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Design and Implement Semantic Web Services In Decentralized Environment Based on Location Algorithm

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Abstract: The word Semantic web services have received great concentration from industrialists, researchers and academicians because of automatic publishing, execution, composition and discovering web services. Presently web services systems for publishing, discovering, choreography, orchestration, composition and invocation are based on central registries. With the increasing number of web services and due to its dynamicity centralized approach swiftly becomes unrealistic and incompetent. Moreover, existing web services protocols like UDDI and WSDL cannot support semantic description which is necessary for automation of web services function such as execution, discovery and composition. Therefore, we propose a CAN-based P2P novel system that enable efficient semantic web service discovery and publishing in a entirely decentralized network. We also design and implement CAN-based P2P system for replacing existing centralize UDDI system by novel decentralized system of the UDDI. The decentralized system distribute the function of UDDI among each and every one peers in the Peer-2-Peer network technologies. Simultaneously, we propose an ontology based mechanism which guaranty that each semantic web services in the CAN-based P2P system with ontology service would be registered on a particular peer. By replacing the centralized UDDI system with decentralized UDDI, our CAN-based P2P system improves the stability and scalability of the systems and recognizes well-organized ontology-based semantic web services discovery.

Keywords- Location Algorithm, Discovery of web services, Distributor, Localizer

1. INTRODUCTION

The word semantic web services (Zeng ZhiHao & Yu, 2012) have received great concentration from investors, industrialists and researchers because of automatic searching, registering, executing and composing web services. Currently web services have been industrialized with the rapidly growing of e-Business (Li, 2011) starting business to business, business to customer and localization to globalisation. Web services are well-organized system for integration of information and data on Web. Web services have rapidly achieve popularity in distributed application by using standard protocols such as XML(Stefan Böttcher, 2010), UDDI, WSDL and SOAP (Khalil, 2012). Although in web service description of services are stored in UDDI central server repository. Where the web services are described in WSDL documents are syntactically not semantically. Therefore the capability of executing, publishing, discovering and composing web services has created server problem. The semantic web has taken efforts to design a new infrastructure to supplements the contents of existing web with semantics. The semantic contents are prepared appropriate for machine utilization as compared to syntactic content which are suitable for human utilization only. The semantic content facilitates automated agents to make available intelligent reply about web content and unexpected circumstances. The description web services in semantic web content, Artificial Intelligence enrich semantic mark up languages support semantic web services for automatic and executing. The famous enrich semantic mark-up languages are RDF (Rodriguez, 2011), RDFS, OWL and OWL-S(David Martin, 2007). Whereas in traditional system of web services every service has been registered in central server and described in web service description language. As result of weak central servers, such traditional web service systems are very weak in front of malevolent hits. Therefore these systems are not able to effectively and easily sustain to a huge amount of web services. Furthermore, UDDI based traditional system of web services are not fully supporting semantic web services. For that reason new web service system has been proposed. The proposed web service system is a more stable and scalable as match up to conventional web service structures. The new structure of proposed system offers gracefully support to semantic web services.

In this paper a novel system has been introduced for semantic web services registering, searching, executing and composing in decentralized environment based on location algorithm. The rest of paper is organized as follows: In section 2 overview of propose system has been described. In section 3 design and implementation of system has been discussed in detail. Finally section 4 has been furnished with conclusion and future work.

2. MATERIAL AND METHODS

Overview of semantic web services proposed system

The infrastructure of our proposed Content addressable network based Peer to peer system is shown in **(Fig. 1)**. Proposed system has been composed in three

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major components including interpreter, distributor and peer to peer network. Interpreter translates WSDL described web services into OWL-S and distributor is in charge of allocating OWL-S services in all peers according to ontology in the peer to peer network. The peer to peer network system replaces traditional UDDI web services system in Peers. When publisher publish a web service then interpreter would interpret the WSDL documents of web service into OWL-S documents and the distributor extracts the ontology which are available in OWL-S documents and distribute the web service to a particular peer in the peer to peer framework according to ontology. So in our peer to peer proposed system, we use interpreter which interprets WSDL described services into OWL-S and make available enriched semantically description. It is a notable that the procedure of translation is not fully automatic. Some components of the mechanism for interpretation require dealing with humans.

