Empower Service Directories

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ABSTRACT
Web Service Technology (WST) is a Service Oriented Architecture (SOA) implementation framework that has attracted much attention. With the help of WST, user finds the required service in the service directories. Current service directories, such as Universal Discovery Description & Integration (UDDI), store service descriptions without any processing and knowledge management. They act as simple stateless search machines and do not use previous matching information to enhance future search. This motivates the need to create the Empower Service Directories (ESD). These directories are augmented with knowledge about web services that is encoded by a Semantic Interlinked Graph (SIG) of WST entities. In the proposed system, the services and their operations are the core entities of SIG and are interlinked using some defined semantic relations. In addition an ontology language is used to formally express knowledge in service directories. Using the SPARQL web services are extracted from the ESD. The major advantage of using the empower service directories service is its supports for highly complex queries which can be processed less time.

Keywords
Web service, Service directory, Service publishing, Semantic relationship.

1. INTRODUCTION
The Semantic Web is an extension of the World Wide Web in which information is given well-defined meaning, better enabling computers. It provides a standardized way of expressing the relationships between the web pages, to allow machines to understand the meaning of hyperlinked information. The semantic web is based an artificial intelligence and knowledge representation theories. It develops language standards, such as RDF, OWL and rule-based languages which focus on machine readable semantics (knowledge). It is a source to retrieve information from the web and access the data through semantic web agents or semantic web service. It is based on the Resource Description Framework (RDF), which integrates a variety of applications using XML[4] for syntax and URIs for naming.

Ontology is an explicit specification of a conceptualization. A common ontology defines the vocabulary with which queries and assertions are exchanged among agents. Ontological commitments are agreements which use the shared vocabulary in a coherent and consistent manner. The concept of an ontology is necessary to capture the expressive power that is needed for modeling and reasoning with knowledge. Generally ontology determines the extension of terms and provide the relationship between them. An ontology is simply published, more or less agreed, conceptualization of an area of the content. The aim of semantic web is to allow much more advanced knowledge management system in which,

- Information will be ordered according to its meaning.
- Automated tools support maintenance by checking for in consistencies and extracting new knowledge.
- Keyword-based search will be changed by query [2] answering.

Web services has emerged as a promising technology that offers a standard way to access and integrate functionalities. They are loosely coupled software components published, located and invoked across the web. It is an XML based set of standards to integrate software application systems using internet technology. Web services are independent of specific programming languages or operating systems. One of the main ideas behind web services is that applications of the future will be assembled from a collection of network-enabled services. As long as equivalent services are able to advertise themselves to the network in a standard and neutral way.

2. RELATED WORKS
Macro Luca Sbodioa et al.,[9] proposed, service discovery the identification of services that are capable of accomplishing a given objective is a central problem in Semantic Web Services(SWS) research. SPARQL query language can be used to express the preconditions and post conditions of services, as well as the goals of agents. It showed that SPARQL query evaluation can be used to check the truth of a precondition in a given context, construct the post- condition that will result from the execution of a service those results will satisfy the goal of an agent. Using these SPARQL queries, it allows a natural, flexible and expressive formulation of conditions and goals. In addition, since SPARQL is designed to be an integral part of the semantic web technology family, its use with RDF and OWL is already well understood and supported by many tools and environments, and its usage is in keeping with OWL-S's objective to remain firmly situated in the word of semantic web standards.

Cardosa.J et al.,[3] presented, Service-Oriented Architectures (SOA) and web services have mainly served as technological solutions that enable enterprise functionality to be made available to users as shared and re-usable services on a network. Service-Oriented Architecture (SOA) and web services leverage the technical value of solutions in the areas of distributed systems. The evolution of internet marketplaces for business services is driving the need to report the services to the business and operational facts.While, SOA and web services attached in an IT layer, organizations having internet marketplaces are requiring advertising and trading business services which reside in a business layer. It presents USDL (Unified Service Description Language), a specification language to relate services from a business, operational and technical facts. USDL is a major role in the internet of services to provide tradable services which are advertised in electronic marketplaces.

