



## The role of semantics in the development from Web2.0 to Web3.0”

SDM – IMD New Gen Lib Workshop, 2008-02-25

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FAO of the United Nations

Knowledge Exchange and Capacity Building Division



# This presentation

## 1. Introduction

- Knowledge to combat Hunger and poverty

## 2. Important Developments

- The web becomes a mass activity
- Global Public Goods
- Going Digital
- “Web20”

## 3. The next Internet Revolution

- Requirements
- Does semantics matter?
- Bricks for the semantic web

## 4. The Agricultural Ontology Service

- Application Profiles
- AgroVoc
- Domain Ontologies
- Semantic Applications (Agropedia Indica)





# Millenium Development Goals

Target year 2015

- Eradicate extreme poverty and hunger
- Achieve universal primary education
- Promote gender equality and empower women
- Reduce child mortality
- Improve maternal health
- Combat HIV/AIDS, malaria and other diseases
- Ensure environmental sustainability
- Develop a global partnership for development

<http://www.un.org/millenniumgoals/>

# Cross Cutting Issues for our Future Work

- **Knowledge management;**
- Policy support and the development of policy and strategy;
- Capacity building;
- Basic data and statistics;
- Environment and natural resource management;
- Emergencies and rehabilitation; and
- Gender mainstreaming and women's empowerment.





**FOOD AND AGRICULTURE ORGANIZATION OF THE UNITED NATIONS**  
*helping to build a world without hunger*

العربية 中文 français español

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- What is FAO?
- From the Director-General
- Governing Bodies
- Agriculture and Consumer Protection
- Economic and Social Development
- Fisheries and Aquaculture
- Forestry
- Natural Resources Management and Environment
- Technical Cooperation
- Programme and Budget; Evaluation
- Legal Office
- Decentralized Offices
- Employment
- Procurement Service
- Interdisciplinary Activities: Trade, Biotechnology, Gender...
- Statistical Databases
- Country information
- Virtual Library
- Publications and Documents
- more...

### Newsroom

**Improved management of fishing's "last frontier" needed**  
Countries discuss how to better protect deep sea species and habitats

**Tea prices to maintain upward trend in 2008**  
Output in Viet Nam increases 28 percent, another record crop in China

**Significant increase in world cereal production forecast for 2008, but prices remain high**  
New FAO web portal tracks market trends

**FAO unveils new bioenergy assessment tool**  
Weighs impact on food security

[more news...](#)

**Webcasting from FAO**



Jatropha nuts to make biodiesel in Thailand  
[more photos...](#)

### Knowledge Forum

#### World Food Situation



World Agricultural Information Centre



#### H5N1 Avian Influenza



Progress since the World Food Summit



#### World Food Day



#### FAO Hunger Map



#### TeleFood



Feeding Minds Fighting Hunger



### Information Finder

All FAO & related sites

### Selected Key Programmes

**SPFS:** Special Programme for Food Security

**EMPRES:** Emergency Prevention





## FOOD AND AGRICULTURE ORGANIZATION OF THE UNITED NATIONS

helping to build a world without hunger

### WAICENT PORTAL

Home [FAO Home](#)

[WAICENT Information Finder](#) [Ask FAO](#)

Search  
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#### WAICENT Highlights

- 5 February 2008 Over 11 000 new bibliographic records added to AGRIS Repository.
- 31 January 2008 Crop Wild Relatives Ontology Browser is now available online!
- 16 January 2008 [Opening the content of agricultural repositories using Open Archives Initiative \(OAI\) framework](#)
- 9 January 2008 LAST CALL FOR PAPERS: Special Issue on Agricultural Metadata & Semantics International Journal of Metadata, Semantics and Ontologies

[More](#)



#### What's new on the FAO Web site

[PARTNERS](#)

#### Glossary of FAO Databases and Information Systems

[ABOUT WAICENT](#)

#### FAO Web site directory

This Web site directory provides links to approximately 250 main sites and subject entry points.

##### Animal Production & Health

[Animal Health](#), [Animal diseases & Control](#), [Animal genetic resources & Breeding](#), [Animal nutrition & Feeds](#), [Production & Livestock](#), [more](#)

##### Economics & Policy

[Agroindustry](#), [Economic development](#), [Policies](#), [Trade](#), [Marketing & Commodities](#), [more](#)

##### Education & Extension

[Communication for development](#), [Education](#), [Extension](#), [Training & Capacity building](#), [more](#)

##### Engineering, Technology & Research

[Biotechnology](#), [Geographical information systems](#), [Postharvest technology](#), [Research](#), [Statistics](#), [more](#)

##### Farming Practices & Systems

[Farm management](#), [Farming systems](#), [Land use](#), [more](#)

##### Fisheries & Aquaculture

[Aquaculture](#), [Development](#), [Ecosystems](#), [Governance](#), [Issues](#), [more](#)

##### Forestry

[Assessment & Monitoring](#), [Environment](#), [Forest management](#), [Forest products & Services](#), [Forest resources](#), [more](#)

##### Geographical & Regional Information

[Africa](#), [America](#), [Asia](#), [Europe](#), [Oceania](#), [more](#)

##### Government, Administration & Legislation

[Administration](#), [Agricultural and rural legislation](#), [Environmental legislation](#), [Fisheries](#), [Food legislation](#), [more](#)

##### Information Management

[Databases & Information systems](#), [Documentation](#), [Early warning systems](#), [Geographical information systems](#), [Information science](#), [more](#)