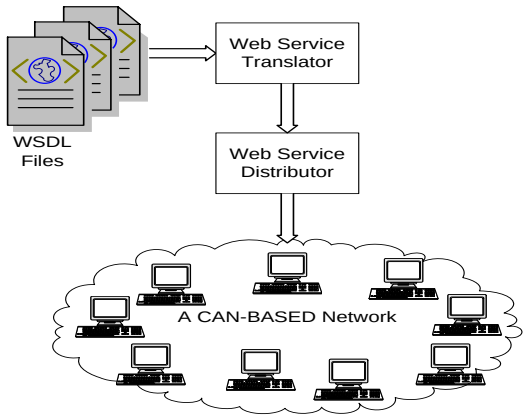


Fig. 1 Proposed infrastructure of semantic web services

Once WSDL web services have been translated in OWL-S then they must be discovered and published for upcoming business process. Usually web services are discovered and published on business registry but our planned system replace business registry with P2P network where every peer works as a small business registry and work together with other peers. In our proposed system third components is a distributor and its major function is mapping web services which are described in OWL-S publish on a particular peer according to ontology which are available in Owl documents. For replacing business registry with peer to peer network suitable protocol has been selected to sort out the P2P infrastructure. It is significant that published web services on P2P infrastructure categorically discovered in a lookup procedure; alternatively such lookup procedure would be over and done quickly and efficiently. Regarding above scenario Content Addressable Network (CAN) protocol has been selected for P2P network architecture because the entire resources are well structured in P2P network (Nizamuddin Channa, 2005) according to their coordinates. All resources would be efficiently and rapidly located if their match up are available.

3. DESIGN AND IMPLEMENTATION

3.1. A. Web Service Translator

The major component of our designed system is translator. Translator lies on first layer and its function interprets WSDL described web services into OWL-S documents.

Ontology services are described in OWL-S which supports complex as well as simple web services. OWL-S make possible to automatically invocate, discover, interoperate, monitor and compose web services. Description of OWL-S has been organized into three abstract areas; they are Service Profile, Process Model and Service groundings. Widespread picture of a web services for discovering and advertising is provided in Service Profiles. Service Profiles give an idea regarding what web service accomplish and provide way for describing web services. How the web services are working is presented in Process model. The process models have IOPE means inputs, outputs, preconditions and effects. The data transformation which is produced by process model has been specified in input and output. For execution of the process required information is represented in inputs and result which received after execution of process is called output. Satisfy and correctly execute web services restrictions are specified in Preconditions. The actual results have been described in effects as a outcome of web services execution. The details of contact or right to use of web services are specified in the services grounding. **(Fig. 2)**

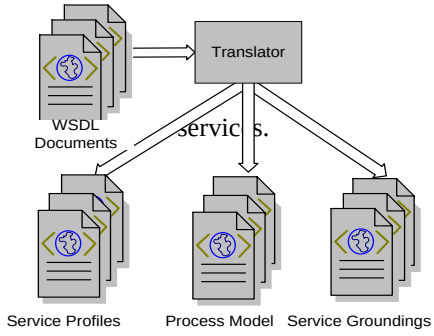


Fig. 2: Translator for semantic web

The complete framework of translator offers automatic or semi-automatic creations of OWL-S starting from the specification of WSDL. The Figure 2 shows that how translator works. The OWL ontologies are created with translator. Theses ontlogies are very significant for automatic composition of semantic web. The result of translator offers the fundamental structure of an OWL-S and save a user from manual work. The

WSDL documents are the main source of translator for generating OWLS documents automatically. The WSDL documents offer only information of input and output whereas together with input and output OWL-S offers information of Preconditions and effects.

3.2. Web Service Distributor

The Distributor of Web Services lies in the second layer of proposed framework which allocate and publish web Services on the Peer to Peer infrastructure. The result of web services translator is a input of web service distributor in three OWL files. From OWL-s files ontologies are extracted and published in the specific location of Peer to Peer network. Finally web service distributor according to that information publishes and registers web service on a particular server. There are three layers of web service distributor such as file Processor, Localizer and Register as shown in **(Fig. 3).**

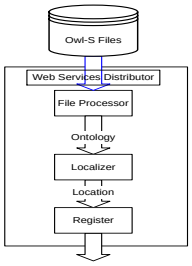


Fig. 3 Distributor for semantic web service registry.

The major function of file processor is a retrieving ontologies from OWL files and send these ontlogies to second layer of web service distributor which is localizer. File processor only extracts the ontology in the region where we are interested. The major function of localizer use location algorithm and according to that work out on location of web services. In this paper research has proposed a location algorithm. The location algorithm has set up a coordinate space with numbers. In this algorithm all the promising ontologies are coded with numbers and coordinate by mapping in this coordinate space with input ontology. For make things easier air line example is given in **(Fig. 4).** In this figure two ontologies, Service ontology of Air Line and Domain ontology of Air Line are given.

