A Novel Technique for Access Control in Web Services using Ontologies

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ABSTRACT

Ontologies are very common and useful topic in many communities. In reality, ontology is a main module of this research; therefore, structure, the definition and the main operations and applications of ontology are provided. Ontology is used to represent Knowledge of any domain as a set of concepts and the relationships between those concepts. An upper ontology describes very broad concepts that are the same in every part of knowledge domains. One of the most important functions of an upper ontology is to maintain extensive Semantic Interoperability among huge number of Ontologies. In this paper we have worked on ontology for the hospital management by faculty members like doctor and lab attendant etc. Each doctor has a specialization in a disease and is linked to a patient. Privacy policies are used to maintain this work which are made in Semantic Wed Rule Language (swrl). SWRL enables the well-formed information to be semantically searchable on the web environment.

Keywords*: ontology, domain, semantic, swrl, privacy policy.*

I. INTRODUCTION

The Semantic Web is an idea of World Wide Web Consortium (W3C). The Semantic Web provides a common framework which gives permission for data to be shared and reused by enterprise, group of boundaries and application [1].

The W3C explains the main objectives of the Semantic Web as follows: "The Semantic Web is a Web of Data. The idea of the Semantic Web is to broaden the principles of the Web from credentials to data. Data should be accessible by using the common Web architecture e.g., URIs; data should be associated to one another just as documents (or particular parts of documents) are already. This also means making of a general framework that permits data to be shared and reused among applications, enterprises, and community boundaries, to be processed automatically by methods as well as manually without any tool or methods, including revealing possible new relationships between pieces of data. In order to complete these goals, it is required to define and explain the relations among data on the Web. This is not as like the usage of hyperlinks that connect the current page with other pages: the hyperlinks define a connection between the current page and the target. On the Semantic Web, these type of relationships can be established among any two named resources or values and the relationship itself (i.e, the link) is also named. On the other side, a link on the usual Web is not named, which means that the importance or meaning of that link needs to be deduced by the human reader. The naming and defining those relations clearly enables better and automatic interchange of data. RDF, which is one of the essential building block of the Semantic Web, gives a proper definition for that interchange."[2]

In the Semantic Web, difficult and developing concepts, resources and relationships could have a deep effect on how we access data and use data [3]. A lot efforts have been made to accomplish the visualization of Semantic Web i.e. machine-readability. Some of the industries are broken up from a "wait-and-see" approach [4] to the real-world operation of applications which will give them a competitive advantage[5].

II. ONTOLOGY

An Ontology is a proper description of important concepts in a specific domain [6]. An ontology is a representation of concepts in a domain, uniqueness of concepts can be described by the properties of concepts. properties are also known as roles and Concepts are also known as classes[7]. An ontology describes a familiar vocabulary for information sharing in a domain. It includes machine-interpretable definitions of essential concepts in the domain and relations between concepts. An ontology provides a way to share a common understanding of the construction of information between software agents as well as among people. An ontology is an approach of separating operational knowledge from domain knowledge [8,9].

Upper Ontology Upper ontologies are rapidly becoming a key technology for integrating mixed knowledge coming from various resources. Actually, these ontologies may be used by various parties concerned in a knowledge integration and exchange procedure as a reference, a general model of the reality. Upper ontology is also known as top level ontology. The

explanation of upper ontology, (also named as foundation ontology) given by Wikipedia [10] is "an technique used to make an ontology which explains very common concepts that are the similar across all domains. The aim is to have a large number of ontologies which are easily accessible under this type of ontology"[11]. There are two types of benefits by using these formal upper ontologies. First, they present a rich vocabulary for describing the systems we are making and working with, so they can support the developer in their design and to understand them. Second, they outline the basis of a suite of conceptual data types which can be provided as libraries to the developers of agents. They will automatically inter control with the systems and each other [12]. The possible advantages of ontology for the reason of information management are understandable. Each group of data analysts would need to carry out the task of making its terms and concepts well-suited with those of other groups only once – by calibrating its outcomes in the terms of the particular canonical backbone language. If each database was standardized in terms of just one general ontology (single, a single consistent and highly expressive set of category labels), then the prospect would happened to leveraging the thousands of person-years of effort that have been devoted in creating separate database resources in such a way as to create, in less or more automatic fashion, a single integrated knowledge base of a scale up till now unimagined, thus fulfilling an earliest philosophical vision of a Great Encyclopaedia comprehending all knowledge within a single system. The problems standing in the way of the building of a single shared ontology in the sense explained are unfortunately unusual. Consider the task of building a common ontology of world history.