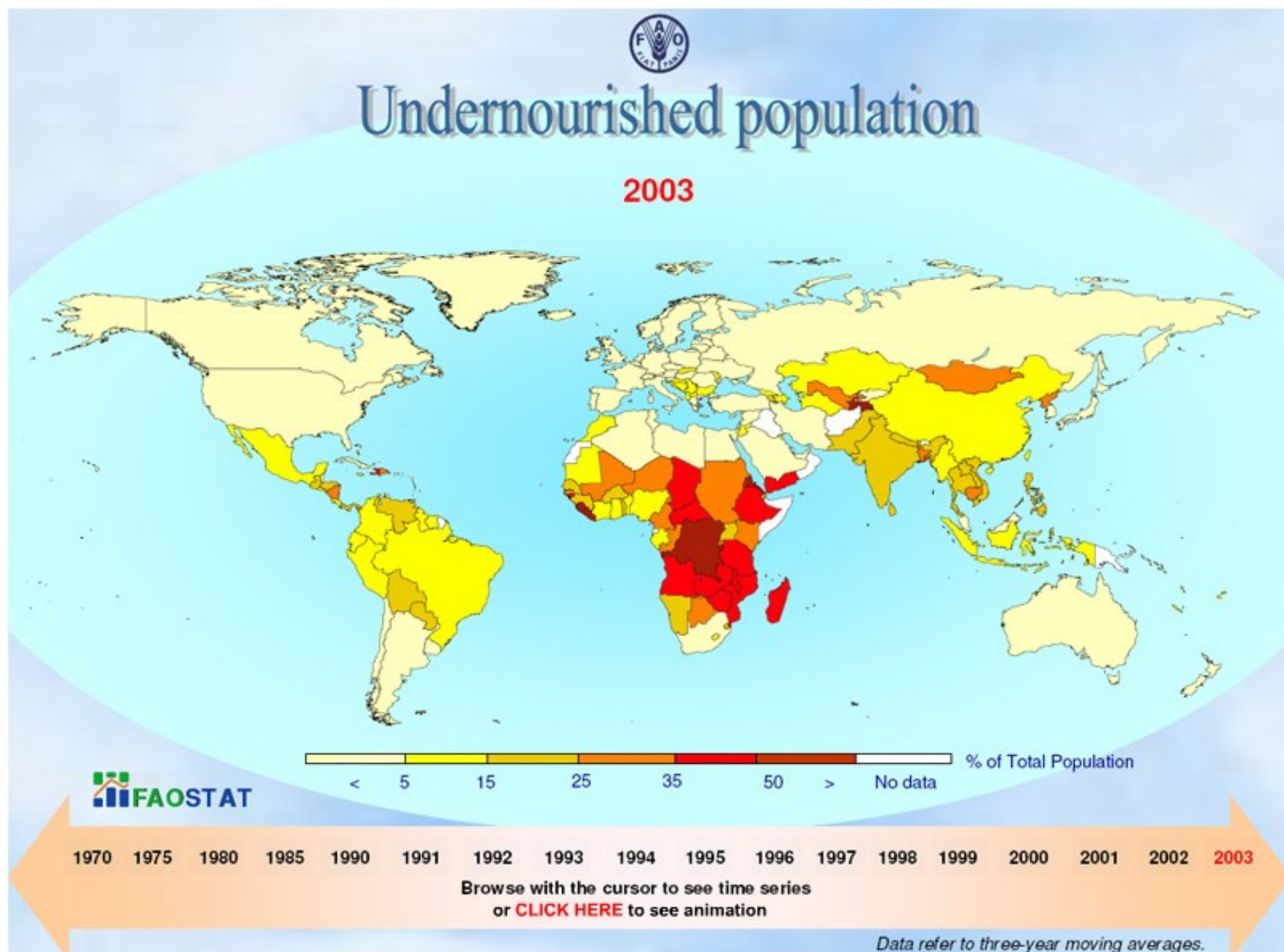
##### Natural Resources & Environment

[Biodiversity](#), [Climate change](#), [Desertification](#), [Drainage & Irrigation](#), [Ecology & Ecosystems](#), [more](#)

##### Plant Production & Protection

[Crops & Crop management](#), [Fertilizers](#), [Integrated pest management](#), [Irrigation](#), [Pest control](#), [Pesticides](#)





# Important Developments

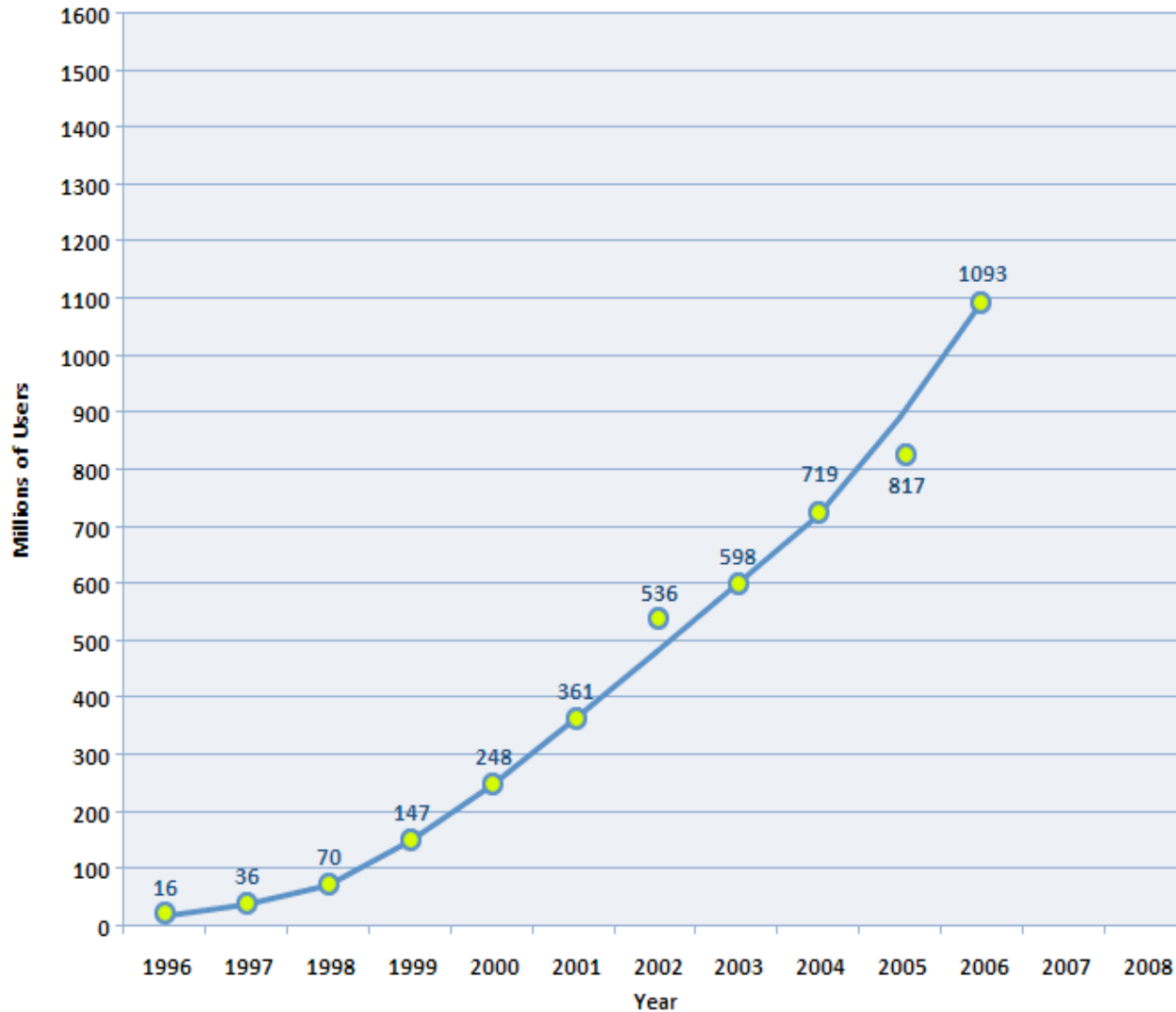
1. The web becomes a mass activity
2. Global Public Goods
3. Going Digital
4. “Web20”