M.Klusch et al.,[8] used, Service discovery is the process of locating existing web services based on the description of their functional and non-functional semantics discovery scenarios typically occur when one is trying to reuse an existing piece of functionality (represented as a web service) in building new or enhanced business processes. A semantic web service is a web service which functionality is described by use of logic-based semantic annotation over a well-defined ontology. The OWLS-MX matchmaker selects OWL-S 1.1 services that are similar to a given service request by means of logic-based matching complemented with syntactic similarity measurement. It summarized the results of the retrieval performance of OWLS-MX in terms of its false positives and false negatives using the service retrieval test collection OWLS-TC 2.1..To implement a matchmaker OWLS-MX2 with improved precision in average. Semantic service matching is the pair wise comparison of an advertised service with a desired service (query) to determine the degree of their semantic match. This process can be non-logic-based, logic-based or inter crossed depending on the, nature of reasoning means used by the matchmaker to compute partially or totally ordered matching degrees between given pairs of representations of service semantics. Subsequent ranking of services determines the order of their individual degrees of semantic matching with a given query.

The UDDI Version 3.0.2[13] specification describes the web services, and behaviours of all instances of a UDDI registry. Several attempts have been made to empower service directories by proposing new service description languages or enhancing matching operations. Web services are meaningful only if potential users may find information sufficient to permit its execution. The aim of Universal Description Discovery & Integration (UDDI) is the definition of a set of services supporting the description and discovery the web services and make them in to available, and the technical interfaces which may be used to access those services. It is based on a common set of industry measures, including HTTP, XML, XML Schema, and SOAP, UDDI supply an interoperable, basic infrastructure for a web services-based software environment for both publicly available services and services only exposed internally within an organization.

T.Pilioura et al.,[14] presented, the challenge of issuing and finding web services has recently received lots of attention. Various solutions to this problem has been submiting which, apart from their offered advantages, it overcome the following disadvantages: (i) most of them are syntactic-based, guiding to poor precision and recall, (ii) they are not suitable to large numbers of services, and (iii) they are incompatible. The design of PYRAMID-S which addresses these disadvantages by providing a scalable framework for unified publication and discovery of semantically enhanced services over heterogeneous registries. PYRAMID-S used a hybrid peer-to-peer topology to create the web service registries based on domains.

3. PROPOSED SYSTEM

The proposed Empower Service Directory (ESD) consists of the following set of processes.

- Design and implementation of the directory for matching offers.
- Implementation mechanisms for the ESD, web services are published by interlinked based on the semantic relationships. These semantic relationships are used to create a graph. SIG increases the knowledge of the web service, easy to express, to response more quickly to the user queries.
- Using ontology language the formal specification is given to the semantic relationship web services.
- Getting of the required information from the ESD, using SPARQL language.

The overall workflow of the ESD is illustrated in Fig.no5.1. The ESD contains a description of registered services in the network. The components of the ESD are Ontologies, Monitoring Process, Inference Engine, SPARQL Endpoint and the service descriptions DB. Web services are registered directly to the ESD ontology, which provides the conceptualizations of services, orders and resources. The retrieval of services and resources is performed by submitting queries from the user.

