Global Journal of Business Management and Information Technology.
Volume 1, Number 1 (2011), pp. 27-34

http://www.ripublication.com

Providing Smart-Space to E-Commerce with Semantic Web

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Abstract

The success of E-commerce services will largely depend on their ability to maximise their value in varying context. E-commerce, a platform on web where buyers and sellers meets and make a business, but the business transaction succeeds only when the right product found by right purchaser at right time. This Semantic Web will provide intelligent access to heterogeneous, distributed information, enabling software products to mediate between user needs and the information sources from WWW. The Semantic Web serves E-commerce transactions as a Smart-Space platform on which Customer's requirement of product & priority both manages simultaneously, as well Product portfolio, With Semantic web transaction and can be created, shared and reused as per the E-commerce organisation policies. Semantic Web provides a Smart-Space for deal exact product & service to appropriate customer over web for E-commerce transaction. In this paper we analyse ongoing work on Field of knowledge management and E-Commerce.

Keywords: *E-Commerce, Semantic Web, Ontology, B2B, B2C*

E-Commerce at a Glance

The extensive growth in Internet over the past decade has created many-many business opportunities for many modern enterprises selling or advertising their products on the WWW. Electronic commerce is having a revolutionary effect on business. It is changing the way businesses interact with consumers, as well as the way they interact with each other. Although, there are extent electronic payments, information brokering and automated negotiation systems for strengthen the E-commerce.

Limitations of the present E-Commerce over Web Service

The WWW currently contains more than 3 billion static documents, which are accessed by over 300 million users internationally. However, this enormous amount of data has made it increasingly difficult to find, access, present and maintain the information required by a wide variety of users. This is because information content is presented primarily in natural

language. Thus, a wide gap has emerged between the information available for tools aimed at addressing the problems above and the information maintained in human-readable form.

Once a Customer or Business Organisation wish to make transaction over WWW, priority problem occurs from choosing appropriate as well to mapping geographical distance to decide the product availability, for such international transaction the currency exchange rate is also a concern for all. So while the Customers make E-commerce transactions, they need to verify each and every aspect of transaction. For Customers & Business organisations to dealing over E-commerce not much easy and assure. So, they need some support over WWW to help for solving these certain aspects.

Introduction to Semantic Web

The Semantic Web is a vision, the idea of having data on the web defined and linked in a way that it can be used by machines not just for display purposes, but for automation, integration and reuse of data across various applications. It promises to radically improve our ability to find, sort, and classify information, tasks that consume a majority of the time spent on and off-line. The objective of the Semantic Web Architecture is to provide a knowledge representation of linked data in order to allow machine processing on a global scale. The W3C has developed a new generation of open standard markup languages that are now poised to unleash the power, flexibility and, above all, logic of the next generation of the Web, and open the door to the next generation of Web Services.

Ontology for Semantic Web

Ontology is a classification system for concepts and their underlying connections within a specific domain of knowledge. It is a kind of proto-theory, indicating which elements exist within a specific domain and how these elements can be related to each other [1].

Ontologies are the building blocks for the semantic web. Ontologies play an important part on the Semantic web as they allow the processing, sharing and re-use of knowledge between programmes over web. An ontology a representation of shared conceptualisation of a specific domain. They support the integration of heterogeneous and distributed information resources.

Ontology Languages

Semantic Web works with Ontology languages, where the Machine-Learning-Processing is priority. Many Ontology Languages are available for creation of Semantic Web; Such Ontology Languages develop by W3C.

Such Languages as follows:

(1) Web Ontology Language (OWL)
(2) Ontology Exchange Language (XOL)
(3) Ontology Markup Language (OML)
(4) Resource Description Framework (RDF)
(5) RDF Schema
(6) Ontology Inference Layer (OIL)
(7) DARPA Agent Markup Language+OIL (DAML+OIL)

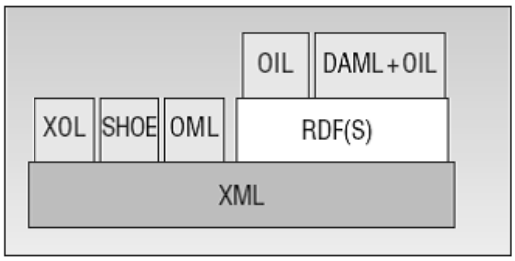

Figure 1: The languages in the Semantic Web.

Semantic Web Layers

The Semantic Web principles are implemented in the layers of Web technologies and standards. The Unicode and URI layers make sure that use international characters sets and provide means for identifying the objects in Semantic Web. The XML layer with namespace and schema definitions make sure we can integrate the Semantic Web definitions with the other XML based standards. With RDF [RDF] and RDF Schema [RDFS] it is possible to make statements about objects with URL's and define vocabularies that can be referred to by URL's. This is the layer where we can give types to resources and links. The Ontology layer supports the evolution of vocabularies as it can define relations between the different concepts. With the Digital Signature layer for detecting alterations to documents, these are the layers that are currently being standardised in W3C working groups.

