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A Novel Technique for Privacy Aware Access Control in Web Services

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Abstract— With the growth of internet, Access control is very necessary to provide the security to a user. There are various fields in which access control is very common. Web service is one of them. Access control can make the web more secure. To provide access control, there are numerous ways. In this work, privacy policies are used to provide the access control. ontologies and Semantic Web Rule Language in protégé are used to implement this work. The ontologies are used to apply preferences on user's requirements. Rules are used to help the user to provide policies for privacy. A scenario of Hospital is taken in which an ontology is created to make hospital data. To implement this scenario, an ontology is created. Ontology contains various classes. Our proposed system provided promising access to make the data private from outside resources. Ontology is a part of Semantic web. It uses Semantic Web Rule Language (SWRL) to preserve the privacy by making the policies (rules). In this technique, JESStab (Java Expert System Shell) is used as a reasoned. There are various figures are shown in implementation and results and discussion chapter to show the progress of our work like (i) Number of Policies vs Execution Time, (ii)Execution time of Traditional System vs Proposed Technique. The first graph will be a linear graph. The second graph will show that it takes more time in proposed system as compared to Traditional system.

Keywords: ontology,jess, semantic, swrl, privacy policy.

I. INTRODUCTION

In today's world Web service is very common term which is based on XML. It is a part of software application whose binding and integration can be defined specified, represented and identified as XML artifacts. It supports direct communication using XML based messages exchanged via Internet Based Protocols with other software agents. It uses the internet for direct interaction between applications. It uses protocols to exchange data between different systems and applications. Web services can be used on computer networks to exchange data between applications which are written in various programming languages and running on various platforms. Web services are applications which use protocols like WSDL (Web Services Description Language) for interface description, SOAP (Simple Object Access Protocol) for message exchange, and UDDI (Universal Description, Discovery, and Integration) for service discovery and communication across different security domains in a distributed environment. There are various security issues in web services like privacy, security, access control, lack of structure, storage issue and integrity. These issues are much similar to issues of databases. This thesis work is done on privacy, security and access control issues[1].

II. RELATED WORK

Ontologies offers the access control in new way. OWL (Ontology Web Language) is the first language to make use of ontologies. There are numerous rsearchers who worked in ontologies. [12] have introduced an access control system for web services. They presented the semantic policy language (SPL) for the representation of access control criteria based on attribute certificate's use. [14] The authors have motivated the design of an access control scheme that addresses the issues of access control and proposed an extended trust enhanced version of our XML based role based access control (XRBAC) framework that incorporates context based Access control. [15] The authors gave the basic concepts for securing web services and the requirements for implementing secure web services. The authors describe the design and implementation of web service architecture for enforcing access control policies, the overall rationale and some specific choices of design are discussed. [20] The authors discussed some problems in knowledge by using ontology. They discussed knowledge mining in cloud computing. They defined knowledge mining as merging databases together statistics and any other linked area to get important facts and information, major quantity of data. [25] The authors have proposed a novel approach to policy based provenance pruning - leverage the confinement properties provided by Mandatory Access Control (MAC) systems in order to identify sub domains of system activity for which to collect provenance.

III. PROTEGE AND ONTOLOGIES

Protégé is most common tool for ontologies. The protégé tools are applied for development in disciplines for better perceptive of knowledge. This tool uses four ways of ontology visualization namely zoomable, indented list, node link

and tree and focus+context. It is freely available tool which is used to build ontology for intelligent systems. It is supported by government, corporate users and a strong society of students. Protégé is developed by Stanford University. Stanford is a center for biomedical informatics research. By opening Protégé tool, it shows two windows one is to make ontologies and another is protégé.exe which shows times to open ontologies, to process any class and for execution in ms(miliseconds). Ontologies of protégé is fitting more and more popular schemas for applications and knowledge management services. Protégé gives a perceptive editor for ontologies and has extensions for modeling tasks. There are a number of formats of a protégé file like OWL, RDF(s) and XML schema by using which exportation of an ontology is possible[34].

Ontology in Protégé

Ontology is a strict clear explanation of a domain, including classes, which are the concept found in domain. Classes in ontology are ordered in hierarchy i.e. generalization or specialization hierarchy by using "is a" links. Each class can have any number of parent classes. Each class has properties which describes the feature of various modeled classes. Restrictions can also be defined on these properties. Properties are also known as attributes. A class can have multiple instances. Each instance has an actual value for each attribute of class[34].

Some Plugins in Protege Tool: There are various plugins in Protege tool. Some are preinstalled and some need an installation. These Plugins are explained as follows:

- **OWL Classes** It shows the name of classes and sub classes. In this tab, a new class or a subclass can be created and an existing class can be deleted.
- **Properties** it consists of four tabs: Objects, Data type, Annotation and all. Each property has their domain and range. These four tabs show properties of data, object, annotation and all combined properties in fourth tab.
- **Individuals** It shows a list of instances which are already created. New instances can be created in this tab. This tab shows selected instance's data types. Data can be entered in this tab.
- **Forms** It divides the window in two halves. One is Form Browser and another is Form Editor.