# The web becomes a mass activity

Internet Usage Growth  
1995 - 2006

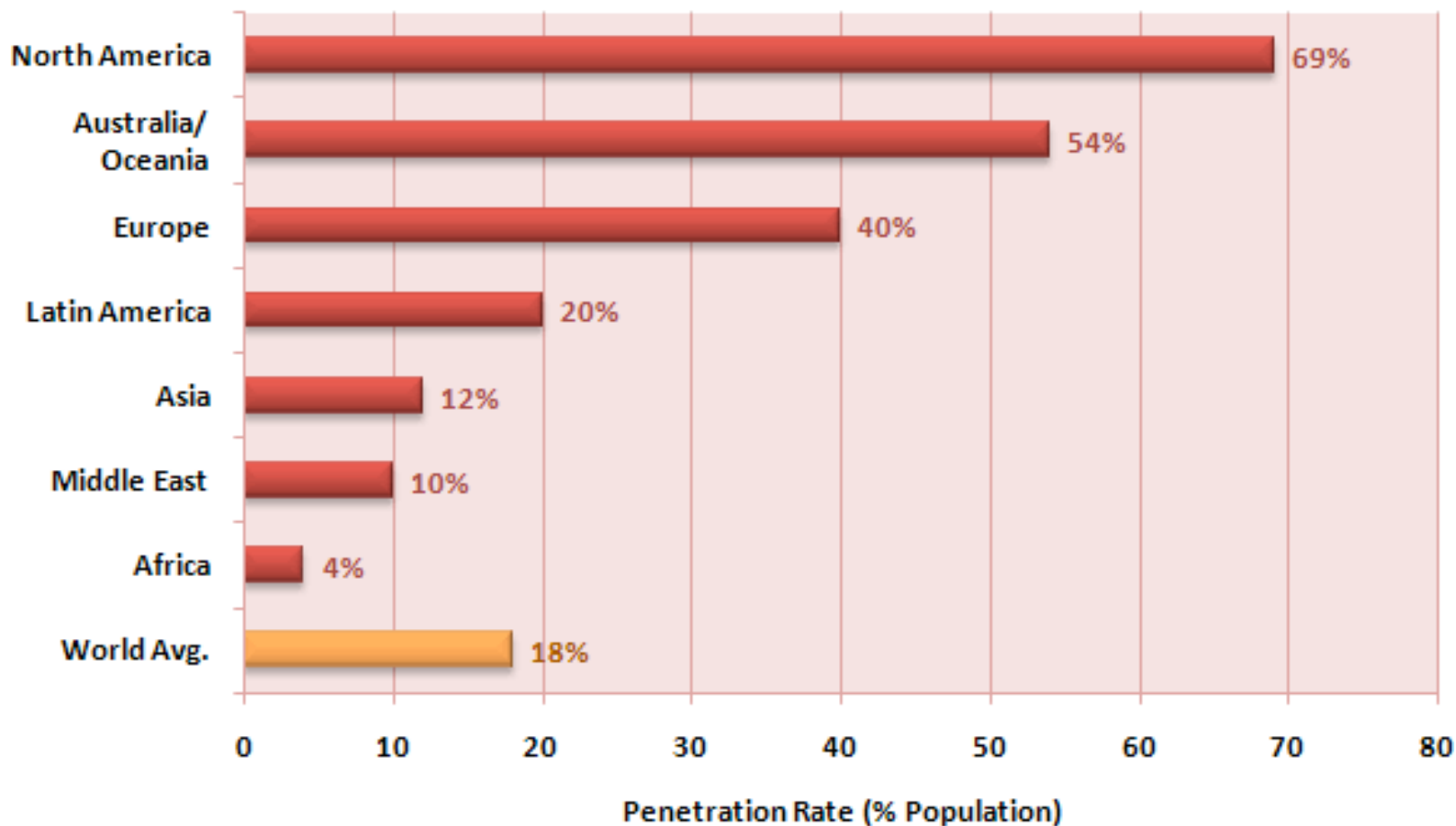


Copyright © 2007, [www.internetworldstats.com](http://www.internetworldstats.com)



# The web becomes a mass activity

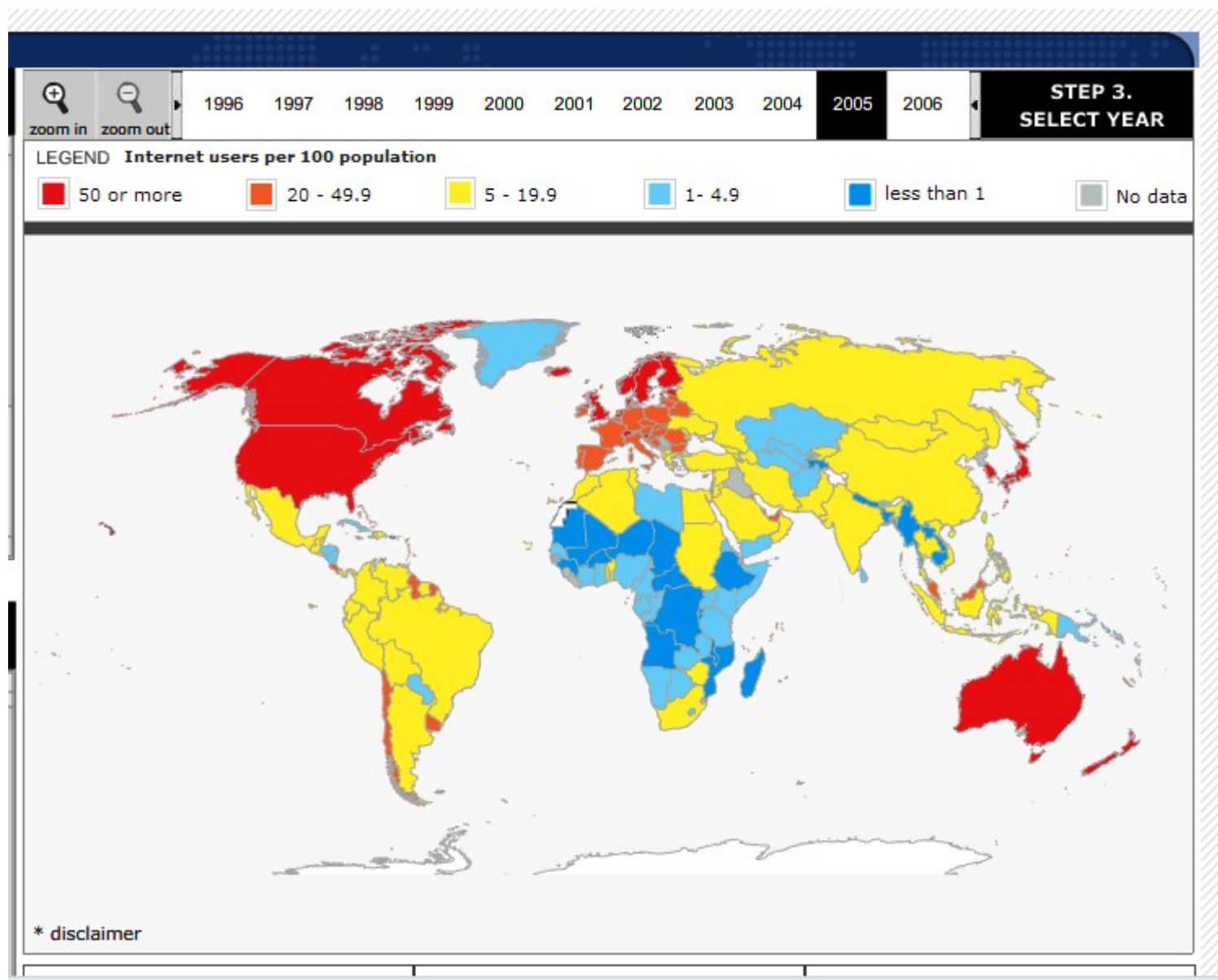
## Internet Penetration by World Region



Copyright © 2007, [www.internetworldstats.com](http://www.internetworldstats.com)