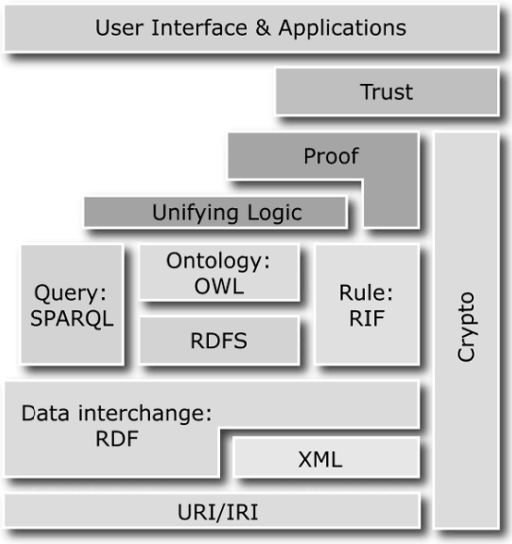

Figure 2: The Semantic Web layers.

The top layers: Logic, Proof and Trust, are currently being researched and simple application demonstrations are being constructed. The Logic layer enables the writing of rules while the Proof layer executes the rules and evaluates together with the Trust layer mechanism for applications whether to trust the given proof or not.

Application of Semantic Web

Unlike the simple HTML Languages uses for Web Page Creation, the Semantic Web uses in such area of intelligent application, Machine Learning & Knowledge Processing domains [2].

A few applications of Semantic Web as follows:

- E-learning, E-Commerce, E-Banking
- Natural Language Processing
- Knowledge Management
- Mobile Network Management (Proposed)
- Integrate Intelligent Information
- Pervasive Computing

Various transaction of B2B E-Commerce over WEB

E-commerce emerges from the need of product from customer. So Product presenting or searching makes starting phase of E-Commerce over WWW. But the E-commerce process varies in many tasks [3].

For B2B transaction over WWW the tasks are

- **Matchmaking:** A customer locates traders that it could potentially do business with. This is done by some traders placing advertisements, and others making queries over these advertisements. For both B2C, B2B this task always emerge in beginning.
- **Negotiation:** The trader enters into negotiation with one or more of these potential business partners, to see if they can agree mutually acceptable terms of business. This is done through an interchange of negotiation proposals describing constraints on an acceptable deal. The outcome of this is an agreement, specifying the terms that both parties consider acceptable. These terms could include a definition of the good or service being traded, price, delivery date, etc.
- **Confirmation of order:** Customer finally placing confirmation for purchasing product with E-commerce service provider organisation. For such confirmation in B2B transaction agreement also signed, but for B2C the simple E-Payment and E-receipt given for confirmation.

Creating "SMART-SPACE" by Wrapping E-Commerce with Semantic Web

Semantic Web is also called Meta-data Web, so with E-commerce while Semantic Web serves any product, the customer point-of-view approach must be considered [4].

Customer Approach for E-Commerce

For an example mentioned below, i-Phone is choose by customer, so which are the factors that needs to support i-phone choice by customers. As well while this product set online, which criteria must mention for make available to appropriate needy.

Figure 3: Semantic Web Working strategy & Customer Approach.

At this point in the evolution of the Web, Customer would look at different retailers' web pages, comparing prices and shipping times and rates [5].

Customer also looks for a site that will compare prices and shipping options from several retailers all at once. This way customer finalises the process of purchasing.

Ontologies in electronic commerce

For e-commerce the development of the semantic web is of great importance. One of the most crucial problems is the integration of heterogeneous and distributed product descriptions. Suppliers and salesmen of online products and services usually don't reach a consensus on the products and services belonging to a domain, on how they can be described and how a product catalogue should be structured. So, ontology for the domain of electronic commerce is primarily established by the construction of a common product catalogue that can be used for all search actions and transactions [6].

These ontologies allow for semantics of data that can be processed by machines. Within such an infrastructure of meaningful data completely new kinds of automated services can be grafted. Intelligent software agents can relatively independently search the whole internet for products and services the user is interested in, they can compare prices and make suggestions, they can form coalitions of buyers and sellers, they can deal about products and prices, or help configure products and services in such a way that they come up to the specified demands of the users.

Ontology for E-Commerce Platform of Office Material

In this section, we explain how we use DAML+OIL to describe the various descriptions that are used in the e-commerce lifecycle. While other more general efforts like DAML-S already use DAML+OIL in their service descriptions, we show here how DAML+OIL is suitable for e-commerce, and especially automated negotiation [7].