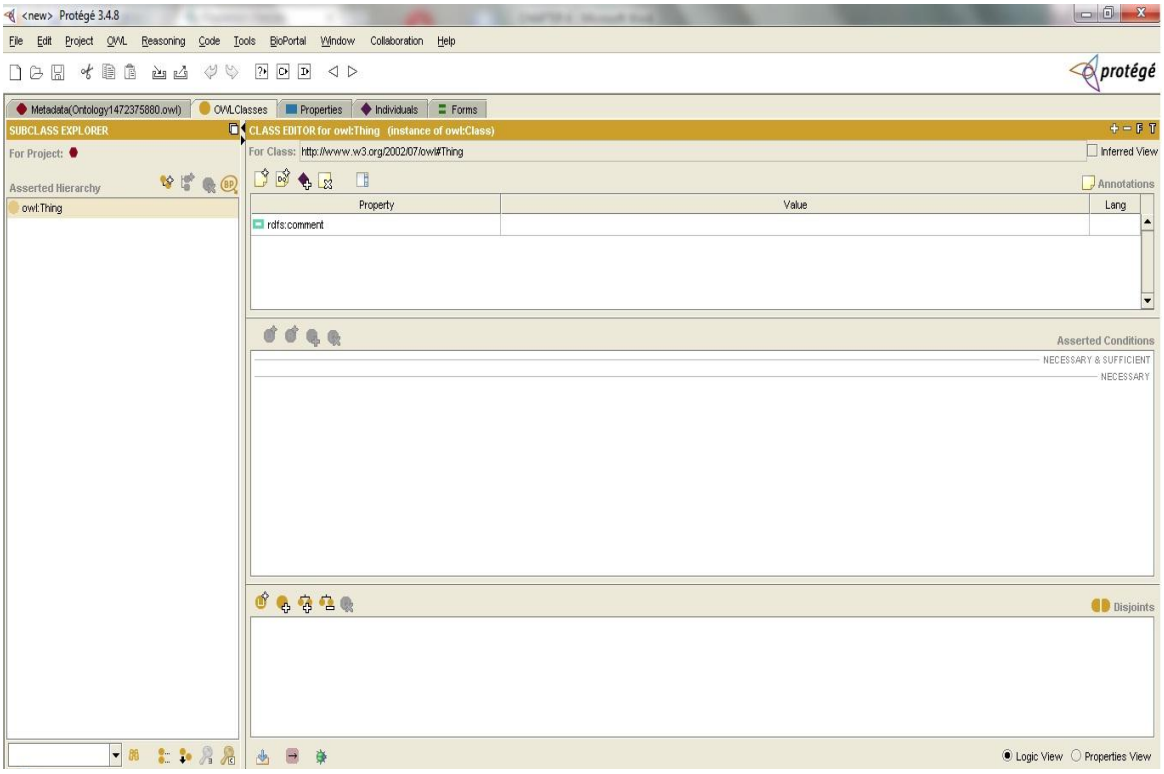

Fig. Snapshot of Protege Tool

- **JessTab –** It shows a Jess console window to cooperate with Jess at the time of execution of running. It is used to do reasoning of rules and ontology. This plug-in is not freely available.
- **SWRL –** It allows a user to make user defined rules. These rules are used to provide access to the selective data. It can work with Jess tab.
- **Jambalya –** A plug in used to show ontology from various aspects like nested view, nested tree map, class and individual tree, class tree and domain range[36].

IV. IMPLEMENTATION

Implementation of this work is described in the following steps:

Create classes in Protégé: First step to implement the proposed work is to make an ontology in protégé. The first class is Hospital which is parent class for all other classes. Under hospital, some sub classes are created like Disease, Lab, Person, Report and Ward. Person class further contains three subclasses Patient, Doctor and Lab Attendent.

Create properties in Tool: some properties are created according to the classes. There are two types of properties. One is Object Properties and another is Data type properties. Each property has their domain and range.

Create individuals and Add Data: in this window, it shows class Hierarchy. Select a class for which an instance is required. In the given figure 5.3, Disease Class is selected to create instances.

Make Rules in SWRL: SWRL is a semantic Web Rule Language. Various rules are created under this language.

Reasoning With Jess Tab: By clicking on the J button at the top right corner, JESS is turned on. Jess is used to run Owl ontologoies and SWRL rule.

V. RESULTS AND CONCLUSION

We have observed the performance of the proposed technique and our main discovery is that the time taken for decision of privacy policy policy access control is satisfactory.