# Internet Usage in 2005

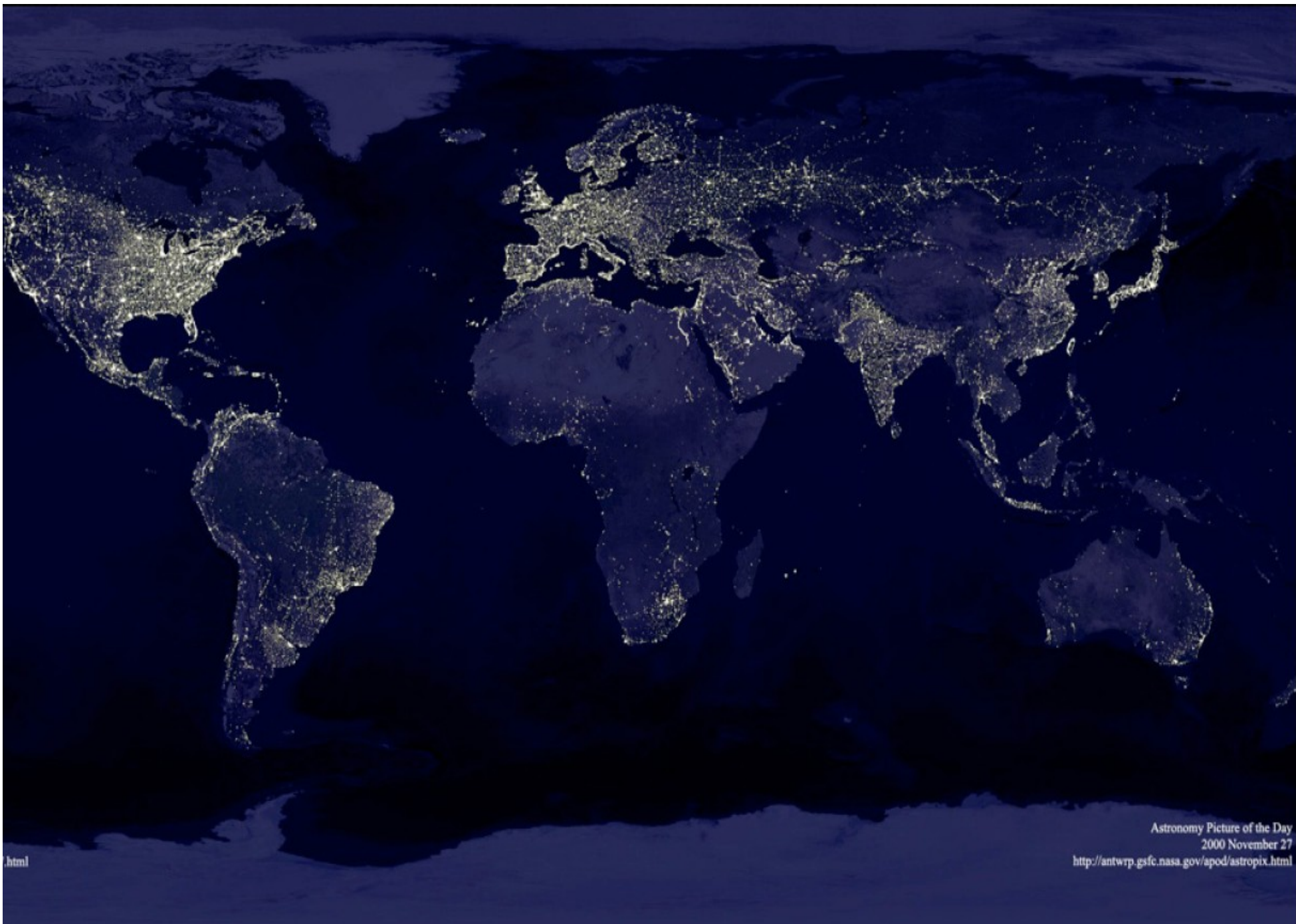




# Internet Usage the tendencies

Internet Users/100 population	2000	2005
India	0.54	5.44 ( 61 Mln)
China	1.77	8.44 (112 Mln)
USA	44.06	66.33 (200 Mln)
Germany	30.15	43.17
Ghana	0.15	1.81
Sweden	45.08	76.21

Source: Millennium Development Goals Monitor



Astronomy Picture of the Day  
2000 November 27  
<http://antwrp.gsfc.nasa.gov/apod/astropix.html>



# Global Public Goods

- The Open Access publishing Paradigm gets mainstream
- Research Results available as global public goods (Gene Ontology, CGIAR Programs)
- Substitution of proprietary software by open Source





# Open Access Publishing

- Started in 90s in Los Alamos
- Now mainstream for all bigger research organizations
- Mandatory in US and UK for research done with public funding
- No change in scholarly publishing system, but in addition institutionally and subject repositories
- Most scholarly publishing available in open access with OAI-MPH protocol in the next 20 years?

# Going Digital

- Most formal knowledge will be digitally accessible
  - Institutional Repositories
  - Googlebooks and related projects
  - eGovernment?
  - Everything what you want to buy in e-commerce(Amazonization?)
- Also tacit knowledge becomes explicit
  - Wikis
  - Blogs
  - Question and Answer Services







# Web 20

- People on the web
  - Wikipedia (becomes mainstream information source)
  - Blogs for (nearly) everyone
  - Social Networking (MySpace, Facebook)
- More structured data
  - CMS Inflation and
  - Tagging - Folksonomies
  - Much more semistructured data and semi-defined semantics??  
With a lot of metadata

Web 20 is more about people than about technology, some Web20 technology is even old(Wiki, Blogs) - the difference is the mass participation of people in the web

# An what is to come

- 2 billion Internet users in the world in 2010 !?
- All relevant content will be digitally (and mostly freely) available!?
- 10 Million internet users with their own blogs?
- 100,000s of Folksonomies!?
- Most of Internet Content in CMS or semistructured databases!?
- ICT Literacy of Internet Users will increase by order of magnitudes (today a majority of users of Internet ICT tools are “illiterate”)!?



# Some requirements to a global network

1. Does the knowledge/ information/ resource I need exist ?
2. Where is it?  
(Questions for reference librarians)
4. How can I use this knowledge for my own business
5. How can I collaborate with others over the network





## Where is it

Up to know a satisfactory solution has been found  
only for Question 2

“Where is it?”

If you know precisely for what you are looking, and  
if it is present on the web, Google will most  
probably find it for you



## Question 2

1. Does the knowledge/ information/  
resource I need exist?

here is a bias: (some people think they can  
investigate this)

telling a story from the preparation of my last summer  
holidays

# The problem of meaning

- Input to the Internet is mostly given by humans, but the information is processed by machines (computers)
- Humans can interpret Information
  - Semantic and Linguistic Agreements
  - Inferences through known relations (a cow is a mammal)
- Computers see only bit streams and transfer them into strings and other visible objects or they see strings and other visible objects and transfer them into bit streams
- What can be done to teach them meaning?





# The problem of meaning (2)



cow, mucca, vacca, Kuh, vache, بقرات , गाय ,

.....



...in a certain environment the same concept...

..you know, a Computer does not know

## Questions 3 + 4

- doing business and collaborative work on the web
  - very, very poor
    - How often do you need to register to access information
    - How easy is it for you to personalize information streams?
    - email dominates communication leading to wrong communication structures
    - social networking exists on proprietary platforms only, no social working exists, it is even complicated to link to your peers
  - the problem is also here, computer cannot interpret information







# Why metadata tags were a failure

- DC 1995
  - tried to copy library cataloguing to the web
  - but catalogues were interpreted by humans, not by machines
  - computer could not understand the meaning of the metadata
- Semantic Identification of knowledge objects and concepts within knowledge objects

## Knowledge Objects

- it's a Hotel
- it's a CV
- it's a Recipe
- it's a political journal

## Concepts

- it's a cow
- it's a Person
- it's Johannes Keizer
- it's .....

