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Keys for Unlocking the Intelligent World Wide Web

PD Dr. Pascal Hitzler

AIFB, University of Karlsruhe, Germany

http://www.pascal-hitzler.de

Luxembourg, March 2008

ReaSem
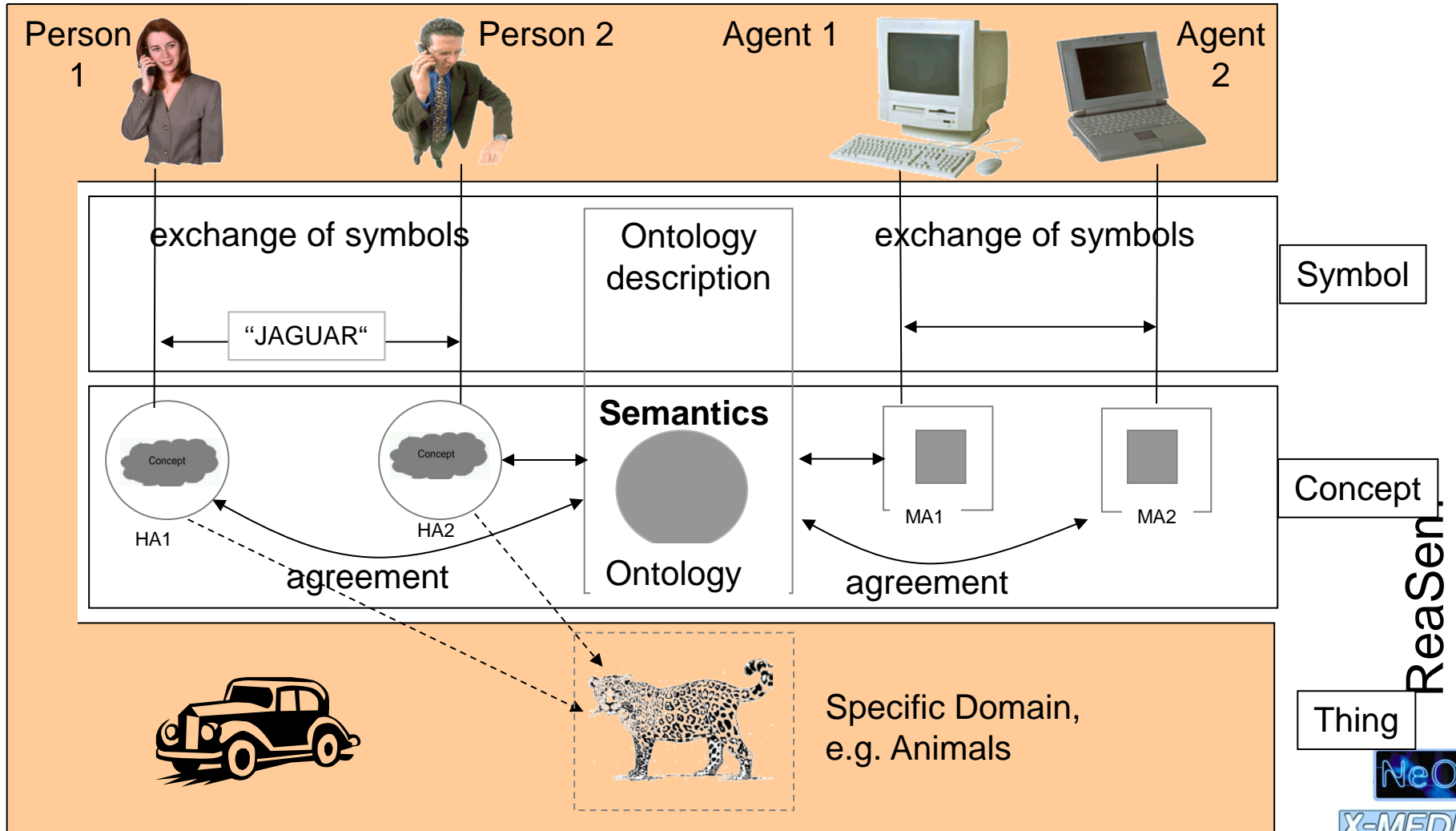
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   – The main idea

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5. Accessing implicit knowledge by automated reasoning

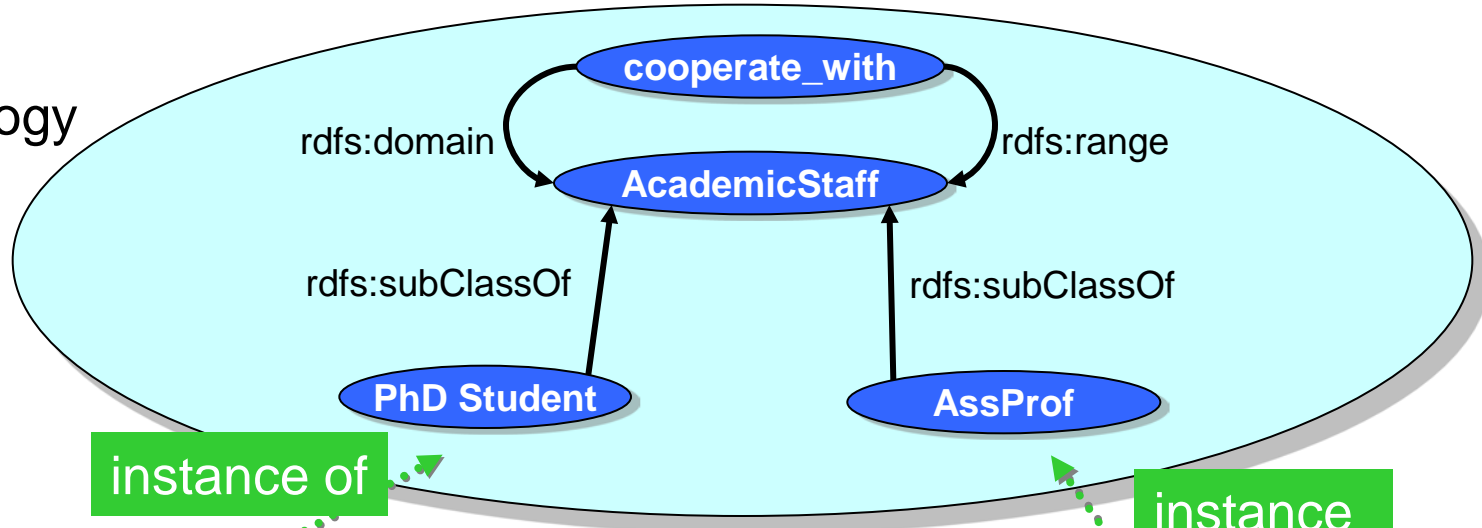6. Conclusions

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The current (World Wide) Web

- Immensely successful.

- Huge amounts of data.

- Syntax standards for transfer of structured data.

- Machine-processable, human-readable documents.

- Content/knowledge cannot be accessed by machines.
  Meaning (semantics) of transferred data is not accessible.

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Semantic Web – Main Idea

Person 1   Person 2   Agent 1   Agent 2

exchange of symbols   Ontology description   exchange of symbols

Symbol

"JAGUAR"

Semantics

Concept   Concept

HA1   HA2   MA1   MA2

Concept

agreement   Ontology   agreement

Specific Domain, e.g. Animals

Thing

Ontologies & Metadata

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Ontology

cooperate_with

rdfs:domain

AcademicStaff

rdfs:range

rdfs:subClassOf

rdfs:subClassOf

PhD Student

AssProf

instance of

instance of

Anno-tation

```
<swrc:PhD_Student rdf:ID="sha">
 <swrc:name>Siegfried
Handschuh</swrc:name>
 <swrc:cooperate_with rdf:resource =
    "http://www.aifb.uni-
karlsruhe.de/WBS/sst#sst"/>

...
```

```
<swrc:AssProf        t">
   <swrc:name>Steffen Staab
   </swrc:name>
...
</swrc:AssProf>
```

Cooperate_with

Web Page

Siegfried Handschuh

Links have explicit meanings!