Our first result is taken as the comparison of number of policies and Execution time.

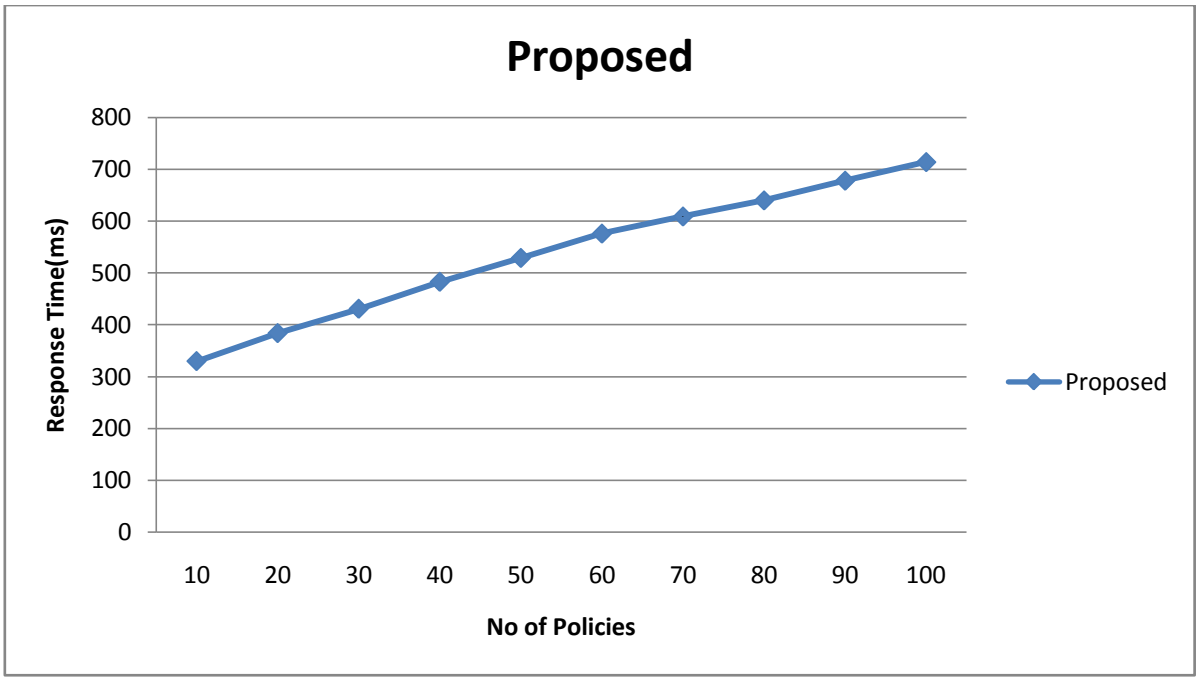

Fig. 6.3 No. of Policies vs Response Time

At first step, we have chosen the 10 policies and calculated the response time and then we added 10 more policies. We did this process upto 100 policies. We took execution time for each number of policies for 10 times. The result is almost linear which is also satisfactory.

