

3D Anatomical Human  
EU Marie Curie Research training network



# Data Elicitation for Ontologies

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Vrije Universiteit Brussel

VUB **STAR.Lab**

Semantics Technology & Applications  
Research Laboratory

# Overview



- VUB - STARLab
- What is Ontology?
- The DOGMA Methodology
- Our Tools:
  - HCS
  - Semantic Wiki
  - OMOGENIA
  - DOGMA Workbench
- 3D-AH Collaboration Days
  - Participants
  - The 3D-AH Ontology



# About STARLab



- The Semantics Technology and Applications Research Laboratory (VUB STARLab), founded by Prof. Dr. Robert Meersman.
- STARLab's core focus has been the research on semantic technologies and collaborative environments focused to support communities of experts and ontologies.



# Some of our Projects...



PRO  
LIX

@mE



Ambient Intelligence for the Elderly

TS<sup>3</sup>

Trust and Security



Competency Ontology Driven  
Vocational Education



**AcKnowledge**

ACCESSIBLE & Open KNOWLEDGE Infrastructure for Flanders



***“An ontology is a specification of a conceptualization” [Gruber 1993]***

This definition is given in the article:

- T. R. Gruber. A translation approach to portable ontologies. *Knowledge Acquisition*, 5(2):199-220, 1993.

A more detailed description is given in:

- T. R. Gruber. Toward principles for the design of ontologies used for knowledge sharing. Presented at the Padua workshop on Formal Ontology, March 1993, later published in *International Journal of Human-Computer Studies*, Vol. 43, Issues 4-5, November 1995, pp. 907-928.

An ontology is:

- Formal,
- Computer-stored,
- Shared,
- Conceptualization
  - of the/a real world

[Gruber 1993][Studer 2000]



# Why Build an Ontology?



- Interworking and information sharing
  - Providing a well organised controlled vocabulary
- Indexing complex information
  - “Knowledge is fractal”
    - Ontologies are fractal
      - Self similar structure at every level of granularity (detail)
- Combat combinatorial explosions
  - The exploding bicycle
    - “Conceptual Lego”
      - A “dictionary and grammar” instead of a “phrasebook”



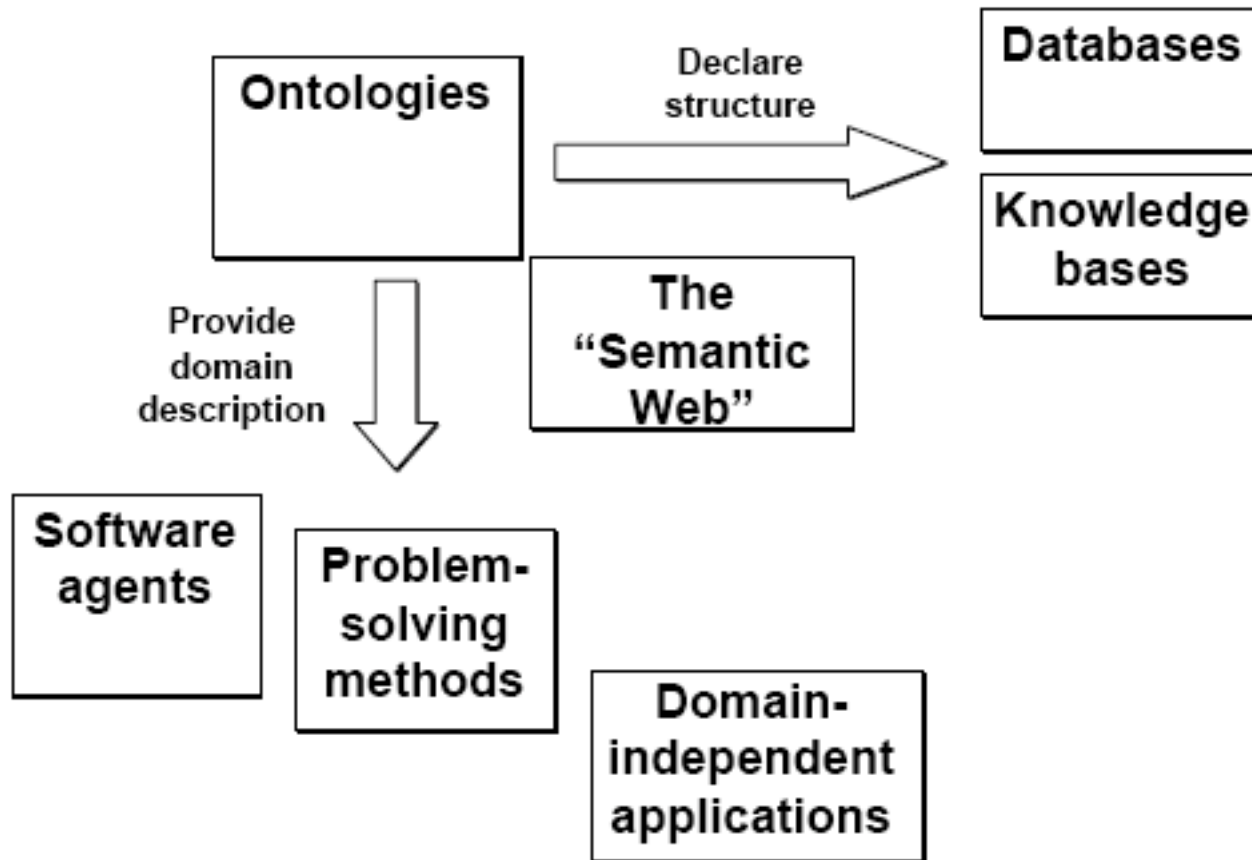
# So Where to Find Ontologies?