This would need a neutral, universal and general framework for all descriptions of historical essentials, which would need in turn that all political systems and all legal, rights, beliefs, powers, and so forth, be comprehended within a single, perspicuous list of categories.

The top-level ontology would next to be designed to provide as common neutral backbone, which would be incremented by the job of ontologists working in more specific domains on, for example, ontologies of medicine or geographically, or ecology, or law, still more specifically, ontologies of constructed environments[13], or of surgical deeds[14,15].

III. PROTEGE

Protégé is an open source ontology editor java based free and knowledge base framework. It is an scalable and provides a plug and play environment which make it more stretchable for prototyping and application development. In the Protégé platform ontology can be modelled by two ways - Protege-OWL editors and the Protege-Frames. The ontology which is developed in Protege can be saved in a range of formats including eXtensible Markup Language Schema (XMLS), Web Ontology Language (OWL) and Resource Description Framework Schema (RDFS) [19]. These formats make it more useful. As per survey done by Jorge Cardoso, To make an ontology, Protégé as Ontology development tool is used by more than 75% developers[20]. One more survey is done by M. Rahamatullah Khondoker, Paul Mueller, they asked a question to the Ontology developers that "Which tool you used to develop an Ontology mostly?" They permitted only single response for this question and then Protégé as Ontology Development tool is used by 24 out of 32 Ontology developers. By using this online survey, we also decided to use Protégé as Ontology development tool for the improvement of ontology for published articles on Web.

IV. PROTOTYPE MODEL AND SOLUTION

The problem of searching for publication details by machines was undertaken. We have developed a prototype which includes two entities:

Faculty: doctor, lab attendant, lab, patient

Resources: disease, report

In **Metadata for each Article**: (Using Dublin Core metadata) Creator, date, description, publisher, title In the **Faculty** class, information regarding the faculty members is stored. In the **Doctor** class, information regarding patient and disease is added. The main details of the Articles are stored using Dublin Core metadata in the annotations. These annotations are machine-readable metadata. A faculty can publish one or more articles. If all the information is available in Article class while searching the current search engines would display the results which may include additional results with partial keywords matches. With our prototype, we are associating metadata or semantics using Dublin Core which contains additional information (metadata) about the Doctor and patient. The advantage is that in addition to the normal searching by humans, even an automated application can search for information without human help since semantics is associated with the information. In the following query, we are using two concepts. The first is using an inverse relationship and secondly, we are using metadata through this relationship.

V. SIMULATION RESULTS

Following is the screen shot of the implemented system which shows list of entities under subject section and two relationships between entities under association section. It also shows ten individuals of entities as well as relationships.

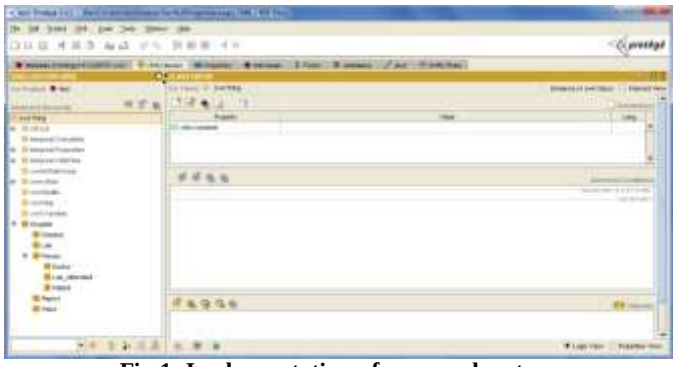

Fig 1: Implementation of proposed system

Fig 1 is the representation of the proposed systemusing create of classes and to update data in those classes.