He is working together with
Steffen Staab in the Knowledge
Management Group

Research:

Semantic Web, Knowledge
Management, Natural Language,

URL

http://www.aifb.uni-karlsruhe.de/WBS/sha

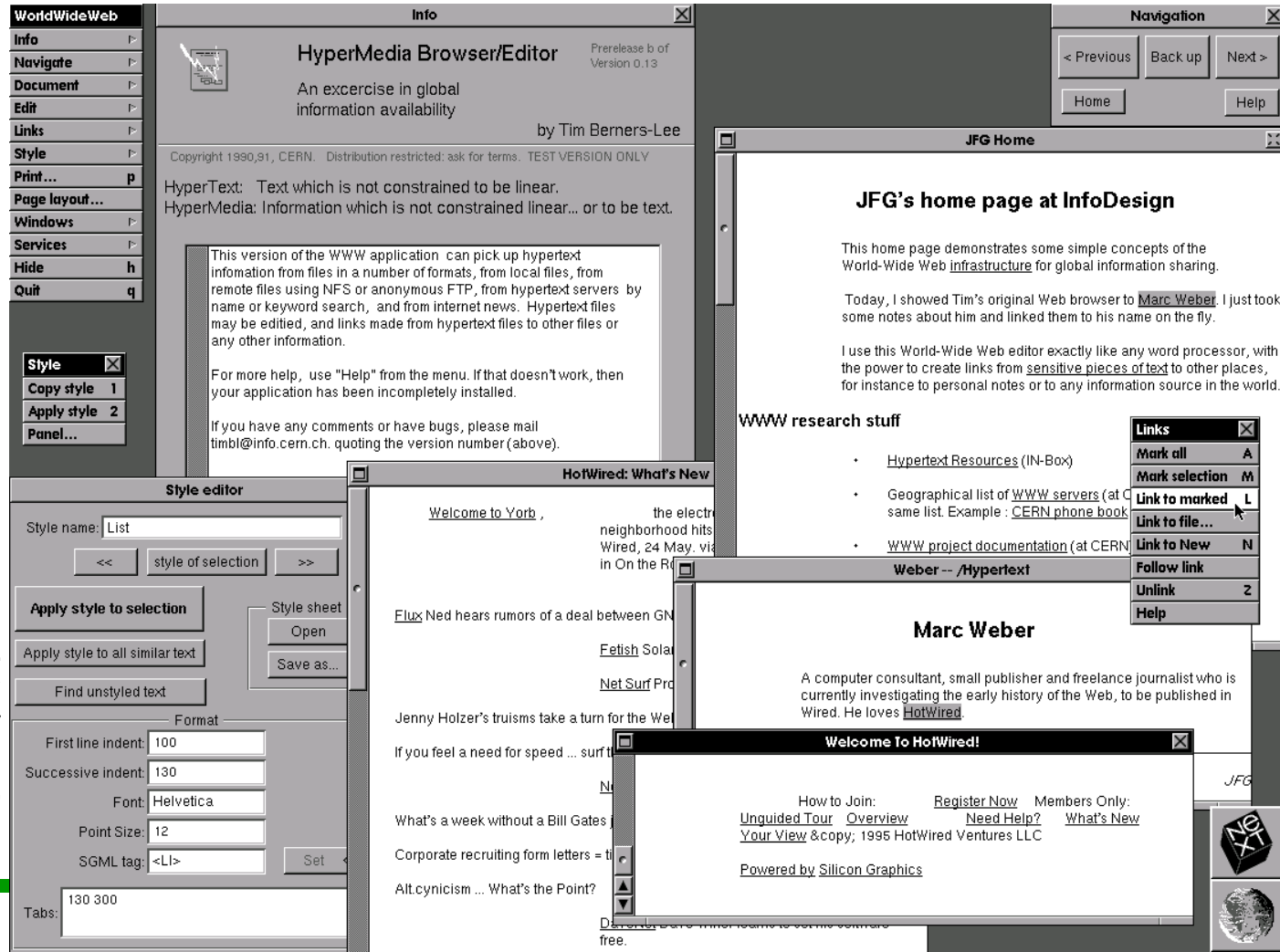http://www.aifb.uni-karlsruhe.de/WBS/sst

Sem

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1992: Internet release (CERN)

Basic ideas for the *Web* were fixed 1989 by Tim Berners-Lee.
Ideas for the (today so-called) *Semantic Web* have already been part of the initial ideas!

The Semantic Web Idea is not new!

First browser by TBL 1991/92

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Very brief history of the Semantic Web

- invented ca. 1989.

- 1990s: W3C metadata activity (lead to RDF(S))

- W3C semantic web activity: chartered 2001.

- USA: DAML-Programme 2000-2005 approx. 70M€.

- Many large scale EU projects since 2002 and ongoing.
  ! FP6/FP7

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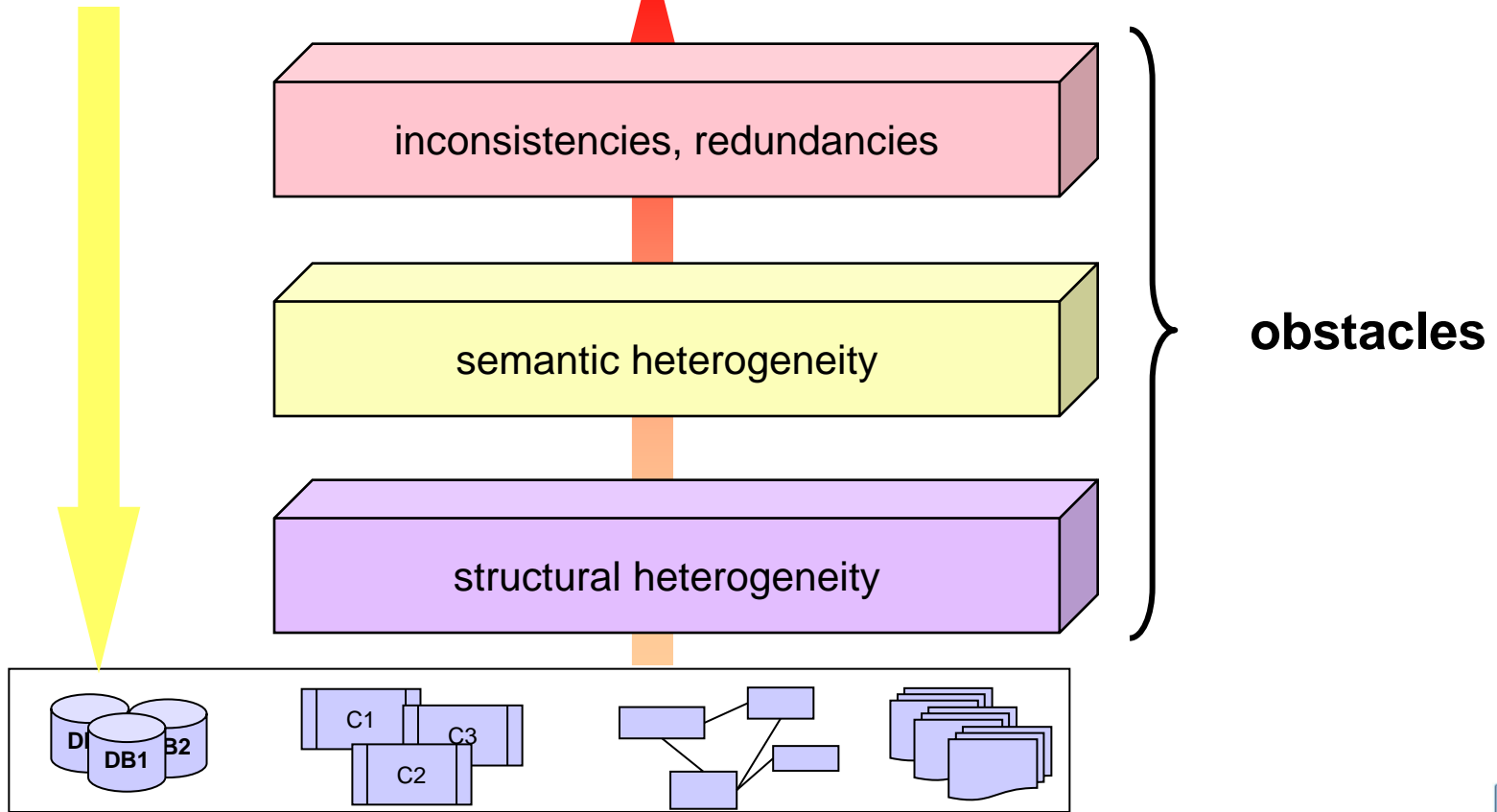
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Semantic Technolgies

- Same techniques and methods
- Usage not on the web
    - content management
    - data integration
    - intelligent systems
    - ambient intelligence
    - software engineering
    - etc.

- likely to have huge impact on industrial developments in near future

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Enterprise Information Integration

SOFTWARE AG

ontoprise

Queries

Answers

inconsistencies, redundancies

semantic heterogeneity

structural heterogeneity

obstacles

ReaSem

C1
C3
C2
DB1
D   B2

NeOn

X-MEDIA

Semantic Search with context information

ontoprise

KUKA Xpert ▪ Suche / Anzeige ▪ Erweiterte Suche					eingeloggt als

▪ **Robotertyp:** KR30/1 ▪ **Steuerung:** KRC3 ▪ **Software:** KRC 1.1.10b ▪ **Applikation:** Fräsen ▪   ▪ Suche
Suchbegriff: grundachse leckt   verändern
    ▪ Neue Suche

▪ Fehler (6)	▪ Fehlermeldung	▪ Treffer	▪ Nutzen	▪ Ranking	
▪ F_M_004	Leckage an Grundachse A2	Meldung	76	2.87	○
▪ F_M_006	Öl im Armgehäuse	Meldung	78	1.00	◉
▪ OH_2873	LTC: Initialisierung fehlgeschlagen (Grund: %1)	Meldung		0.90	○
▪ OH_2899	Start blockiert (Steuerung: %1, Grund: %2)	Meldung		0.90	○
▪ F_M_007	Druckverlust Hydropneumatischer GWA	Meldung	82	0.87	○
▪ F_M_008	Druckverlust Gas-GWA	Meldung	37	0.87	○

KUKA Xpert

Suche / Anzeige

Dokumentensuche
Erweiterte Suche
Historie

Explorer / Übersicht

Redaktion

Modell

Administration

Auswertungen

Top Tipps

Mein Konto

Hilfe

Kontakt

Abmelden

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NeOn

X-MEDIA

Application Scenario: Rolls Royce

- Manufacturer of turbines and propelling devices
- Rolls Royce needs solutions for the supervision of product lifecycles based on multimedial data.