- Elicit from scratch: role of natural language...
  - Top down from upper ontologies
  - With/by domain experts
- Mine from suitable sources
  - Bottom up from instance templates
  - From databases
  - From text (e.g. Web, document corpora)
- Convert existing (*almost*-)ontologies
  - e.g. WordNet, thesauri, lexicons, glossaries, ...
  - e.g. Wikipedia, Cyc, HR-XML, UMLS, ...



# Ontology is just the Beginning...





# Beware...



## Ontologies are not databases!!!

- Ontologies are (mostly) about the classes
  - Can be used to represent database schemas
    - What must be true of any database consistent with the schema
  - The terminology
    - What must be true of any concept consistent with the ontology
  - The “T-Box” – for “terminology box”
- Limited functionality for individuals (‘instances’)
  - Primarily to help define classes
  - To describe individuals use
    - A database
    - Triple representation (RDF or Topic Maps)
    - An instance store



# Steps in Developing an Ontology



1. **Establish the purpose**
  - Without purpose, no scope, requirements, evaluation,
2. **Informal/Semiformal knowledge elicitation**
  - Collect the terms
  - Organise terms informally
  - Paraphrase and clarify terms to produce informal concept definitions
  - Diagram informally
3. **Refine requirements & tests**



# Steps in Developing an Ontology



## 4. Implementation

- *Paraphrase and comment at each stage before implementing*
- Develop normalised schema and skeleton
- Implement prototype recording the *intention as a paraphrase*
  - Keep track of what you meant to do so you can compare with what happens
    - Implementing logic-based ontologies is programming
- Scale up a bit
  - Check performance
- Populate
  - Possibly with help of text mining and language technology

## 5. Evaluate & quality assure

- Against goals
- Include tests for evolution and change management
- Design regression tests and “probes”

## 6. Monitor use and evolve

- *Process not product!*



# Eliciting Knowledge



- Most knowledge is in the heads of experts
- Experts have vast amounts of knowledge
- Experts have a lot of tacit knowledge
- They don't know all that they know and use
- Tacit knowledge is hard (impossible) to describe
- Experts are very busy and valuable people
- Each expert doesn't know everything





...there are known knowns; there are things we know we know. We also know there are known unknowns; that is to say we know there are some things we do not know. But there are also unknown unknowns -- the ones we don't know we don't know.

