Will the Semantic Web deliver Information Interoperability?

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Will the Semantic Web Deliver Information Interoperability?

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See also ADM202135, RTO-MP-IST-042. Coalition C4ISR Architectures and Information Exchange Capabilities (Les architectures C4ISR et les capacites d’echange d’information en coalition), The original document contains color images.
Some Personal Experiences

- Industrials
  - CCL
  - Epistemics
  - Rolls Royce
- DERA
  - SA for SAR
  - FOAEW
  - With USAF Cognitive Cockpit
- DTC project
  - KB SA for OOTW
- DSTL
  - IM in NEC MPA
  - CBM
Network Enabled Capability: e-Defence

- Key Drivers
  - not just plumbing legacy systems!
  - achieving shared understanding & decision-making – semantic interoperability
  - enabling two types of networks: people & equipment
- Key NEC Themes
  - Effect Synchronisation
  - Agile Mission Groups
  - Dynamic Collaborative Working
  - Shared Understanding
  - Full Information Accessibility
  - Resilient Information Infrastructure
  - Inclusive Flexible Acquisition

Specifying the information required and using it better

Getting information to the right place and sharing it

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Network Enabled Healthcare: e–Health

- **Key Drivers**
  - not just plumbing legacy systems!
  - achieving shared understanding & decision-making – semantic interoperability
  - enabling two types of networks: people & equipment

- **Key NEH Themes**
  - Effect Synchronisation
  - Agile Medical Teams
  - Dynamic Collaborative Working
  - Shared Understanding
  - Full Information Accessibility
  - Resilient Information Infrastructure
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Putting Semantics on the Web

THE ELEVENTH INTERNATIONAL
WORLD WIDE WEB CONFERENCE

Sheraton Waikiki Hotel
Honolulu, Hawaii, USA
7-11 May 2002

1 LOCATION. 5 DAYS. LEARN. INTERACT.

Registered participants coming from:

Australia · Canada · Chile · Denmark · France · Germany · Ghana · Hong Kong · India · Italy · Ireland · Japan · Malta · New Zealand · The Netherlands · Norway · Singapore · Switzerland · The United States · Vietnam · Zambia

On 7-11 May 2002, Honolulu, Hawaii will provide the backdrop for The Eleventh International World Wide Web Conference. This prestigious series of the International World Wide Web Conference Committee (IW³C²) attracts participants from around the world, and it provides a public forum for the World Wide Web Consortium (W3C) through the annual W3C track.

The conference is being organized by the International World Wide Web Conference Committee (IW³C²), the University of Hawaii and the Pacific Telecommunications Council (PTC).

FEATURED SPEAKERS (CONFIRMED)

Tim Berners-Lee, inventor of the World Wide Web and Director of the W3C who now holds the 3Com Founders chair at the Laboratory for Computer Science (LCS) at the Massachusetts Institute of Technology (MIT).

Richard A. DeMillo, vice president and chief technology officer for Hewlett-Packard Company.

Ian Foster, guru of "Grid Computing", associate professor of computer science and director of the Edinburgh Centre for Parallel Computing at the University of Edinburgh.

Jack Dangermond, chief scientist at Esri and McArthur Prize Winner.
Event: WebPage

Event: WWW 2002

THE ELEVENTH INTERNATIONAL WORLD WIDE WEB CONFERENCE
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REGISTERED PARTICIPANTS
Australia • Canada • Chile •
Netherlands • Norway • Spain •
Italy

Conference Proceedings
Call for Participation
Program
Registration Information
Hotel Accommodation
Conference Committee
Sponsorship/Exhibition
Opportunities
Volunteer Information
Information about Hawaii
Previous & Future WWW Conferences

On 7-11 May 2002, Honolulu hosts the eleventh annual Web conference, which features the most prestigious series of the year. The conference provides a public forum for discussing and showcasing the latest developments in the world-wide-web community.

The conference is being co-located with the Pacific Telecommunications Conference (PTC) and the Pacific Telecommunications Council (PTC) conference.

Event1 a Event:event;
date “May 7-11”,
speaker http://…#timbl.htmlTitle “WWW 2002…”

TimBL rdf:type w3c-ont:person;
nname “Tim Berners-Lee”
Standards are fundamental

- HTML
- XML + Name Space + XML Schema
- RDF
- RDF(S)
- OWL
- Topic Maps
- SMIL
- XOL
- Unicode
- URI
Ontologies: Fundamental Building Blocks of the Semantic Web
Perspectives on ontologies

- A shared and agreed conceptualisation
- Agreed terminology
- The salient concepts and relations between them

- **The semantic view:** An ontology is the context needed to understand a specification, model, or other communication in the way that was intended.

- **The specification / reference view:** "An ontology is an explicit specification of a conceptualization."

- **The modeling view:** An ontology is a metamodel.
## Ontologies offer....

