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SEMANTIC WEB: WEB SERVICE DISCOVERY AND COMPOSITION FOR HEALTH SERVICES

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ABSTRACT

A Web Service is a collection of open protocols and standards used for exchanging data between applications and systems. Web Service Discovery is the process of finding a suitable Web Service for a given task. Web service composition provides an open, standards-based approach for connecting web services. In web service composition set of web services collectively executed to achieve something. The existing approach makes use of iServe for web service discovery and Compos IT for web service composition which has some drawbacks during searching. The proposed approach uses PSO (Particle Swarm Optimization) algorithm for web service discovery. A basic variant of PSO algorithm works by having a population (called a swarm) of candidate solutions (called particles). The proposed approach also uses AHC (Agglomerative Hierarchical Clustering) for web service composition. AHC is a bottom-up approach, it starts with each service being a single cluster and eventually merges all services into one cluster. Finally, composite services are generated and it is used by the user.

KEYWORDS: Web service discovery, service selection, service composition, Health service system.

INTRODUCTION

Web Service describes a standardized way of integrating web based applications using the XML, SOAP, WSDL, and UDDI open standards.[1] XML stands for Extended Mark-up

Language. It is used to tag the data.[22] SOAP stands for Simple Object Access Protocol. It is used to transfer the data. It is an XML based protocol for accessing web services.[16]

WSDL stands for Web Services Description Language. It is used for describing the services available. It is an XML based language for describing web services.[15] UDDI is used for listing what services are available. It is an XML based standard for describing, publishing, and finding web services.[14] Semantic Web is the extension of the World Wide Web that enables people to share content beyond the boundaries of applications and websites. The semantic web has inspired and engaged many people to create innovative semantic technologies and applications. semanticweb.org.edu is the common platform for this community.[2]

WordNet is a large lexical database for the English. Nouns, verbs, adjectives and adverbs are grouped into sets of cognitive synonyms called “synsets”. It is accessible to human users via a web browser. It is also freely and publicly available for download. WordNet’s structure makes it useful tool for computational linguistics and natural language processing.[3]

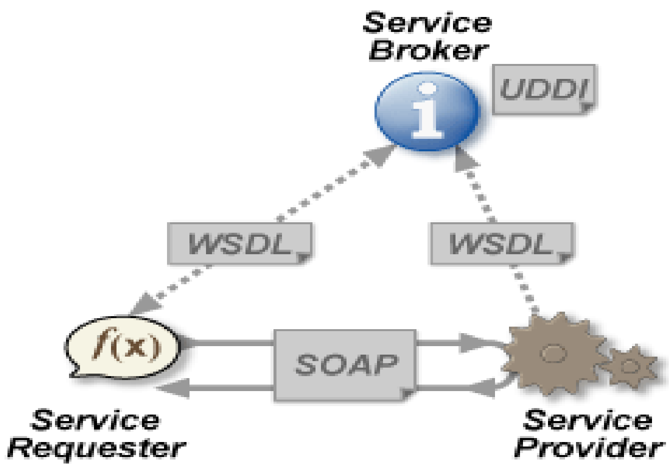

Fig 1: SOA Components.

Literature Survey

In Maamar et al. (2009), we discuss the notion of capacity and how it weaves smoothly into Web services. By capacity, we mean how a Web service is empowered with several sets of operations from which it selectively triggers a particular set with respect to some run-time environment requirements. The description of these sets of operations is included in the Capacity-driven Web Services Description Language (C-WSDL) document of the capacity-driven Web service. The rationale of examining capacities is backed by the statement that 'most Web services platforms are based on a best-effort model, which treats all requests uniformly, without any type of service differentiation or prioritization' (Malay Chatterjee et al., 2005).[4]

Jinghai Rao and Xiaomeng Su gives an overview of recent research efforts of automatic Web service composition both from the workflow and AI planning research community. Automatic service composition processed in 5 phases,

- Presentation of single service
- Translation of the languages
- Generation of composition process model
- Evaluation of composite service
- Execution of composite service.

Web service composition using workflow techniques such as EFLOW, PPM (Polymorphic Process Model). Web service composition using AI planning such as DAML-S (also called OWL-S).[5] Virginie Gabrel et al propose a new model based on 0-1 linear programming for determining a composite web service (structured by a workflow) maximizing a QoS aggregate measure and satisfying transactional properties. The proposed 0-1 linear program is solved using a standard solver (CPLEX) but CPLEX is performing for solving very big size problem.[6]

Maja Vukovic et al The complexity of a context aware application arises from the sheer number of contextual types it needs to accommodate, as well as the range of values for each context type.[7] P. Traverso et al proposes the generated plans can be translated into executable processes, e.g., BPEL4WS programs. In this paper, we propose a technique for the automated composition of web services described in OWL-S, which allows for the automated generation of executable processes. "Planning as Model Checking" approach based on symbolic model checking techniques, which has been shown to provide a practical solution to the problem of planning with nondeterministic actions, partial observability, and complex goals, and which has been shown experimentally to scale up to large state spaces.[8]