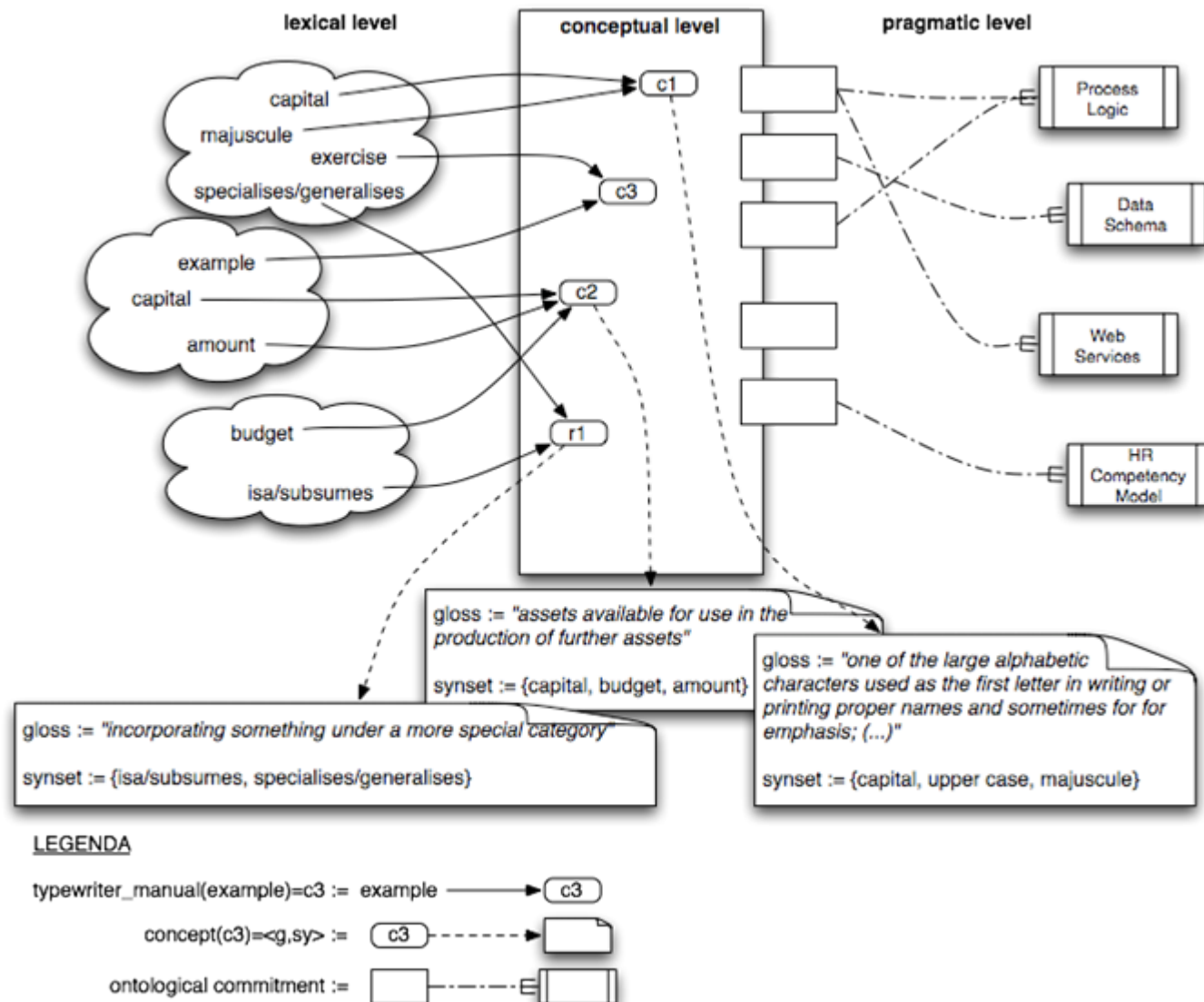
# Elicitation Techniques



- Take experts off the job for short time periods
- Allow non-experts to understand the knowledge
- Focus on the essential knowledge
- Can capture tacit knowledge
- Allow knowledge to be collated from different experts
- Allow knowledge to be validated and maintained



# Ontology Elicitation



# Requirements for Ontology Elicitation



- **Usability and Reusability**
- **Application-specific Contextualisation:** narrow down possible interpretations
- **Flexible Implementation:**
  - W3C compliance, HR-XML compliance, RDF, OWL, *etc.*