- Unvalidated Metadata are useless

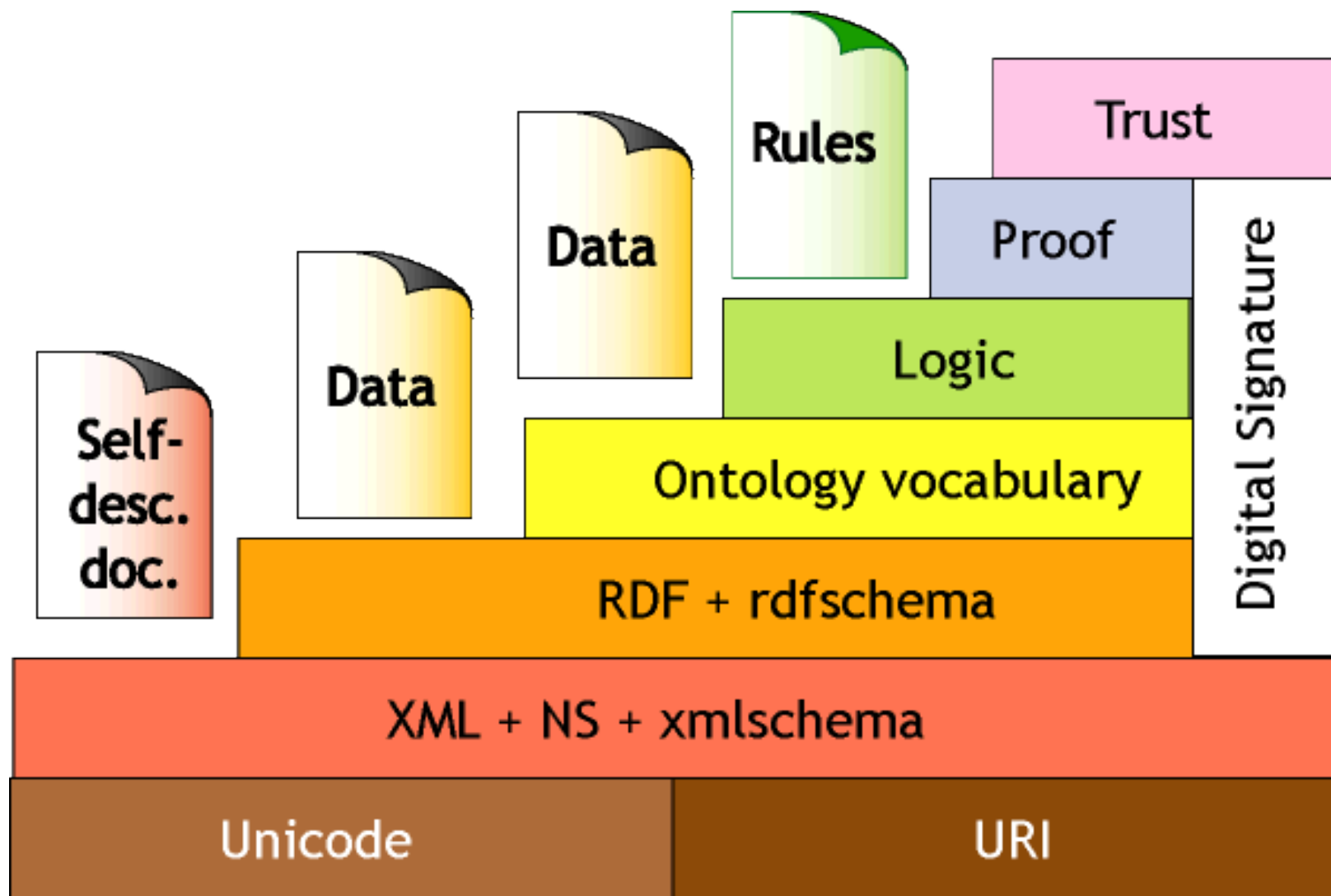
# Semantic Identification of Metadata/data

- How can computer validate Information
  - it must find a machine interpretable information
- Trusted Namespaces with standard URIs (Ontology Vocabulary Registries)
  - Persons, Organizations, Projects, Conferences
  - Concepts, thesauri, ontologies
- To be established by standard bodies or communities of practice





# Sir Tim's Vision of the semantic Web



## Agricultural Ontology Service

<http://www.fao.org/aims>

- Application Profiles/Ontologies
- AGROVOC
- Domain Ontologies
- Knowledge Based Applications (Agropedia Indica)

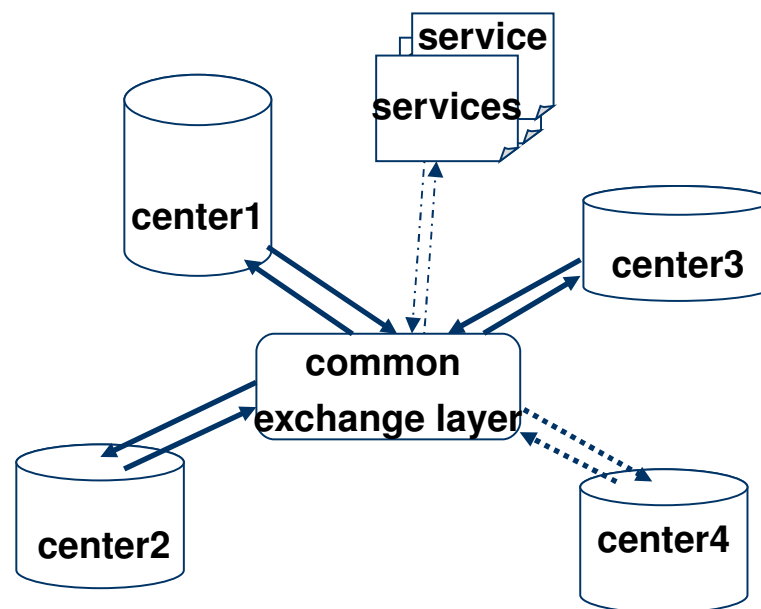
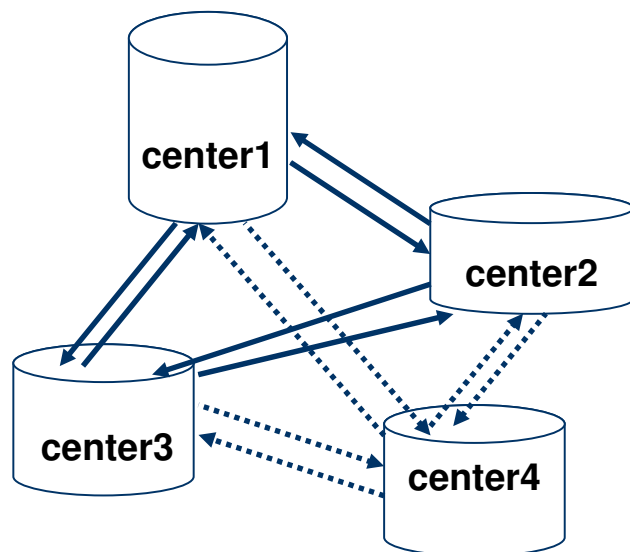




# Application Profiles/ Application Ontologies

The AGRIS problem

$$n_P_2 = \frac{n!}{(n - 2)!}$$





# How to teach computers meaning

Section 1: Elements	Section 2: Refinements	Section 3: Schemes
<a href="#">(DC) Title</a>	<a href="#">(DCTERMS) Alternative</a> <a href="#">(AGS) titleSupplement</a>	-
<a href="#">(DC) Creator</a>	<a href="#">(AGS) creatorCorporate</a> <a href="#">(AGS) creatorPersonal</a> <a href="#">(AGS) creatorConference</a>	-
<a href="#">(DC) Subject</a>	<a href="#">(AGS) subjectClassification</a>  <a href="#">(AGS) subjectThesaurus</a>	<a href="#">(AGS) ASC</a> <a href="#">(AGS) CABIC</a> <a href="#">(AGS) GFDC</a> <a href="#">(DCTERMS) DDC</a> <a href="#">(DCTERMS) LCC</a> <a href="#">(DCTERMS) UDC</a>  <a href="#">(AGS) AGROVOC</a> <a href="#">(AGS) CABT</a> <a href="#">(AGS) ASFAT</a> <a href="#">(AGS) NALT</a> <a href="#">(AGS) BT</a> <a href="#">(DCTERMS) MeSH</a> <a href="#">(DCTERMS) LCSH</a>
<a href="#">(DC) Description</a>	<a href="#">(DCTERMS) Abstract</a> <a href="#">(AGS) descriptionNotes</a> <a href="#">(AGS) descriptionEdition</a>	-
<a href="#">(DC) Publisher</a>	<a href="#">(AGS) publisherName</a> <a href="#">(AGS) publisherPlace</a>	-
<a href="#">(DC) Date</a>	<a href="#">(DCTERMS) Created</a> <a href="#">(DCTERMS) Valid</a> <a href="#">(DCTERMS) Available</a> <a href="#">(DCTERMS) Modified</a> <a href="#">(DCTERMS) Issued</a>	<a href="#">(DCTERMS) W3CDTF</a>
<a href="#">(DC) Type</a>	-	<a href="#">(DCTERMS) DCMIType</a>
<a href="#">(DC) Format</a>	<a href="#">(DCTERMS) Extent</a>	-

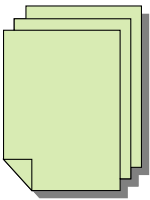




<http://oai.bibsys.no/repository?verb=listRecords&metadataPrefix=agris&set=agris>