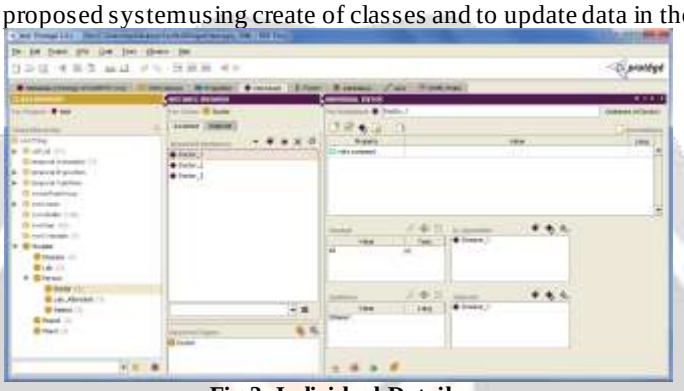

Fig 2: Individual Details

Fig 2 is the representation of the data storage and the relationship of various classes and attributes among those classes.

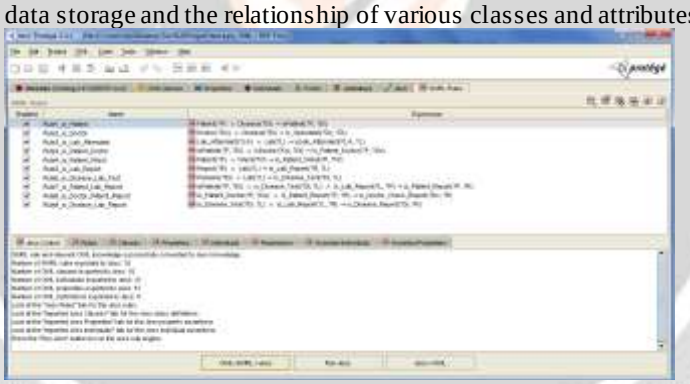

Fig 3: SWRL Rules and Jess tab for reasoning

Fig 3 is the representation of SWRL rules and jess tab for proposed ontology.

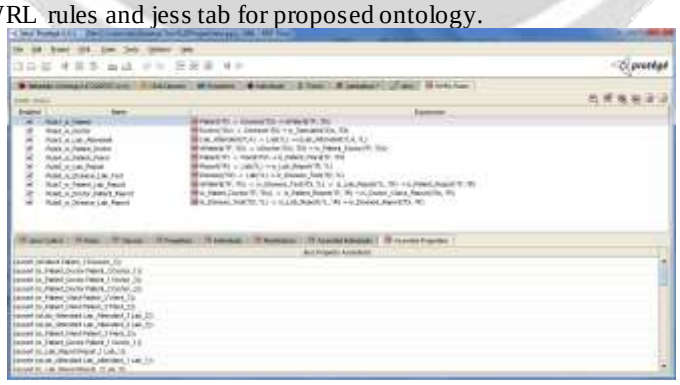

Fig 4: Jess Assert Tab

Fig 4 is jess assert tab in which the validation process is defined. In this tab the data in individual data is presented according to the data feeded in individual.

VI. CONCLUSION

The sample ontology which we developed was tested by executing semantic queries against it. All the nodes as well as each instance metadata could be searched through the SPARQL query. This is sufficient to prove that the ontology is semantically searchable. If such ontology is available on the Semantic Web, then a semantic search engine would be able to search for it. The main advantages are reusability and semantically searchable. In the era of Semantic Web, the ontologies have become a powerful tool for knowledge sharing and it also supports the semantic interoperability among heterogeneous distributed systems. Ontologies and agent technologies are essential part of the semantic web, and their combined use will make possible the sharing of heterogeneous, autonomous knowledge sources in a capable, extensible and adaptable manner. In the multi-agent system, Ontology is used to assist the interactions among different agents and improve the quality of the service provided by each agent.

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