Semantic Web for E-Government Services

Jaya Pradha Avvaru

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Handout of figures & references to supplement the presentation

Agenda

- Introduction
- Semantic Web Architectural Overview
- Motivations / Goals
- Design
- Conclusion
“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” – Semantic Web Activity Statement

“The current web is one designed for machine readability & human consumption” – Web Architecture from 50,000 feet

“The Semantic Web is an extension of the current Web in which information is given well defined meaning, better enabling computers and people to work in cooperation” – Tim Berners-Lee
Introduction

- Well established and distributed Web model
- Machine processing
- User intervention
- HTML to XML transition
- XML Schema’s implicit semantics
- Need for stronger semantic framework

Introduction

- RDF / RDFS to the forefront
- More sophisticated frameworks
- DAML + OIL
- XOL
- SHOE
- Transition to machine understandability
Web Evolution

Main tasks related to E-Government services with Semantics as the underlying principle

- Locating Resources – sophisticated Semantic searches
- Web Tasks and Services – doing things instead of finding them
- Dependency on semantics

Semantic Web Architectural Overview

Figure 1 [Berner-Lee, Tim, Semantic Web on XML, W3C]
Semantic Languages

- XML Schema
- RDF / RDFS
- DAML + OIL

Figure 2 [Berner-Lee, Tim, Semantic Web Road Map, W3C]
Motivations / Goals

- Purpose of Semantic Web for E-Government Services
- System users
- Input / Outputs
- Basic Functions
- Desirable Functions
- Optional functions

The purpose of the system is to demonstrate the viability of SW by modeling the scenario in which it can be used, the scenario being the SW for E-Govt services.

The system users can be anyone with minimal experience of surfing the WWW.

Input:
- User input to initiate the action to be taken on E-Govt services
- Required information of user to complete the action
- Confirmation by user of the commitment to the transaction

Output:
- Result of the initial action made by user
- Error messages that might result from the transaction
- Logs of the agent habitats to show what is happening
- Graphical display of the agents within the rooms of a given habitat
The basic functions of the system are the need for a client to be able to request an action to be executed on the E-Govt site and for that action to be completed without further user intervention.

Desirable functions:
• The ability to query a database directly through the use of instances of the RDF/RDFS schema
• The integration of a richer ontology
• A flexible enough Agent Communication Language (ACL) that can allow for interaction with other agents

Optional functions:
• A GUI front end specifically for E-Govt services
• Inclusion of business objects instead of just using messaging performatives and parameters
• The ability to translate between different ontologies using an ontology translation engine
Design Alternatives

- Screen Scraping
- Embedded Knowledge Representation
- Agent based
- Multi-Agent based
- Client / Server / Multi-Agent based

Design Cycle

- The Agent World – The ADK Architecture
  - Agent Runtime Environment (ARE)
  - Agent Foundation Classes (AFC)
  - Application Framework
- Figure 4 The Agent Design Cycle
Multi-agents relating to E-Government Services are:

- **PersonalAgent** – responsible for executing the request of the client, usually by traveling to the remote site where the task is executed and returning home to report on the outcome of the task.

- **E-GovAgent** – responsible for executing the incoming requests from agents such as the Personal Agent.

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**Modeling the SW for E-Govt**

- Defining the ontology
- Marking up pages
- Tasks
  - DefaultTask
  - ScheduledTask
- Message structures
  - OutgoingMessage
  - IncomingMessage
Types of Semantic

- **Real World Semantics** – mapping computational world onto real world
- **Agent Communication Language Performatives** – special items that ensure effective agent communication
- **Axiomatic Semantics** – mapping a set of descriptions into FOL
- **Model-Theoretic Semantics** – language mapping to a world, describing minimal conditions needed to assign meaning to expression in language

Semantic Classification

- **Implicit Semantics** – meaning conveyed through shared understanding based on consensus
- **Explicit and Informal Semantics** – expressed in an informal manner
- **Explicit and Formal for Human Processing** – formal documentation or specification of meaning
- **Explicit and Formal for Machine Processing** – machines using automated processing
Semantic Web Ultimate Goal

Figure 6: The Knowledge Web [Fensel, Dieter; Ontologies: A Silver Bullet for Knowledge Management and Electronic Commerce, Springer-Verlag, Berlin, 2001]

Conclusion

- DAML-L
- DAML-S
- Web Ontology Language (OWL)
Conclusion

- Integration of heterogeneous and distributed data and information sources
- Mature ontologies to provide for translation between domains
- Web of today comparable to assembler programming

“The more agreement there is, the less it is necessary to have machine processible semantics” – Michael Uschold
Happy Thanksgiving