components that semantically encapsulate discrete functionality and are distributed and programmatically accessible over the internet. Web Service Composition plays an important role in SOA. Web Service Composition may be dynamic or static. A composition process requires an algorithm to perform composition task. Now-a-days various approaches for composition algorithm are used as required by research task. In this study, we have done a survey on various web service composition algorithms.

Keywords— SOA, Web Services, Semantic Web, Semantic Web Services, Web Service Composition, Algorithm.

I. INTRODUCTION

Service Oriented Architecture (SOA) is a collection of services. The correspondence of these services takes place with one another. Service Oriented Architecture (SOA) is an emerging cross-disciplinary paradigm for service architecture that is changing the way, of how software is designed, architectured, delivered and consumed.

The communication can involve either simple data passing or it could involve two or more services coordinating some of the activity. Some means of connecting services to each other is needed. In SOA—the term 'service' means – A function that is well-defined, self-contained, and does not depend on the context or state of other service. The SOA model consists of three entities, the service provider, the discovery agencies and the service requester.

Figure 1 shows a graphical representation of the traditional SOA model–

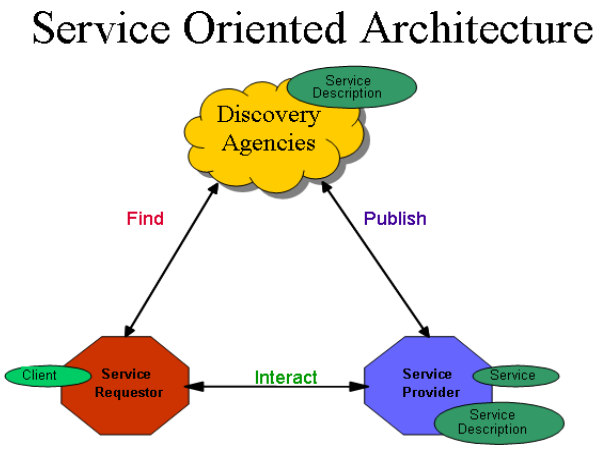

Fig.1 Service Oriented Architecture (SOA) [11]

II. WEB SERVICE

Web Services are the most important & promising part. Web services, adopted by Service Oriented Architecture (SOA), are loosely coupled reusable software components that semantically encapsulate discrete functionality and are distributed and programmatically accessible over the internet. Web services are a new breed of Web applications. It provides a standard means of interoperating between different software applications, running on a variety of platforms and/or frameworks. They are self-contained, self-describing, modular applications that can be published, located, and invoked across the Web. Once a Web service is deployed, it can be discovered and invoked by other applications (or other Web services).The Web services model consists of three entities, the service provider, the service broker and the service consumer. Figure 2 shows a graphical representation of the traditional Web service model –

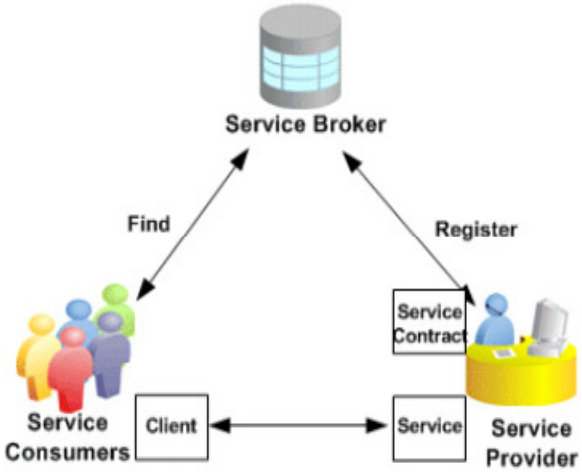

Fig. 2 Web Service model[5]

A Web service paradigm is typically supported by set of standards. For example, the industry standards include Simple Object Access Protocol (SOAP) for transferring of data; Web services Description Language (WSDL) for describing services available, and Universal Description, Discovery, and Integration (UDDI) for listing what services are available.