  – EU IST IP X-Media

Application Scenario:
UN Food and Agriculture Organisation (FAO)

- FAO is the single institution world wide with knowledge about the global fish stock situation

- FAO needs solutions for the management of huge amounts of data about fishery

- One of the goals: Development of a ontology-based stock overfishing warning system
  - EU IST IP NeOn

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RDF Schema – Example

Declaration
of properties

Declaration
of classes

↑ subClass

╎ instantiation

ReaSem
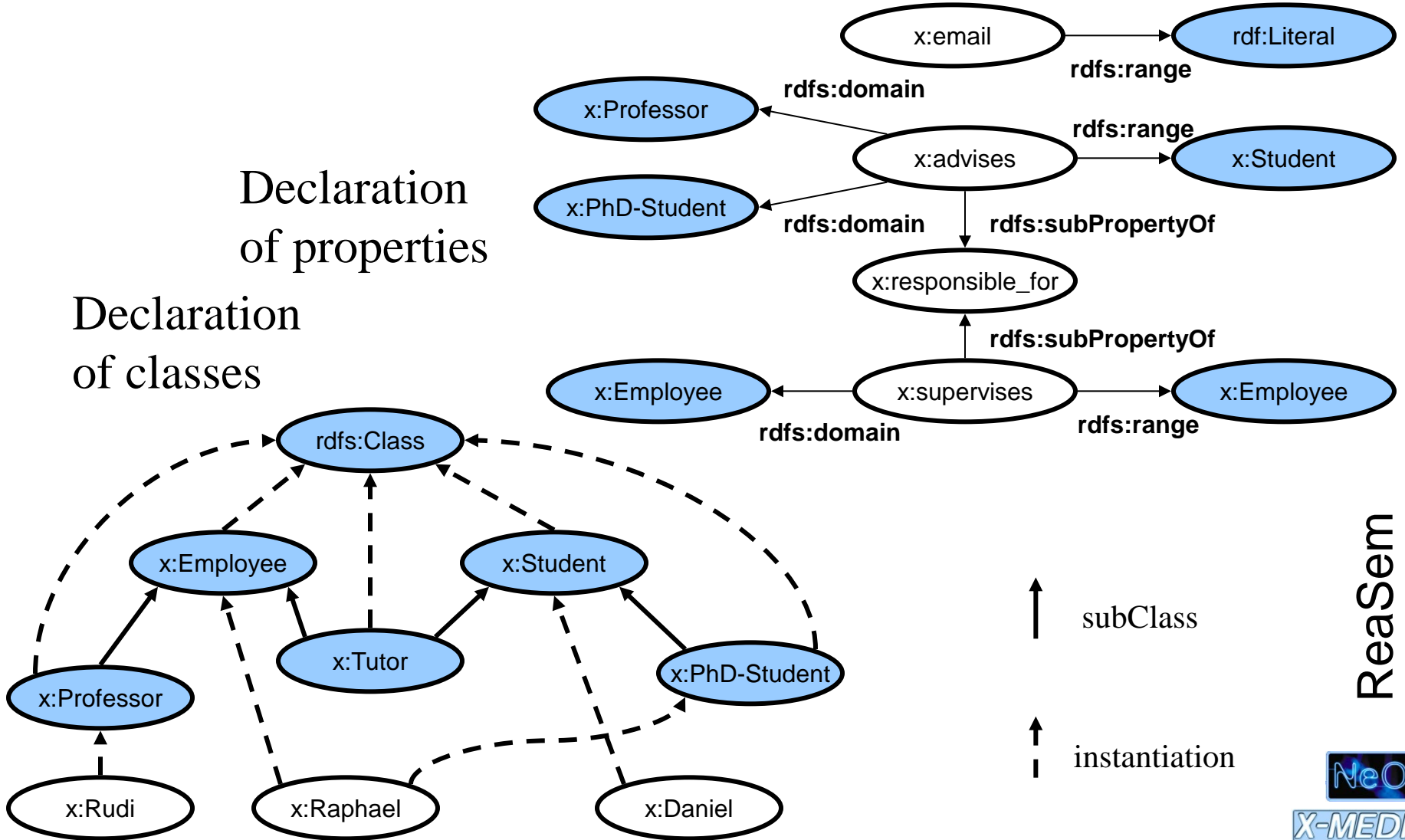
RDF/RDF Schema (Resource Description Framework)

- W3C standard since April 2004.
- XML Syntax for expressing very simple ontologies.

- Classes (unary predicates), subClassOf relation
- Properties (binary predicates), subPropertyOf relation
- RDF statements are triples (Object, Property, Object)
  - Objects can be
    - URIs
    - Classes
    - Properties
    - or triples(!)

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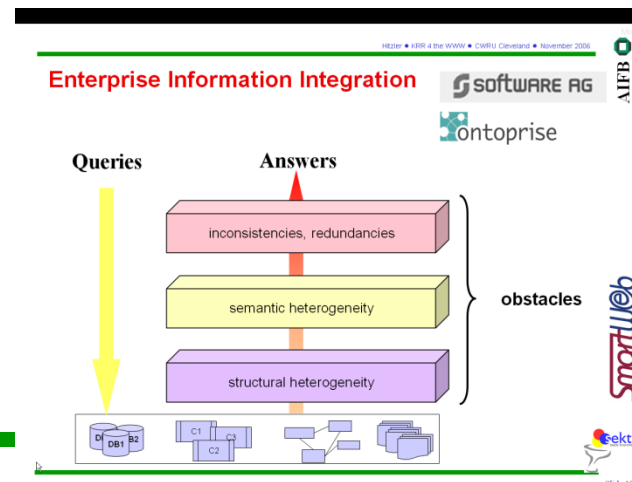6. Conclusions

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F-Logic

- Kifer, Lausen, Wu 1995.
- Logic Programming plus syntactic sugar.
- Used in Ontobroker by ontoprise GmbH.
- Scalable for industrial usage.
- W3C member submission "Web Rule Language WRL"
- Well-founded semantics (non-monotonic).

F-Logic – example

```
/* facts */
abraham:man.          sarah:woman.
isaac:man[father->abraham; mother->sarah].


/* conceptual knowledge */
man::person.
person[father=>man].



/* regeln */
FORALL X,Y X[son->>Y] <- Y:man[father->X].
jacob[son@(leah)->>{reuben, simeon};
                son@(rachel)->>{joseph, benjamin}].


/* queries */
FORALL X,Y <- X:woman[son->>Y[father->abraham]].
```

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Web Ontology Language OWL

- More expressive than RDFS.
- W3C recommendation April 2004.
- OWL DL: Fragment of 1st order predicate logic.
- OWL Full: OWL DL plus reification (etc.).

- OWL DL:
  - **Description Logic SHOIN**(D).
  - decidable.
  - largely compatible with RDFS.

OWL DL simple example

TBox: human v 9hasParent.>

     orphan ´ human u :9hasParent.alive

Translation to FOL:

(8X) (human(X) ! (9Y) hasParent(X,Y))

(8X) (orphan(X) $

     (human(X) Æ :(9Y) (hasParent(X,Y) Æ alive(Y)))

ABox: orphan(harrypotter)

     hasParent(harrypotter,jamespotter)
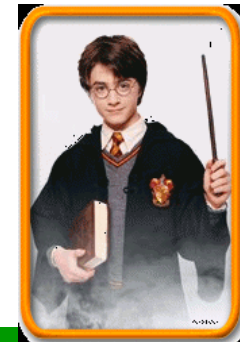
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Wikipedia growth

Year	Articles	English	Languages
2002	20,342	17,307	17
2003	133,129	98,475	25
2004	420,562	189,124	52
2005	1,311,697	438,289	162
2006	3,100,360	893,237	197
11/2006	5,565,830	1,462,910	250

Wikipedia users

- 2.7 Mio registered users
- About 70,000 contributors
- 2% (1,400) make 73.4% of all edits

- Most content from wide user base
- Clean up / "gardening" by small group

[English Wikipedia, study by Aaron Swartz]

A Wikipedia Problem

- Reuse of content on other pages can only be done manually.

- Wikipedia is full of manually created lists with overlapping content.

- Enormous overhead to maintain the lists and to ensure quality and consistency.

- Semantic Technologies are made to resolve such issues.

List of countries by GDP (nominal)

From Wikipedia, the free encyclopedia

This article includes a **list of countries of the world** sorted by their **gross domestic product** (GDP), the value of all final goods and services produced within a nation in a given year. The GDP dollar estimates presented here are calculated at market or government official exchange rates.

The table below includes data for the year 2005 for all 181 members of the International Monetary Fund, for which information is available. **Data are in millions of current United States dollars.**

It should be noted these figures do not include Somalia, Cuba, North Korea, Iraq, and several small states in Europe (Andorra, Monaco, San Marino, Liechtenstein, Vatican City, Greenland) and the Pacific (Palau, Marshall Islands, Micronesia, Nauru and Tuvalu).