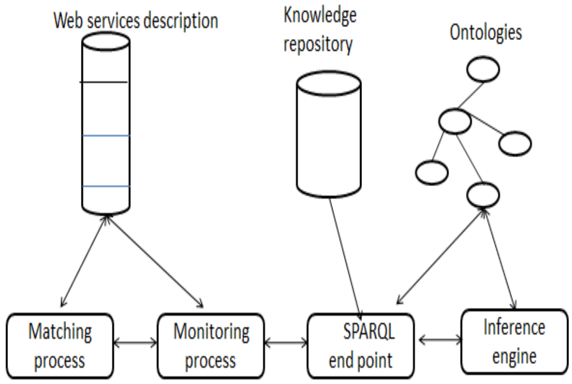

Fig 3.1: Empower service directory structure

- **Inference engine:** It discover and register new relationships by using the properties of semantic relationships.
- **Monitoring process:** It provides service monitoring. In the case of changing a situation in the service directory, the changes are reflected in a knowledge repository, with the change effected by this component. When a service is added ,this process informs the inference engine, and also ESD can check the status of providers and services in the case of the unavailability of either, can extract them using the set of X semantic relationships and prevent them from appearing in the search results.
- **Ontology:** It is used to implement the SIG.
- **SPARQL endpoint**: This process answers the query on RDF data that are stored. The queries are submitted by the inference engine, monitoring process and recommender system.
- **Knowledge repository:** All the information about the system is stored and described by the OWL-SD language by using RDF triples, and is stored in this repository.
- **Matching process:** It provides a service matching utility. The ESD can be queried by users that need to web services, resources an etc.. with the aim of satisfying their requirements. To augment service directories with knowledge, an interlinked graph of WST entities is constructed in the service directories. In this graph, entities are connected by means of semantic relationships that may exist between them. Service directories record their findings and knowledge about web services by establishing semantic relationships between them.

Advantages:

- The ESD architecture does not impose any specific requirements upon the overall ESD infrastructure, being minimal in the set of tools and architectural components that it uses.
- Empower service directories to offer low-cost and powerful operations.

- A new method for web service knowledge management is presented to find the similar services in response with less time.
- Empower service directories such as service versioning and registering composition plans can be resolved.

4. IMPLEMENTATION

ESD is implemented using ASP.NET enterprise technologies.
In addition it provides services and operations.
The ESD consists of four modules as follows,
1. Semantic relationships between WST web services
2. OWL model for the web services
3. Knowledge extraction using SPARQL
4. Empowered service directory

All the above mechanisms are used by the user to offer or the request of the resources. Resource retrieval in this context extends the notion of resource matchmaking to the process of discovering the resources, each with its own auction mechanism, which resources that match the requests of users and the offers of the providers.

4.1 Semantic relationship between the web services

In this modules, web services are published by interlinking them based on their semantic relationships, they are joined to a graph of WST entities by constructing some semantic links. The term SIG will be used to refer to this semantic interlinked graph. This SIG increases the knowledge in the web service network and makes it easier to express, infer and query. In WST, there are four individual entities involved in providing and publishing the service. The entities are web service, service provider, machine on which the web service is hosted in the service directory. Furthermore, each web service provides one or more operation.
Entities considered are,

- **Provide:** provider provides the service.
- **Deploy:** service is deployed on the machine.
- **Host:** machine hosts the services of provider .
- **Present:** service presents the operation.

Semantic relationships are at the service and operation levels. At first, the semantic relationship of web services are defined. These semantic relationships are extracted by investigating the published web services incurrent directories and related works between web services. The reversal of each relationship is also used to create the semantic relationship.

- **is Similar To:** two services can be used interchangeably.
- **is New Version Of:** a service published is a new version of an existing service.
- **is Richer Than:** a service provides richer functionality than another service.
- **is Composed Of:** interlinks a composite plan with a service contributing to the plan.

With the help of this the semantic relation are created between the different web services.

4.2 Owl model for web services

Ontology language is used to express knowledge in service directories. An ontology is a set of concepts and the relationships between them for a specific scope. One of the advantages of ontologies are the formal definition of concepts and the specification of constraints in the system. Thus, the ESD structure, the entities, semantic relationships and their constraints, properties, and cardinalities can be expressed using ontology. Based on the entities and semantic relationships, the ontology language of the system is created. This ontology language is machine-understandable and is more capable of expressing semantics than current ontology language. This ontology is called as OWL-SD(Service Directory). It is used to represents knowledge, that is independent of service description language.

