

Intelligent Systems on the World Wide Web

Semantic Web

Lecture Slides
Steffen Staab

Institute for Applied Computer Science and Formal
Description Methods (AIFB)
Karlsruhe University

1 Overview

Vorlesung

Vorlesungstermin:

Mittwoch 11:30 – 13:00, in 11.40 –116 (in der Regel)

Aktuelle Informationen und Unterlagen:

<http://www.aifb.uni-karlsruhe.de/>

Lehre/Sommer2004/ISWWW/

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1 Overview

Übungen

Termin:

Montag 11:30-13:00, in 11.40 –116

Beginn: 7. Mai, 14-tägig

Betreuer:

Holger Lewen (h_lewen@web.de)

Christoph Tempich (cte@aifb.uni-karlsruhe.de)

Mailingliste:

[http://www.aifb.uni-](http://www.aifb.uni-karlsruhe.de/mailman/listinfo/iswww)

[karlsruhe.de/mailman/listinfo/iswww](http://www.aifb.uni-karlsruhe.de/mailman/listinfo/iswww)

Übungsblätter und Diskussionsforum

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Terminkalender (tentativ)

Vorlesungen

- April 20
- April 27
- Mai 5 – verschoben auf
- Mai 10 am Übungstermin
- Mai 12
- Mai 19 – verschoben auf
- Mai 24 am Übungstermin
- Mai 26
- Juni 2
- Juni 9
- Juni 16

- Juni 23 (Tempich)
- Juni 30 – verschoben auf
- Juli 5 (am Übungstermin)
- Juli 7 (entfällt)
- Juli 14
- Juli 21 (Fragestunde)

Klausur

Am 27. Oder 28. Juli

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Terminkalender (tentativ)

Übungen

- Mai 3
- Mai 17
- Mai 31 wg Pfingstmontag verschoben auf
- Juni 7
- Juni 14
- Juni 28
- Juli 12

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Semantische Technologien

“While the industry is busy creating the underpinnings of open computing with standards like Extensible Markup Language, still **missing are what Plattner calls "semantic" standards**, or how to make different computers recognize data about a business partner, a customer, or an order and know what to do with it. In other words, said Plattner, the software industry is building an alphabet but hasn't yet invented a common language.”

Hasso Plattner, SAP, in CNet News, 27.März 2002.

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1 Overview

Syntax is not enough – B2B

```
<Bestellung>  
  <Anzahl>500</Anzahl>  
  <Objekt>Schekel</Objekt>  
  .....  
</Bestellung>
```

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1 Overview

Syntax is not enough – B2B

```
<Bestellung>  
  <Anzahl>500</Anzahl>  
  <Objekt>Schekel</Objekt>  
  .....  
</Bestellung>
```



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1 Overview

Syntax is not enough – ~~PDA~~ PDWC

RAFAEL

- Tel1
- E-Mail

By the way: I forgot some devices!!!!!!!!!!!!

1 Overview

Syntax is not enough - Search

Ask Google „Ich suche Akkus für Gateway Solo“



What you find:

- Advertisements of Gateway Solo (including Akku)
- Some Akkus for whatever (not necessarily Gateway Solo)
- A lot of data garbage attached to virtually empty web sites

What you don't find:

- Akkus for Gateway Solo (at least not directly)

1 Overview

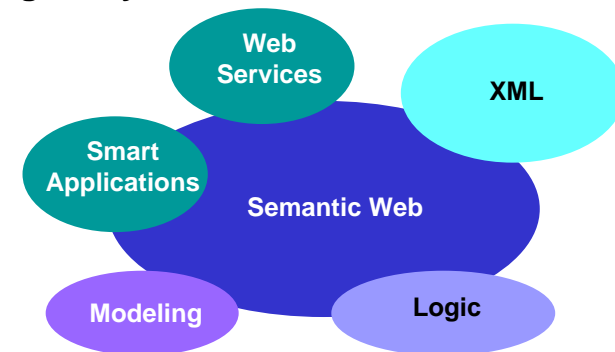
Motivation

The primary goal is to make the Web (internet or intranet) more like a library and less like a heap of messy books on the floor.