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  xmlns:dc="http://purl.org/dc/terms/" xmlns:dcterms="http://purl.org/dc/dc/terms/"
  xmlns:agls="http://www.aa.gov.au/recordkeeping/gov_online/agls/1.2" xmlns:ags="http://purl.org/agmes/1.1/"
  xsi:schemaLocation="http://www.openarchives.org/OAI/2.0/ http://www.openarchives.org/OAI/2.0/OAI-PMH.xsd
  http://www.openarchives.org/OAI/2.0/oai_dc/ http://www.openarchives.org/OAI/2.0/oai_dc.xsd">
  <responseDate>2005-09-08T12:30:20Z</responseDate>
  <request verb="ListRecords" metadataPrefix="agris">oai.bibsys.no/oai/repository</request>
  - <ListRecords>
  - <record>
  - <header>
    <identifier>oai:bibsys.no:biblio:021667489</identifier>
    <timestamp>2005-01-05</timestamp>
    <setSpec>agris</setSpec>
  </header>
  - <metadata>
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    <ags:subjectThesaurus xml:lang="eng" scheme="ags:AGROVOC">Seed storage</ags:subjectThesaurus>
    <ags:subjectThesaurus xml:lang="eng" scheme="ags:AGROVOC">Indigenous
  
```



# Application Profiles

- Document – Like Information Objects (DLIOs) 
- Learning resources 
- Organizations 
- Projects 
- News and Events 



# AGROVOC

- Thesauri, were traditionally the tool of librarians to describe the content of a document
- They are now basis to describe knowledge and meaning in a machine readable way
- AGROVOC was maintained by FAO since the 80s



# AGROVOC

Learn more about AGROVOC by browsing: [AGROVOC Hierarchy](#)

Search term:

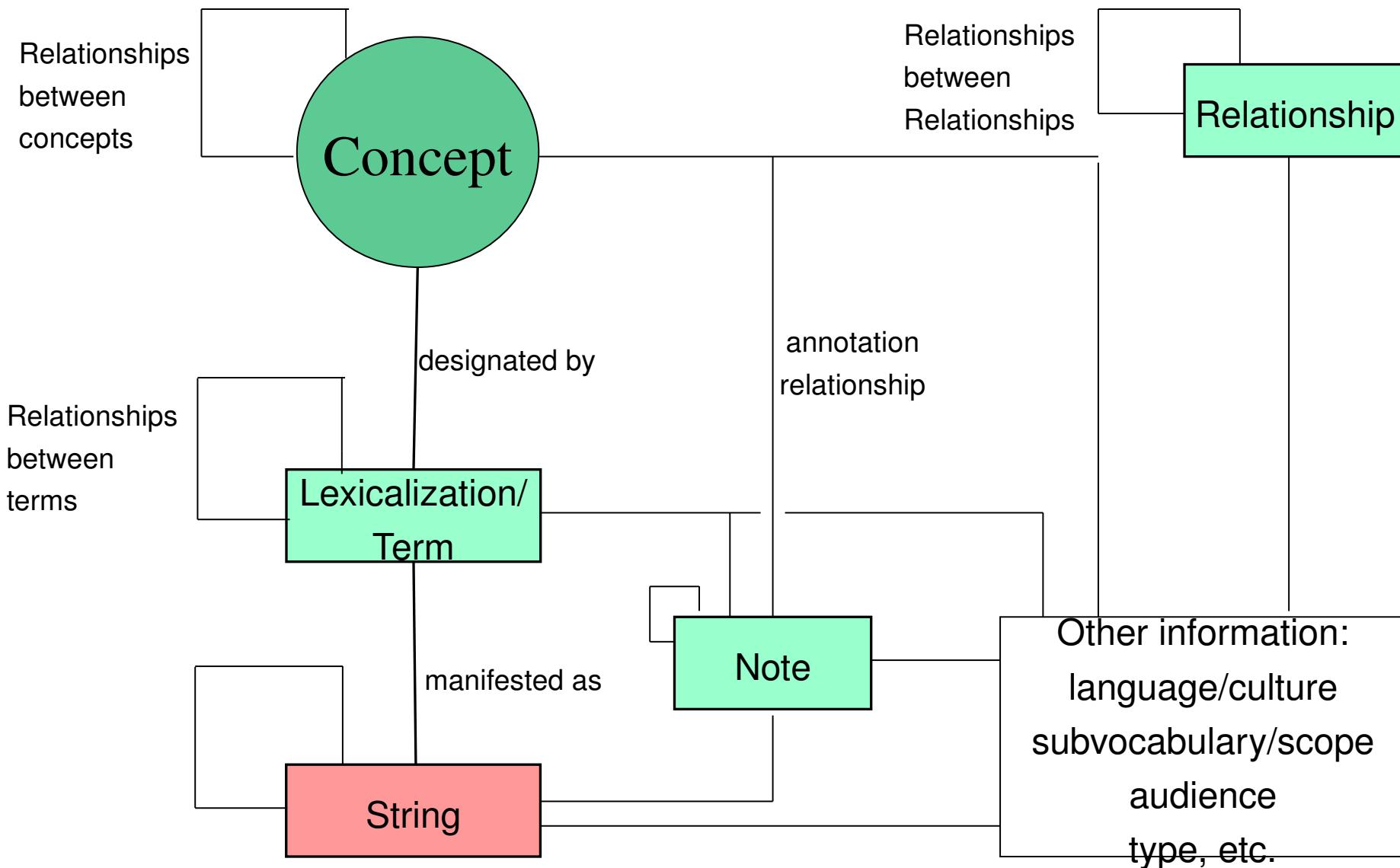
starting with  containing text  exact match

EN : <a href="#">Rice</a>	BT : <a href="#">Cereals</a>
FR : <a href="#">Riz</a>	RT : <a href="#">Rice flour</a>
ES : <a href="#">Arroz</a>	RT : <a href="#">Oryza</a>
AR : <a href="#">أرز</a>	RT : <a href="#">Rice straw</a>
ZH : <a href="#">稻米</a>	UF : <a href="#">Paddy</a>
PT : <a href="#">Arroz</a>	
CS : <a href="#">rýže</a>	
JA : <a href="#">米</a>	
TH : <a href="#">ข้าว</a>	
SK : <a href="#">ryža</a>	
DE : <a href="#">REIS</a>	
HU : <a href="#">rizs</a>	
PL : <a href="#">Ryż (ziarno)</a>	
FA : <a href="#">برنج</a>	
IT : <a href="#">Riso</a>	