Countries by nominal GDP.
Source: IMF (2005)
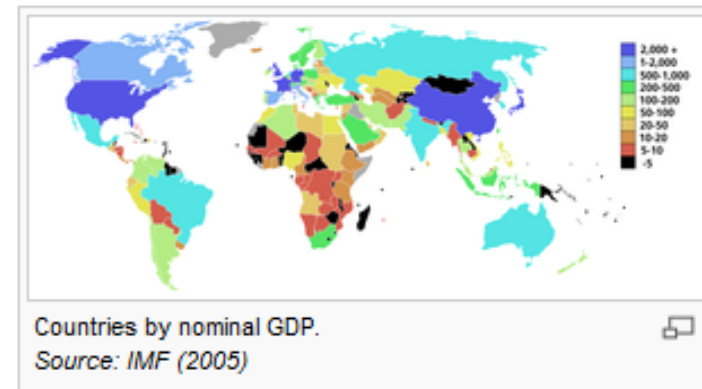
Rank	Country	GDP (millions of USD)
—	*World*	**44,454,843**
—	*European Union*	13,502,800
1	United States	12,455,825
2	Japan	4,567,441
3	Germany	2,791,737
4	People's Republic of China [2]	2,234,133
5	United Kingdom	2,229,472
6	France	2,126,719
7	Italy	1,765,537

List of countries by GDP (nominal) per capita

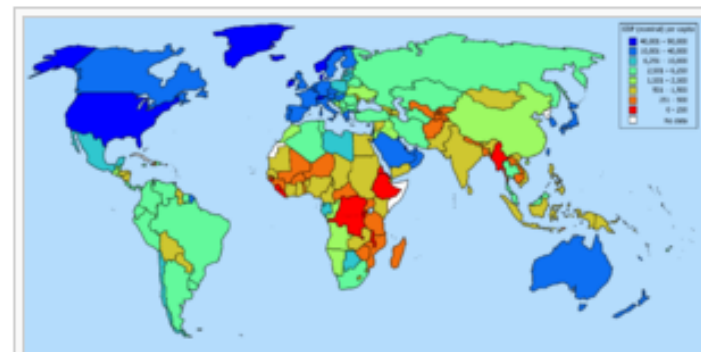From Wikipedia, the free encyclopedia

This article includes a **list of countries of the world** sorted by their **Gross Domestic Product** (nominal) **per capita**, the value of all final goods and services produced within a nation in a given year, divided by the average population for the same year.

The figures presented here do not take into account differences in the cost of living in different countries, and the results can vary greatly from one year to another based on fluctuations in the exchange rates of the country's currency. Such fluctuations may change a country's ranking a great deal from one year to the next, even though they often make little or no difference to the standard of living of its population. Therefore these figures should be used with caution.

Map of countries by GDP (nominal) per capita. *Source: IMF (2005)*

Comparisons of national wealth are also frequently made on the basis of purchasing power parity (PPP), to adjust for differences in the cost of living in different countries (*See* List of countries by GDP (PPP) per capita). PPP largely removes the exchange rate problem, but has its own drawbacks. It does not reflect the value of economic output in international trade, and it also requires more estimation than GDP per capita. On the whole PPP per capita figures are more narrowly spread than GDP per capita figures.

Great care should be taken when using either set of figures to compare the wealth of two countries. Often people who wish to promote or denigrate a country will use the figure that suits their case best and ignore the other one, which may be substantially different, but a valid comparison of two economies should take both rankings into account, as well as utilising other economic data to put an economy in context.

The table below includes data for the year 2005 for all 180 members of the International Monetary Fund, for which information is available. Data are in United States dollars.

| Rank	Country	GDP per capita
1	Luxembourg	80,288
2	Norway	64,193
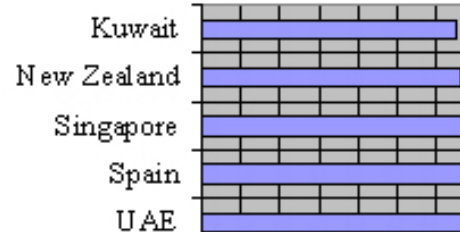
List of countries by GDP (PPP)

From Wikipedia, the free encyclopedia

There are three **lists of countries of the world sorted by their gross domestic product** (GDP) (the value of all final goods and services produced within a nation in a given year). The GDP dollar estimates given on this page are derived from Purchasing Power Parity (PPP) calculations. Using a PPP basis is arguably more useful when comparing differences in living standards because PPP takes into account the relative cost of living and the inflation rates of the countries, rather than using just exchange rates which may distort the real differences in income. The Market Exchange Rate (MER) GDP is more useful for understanding the international economic purchasing power and the total value of tradeable goods and services of different countries.

Map of world GDP (PPP) by country using the IMF list for 2005
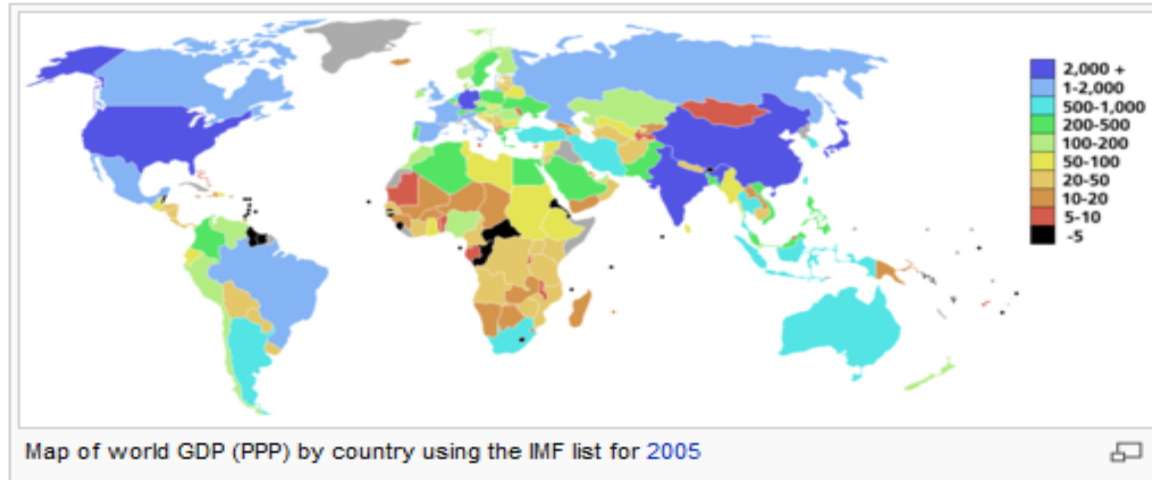
- The first table includes data for the year 2005 for all 180 members of the International Monetary Fund, excluding East Timor for which information is not available, and the unranked entities: world and European Union. Data is in millions of international dollars and is calculated by the International Monetary Fund.

- The second table shows 162 national entities as well as figures for the European Union and the World. This list was compiled by the World Bank. Data is for the year 2005, with figures in millions of international dollars.

- The third table is a tabulation of the CIA World Factbook data update of April 2006, according to the data provided by the CIA. Figures are estimates in millions of international dollars, for various years ranging from 1993 to 2005 (most figures are however for the year 2005).

List by the International Monetary Fund

Rank	Country	GDP (PPP) $m
—	World	61,027,505
—	European Union	12,427,413
1	United States	12,277,583

List by the World Bank

Rank	Country	GDP (PPP) $m
—	World	61,006,604
—	European Union	12,626,921
1	United States	12,409,465

List by the CIA World Factbook

Rank	Country	GDP (PPP) $m
—	World	60,630,000
1	United States	12,310,000
—	European Union	12,180,000

List of countries by GDP (PPP) per capita
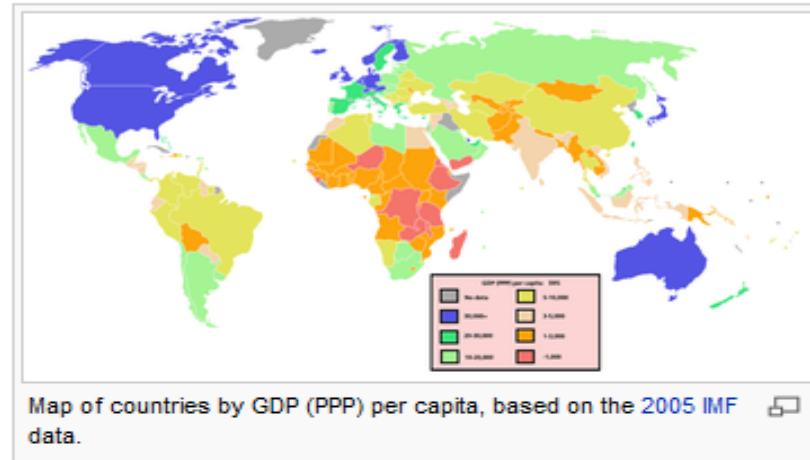
From Wikipedia, the free encyclopedia

This article includes a **list of countries of the world** sorted by their **gross domestic product** (GDP) at **purchasing power parity** (PPP) **per capita**, the value of all final goods and services produced within a nation in a given year divided by the average population for the same year.