Tim Bray

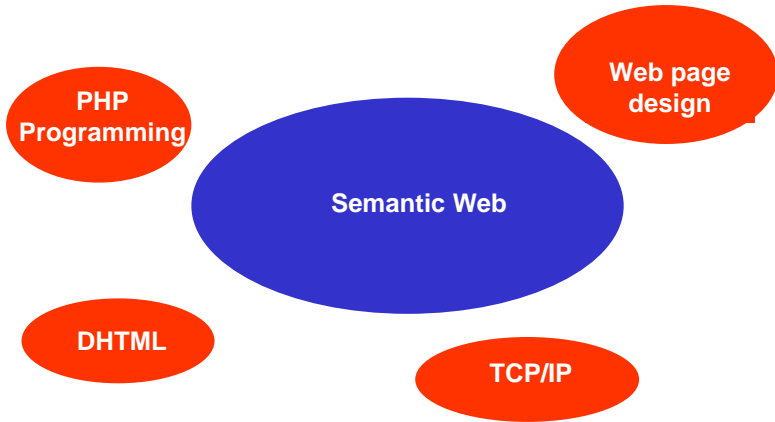
1 Overview

Intelligent Systems on the Web – what it is



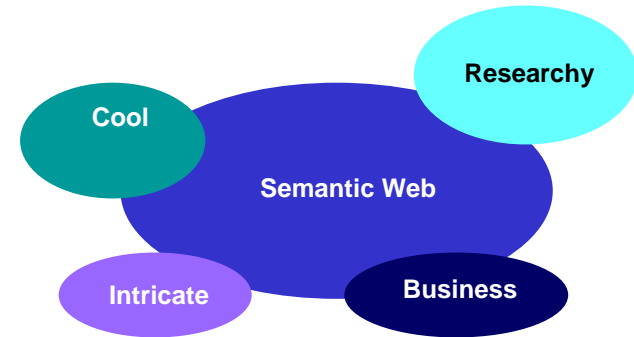
1 Overview

Intelligent Systems on the Web – what it is not



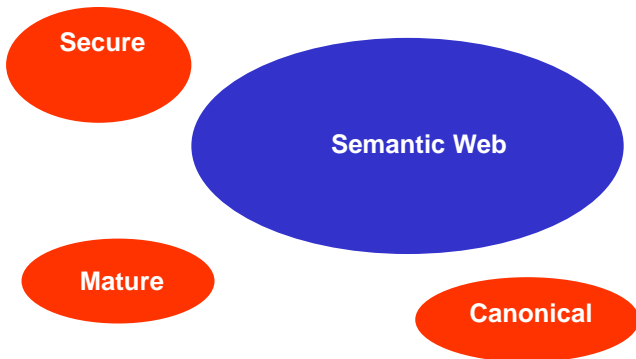
1 Overview

Intelligent Systems on the Web – what it is



1 Overview

Intelligent Systems on the Web – what it is not



1 Overview

Some Principal Ideas

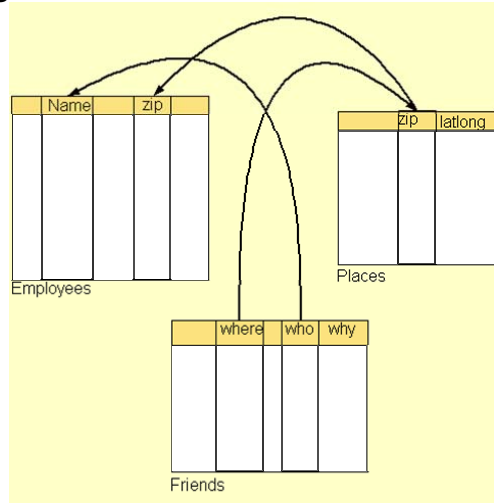
- URI – uniform resource identifiers
- XML – common syntax
- Interlinked
- Layers of semantics – from database to knowledge base to proofs

Tim Berners-Lee,
Weaving
the Web

Design principles of WWW applied to Semantics!!

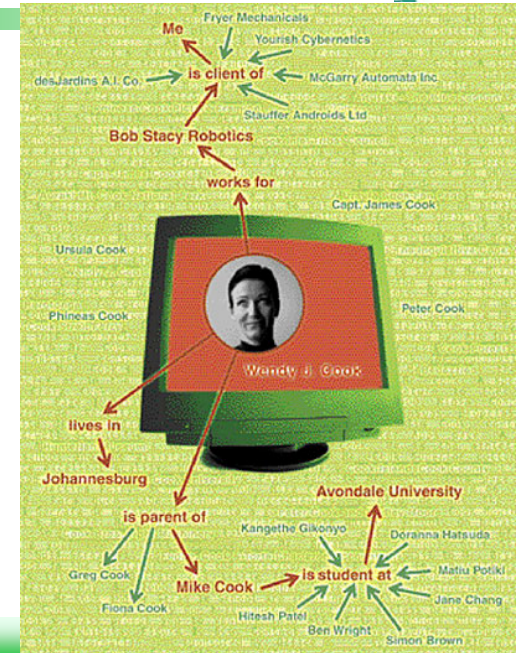
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Knowledge in Linked Tables