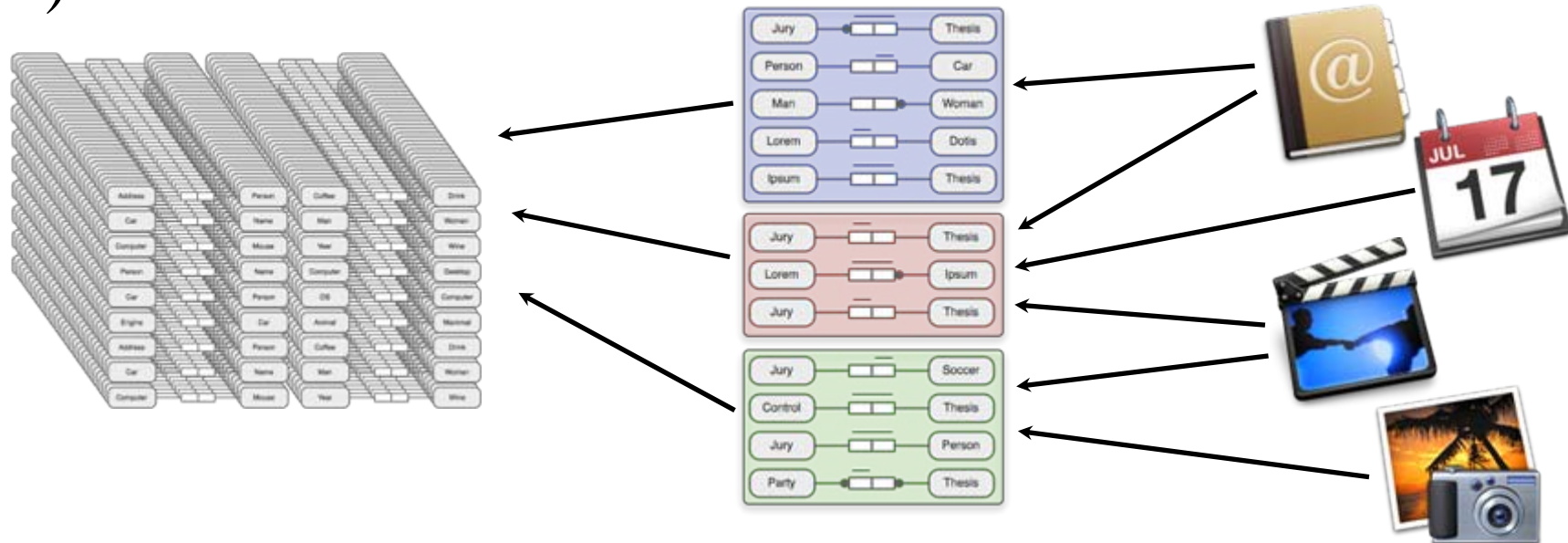


# DOGMA Articulation

LexonBase(s)  
)