HI : <a href="#">चावल/धान</a>	
LO : <a href="#">?????</a>	

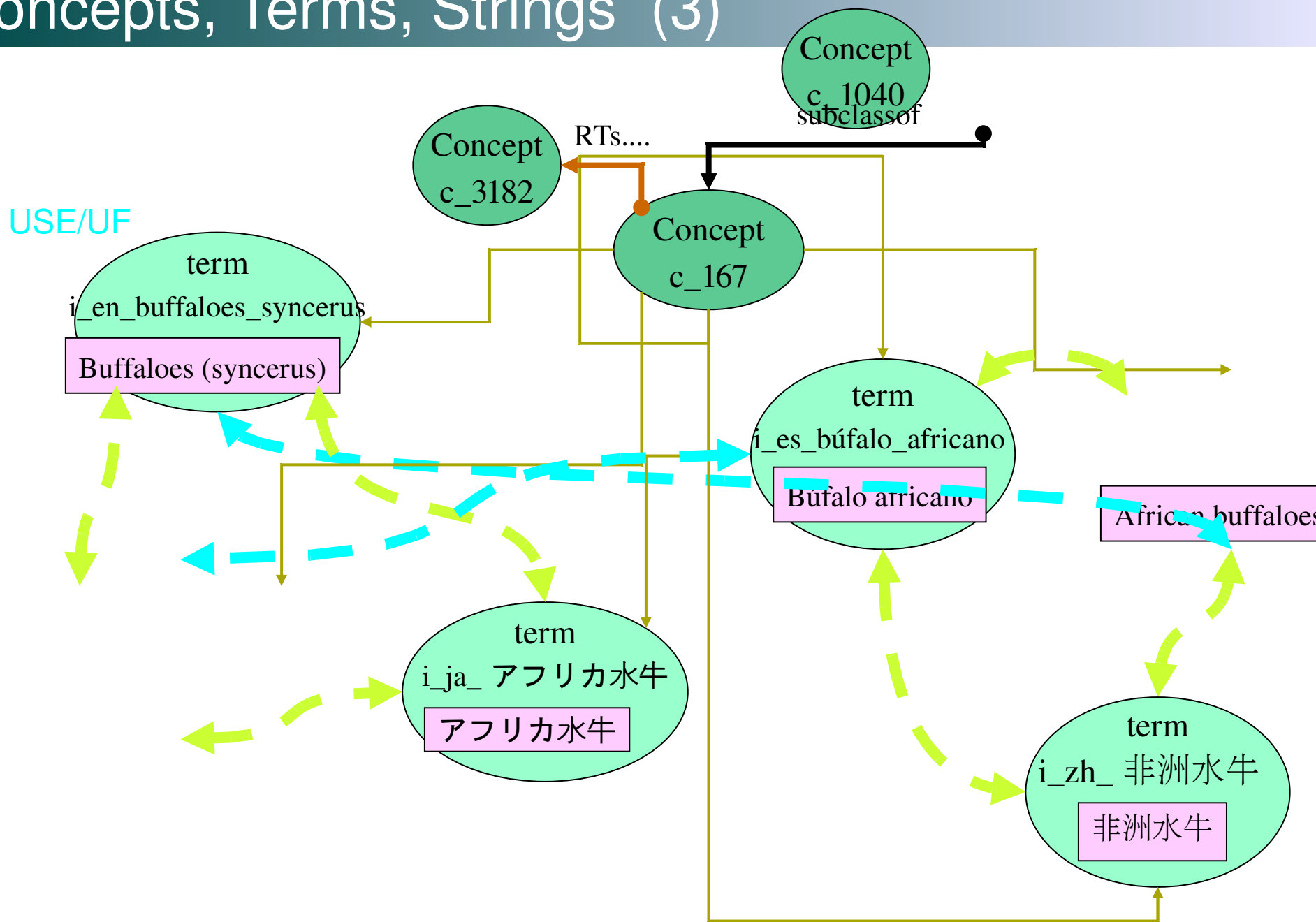




# Concepts, Terms, Strings (2)



# Concepts, Terms, Strings (3)



has_translation	has_synonym	rdfs:label:	has_lexicalization
-----------------	-------------	-------------	--------------------



# Different Views on the Same knowledge

## Plant products

- NT Cereals

- NT Barley

- NT Malting barley

- NT Coarse grains

- NT Maize

- NT Dent maize

- NT Flint maize

- NT Popcorn

- [C] Plant products(en)Prodotti di origine vegetale(it)उत्पाद(hi)ಆದಿವಸ್ತು(lo)

- [C] धान्य(hi)Cereali(it)ธัญพืช(th)Cerealia(it)

- [C] Riso(it)ข้าว(lo)Rice(en)ข้าว(th)

- [C] ข้าวโพด(th)मक्का / मक्की(hi)အပူ(lo)

- [C] Sorgo(it)粟(lo)Sorgho(en)

- [C] Avena (prodotto)(it)ข้าวโอ๊ต(th)

- [C] Triticale (prodotto)(it)ทริคัล (product)(en)အပူပဲခူး(lo)

- [C] Millets(en)အပူ(lo)Miglio(it)

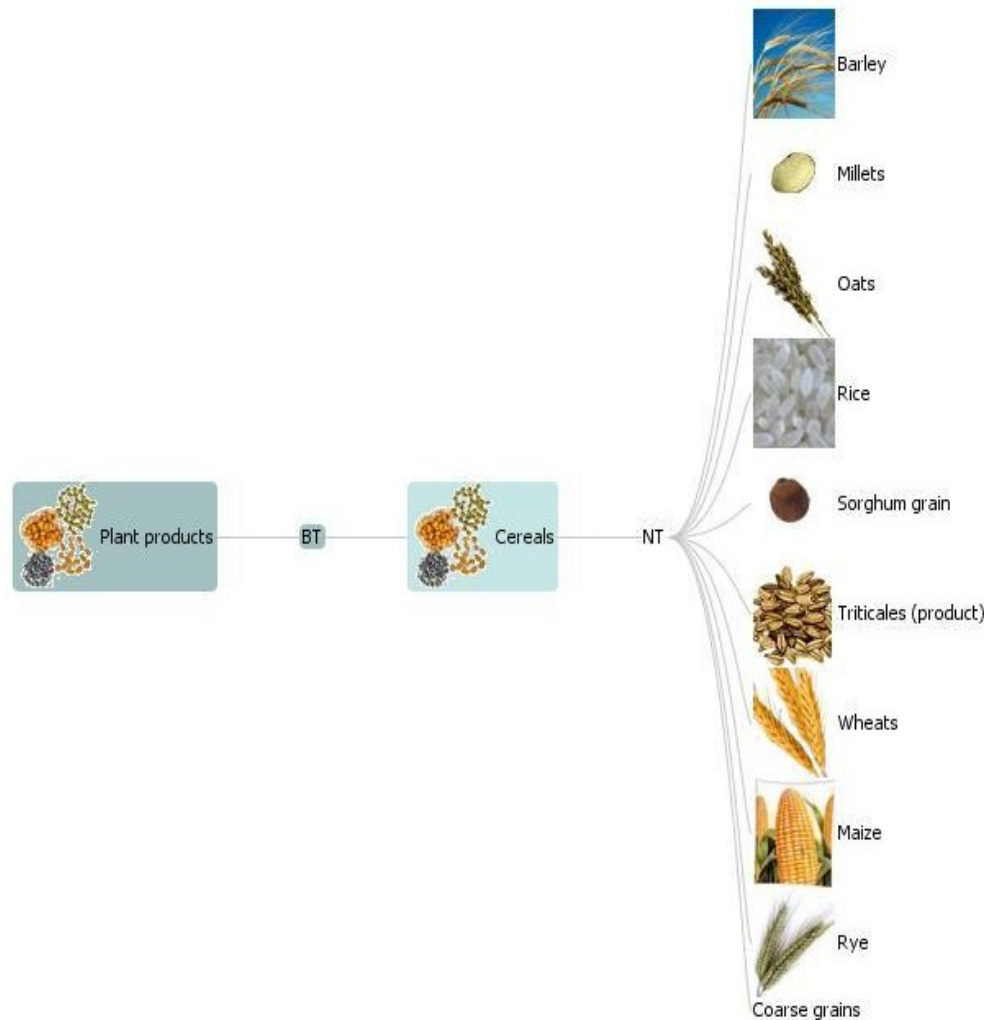
- [C] ข้าวไรย์(th)राई(hi)Segale(it)Rye(en)

- [C] Orzo(it)ข้าวบาร์เลย์(th)အပူ(lo)

- [C] ธัญพืชเมล็ดโต(th)Coarse grains(en)Cereali per l'alimentazione animale(it)मोट्टे बाने(hi)အပူ(lo)

- [C] गेहूं(hi)အပူ(lo)ข้าวสาลี(th)Grani (cereali)(it)Wheats(en)

- NT Co
- NT C



# Creating Ontologies (an example)

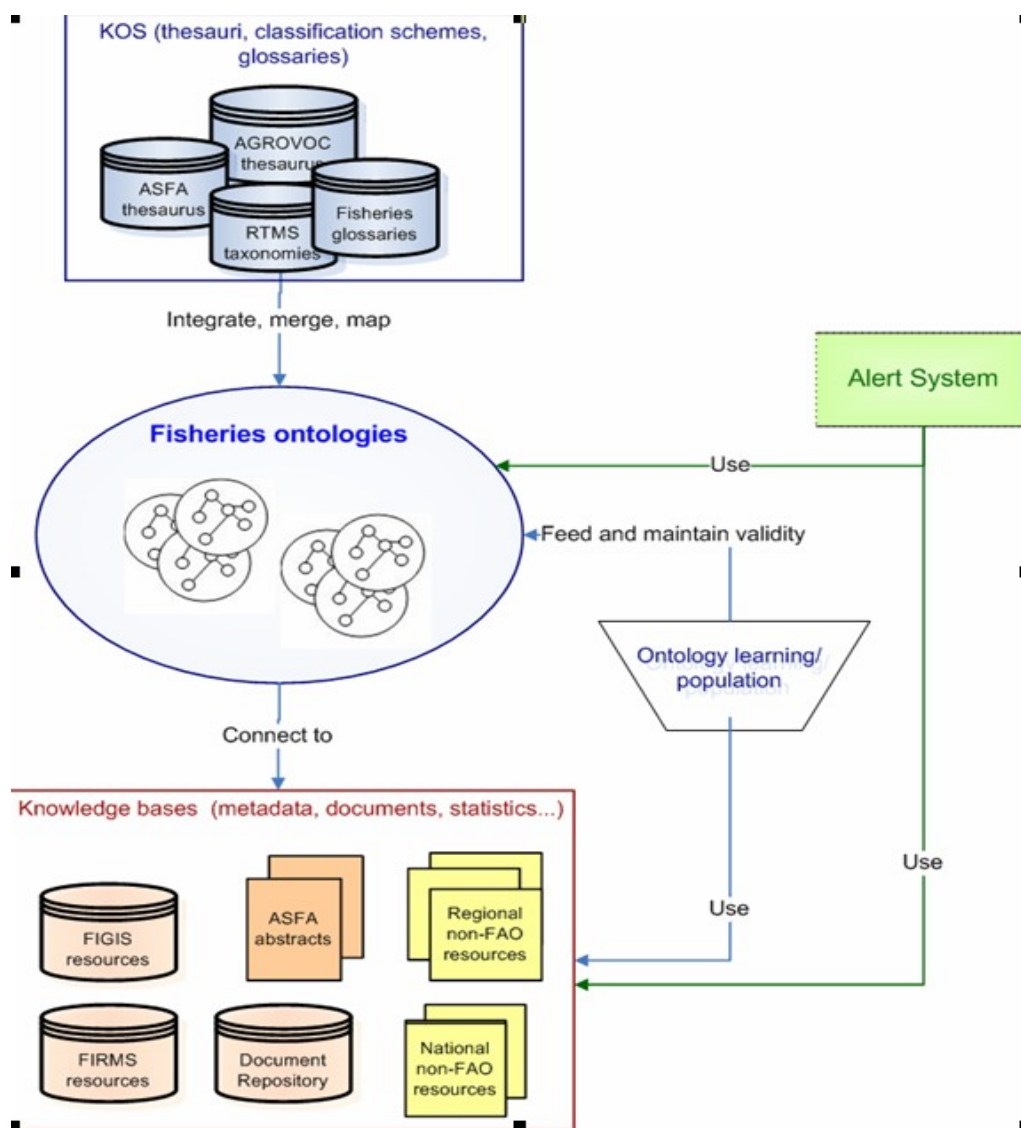


Figure 4 – Overview of the ontology-driven FSDAS



# Creating Ontologies (2)

How it looks like

- [http://www.fao.org/aims/aos/fi/fishing\\_areas](http://www.fao.org/aims/aos/fi/fishing_areas)

And how we did it

- <http://www.fao.org/aims/neon.jsp>



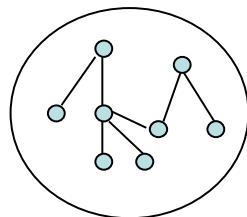
# Building applications (ex. Agropedia Indica)

Value added Information Services

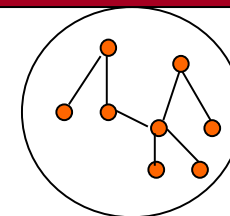
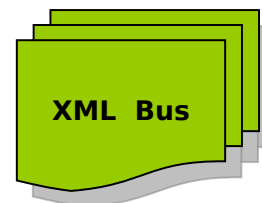


- Portal 1
- Portal 2
- Portal 3
- Portal 4
- Portal 5
- Portal 6
- Portal 7

## Specific Knowledge Views



Metadata ontologies (Application Profiles)



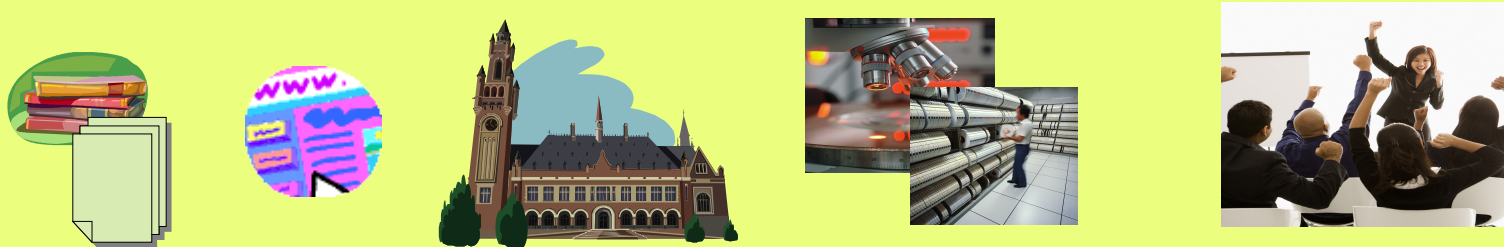
Subject ontologies

## Repository Specific Wrappers

- OAI-MHP
- CMS
- eGovApps
- PlantOnto
- BioMoby
- Blogs
- WIKIs
- QA

## Digitization: Unicode and URI

Agricultural Knowledge





