Outline

- Information Transmission and Use
  - Convergent Networks
  - Introduction to the Semantic Web
  - A Portrait of the Semantic Web in Action
- Q&A
Convergent Networks

A programmable network switch that can process the signaling for all types of packet protocols.

Concepts:
- Wireline
- Mobile
  - 3G/ WiBro/4G
  - Ad-hoc N/W
  - MANet
- Nomadic
  - Hot Spot (Airport, Campus)
  - WLAN/ Wi-MAX
Future of Search Technology
[Brewer02]

- Integration of Textual Search and Database Technologies
- Distributed Repositories
- Context
- Integration with the Physical World
- Novel User Interface
  - To Avoid Information Overload
- Personalization
- Bias
Semantic Web Basics

[Gruninger02]

Ontology

- Formal Explicit Specification of a Shared Conceptualization
  - Conceptualization: how people think about things in a particular subject area
  - Explicit Specification: concepts and relationships of the abstract model given explicit terms and definitions
Semantic Web Basics (Cont’d)

**Ontology Uses**

<table>
<thead>
<tr>
<th>Uses of Ontology (customized from the uses of ontology identified at the KRSL kickoff meeting 1994).</th>
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<tbody>
<tr>
<td><strong>For communication</strong></td>
</tr>
<tr>
<td>between implemented computational systems.</td>
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<tr>
<td>between humans.</td>
</tr>
<tr>
<td>between humans and implemented computational systems.</td>
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<tr>
<td><strong>For computational inference</strong></td>
</tr>
<tr>
<td>for internally representing and manipulating plans and planning information.</td>
</tr>
<tr>
<td>for analyzing the internal structures, algorithms, inputs and outputs of implemented systems in theoretical and conceptual terms.</td>
</tr>
<tr>
<td><strong>For reuse (and organization) of knowledge</strong></td>
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<tr>
<td>for structuring or organizing libraries or repositories of plans and planning and domain information.</td>
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</table>
XML vs Ontologies [Kim02]

**Commonality**
- Means of Explicitly Representing Information Applied So That a Reader Interprets Shared Data As Intended by the Data Author

**Differences**
- Need for the Same Understanding
  - XML requires it while ontology does not
    - E.g., `<foo>7</foo>`
- Complexity
  - Semantics are not represented with XML use
- Efficiency vs Interpretability
  - Reducing Complexity vs Reducing Uncertainty
Using Ontologies for Uncertainty Reduction [Kim02]

- Case Where Ontology Is Appropriate
Example CS Department Ontology

Name: cs-dept-ontology
Version: 1.0

Extended Ontology
Base Ontology (base-ontology, version 1.0)
ISA Hierarchy (Taxonomy)
  Person
    Worker
    Faculty
      Professor
      Assistant
    AdministrativeStaff
  Student
  Organization
  Publication
  Schedule

Relationships
  Relation  Arg1  Arg2
  --------------------
  PublicationAuthor  Publication  Person

Inferences
  Suborganizations are transitive
  Affiliations are invertible
  Membership transfers through suborganizations

For the Semantic Web, an Ontology Must Be Expressed in a Formal Language So That a Given Ontology Expression Can Be Interpreted and Processed Unambiguously by a Machine
Ontology Issues [Kim02]

- Designing an Ontology Development Tool
  - Useful and Usable to a Knowledge Worker
- Developing of Decentralized and Adaptive Ontologies
  - To Be Used in Combination with Other Ontologies
    - Use of Ontologies for Software Specification
References