III. SEMANTIC WEB

The World Wide Web (WWW) was invented by Tim Berners Lee in 1989, while he was working at the European Laboratory for Particle Physics (CERN) in Switzerland. It was conceived as a means to allow physicists working in different countries to communicate and to share documentation more efficiently. He wrote the first browser and Web server, allowing hypertext documents to be stored, retrieved and viewed.

The Definition of Semantic Web Is……
"Semantic Web is not a separate Web but an extension to the current one, in which information is given well defined meaning, enabling computers and people to work in cooperation" [9].

Figure 3 shows a graphical representation of the layers of semantic web –

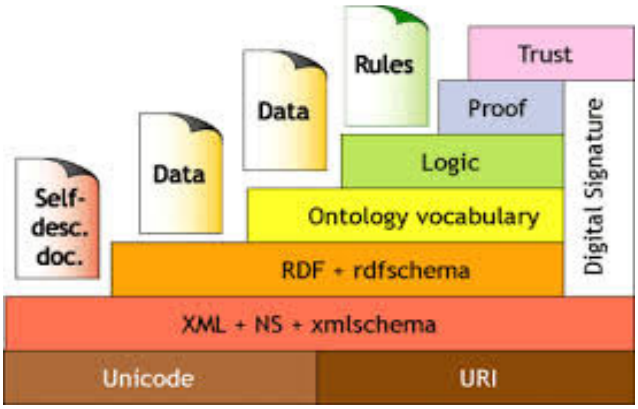

Fig. 3 Semantic Web Layers [15]

Semantic web which is the advance form of the normal web and refers to the ontology languages, development frameworks and development tools; it uses semantic annotation (web pages with structured data to facilitate the software / intelligent agents to process the data) for describing some of the parts of the web and the meaning of the message of the web services. With the help of annotations semantic web services infer inherent properties to identify services that meet to the requesters demand during the discovery process.

IV. SEMANTIC WEB SERVICE

Semantic web services are the combination of web services and the semantic web. Semantic web services are the extension of existing web services where the information is represented in a well-defined way.
Figure 3 shows a graphical representation of the semantic web service model –

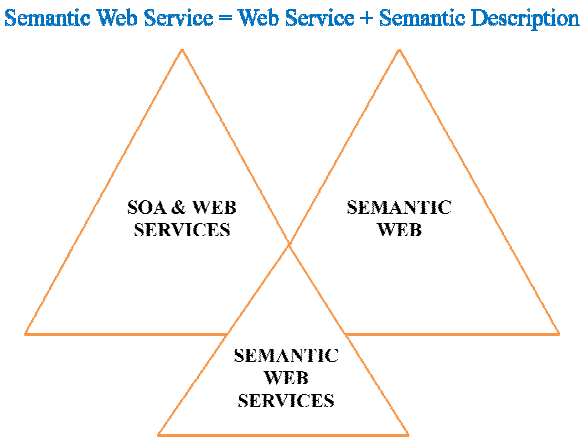

Fig. 4 Semantic Web Service model

Large amount of data over the web is understandable only by the humans and the custom software. The target goal of semantic web is the medium where the data could be shared easily and processed automatically. Semantic web services are used for combining data and services from different sources without losing their meaning.

V. WEB SERVICE COMPOSITION

Individual web service cannot satisfy all the service requests. It becomes necessary to combine functionality of several web services to full fill the need of a given client or when the implementation of a web service's business login involves the invocation of other web services. Such a service built from multiple web service is called a composite service and the process of developing a composite service is called service composition. The components of a composite service can in turn be an elementary service or a composite service. [8]