## Agricultural Information Management Standards

■ *Interoperability, Reusability, and Cooperation* ■

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Search AIMS

[AGROVOC Concept Server](#) | [Metadata schemas](#) | [Tools](#) | [Publications](#) | [News and Events](#)

### AIMS Highlights

- Learn more about the [AGROVOC Concept Server](#)
- Test the [AqriFeeds!](#)
- AGROVOC is now available in [Lao](#) via AIMS Website!
- Special Session on Agricultural Metadata and Semantics [Presentations and Report](#)

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### Agricultural Information Management Standards

The main objectives of the initiative are:

- to facilitate collaboration, partnership and networking among partners by promoting information exchange and knowledge sharing;
- to harmonize the decentralized efforts currently taking place in the development of methodologies, standards and applications for management of agricultural information systems; consequently, providing a 'one-stop' access to system designers and implementers.

Read the complete proposal [here](#).

---

If you want to know more about the [AGROVOC](#) thesaurus, [metadata](#), [ontologies](#) and [AGROVOC Concept Server Workbench](#) and read our flyers!

### :: NEWS ::

- Launch of an international Task Force on Agricultural Learning Repositories (AgLR-TF)  
(Tue, 12 Feb 2008)
- Over 11 000 new bibliographic records added to AGRIS Repository.  
(Tue, 5 Feb 2008)
- Crop Wild Relatives Ontology Browser is now available online!  
(Thu, 31 Jan 2008)

[More..](#)

---

### :: EVENTS ::

- DSpace User Group Meeting 2007  
(Wed, 17 Oct 2007)
- Special Session on Agricultural Metadata & Semantics : 2nd International Conference on Metadata and Semantics Research (MTSR'07), Greece  
(Thu, 11 Oct 2007)
- Eighth AOS Workshop -- 7 years of AOS: Achievements and Next Steps  
(Fri, 21 Sep 2007)

[More](#)



# Thank You



.....for your attention

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<http://www.fao.org>

<http://www.fao.org/aims>

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