GDP dollar estimates here are derived from purchasing power parity (PPP) calculations. Such calculations are prepared by various organisations, including the International Monetary Fund, the University of Pennsylvania, and the World Bank. As estimates and assumptions have to be made, the results produced by different organisations for the same country tend to differ, sometimes substantially. PPP per capita figures are estimates rather than hard facts, and should be used with caution.

Comparisons of national wealth are also frequently made on the basis of nominal GDP, which does not reflect differences in the cost of living in different countries. (See List of countries by GDP (nominal) per capita.) The advantages of using nominal GDP figures include that less estimation is required, and that they more accurately reflect the participation of the inhabitants of a country in the global economy. On the whole PPP per capita figures are more narrowly spread than GDP per capita figures.

Great care should be taken when using either set of figures to compare the wealth of two countries. Often people who wish to promote or denigrate a country will use the figure that suits their case best and ignore the other one, which may be substantially different, but a valid comparison of two economies should take both rankings into account, as well as utilising other economic data to put their economies into context.

The table below includes data for the year 2005 for all 181 members of the International Monetary Fund, for which information is available. Data are in International dollars. The table excludes Bermuda which is one of the British overseas territories. Bermuda has the highest GDP PPP in the world at $69,900 (2004 est.) according to the CIA Worldfact book. 🔒

Map of countries by GDP (PPP) per capita, based on the 2005 IMF data.

Rank	Country	GDP (PPP) $ per capita
1	Luxembourg	69,800
2	Norway	42,364
3	United States	41,399

List of countries by public debt

From Wikipedia, the free encyclopedia

This is a **list of countries by public debt** as percentage of gross domestic product, based on The World Factbook. For informational purposes several non-sovereign entities are also included in this list. All data per country is from a 2005 estimate, unless otherwise noted. Note that not all countries are included in the CIA data.

Map of countries by public debt
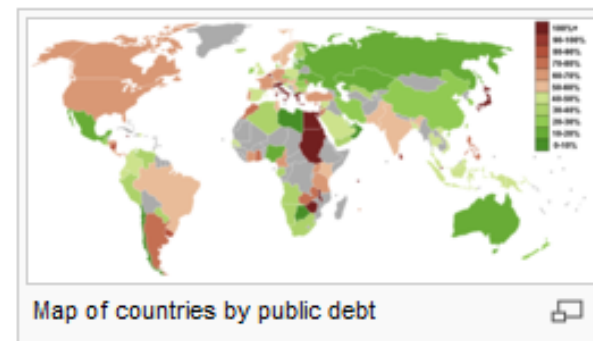
Nations by Public Debt		
Rank	**Nation**	**Public debt (% of GDP)**
1	Malawi	195.90
2	Lebanon	180.50
3	Seychelles	167.00
4	Japan	158.00
5	Jamaica	128.70
6	Zimbabwe	109.80
7	Italy	108.80
8	Sudan	107.00
9	Greece	106.80
10	Egypt	104.70
11	Singapore	102.90
12	Israel	99.70
13	Belgium	94.30
14	Sri Lanka	92.80

List of countries by military expenditures

From Wikipedia, the free encyclopedia

Contents [hide]

Stockholm International Peace Research Institute Figures   [edit]

This is a **list of the fifteen countries with the highest defence budgets** for the year 2005. The information is the most up-to-date from the Stockholm International Peace Research Institute, which is used to calculate defense spending by the British Ministry of Defence and many other government ministries in the European Union. Total World spending amounted to $1.0 trillion in 2005, with about half of the total amount spent by the United States.

Rank		Country	Defence Budget, USD	Date of information
—		**World Total**	**1,000,000,000,000**	2005
1		United States	478,200,000,000	2005
		European Union	216,961,000,000	2006 est.
2		United Kingdom	60,641,903,700	2006/07
3		France	46,200,000,000	2005

List of countries by population

From Wikipedia, the free encyclopedia

See also: List of countries by population in 2005, List of countries by population in 1907

This is a **list of sovereign states and other territories by population**, using the most recently available official figures. Because such figures are not collected at the same time in every country, or with the same level of accuracy, the resulting rankings may be misleading.

The list includes all sovereign states and dependent territories recognized by the United Nations plus the 7 sovereign states that are not recognised by the United Nations.[1]

List of countries by population [edit]

Rank	Country / Territory	Population	% of World Population	Notes
—	*World*	6,560,000,000	100%	population clock
1	People's Republic of China [2]	1,314,100,000	20.03%	population clock, [3]
2	India	1,120,000,000	17.07%	population clock, [4]
3	United States	300,300,000	4.58%	population clock
4	Indonesia	233,400,000	3.56%	population clock
5	Brazil	187,650,000	2.86%	population clock
6	Pakistan	158,750,000	2.42%	population clock

List of countries by length of coastline

From Wikipedia, the free encyclopedia

This is a **list of countries** by length of **coastline**, in kilometers, based on data for the year 2005 by the CIA World Factbook. [1]🔒 Coastline of 0 indicates that the country is landlocked. However, because length of coastline is a fractal measurement, measurements of a country's coastline at different scales will be different - the more detail, the longer the coastline will be. This is why there are different amounts given for a country's coastline.

Rank	Country	Land area (km²)	Land boundary (km)	Coastline (km)	Total perimeter (km)	Coast/Area Ratio (m/km²)	Coast/Perimeter Ratio (%)
1	Canada	9,220,970	8,893	202,080	210,973	21.915	95.8%
2	Norway	324,220	2,515	83,281	85,796	256.866	97.1%
3	Indonesia	1,826,440	2,830	54,716	57,546	29.958	95.1%
4	Russia	16,995,800	19,917	37,653	57,570	2.215	65.4%
5	Philippines	298,170	-	36,289	36,289	121.706	100.0%
6	Japan	374,744	-	29,751	29,751	79.390	100.0%
7	Australia	7,617,930	-	25,760	25,760	3.381	100.0%
8	United States	9,158,960	12,219	19,924	32,143	2.175	62.0%
9	New Zealand	268,680	-	15,134	15,134	56.327	100.0%
10	Greece	130,800	1,160	14,880	16,040	113.761	92.8%
11	People's Republic of China	9,326,410	22,147	14,500	36,647	1.555	39.6%
12	United Kingdom	241,590	360	12,429	12,789	51.447	97.2%
13	Mexico	1,923,040	4,538	9,330	13,868	4.852	67.3%
14	Italy	294,020	1,932	7,600	9,532	25.849	79.7%

List of countries receiving snowfall

From Wikipedia, the free encyclopedia

   Main article: Snow

This is a **list of countries receiving snow**.

<div>
Contents [show]
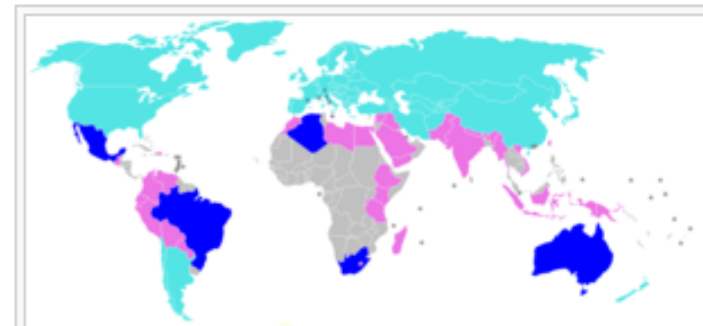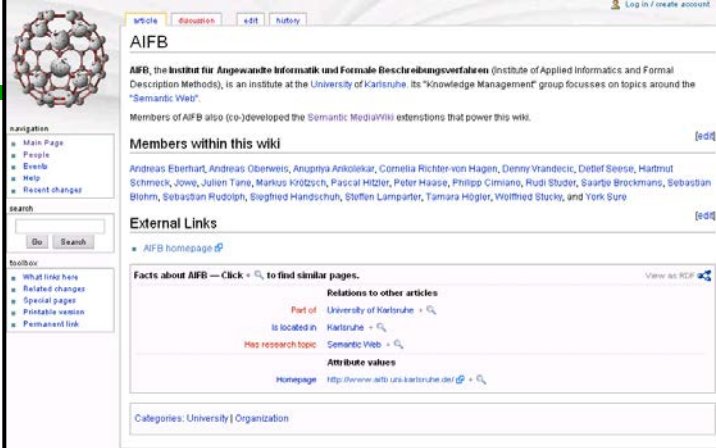</div>

At or below 1,000 meters above Sea Level   [edit]

Cyan = snows at 1000m or below; Blue = may snow at or below 1000m, but very rarely; Magenta = only snows higher than 1000m

Europe   [edit]

(every country except Malta)

- Albania
- Andorra
- Austria
- Belarus
- Belgium
- Bosnia-Herzegovina
- Bulgaria
- Croatia
- Czech Republic
- Denmark
- Estonia
- Finland
- France
- Georgia
- Germany
- Greece

Semantic Mediawiki

- Enhancement of Mediawiki (used in Wikipedia)