Figure 5 shows a graphical representation of web service composition process –

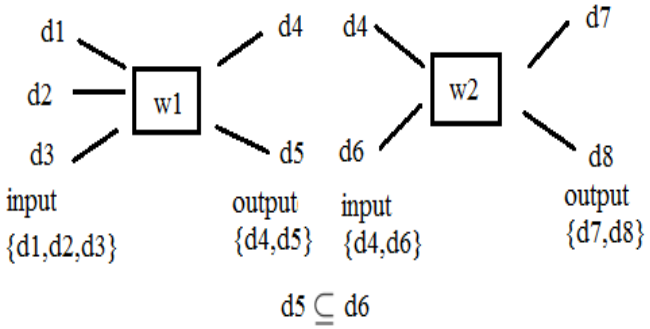

Fig. 5 Web Service Composition process

Here we can coin the process as:
Web Service Composition (WSC): (W, Din, Dout)
- Composition Query: (Din, Dout)
- Service model w = (in(w), out(w))

Most precisely, the process of automatic service composition includes the following phases:
Planning - determine execution order of the task.
Discovery - finding candidate service.
Selection - optimizing service composition.
Execution - executes or re-plans.
WSC is to construct higher-level services based on multiple existing services to meet more sophisticated business requirements. Composing existing Web services into advanced, complex new services promotes rapid application development, service reuse, and cross-enterprise collaboration. It provides a mechanism to support cross-enterprise and intra enterprise application integration. Because it can be time- and cost-prohibitive to identify and compose services manually, automatic or semi-automatic composition of existing Web services to achieve new functionality has become the centre of current attention. From a developer's perspective, service composition offers the possibility of interaction and reuse. From a service consumer's perspective, automated composition offers access to a wide variety of complex services with minimal manual intervention. The ability to perform automated or semi-automated WSC can revolutionize many application areas, including E-commerce applications and system integration. [8]

VI. WEB SERVICE COMPOSITION ALGORITHM

In this paper the different approaches / algorithms for web service composition are surveyed which are based on Graph theory techniques.

TITLE	APPROACH	SUMMARY
A planning graph based algorithm for semantic web service composition. [2] IEEE, (2008).	Simplified planning graph method	Input & Output parameters are defined in **WSDL file** & **OWL file.** It can find a trivial solution in **polynomial time**. Due to redundancy problem **no effective solution.**

Graph based E-Government web service composition. [3]. IJCSI, (Vol. 8, Issue 5, No 1, September 2011).	Graph based method.	Uses **Floyd-Warshall Algorithm** to find shortest path. **Better Time complexity.** Needs to improve reliability & availability of web services.
An Approach for Graph based Planning and Quality driven composition of Web Services. [4]. IJCSE, (Vol. 2 No. 5 Oct-Nov 2011).	Planning Graph approach.	Algorithm is executed using **Java** programming language. Provides **unique search space**, & find a **best solution.** **Worst Time complexity**
Semantic Web Service Composition with Quality of Service. [5] IJARCST, (Vol. 1 Issue 1 Oct-Dec 2013).	QoS model based Graph technique.	**Protégé-ontology** development tool & Web Application Performance Tool **(W.A.P.T.)** used to get **better efficiency**. Info. Of services not provided & not always trustworthy.
A Graph Based Meta-model for Speed-up Service Composition on Web. [6] IEEE, (2014).	Meta-model Graph technique.	Executed in specific service called **Service Orchestration.** **Better Time complexity** Construction & processing done offline, so it **hardly adds the cost.** One of the **focal issues** to **choose the proper composition** or replacement.
Web services composition based on weighted planning graph. [7] IEEE, (2010).	Weighted planning graph model	WSC-WPG is implemented using **Java** through **OWL-S API** & ontology constructed by **Protégé tool.** **Improved efficiency** when test-set is large. **Worst Time complexity**.

Table.1 Web Service Composition Algorithm

VII. CONCLUSION AND FUTURE WORK

In this paper we have done survey on various web service composition algorithms and describe their functionality regarding composition. Today, web service composition is a well-known research topic among researchers.
In the literature the focus is specific towards automating the composition process using Graph Plan techniques.
In all papers, authors use different algorithms using Graph Based Technique & tried to improve the time, cost & efficiency, complexity of Semantic Web Service Composition.
So in future it will be useful for improving the time, cost & efficiency, complexity for a Semantic Web service Composition.

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