<table>
<thead>
<tr>
<th><strong>Communication</strong></th>
<th><strong>Control</strong></th>
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</thead>
<tbody>
<tr>
<td>- Normative models</td>
<td>- Controlled vocabularies</td>
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<tr>
<td>- Networks of relationships</td>
<td>- Accurate data collection or retrieval</td>
</tr>
<tr>
<td>- Consistent and unambiguous</td>
<td>- Classification</td>
</tr>
<tr>
<td>- Integrate multiple perspectives</td>
<td>- Finding, sharing, discovering, navigation, indexing</td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>Inter-operability and Integration: Sharing &amp; Reuse</strong></th>
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<tbody>
<tr>
<td>- Inter-lingua</td>
</tr>
<tr>
<td>- Specifications</td>
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<tr>
<td>- Reliability</td>
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Genetics: Gene Ontology

• One of the earliest examples of the benefits of ontologies
• Integration and interoperability were big wins
• Specific tool support
• Considerable resources invested and continuing in maintenance
• Translated into Description Logics to provide formal semantics
• Spawned more generic biological ontology efforts
Manufacturing: Aerospace

• Considerable work on ontologies for products and components
• Used in all stages of the life cycle, from design to in service maintenance
• Need for multiple perspectives e.g.
  - Whole engine
  - Heat transfer
  - Cost model
  - Manufacturing
  - Assembling/Maintenance
Military: Coalition Operations

- Some of the original motivation behind DAML work
- Lots of activity to build ontologies in a range of contexts
- Particularly important in coalition operations
- Central requirement for the concept of Network Enabled Capability

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Ontologies: Observations

• In any domain
  – Usually highly implicit
  – Poorly documented
  – Likely to be ambiguous, vague, inconsistent
• When modelling
  – Interaction Problem: tasks influence ontologies
  – Integration Problem: integrating multiple ontologies
  – Modularity Problem: how to modularise and what grain size?
• Maintenance
  – Ongoing maintenance overhead
  – Ontologies evolve and change
  – Design rationale is important
• Upside
  – They do facilitate interoperability
  – They do enhance reuse
  – They are becoming part of the infrastructure
AKT started Sept 00, 6 years, £8.8 Meg, EPSRC
www.aktors.org
Around 65 investigators and research staff
Ontology Mediated Information Interoperability: An example from Medicine

Professor Nigel Shadbolt
The University of Southampton

Professor Sir Michael Brady
Oxford University
Multi-disciplinary Assessment: Multiple Ontologies and Multiple Information Sources

- Diverse and heterogeneous content
- Clinical examination
  - Notes
- Imaging
  - X-ray,
  - Ultrasound
  - MRI
- Microscopy
  - Histopathology
- Treatment
  - Protocol Records
  - Re-assessment
- Medical Records
  - Case sets
  - Individual patient records
- Published background
  - Epidemiology
  - Medical Abstracts

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MIAKT Services

- Image Analysis Services
  - Oxford’s XRay Mammogram Analyser
  - KCL MRI Mammogram Analyser/Classifier
- Classification Services
  - Abnormality Naïve Bayes Classifier (Soton)
  - MRI Lesion Classifier (KCL)
- Patient Data Retrieval Services (OU)
  - For example, “Find Patients With Same Age”
- Image Registration (KCL)
  - GRID service invoked via web-service
- Natural Language Report Generation (Sheffield)
  - Generate a patient report from RDF description
- UMLS Lookup (Sheffield)
  - Lookup term definitions in the UMLS
- Patient Records also accessed through web-service (Soton)
  - Web-service enabled AKT 3store
The MIAKT Framework is Ontology Based
Knowledge–Intensive Fusion for Situational Awareness
UK DIF DTC Project 8.14

Professor Nigel Shadbolt et al
The University of Southampton
Desired Outcome

- a knowledge-guided environment to accomplish intelligent information...
  - **FUSION**
    - using formal knowledge models (incl. ontologies) of the sources, user roles and tasks to perform the aggregation task
  - **PROCESSING**
    - using the knowledge models to integrate and reason over the incoming streams of information, generating new knowledge, summaries, predictions, guidance, and direct attention
  - **INTERACTION**
    - supporting effective visualisation of and interaction with diverse information sources as a decision-making aid
The Domain
OOTW Humanitarian Relief

Number of possible data sources
- Media reports
- Meteorological forecasts and reports
- ELINT
- Reports from NGOs
- Other field reports

Multiple foci of situational awareness
- Refugee concentrations and movements
- Communications and transport infrastructure
- Weather conditions, water levels, current and predicted
- Hostile Militia Activity

Views on data and information for needs of different users

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The Scenario

- Comprehensive Afghanistan scenario
- Based on recent available historical data
- Rich source of information feeds
- Ample scope for key properties of KBSA to be demonstrated
- Basis for ontologies
Knowledge Processing and Information Fusion

- Processing rules and strategies for low level and high level interpretation
- *Semiometrics* – measures of what is semantically important
- Who is doing what where?
- What impact is this having?
- What other information should therefore be attended to?

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Content Streams will be
- Multiple User
- Machine assisted
- Rapidly changing
- High-volume
- Multi-source

Need to support content affordances
- Seeing the big picture
- Zooming in on appropriate detail
- Swapping viewpoints and content feeds
- Changing user perspectives
- Avoiding einstellung “functional fixity”
Novelty & Invention

- Group represents leading edge in Semantic Web research and application
- Research and development in this context is new
- Extends work on ontologies for Situation Assessment
- Exploiting semantic annotation for information fusion and selective attention is novel in this context
- *Semiometric* approach novel in context of military information fusion
- Potential to relates to work in US and DSTL interest in information management
"Is this rocket science? Well, not really ... We are not inventing relational models for data, or query systems or rule-based systems. We are just webizing them. We are just allowing them to work together in a decentralized system – without a human having to custom handcraft every connection."


“We're not sure what it is. Rob cobbled it together from paper clips and stuff in the mail room, but man wait till you see how scalable it is.”
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