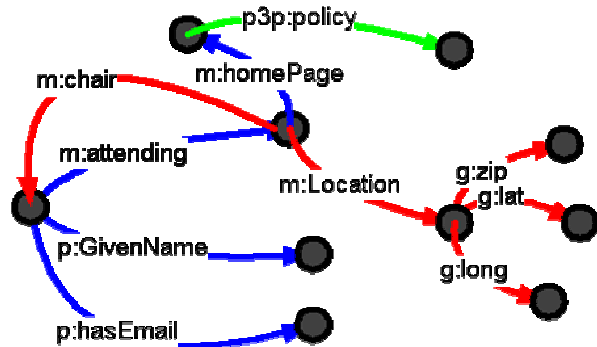
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Knowledge in Graphs



1 Overview

Knowledge in Superimposed Graphs



1 Overview

Why XML is not enough - Skill DB Example

```

<skill-database>
  <people>
    <Person>
      <name>Markus</name>
      <knowHow>SGML</knowHow>
    </Person>
    <Hacker>
      <name>Jürgen</name>
      <pgp>CB FC A8 17</pgp>
      <knowHow>SGML</knowHow>
      <knowHow>Java</knowHow>
    </Hacker>
    <Person name="Rainer">
      <knowHow>Mike</knowHow>
    </Person>
  </people>
  <seminars>
    <Seminar topic="SGML"
      id="SGML-19990808">
      <attendant>
        <name>Dieter</name>
        <name>Robert</name>
        <name>Rainer</name>
      </attendant>
    </Seminar>
  </seminars>
</skill-database>
    
```

1 Overview

Give me all persons!

XQL: //person/name

Returns only „ <name>Markus</name>“!

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1 Overview

Give me all persons!

```
<skill-database>
  <people>
    <Person>
      <name>Markus</name>
      <knowHow>SGML</knowHow>
    </Person>
    <Hacker>
      <name>Jürgen</name>
      <pgp>CB FC A8 17</pgp>
      <knowHow>SGML</knowHow>
      <knowHow>Java</knowHow>
    </Hacker>
    <Person name="Rainer">
      <knowHow>Mike</knowHow>
    </Person>
  </people>

  <seminars>
    <Seminar topic="SGML"
      id="SGML-19990808">
      <attendant>
        <name>Dieter</name>
        <name>Robert</name>
        <name>Rainer</name>
      </attendant>
    </Seminar>
  </seminars>
</skill-database>
```

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1 Overview

What is missing?

- Hackers are persons.
- Seminar attendants are persons.
- There may be syntactic variations that are semantically equally valid.

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1 Overview

Give me all people knowledgable about SGML!

XQL: //person[knowhow=SGML]/name

Returns only „ <name>Markus</name>“!

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1 Overview

Give me all people knowledgable about SGML!

```

<skill-database>
  <people>
    <Person>
      <name>Markus</name>
      <knowHow>SGML</knowHow>
    </Person>
    <Hacker>
      <name>Jürgen</name>
      <pgp>CB FC A8 17</pgp>
      <knowHow>SGML</knowHow>
      <knowHow>Java</knowHow>
    </Hacker>
    <Person name="Rainer">
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    </Person>
  </people>
  <seminars>
    <Seminar topic="SGML"
      id="SGML-19990808">
      <attendant>
        <name>Dieter</name>
        <name>Robert</name>
        <name>Rainer</name>
      </attendant>
    </Seminar>
  </seminars>
</skill-database>
  
```

1 Overview

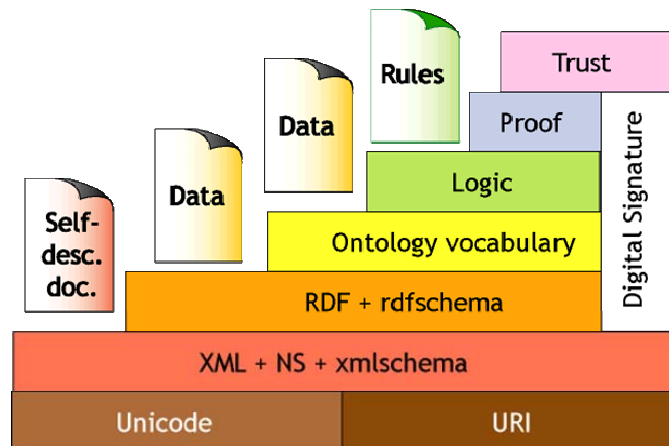
XML is an important basis, but not enough

XML at the syntax layer!

Build on top!