Petros Papapanagiotou Jacques D. Fleuriot present a rigorous framework for the composition of Web Services within a higher order logic theorem prover. Our approach is based on the proofs-as-processes paradigm that enables inference rules of Classical Linear Logic (CLL) to be translated into p-calculus processes.[9] Boualem Benatallah Marlon Dumas Zakaria

Maamar present the SELF-SERV project aims at providing tool support and middleware infrastructure for the definition and execution of composite Web services. A major outcome of the project has been a prototype system in which Web services are declaratively composed, and the resulting composite services can be orchestrated either in a peer-to peer or in a centralized way within a dynamic environment.[10]

Ravi Khadka1 and Brahmananda Sapkota presents the framework are categorized as interleaved, Monolithic, Staged, and Template-based service composition and execution. dynamic service composition approaches namely: eFlow , METEOR-S, WebTransact, DynamiCoS and SeGSeC(Semantic Graph based Service Composition).[11] Pramodh N et al presents an optimization and ranking technique that ultimately leads to the execution of the best service. This paper concentrates on combining optimization and ranking based on non-functional QoS parameters to evaluate its quality. The concept of optimization is carried out by ACO (Ant Colony Optimization) algorithm. Ranking is done using performance index which is calculated dynamically from the non-functional QoS parameters. Genetic Algorithm(GA) based approach is used to finding the optimal composition.[12]

Sam Guinea presents, there are 3 research directions for obtaining trustworthiness of SOA. They are:

- Service and process description
- Monitoring
- Recovery strategies

The three complementary dimensions to the monitoring problem:

- Assertion based monitoring
- Event-based monitoring
- History-based monitoring

In this article, we foresee three possible recovery strategies:

- Retry
- Substitute
- Restructure

The recovery strategies are easier to understand when used to recover from functional errors.[13]

Related work

Web service composition is the process of compositing (or) clustering two (or) more services. Web service composition can be done for hospital service. In hospital service the user has to give a disease name only, but the service returns hospital name, hospital address, doctor name, nearby places such as hotels, banks, insurance offices, travels, temples etc. From one query user has to get more than five web services details by the use of web service composition. I this article web service composition should be done in semantic manner. It is done by the use of AHC (Agglomerative Hierarchical Clustering) Algorithm. Finally, the graph can be generated for available services in X-axis versus services returned by the particular query in Y-axis. In future web service composition can be done for multiple domains.

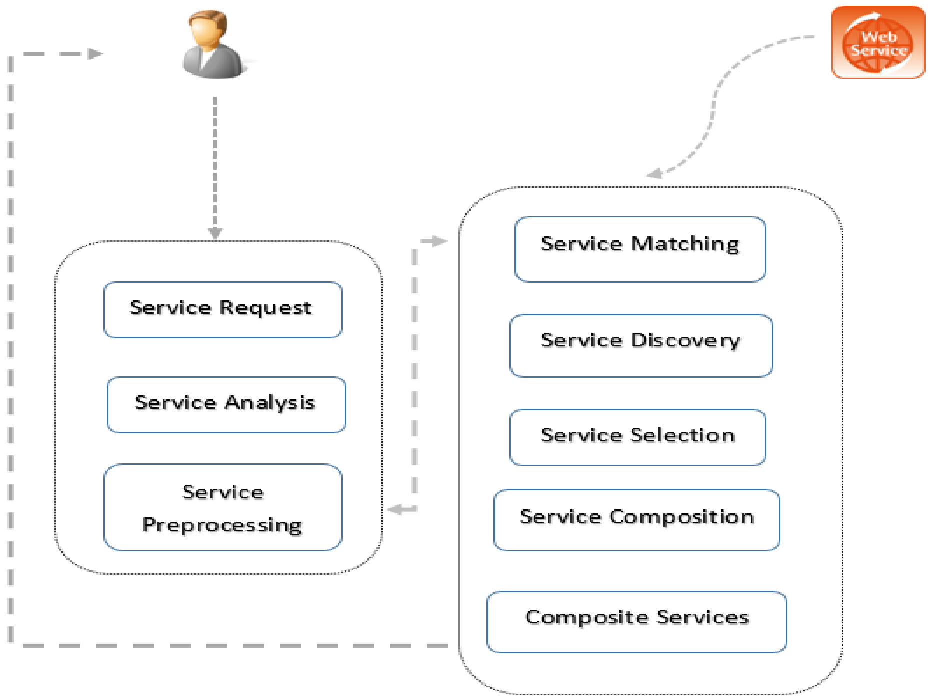

Fig 1: Architecture diagram for semantic web service discovery and composition.