- Simple knowledge representation techniques
- Added value for user

- In particular:
  - better data reuse
  - enhancement of querying

Knowledge Technologies – Semantic MediaWiki

- Description
  Semantic MediaWiki introduces some additional markup into the wiki-text which allows users to add "semantic annotations".
- Structured Knowledge Representation (with RDF export)
- Extensions
  - for *typed* **Links**
    - **Previously: … Karlsruhe is located in [[Germany]] …**
    - **New: … Karlsruhe is located in [[has location::Germany]] …**
  - for **Annotations**
    - **Previously: … Karlsruhe has 280.000 inhabitants …**
    - **New: … Karlsruhe has [[inhabitants:=280000]] …**
- More information at http://wiki.ontoworld.org/

ReaSem

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We go to the article on the RuleML2006 conference …

http://wiki.ontoworld.org/wiki/RuleML2006

Max Völkel   my talk   preferences   my watchlist   my contributions   log out

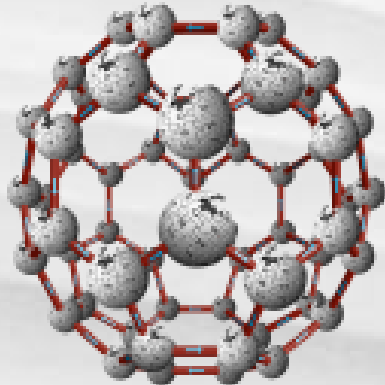article   discussion   edit   history   protect   delete   move

RuleML2006 (non semantic version)

RuleML2006 is the Second International Conference on Rules and Rule Markup Languages for the Semantic Web. It is held from November 9 2006 to November 10 2006 in Athens, Georgia, USA. For more information, see http://2006.ruleml.org/ .

Call for Papers

[edit]

Semantic Web technologies have matured to the point where they are being adopted by many organizations for applications as diverse as data integration, optimized search, and decision support. The increasing use of the technology has resulted from mainstream commercial software vendors providing solutions that support Semantic Web technologies, and W3C making RDF and OWL standard recommendations.
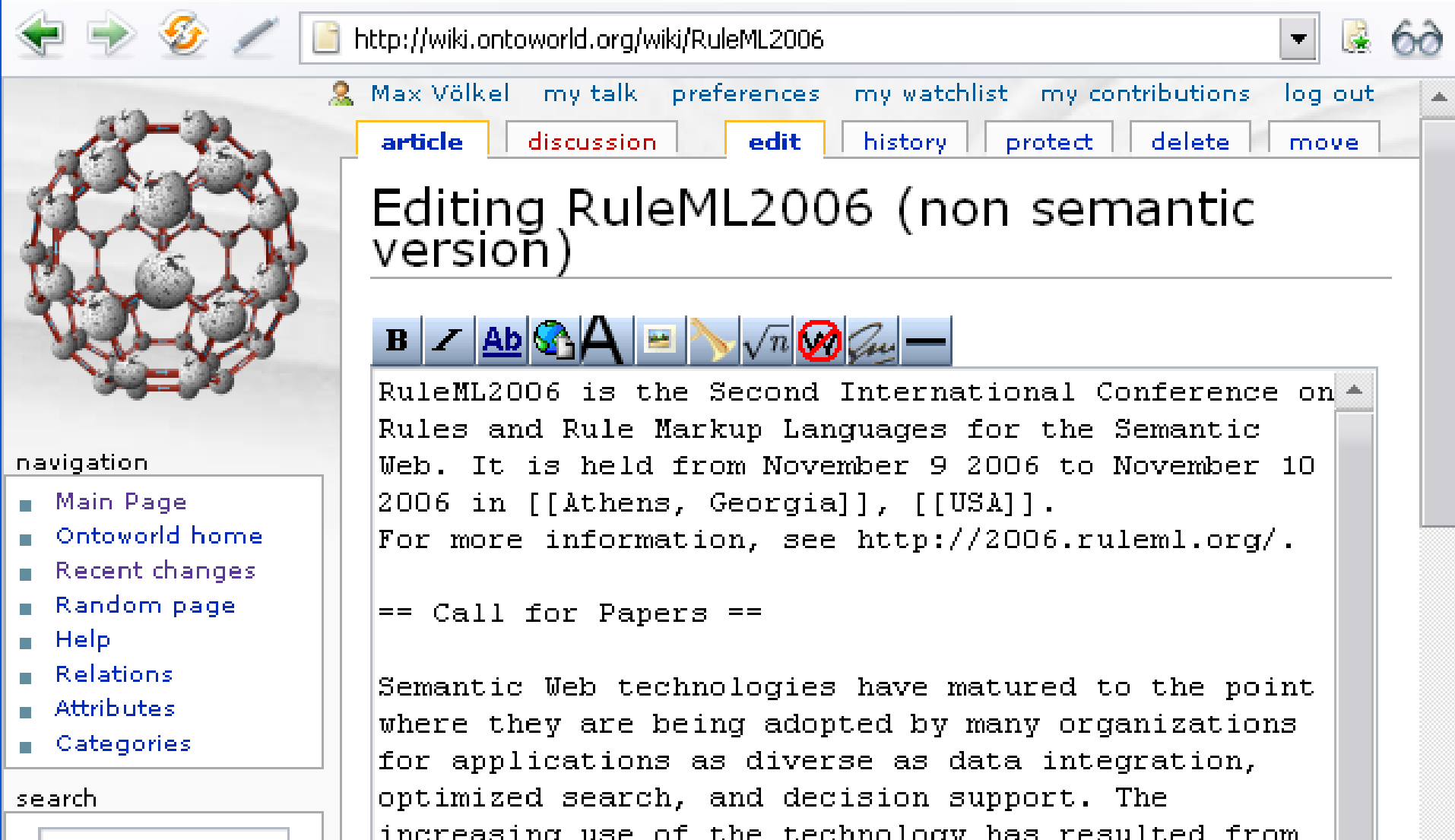
navigation

- Main Page
- Ontoworld home
- Recent changes
- Random page
- Help
- Relations
- Attributes
- Categories

search

IFB

… and edit it

http://wiki.ontoworld.org/wiki/RuleML2006

Max Völkel   my talk   preferences   my watchlist   my contributions   log out

article   discussion   **edit**   history   protect   delete   move

Editing RuleML2006 (non semantic version)

B _ Ab A

```
RuleML2006 is the Second International Conference on
Rules and Rule Markup Languages for the Semantic
Web. It is held from November 9 2006 to November 10
2006 in [[Athens, Georgia]], [[USA]].
For more information, see http://2006.ruleml.org/.

== Call for Papers ==

Semantic Web technologies have matured to the point
where they are being adopted by many organizations
for applications as diverse as data integration,
optimized search, and decision support. The
increasing use of the technology has resulted from
```

navigation

- Main Page
- Ontoworld home
- Recent changes
- Random page
- Help
- Relations
- Attributes
- Categories

search

X-MEDIA

article | discussion | edit | history | protect | delete | move

RuleML2006 is the Second International Rules and Ru____ges for the Sema___ ___. __ __ held from November ___ 2006 to November 10 2006 in [[Athens, Georgia]], [[USA]]. For more information, see http://2006.ruleml.org/.

> There is already an ordinary link to the article of „Athens, Georgia"

ReaSem

article | discussion | edit | history | protect | delete | move

RuleML2006 (semantic version)

RuleML2006 is the Second International Workshop on Rules and Rule Markup Languages for the Semantic Web held from November 9 2006 to November 10 2006 in [[has location::Athens, Georgia]], [[USA]].
For more information, see http://2006.ruleml.org/.

> Just say what the relation between this page (RuleML2006) and „Athens, Georgia" is.

ReaSem

From links …

… in [[Athens, Georgia]], [[USA]]. …

… to typed links

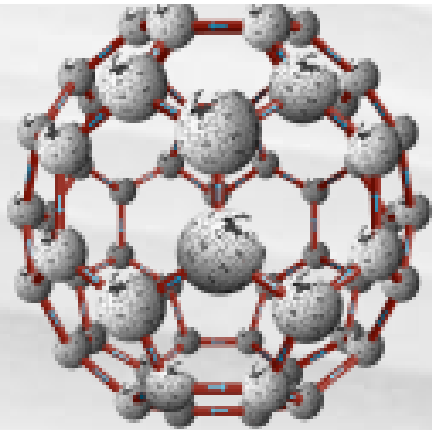**… in [[has location::Athens, Georgia]], [[USA]]. …**

AIFB

From values …

… It is held from November 9 2006 to November 10 2006 in…

… to attributes

… It is held from [[start date:=November 9 2006]] to [[end date:=November 10 2006]] in…

ReaSem

AIFB

Save.

| article | discussion | **edit** | history | protect | delete |

Editing RuleML2006 (simple semantic version)

B _I_ Ab 🌐 A 🖼 📯 √n ~~W~~ ✍ —

```
RuleML2006 is the Second International
Conference on Rules and Rule Markup Languages
for the Semantic Web.
It is held from [[start date:=November 9 2006]]
to [[end date:=November 10 2006]] in
[[has location::Athens, Georgia]], [[USA]].
For more information, see http://2006.ruleml.
org.


[[Category:Conference]]
|
```

navigation

- Main Page
- Ontoworld home
- Recent changes
- Random page
- Help
- Relations
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- Categories