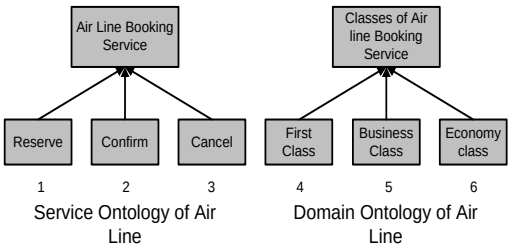


Fig. 4. Service and Domain ontology for Air Line

In service ontology of air line three web services are provided such as reserve, confirm and cancel. Domain ontology of air line is composed of first class, business class and economy class of web services. Location algorithm creates coordinate space and gives discrete numbers to all of given ontologies. Where 6 bits coordinates are long of those ontologies. Therefore "reserve a first class air ticket" the operation will be compared to the coordinate of "100100". Similarly the process of confirm the economy class air ticket operation will be compared to the coordinate of "010001" and cancel the business class air ticket operation will be mapped to the coordinate of "001010". For discovering and publishing web services various locations would be generated by various location algorithms. However in this system distributor is designed in such a way that when applying a various location algorithm then there is no need to modify whole distributor but only modifies the localizer.

The Register publishes web services on particular server with the help of location algorithm by localizer. The CAN based peer to peer system and register is nearly linked with each other. To identify web services IOPE has been used; it means the system is only concerned with the ontology in IOPE (input, output, preconditions and effect) vicinities. In figure 4 domain ontology of airline and service ontology of air line has been used for recognizing mapping from coordinates to ontology. In above example suppose that web services input area includes the action of "reserve first class air ticket". However web service's preconditioned area includes the action of "confirm business class air ticket" and effect area of web service includes the action of "cancel the first class air ticket". In **(Fig. 5)** three dimension space of has been build based on the regions of concern (IOPE). According to the above mentioned location algorithm system easily and efficiently finds the web service coordinates such as (101000, 100010, 010100). Subsequently finding those coordinates it is easy to registered web services on particular peer. In fact multi dimension spaces could be established according to the user's motivations because the regions that cared by users are far more than input, output, preconditions and effects.

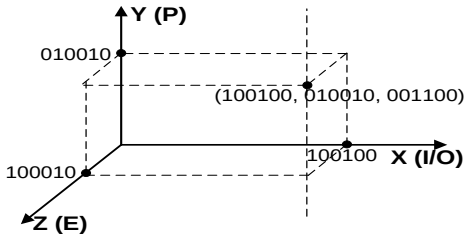


Fig. 5. Multi-dimension Space for registering and discovering

Discovery and composition of web services could be easily recognized, when all web services

would be arranged according the architecture of proposed system. For identifying web services IOPE areas are used as mentioned in above example. Asking for web services IOPE areas information must be provided. The coordinates of the requested services straightforwardly organized with the support of systems distributor. On the basis of those coordinates system automatically discover correct server where requested web services are available. Furthermore system help in indistinguishable lookup process of web services. For instance, only Input, Output and Effect areas information could be provided by client. The coordinates of dimension X and Z of requested web services are achieved by the dealing out distributor, X and Z coordinated have create vertical line as shown in Figure 5. From above scenario it is very much clear that web services which are demanded must be available on one of the servers. Whereas servers vertical line can covers particular space. Therefore as outcome system does not transmit request of web service to all servers but simply transmit the web service request to those particular server. In such a way system reduce time and lookup area greatly.

3.3. Web Service Registration

In order to arrange effectively infrastructure of peer to peer, CAN protocol has been used. Where in whole system every peer is a incharge of range of specific space which has been describe in multi dimension. Location algorithm would register all web service on the specific web server. Web Server register only those web service which covers the location of web service. The example of registering web services on specific peers based on peer to peer infrastructure is shown in **(Fig. 6)**.

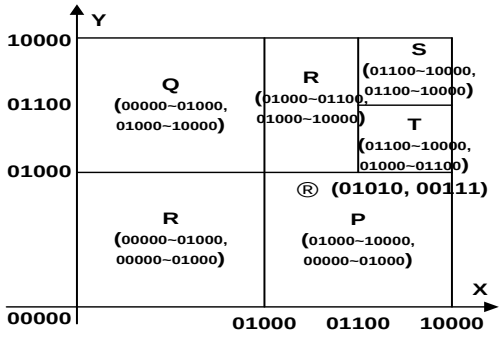


Fig. 6. Web Service Register Process

The incharge of a particular area of space are peers named P, Q, R, S, T, U. The available Web Services marked with "®" registered sign which are located in (01010,00111), would be registered on the "P" peer. Similarly the published web services which are available in (00000~01000, would be registered in "Q" Peer, etc…

4. CONCLUSION

In this paper new system for publication and discovery of semantic web services in a decentralized environment has been proposed. Objective of proposed system is providing effective and efficient semantic enabled web service publishing and discovery mechanism. The mechanism of publication semantic web services is based on location algorithm and ontologies which contain description of semantic web services. Proposed system has replaced the traditional web service system which has been based on UDDI with Peer to peer system. In Peer to peer system has no central server. Therefore proposed system has keep away from single node failure problem which improves the scalability and stability of semantic web services in whole system. The location algorithm has not only has focus on single or fewer servers but distribute web service among all peers. The novel location algorithm semantic web service includes web service discovery, publication, invocation, execution and composition.

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