Modules

The proposed system consists of five modules. They are:

- Request Preprocessing
- Service Matching
- Service Discovery
- Service Selection
- Service Composition

Request Pre-processing

- Request Preprocessing rules can modify the path and query portions of requests before they are processed by the platform server's parser.
- Service parameters are requested and fixed in order to define the concrete service which will be carried out.
- This is a "one-to-one" process between service requester and the selected service provider.
- The request has been preprocessed by "Stemming algorithm".[17]

Service Matching

- Web Services should be matched based on the semantic match between a declarative description of the service being sought, and a description of the service being offered.
- The services are matched using "WordNet algorithm".[18]

Service Discovery

- Ability to find partially matching services very fast is paramount in order to enable exploring efficiently the many possible combinations of services that could lead to a suitable composition.
- The best services are discovered using "PSO (Particle Swarm Optimization) algorithm".[19]

Service Selection

- The input to the service selection stage is a set of classes of web services. The candidate web services in one class provide the same functionality, but they may vary according to other aspects such as QoS attributes values.
- QoS attributes (or nonfunctional properties) are the constraints defined over service functionality.
- The services are selected using "AHP (Analytic Hierarchy Processing) algorithm.[20]

Service Composition

- Mapping inputs and outputs to semantic concepts does allow to reason about data types to improve the matchmaking between service parameters, which leads to more possible semantically valid compositions.
- The "AHC (Agglomerative Hierarchical Clustering) algorithm" is used to generate composite services.[21]

Algorithm: *PSO Algorithm ()*
Input: Full and partial matched set of services. *Output: Full matched services.* *GET userrequest* *DEFINE sqlconnection for database* *OPEN the sqlconnection* *DEFINE sqlcommand cmd* *Cmd = SELECT H-.name,H_address from H.Address* *Disease, Doctor from H_data* *Near_Places,address from Nearby_Places FROM* *Hospital_Address INNER JOIN Hospital_Data ON* *Hospital_Address.H_Name = Hospital_Data.H_Name* *DEFINE dataset* *FILL in dataset as H_Data* *DISPLAY the values in datagridview* *CLOSE the sqlconnection*

Algorithm: AHP Algorithm
Input: Full matched services *Output: Only one service which is best* *GET userrequest* *DEFINE sqlconnection for database* *OPEN the sqlconnection* *DEFINE sqlcommand cmd* *Cmd = SELECT Disease from H_Data WHERE service related to user request* *DEFINE dataset* *FILL in dataset as H_Data* *DISPLAY the values in datagridview* *CLOSE the sqlconnection*

RESULTS AND ANALYSIS

Implementation of the designated approach is tested with the hospital dataset given in the table 1, which provides the details for the disease-treatment and hospital services. The web service dataset consists of 63 web services and their descriptions are given by the WSDL files. We have parsed the WSDL file to identify the parameters of the operations in the web services. Parameters of the services are compared with the user's request to form a service composition. Web service compositions are represented as a set of services which are satisfying the user needs. The figure 3 shows the number of services participated in the service composition.

Table 1: Sample Hospital Dataset.

Hospital	**Disease**	**Doctor**
Apollo	Cancer	Bala
Apollo	Malaria	Ajith
Apollo	Diabates	Ramesh
Vijay	Malaria	Vijay
Vijay	Blood Pressure	Kumar
Anbu	Cancer	Rajesh
Sugam	Cancer	Bala
K.S	Malaria	Durga
Sri Ramachandra	Thyroid	Ashwin
K.M.N	Heart Attack	Kamal
M.N.C	Diabates	Lakshmi
K.S	Thyroid	Karthi

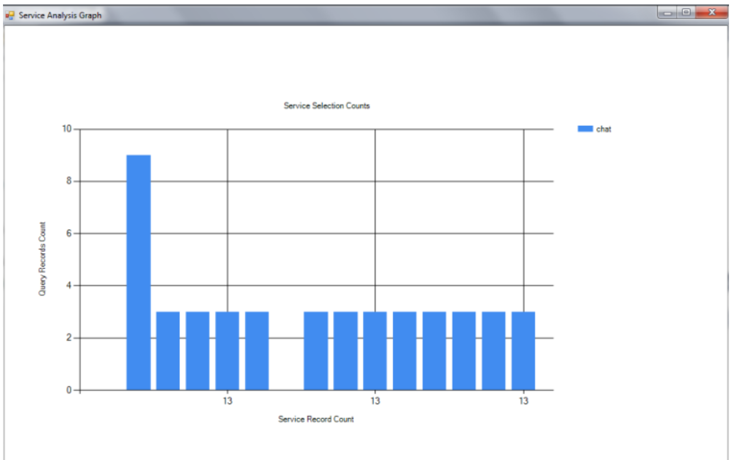

Fig 2: Number of services Versus Query.

CONCLUSION

Semantic web service discovery and composition successfully completed using system analysis, system design, system implementation. The system receives user's request for some service then the request is pre-processed using Stemming Algorithm. The pre-processed words are matched with WSDL words using WordNet Path Algorithm. From matched set of services only full matching services are discovered using PSO (Particle Swarm Optimization) Algorithm and then only one service selected from the discovered using AHP (Analytic Hierarchy Processing) Algorithm. Finally, the selected services are clustered using AHC (Agglomerative Hierarchical Clustering) Algorithm. The graph can be generated for services available versus services returned for particular user request. The experimental result shows that AHC provides good composite set of services.

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