NeOn
X-MEDIA

It looks exactly the same as before

http://wiki.ontoworld.org/index.php/RuleML2006_(simple_semantic_version)

Max Völkel   my talk   preferences   my watchlist   my contributions   log out

article | discussion | edit | history | protect | delete | move

RuleML2006 (simple semantic version)

RuleML2006 is the Second International Conference on Rules and Rule Markup Languages for the Semantic Web. It is held from November 9 2006 to November 10 2006 in Athens, Georgia, USA. For more information, see http://2006.ruleml.org.

navigation

- Main Page
- Ontoworld home
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search

X-MEDIA

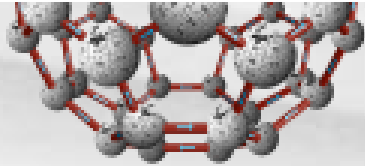# What the humans see, when they scroll down

RuleML2006 is the Second International Conference on Rules and Rule Markup Languages for the Semantic Web. It is held from November 9 2006 to November 10 2006 in Athens, Georgia, USA. For more information, see http://2006.ruleml.org .

navigation

- Main Page
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- Random page
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- Relations
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- Categories

search

[   ]

[Go] [Search]

toolbox

- What links here
- Related changes
- Special pages
- Printable version
- Permanent link

for demonstration purposes, we have

- RuleML2006 (non semantic verison)
- **RuleML2006 (simple semantic version)**

Relations to other articles — Click + 🔍 to find similar articles.

RuleML2006 (simple semantic version) Has location Athens, Georgia + 🔍

Attributes of RuleML2006 (simple semantic version) — Click + 🔍 to find similar articles.

Start date: 2006-11-09 + 🔍
End date: 2006-11-10 + 🔍

Editing help on relations and attributes   View as RDF

AIFB

What the humans see, when they scroll down

Relations to other articles — Click + 🔍 to find similar articles.

RuleML2006 (simple semantic version) Has location Athens, Georgia + 🔍

Attributes of RuleML2006 (simple semantic version) — Click + 🔍 to find similar articles.
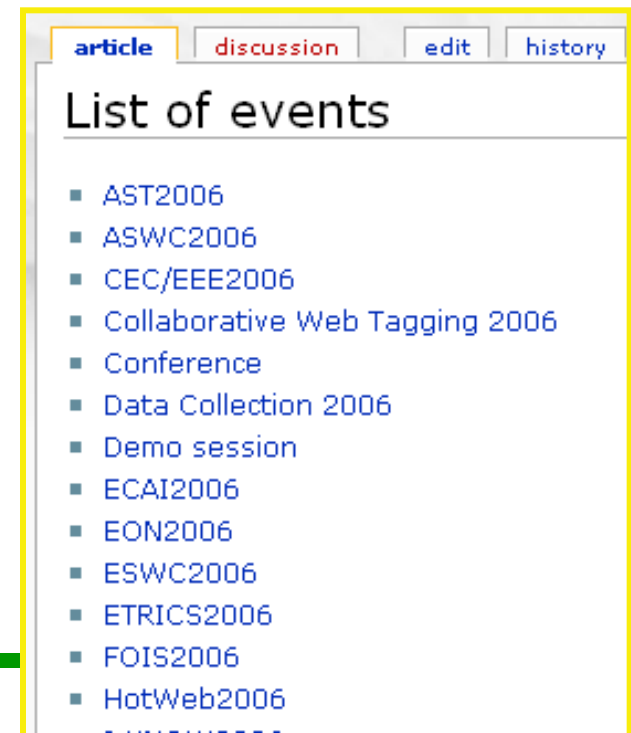
Start date: 2006-11-09 + 🔍
End date: 2006-11-10 + 🔍

Editing help on relations and attributes   View as RDF 📡

X-MEDIA

Benefits for Wikipedians: <ask> for your data

- Inline queries allow for questions like ...
  - ... movies from the 70s starring Sean Connery
  - ... list of events (all conferences and workshops)

```
<ask format="ul" link="all">
      [[Category:Event]]
</ask>
```

| article | discussion | edit | history |

List of events

- AST2006
- ASWC2006
- CEC/EEE2006
- Collaborative Web Tagging 2006
- Conference
- Data Collection 2006
- Demo session
- ECAI2006
- EON2006
- ESWC2006
- ETRICS2006
- FOIS2006
- HotWeb2006

Benefits for Wikipedians: <ask> for your data

- Inline queries allow for questions like ...
    - ... movies from the 70s starring Sean Connery
    - ... list of events with their deadline

```
<ask format="ul" link="all">
    [[Category:Event]]
    [[paper deadline:=*]]
</ask>
```

| article | discussion | edit | history |

List of events

- AST2006
- ASWC2006
- CEC/EEE2006
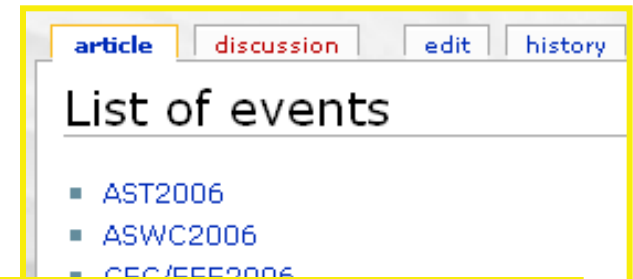
| article | discussion | edit | history | protect | delete | move | watch |

List of events with paper submission deadline

	paper deadline
AST2006	2006-06-16
ESWC2006	2005-11-28
HotWeb2006	2006-06-15
I-KNOW2006	2006-04-17

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Benefits for Wikipedians: <ask> for your data

```
<ask format="ul" link="all">
 [[Category:Event]]
 [[paper deadline:=>June 1 2006]]
 [[paper deadline:=<December 31 2006]]
 [[title:=*]]
 [[paper deadline:=*]]
 [[Category:Topic Semantic Web query
languages]]
</ask>
```

	title	paper deadline
RuleML2006	Second International Conference on Rules and Rule Markup Languages for the Semantic Web	2006-06-05

Applications

- Automatic tables and lists
    - E.g. Countries sorted by area, population, alphabet, ...
- **Maintenance** with hand crafted checks
    - Does every country have one capital?
- Integration in applications
    - ```
      latte = wikipedia.get("Latte
      Macchiatto");
      print latte["contains"]
      ```
- Visualization and browsing
- ... And many unexpected ones

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Who is using Semantic MediaWiki?

- ¸50 *known* sites
- Archiplanet
  - 122801pages
- BibleWiki
  - 40000 pages
- Centiare
  - 5000 pages
- HumanCell
  - 22129 pages

- Jurispedia
  - 4000 pages
- Wikicompany
  - 9000 pages
- OneWoldWiki
  - 2673 pages
- NI Gov. Wiki
  - 1500 pages

Demo and more information at
http://wiki.ontoworld.org/

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2. Ontology Languages
3. Semantic MediaWiki
4. **SmartWeb**
5. Accessing implicit knowledge by automated reasoning
6. Conclusions

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X-MEDIA

SmartWeb: Mobile querying of the Semantic Web
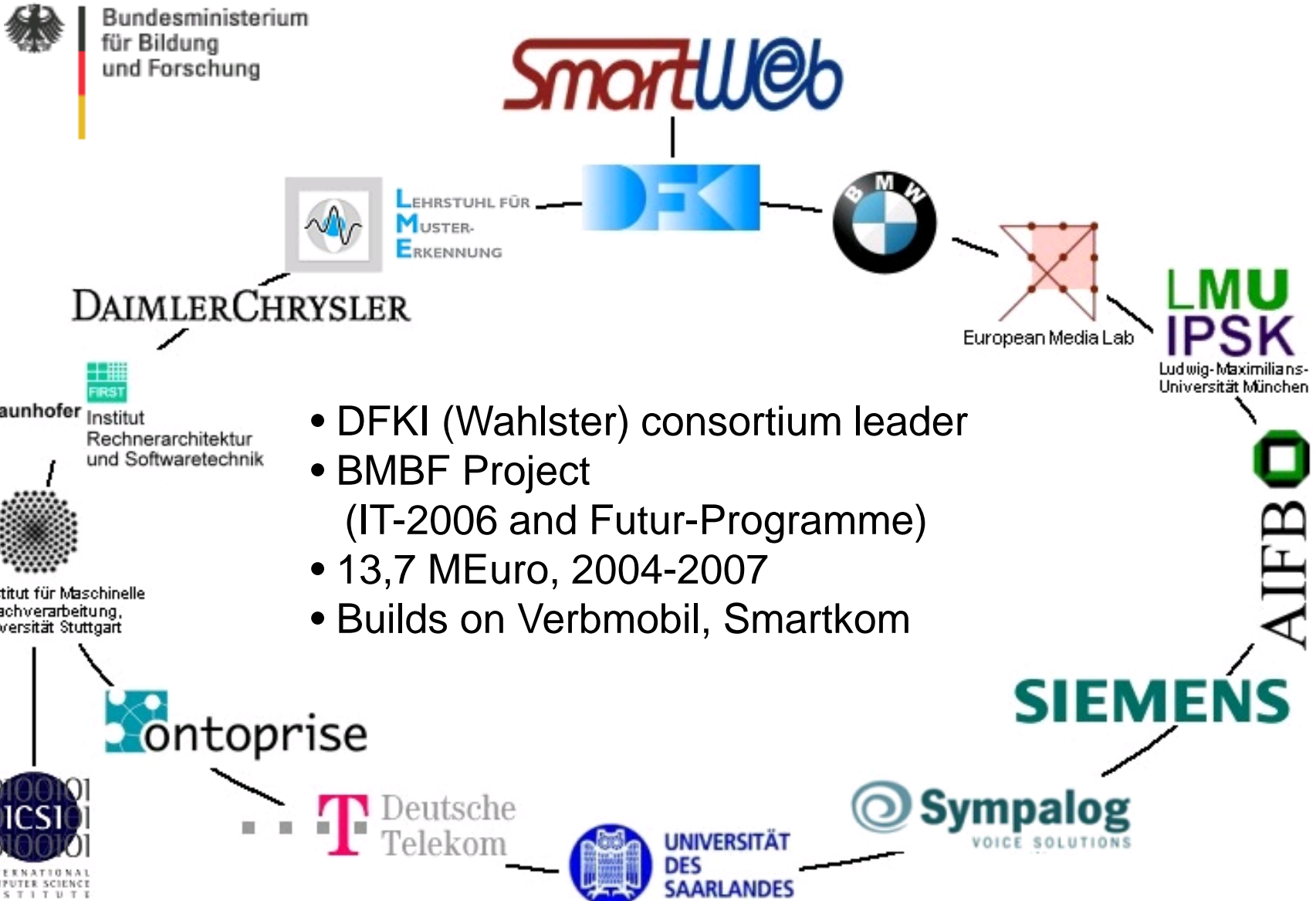
- DFKI (Wahlster) consortium leader
- BMBF Project
  (IT-2006 and Futur-Programme)
- 13,7 MEuro, 2004-2007
- Builds on Verbmobil, Smartkom