We identify that service description ontologies and domain specific ontologies will have an important role to play in order to achieve the semantic level of agreement between the various parties. For the sole purpose of the following examples, we define a simple ontology for the sale and delivery of computers. To keep the descriptions concise, we have chosen to use the description logics notation.

The description ontology: We use the ECConstruct class as a common superclass for Advertisement, Query, Template and Proposal. As we will see later, an agreement is not

modelled as a class but as an instance. More precisely, an agreement is an instance of a particular negotiation template.

$$\begin{aligned} ECConstruct &\sqsubseteq \top \\ Advertisement &\sqsubseteq ECConstruct \\ Query &\sqsubseteq ECConstruct \\ Template &\sqsubseteq ECConstruct \\ Proposal &\sqsubseteq ECConstruct \end{aligned}$$

The sale ontology: Two services are defined in this ontology: Sale and Delivery. A Sale describes the sale of one Product through the object property, for a unit price and a quantity given by the respective datatype properties. We have chosen to model the service of Sale to include the buyer and seller roles as properties. In doing so, we allow the buyer (resp. the seller) to specify who they are and who they would like to do business with.

$$\begin{aligned} Sale \sqsubseteq\ & (= 1\, buyer.Participant) \sqcap \\ & (= 1\, seller.Participant) \sqcap \\ & (= 1\, item.Product) \sqcap \\ & (= 1\, quantity.positiveInteger) \sqcap \\ & (= 1\, unitPrice.nonNegInteger) \sqcap \\ & (= 1\, delivery.Delivery) \\ Delivery \sqsubseteq\ & (= 1\, location.Place) \sqcap \\ & (= 1\, date.date) \end{aligned}$$

The PC ontology: The PC class is a subclass of Product and must have one Processor and one amount of memory.

$$\begin{aligned} PC \sqsubseteq\ & Product \sqcap \\ & (= 1\, hasProcessor.Processor) \sqcap \\ & (= 1\, memory.positiveInteger) \\ Processor \doteq\ & \{PentiumIII, Pentium4, Athlon\} \end{aligned}$$

Business process workflow

For E-Commerce supported by Semantic web XML standards efforts are underway approaches. To a large extent, these standards have been designed with a particular business requirement, for example, the expedient delivery of a piece of mail regarding goods delivery.

```
<?xml version="1.0"?>
<!DOCTYPE xNAL SYSTEM "xNAL.dtd">
<xNAL>
<Record>
<xNL>
<NameDetails PartyType="Person">
<PersonName>
```

<Title>Mr</Title>
<FirstName NameType="GivenName">NAME</FirstName>
<MiddleName Type="Initial">I</MiddleName>
<LastName NameType="SurName">LAST NAME</LastName>
</PersonName>
<Function>FUNCTION</Function>
<DependencyName PartyType="Organisation" DependencyType="C/O">
<OrganisationNameDetails>
<NameLine>COMPANY</NameLine>
<OrganisationType>BUSINESS</OrganisationType>
<OrganisationKnownAs>KNOWN AS</OrganisationKnownAs>
</OrganisationNameDetails>
</DependencyName>
</NameDetails>
</xNL>
<xAL>
<AddressDetails AddressType="Postal" ValidFromDate="1 Jan 2006" ValidToDate="31 Dec 2006" Usage="Communication">
<Country>
<CountryName>COUNTRY</CountryName>
<AdministrativeArea Type="State">
<AdministrativeAreaName>STATE</AdministrativeAreaName>
<Locality Type="City">
<LocalityName>CITY</LocalityName>
<Thoroughfare Type="Street">
<ThoroughfareNumber>2</ThoroughfareNumber>
<ThoroughfareName>STREET</ThoroughfareName>
<Premise Type="Building">
<BuildingName>BUILDING</BuildingName>
</Premise>
</Thoroughfare>
<PostalCode>
<PostalCodeNumber>11111</PostalCodeNumber>
</PostalCode>
</Locality>
</AdministrativeArea>
</Country>
</AddressDetails>
<!-- Extension: Global e-Commerce Postal Company and User Code -->
<GlobaleCommercePostalCode Type="Active">
<GlobaleCommercePostalCompanyCode>XX-001</GlobaleCommercePostalCompanyCode>
<GlobaleCommerceUserCode>1000000001</GlobaleCommerceUserCode>
</GlobaleCommercePostalCode>
</xAL>
</Record>
</XNAL>

Conclusion & Future Work

In this paper, we discuss a brief of Semantic Web, As E-commerce is not new today, but the serve customer effectively and efficiently only and only possible when Customer getting such an Intelligent Decision Making Support, that support we called as "Smart-Space" developed by integrating E-Commerce and Semantic Web with its Language Tools. In future the trend of M-commerce also arises but customer always in search to get appropriate product in shortest searching and time. So again in future while Web 3.0 may provide platform over Internet, the Semantic Web enable E-Commerce always proposition by E-commerce organisations remain priority.

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