4.3 Knowledge extraction using SPARQL

The extraction of required information by matching algorithms is very time consuming. Current service directories are unable to answer semantic and high-level queries. In the ESD the SIGs are expressed and serialized in the RDF language. To query the RDF triples, the SPARQL protocol and language can be used. SPARQL is able to hide the implementation details and generates an overall view regarding the current structures. The simple and descriptive use of SPARQL for retrieving web services based on high-level queries.

4.4 Empower service directory

The proposed a structure for web service directories based on previous concepts. ESD contains a description of registered services in the network. The components of ESD are Ontologies, Monitoring Process, Inference Engine, SPARQL Endpoint and service descriptions DB.

4.5 Performance of the ESD

4.5.1 Find required operation

Upon receiving a consumer query, the ESD machine searches in its data base and attempts to find a best possible operation and send it to the consumer. ESD machines use the SIG to accelerate the search process. To answer a consumer query, there is no need to match the query with all of the other registered operations. By using the SIG, this task can be performed with a lower cost.

4.5.2 Get composition plans

A composition plan is chains of web services that consume the user input and produce the desired output of a consumer query. Thus, the consumer requests a composition plan by sending a query, which specifies the input parameters and desired output parameters of a composition plan.

4.5.3 Get similar operations

In a case of a web service operation failure during execution, ESD can find suitable similar operations for replacement.

4.5.4 Find Top N operations

Consumers may want to retrieve a set of related operations and select among them because matching algorithms only match functional requirements. Consumers may have some preferences such as the cost, availability, and any other preference.

5. RESULTS AND DISCUSSION

The ESD web service is evaluated to measure the performance of matchmaking component of the ESD. Each measurement is taken after submitting a single query to the ESD. Using the ESD the users get the required web services in less time and low cost. Similar queries are given to both of the directories. The time to get the services is calculated. The web service operation discovery in ESD and UDDI are compared based on time and the values are tabulated in table 5.1.The graphical representation in shown in Fig:5.2.

Table 5.1 Result table

Query	ESD(in sec..)	UDDI(in sec..)
Economy	0.03	0.20
Education	0.04	0.20
Food	0.04	0.20
Medical	0.02	0.18
Weather	0.03	0.21

Average time for the ESD response time is 0.032 seconds and the UDDI average response time is 0.198 seconds. compare to this response time ESD will find the results in very less time.

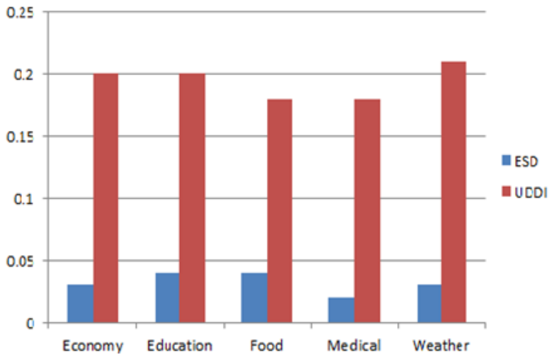

Fig 5.2: Comparison time between sthe ESD & UDDI

From the graph, it is observed that the ESD method give services in much less time than UDDI method.

6. CONCLUSION AND FUTURE WORK

The ESD can be used not only to identify appropriate services for the consumers, it can also be used in several situations such as service composition, finding a suitable replacement for an operation in the case of failure, composing a new operation in the case of the non-existence of a similar one, and returning the similar operation to the consumers. The effect of the structure on minimizing the discovery process and on the other operations. The proposed method is scalable in nature. Service directories are therefore required to share their proxy sets.

The proposed system can be future extended to perform,

- Self discovery of semantic relationships.
- Enhancing the ontology language to store more knowledge about QoS and context-aware information.
- Acceleration of service directories by replicating and distributing SIG in a new network of ESD machines.

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