The SmartWeb System
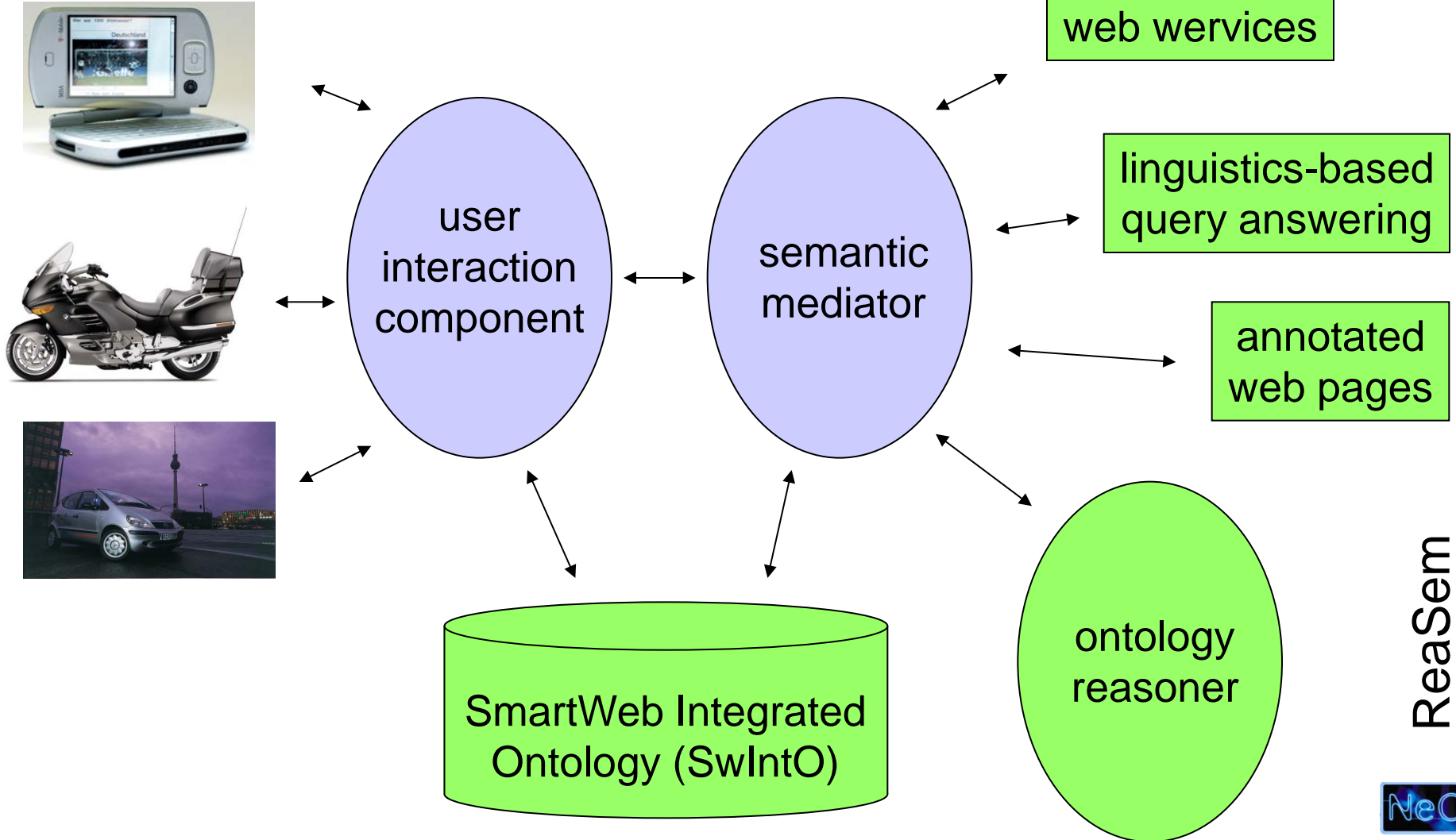
The SmartWeb Demonstrator

- see demo movie

Table of Contents

Simple Reasoning

If I ask for soccer team members, I also want to get the goalkeepers listed ...

If I ask for cities, I also want all capitals listed ...

inheritance reasoning

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Less Simple Reasoning

What was again the name of that russian researcher who worked on resolution-based calculi for EL?

answering requires merging of knowledge from many websites and using background knowledge.

with semantic web this will be simple.

Are lobsters spiders?

What is "Käuzchen" in english?

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Sophisticated Application Needs

The conclusions from the sensor data are uncertain. How do I process that?

fuzzy/probabilistic reasoning

Merging Wiki inputs will lead to inconsistencies. How do we deal with that?

paraconsistent reasoning

Thinkpads run Windows, unless explicitly stated otherwise ...

non-monotonic reasoning

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The Expressive Reasoning Scalability Problem

- OWL DL is a poor KR&R Language.
- But it already is NExpTime hard.

- Old AI bottleneck:
  - Expressive logics have high computational complexity.
  - Expressive KR and reasoning is very expensive.

- But the WWW is huge!

Current Research Trend

- Now, for the first time since AI was invented, expressive reasoning becomes feasible for practice.
  - Rule-based systems
    - **e.g. ontobroker by ontoprise, based on F-Logic**
  - DL-based reasoners
    - **e.g. CEL for SNOMED, based on OWL**

- Initiated by performance breakthroughs end-90s
- Further driven by Semantic Web effort

- Some expressive extensions are still off limits!

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Reasoning in Semantic Mediawiki

- Lightweight use of metadata (mainly RDFS, some EL++. No reasoning in the stronger sense)

- *Already* added value for the user!

- Simple: Introduce further background knowledge by means of *ontologies*.
  - Beware of scalability problems!
  - ... and others ...

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Reasoning in SmartWeb

- Knowledge Representation mainly RDFS-based.

- Some more sophisticated data represented in F-Logic.

- Very large database.
  Reasoning still shallow.
  Already pushing the limits of scalability.

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SNOMED application

- Systematized Nomenclature of Human and Veterinary Medicine (USA-based)
  - industrial strength application
- Application requires reasoning support.
- Solved by applying tractable OWL-DL-fragment EL++
  - (Franz Baader, TUD)

- Current paradigm shift: tractable description logics
  - Horn-SHIQ (Karlsruhe)
  - DL-Lite (Rome)
  - EL++ (Dresden)

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Conclusions

- Semantic Technologies are of added value for multimedia content management and retrieval (and many other topics).

- Reasoning allows to access implicit information and is highly sought for in practice.

- Solutions for industrial applications are within reach now!

Acknowledgements

- Semantic MediaWiki
  - Main developers: Markus Krötzsch, Denny Vrandecic

- SmartWeb – Karlsruhe project members
  - Anupriya Ankolekar, Philipp Cimiano, Andreas Eberhart, Pascal Hitzler (lead), Markus Krötzsch, Daniel Oberle, Tuvshintur Tserendorj

- Ontology Logic and Reasoning (OntoLoRe) subgroup
  - Darko Anicic, Jürgen Bock, Stephan Grimm, Peter Haase, Pascal Hitzler (lead), Markus Krötzsch, Yue Ma, Guilin Qi, Sebastian Rudolph, Tuvshintur Tserendorj

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THANKS!

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