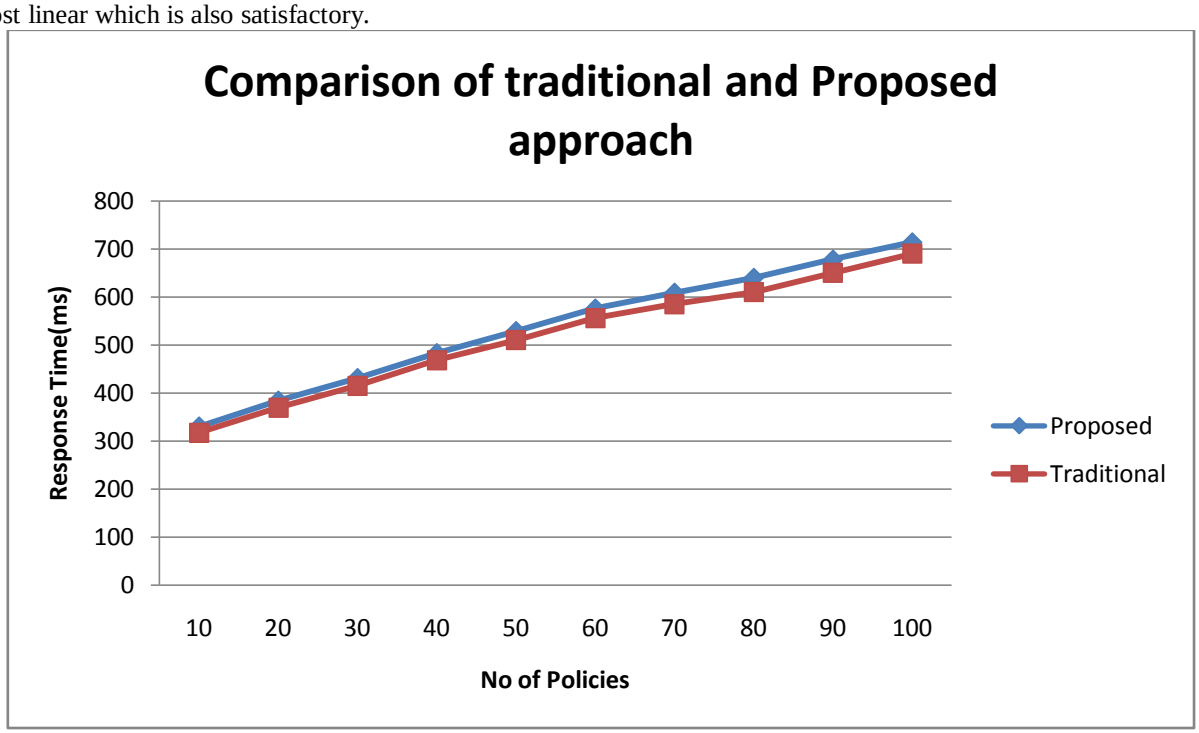

Fig. Response time vs No. of policies for both Traditional and Proposed Approach

In the second result, we calculated the Response for different no. Of policies and made a comparison graph of Traditional and Proposed approach.

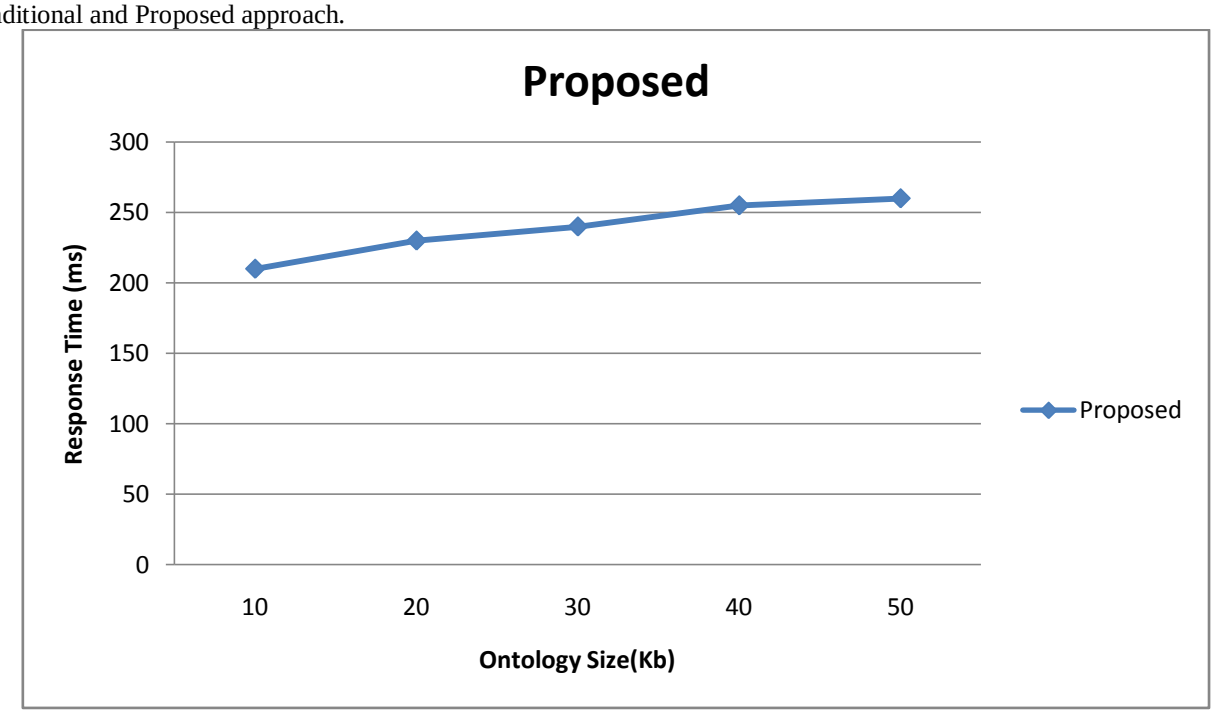

Fig. Size of Ontology vs Response Time

As the third result, we compared Response Time vs Size of Ontology.In the first graph, it showed that the proposed system took more time than the traditional system. The reason behind this is execution of policies. Of course execution of policies will take some more time as compared to the traditional system. It should be clear that if a user wants some privacy, then he has to pay some more cost as compared to the traditional system's cost. In the future of this research, work can be done by using fuzzy logics. One can make the privacy policies by using fuzzy logics. The same work can be done by using sensors like for our scenario, detect voice of a person, check it by using digital image processing and then assign the roles. Some tools are freely available to implement this in digital image processing.

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