1 Overview

(One) Layer Model of the Semantic Web



1 Overview

Applications

- AIFB Intranet
- Community Web Portal
 - Research Community
 - Soccer Fans
 - opinions (www.epinions.com)
- B2B Portal
 - Procurement (VerticalNet)
- B2C Portal
 - Added-value selling (Agent-based Trading)
- Knowledge Management (mostly intranet)
 - Supporting Business Analysts
- Semantic Application Servers
 - Supporting EAI (Enterprise Application Integration)
- Semantic Web Services
 - Supporting EAI / B2B

1 Overview

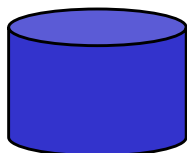
Grundbausteine



Services / Agents



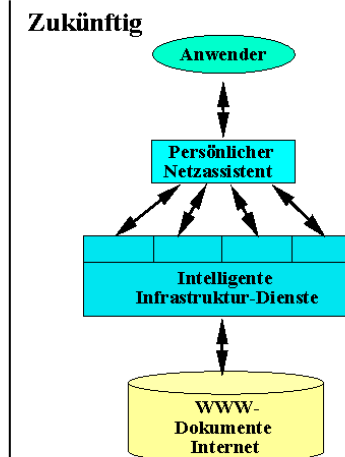
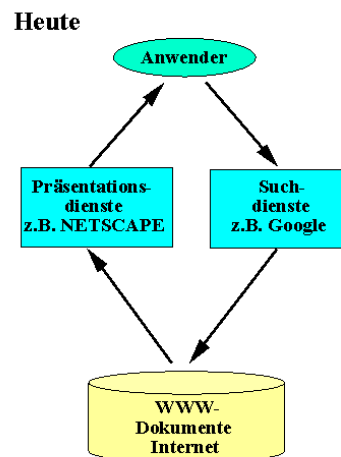
Schema Data



Data

1 Overview

Intelligente Software-Assistenten für die Infobahn



1 Overview

Nachteile konventioneller Internet-Suchsysteme

Suche in manuell erstellten Verzeichnissen (z.B. Yahoo!)

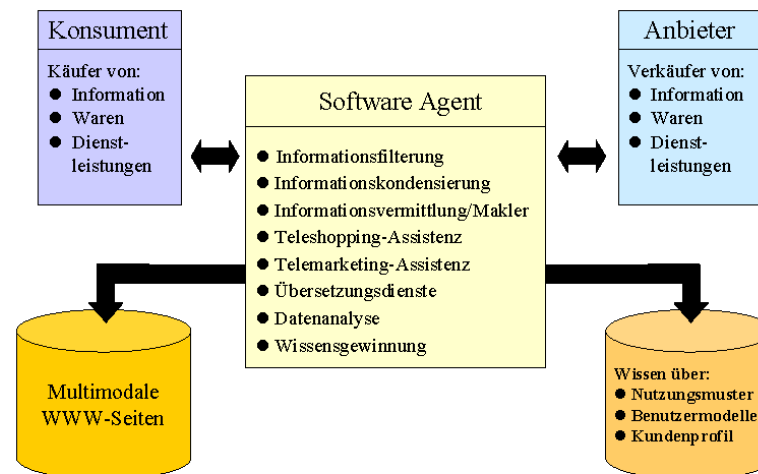
- ⊕ Für große dynamische Kategorien werden aktuelle Verweise nicht gefunden (Klassifikation zu aufwendig und zu langsam)
- ⊖ Für kleine und statische Informationskategorien viele korrekte und vollständige Suchergebnisse

Suche in automatisch generierten Verzeichnissen (z.B. AltaVista)

- ⊕ Sehr umfangreiche und unpräzise Ergebnisse, die vom Benutzer weiter gefiltert werden müssen
- ⊖ Relativ vollständig bis auf aktuelle Seiten, die noch nicht indiziert wurden

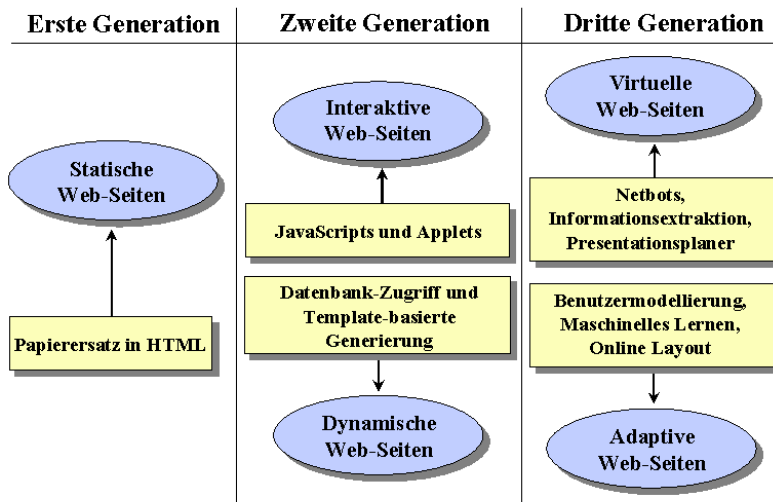
1 Overview

Intelligente Infrastruktur-Dienste auf der Infobahn



1 Overview

Drei Generationen von Web-Seiten



1 Overview

Objectives

- Machine processable information
- Intelligent structuring
- Intelligent access
- Intelligent provisioning
- Intelligent combinations!!
- Fast adaptations!!!

Modelling vs. Programming