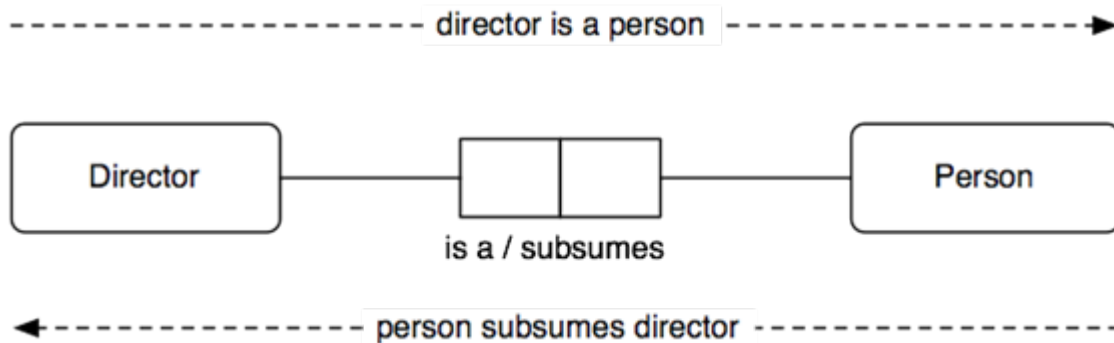
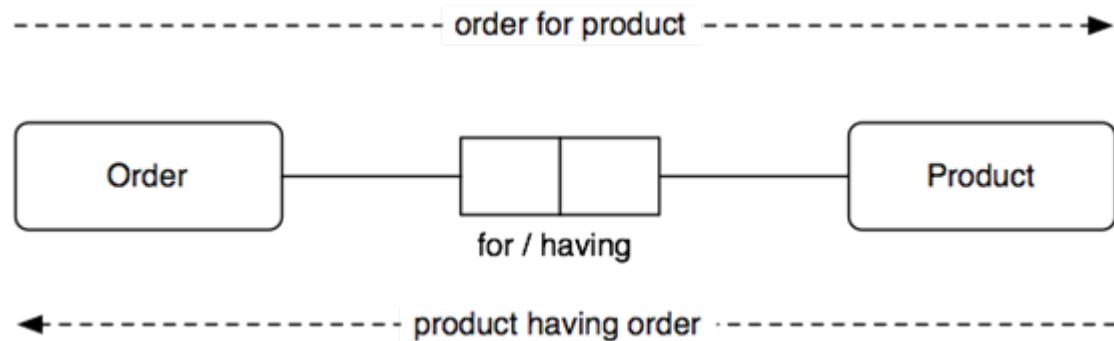
Ontological  
Commitments

Applications

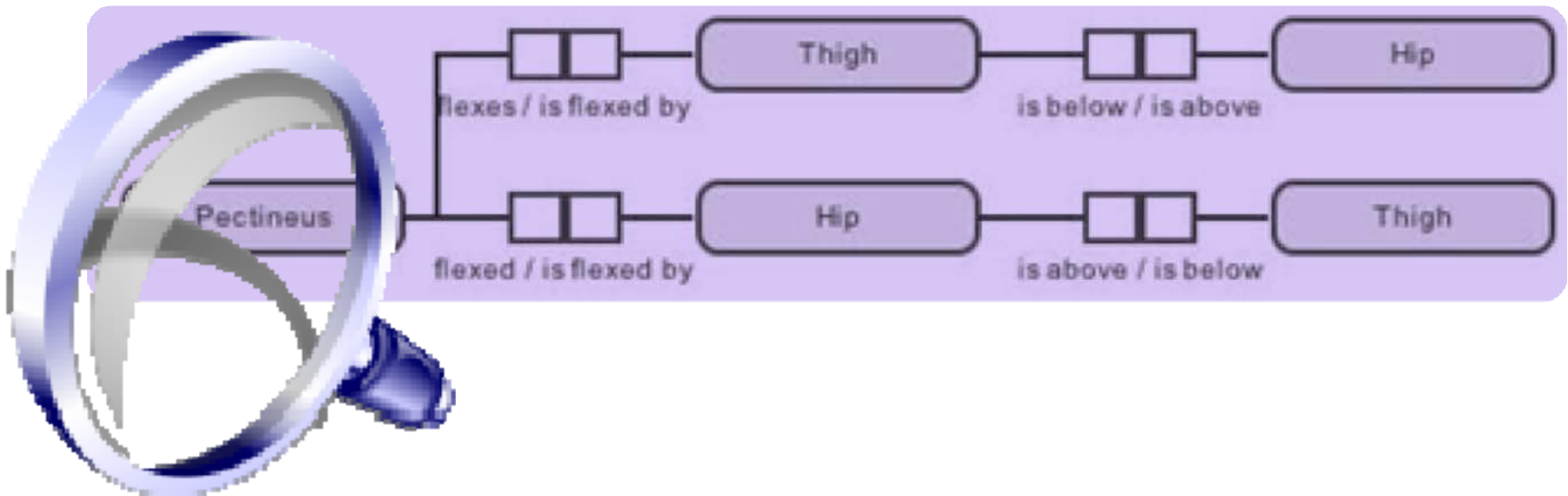


*“Double articulation principle”*

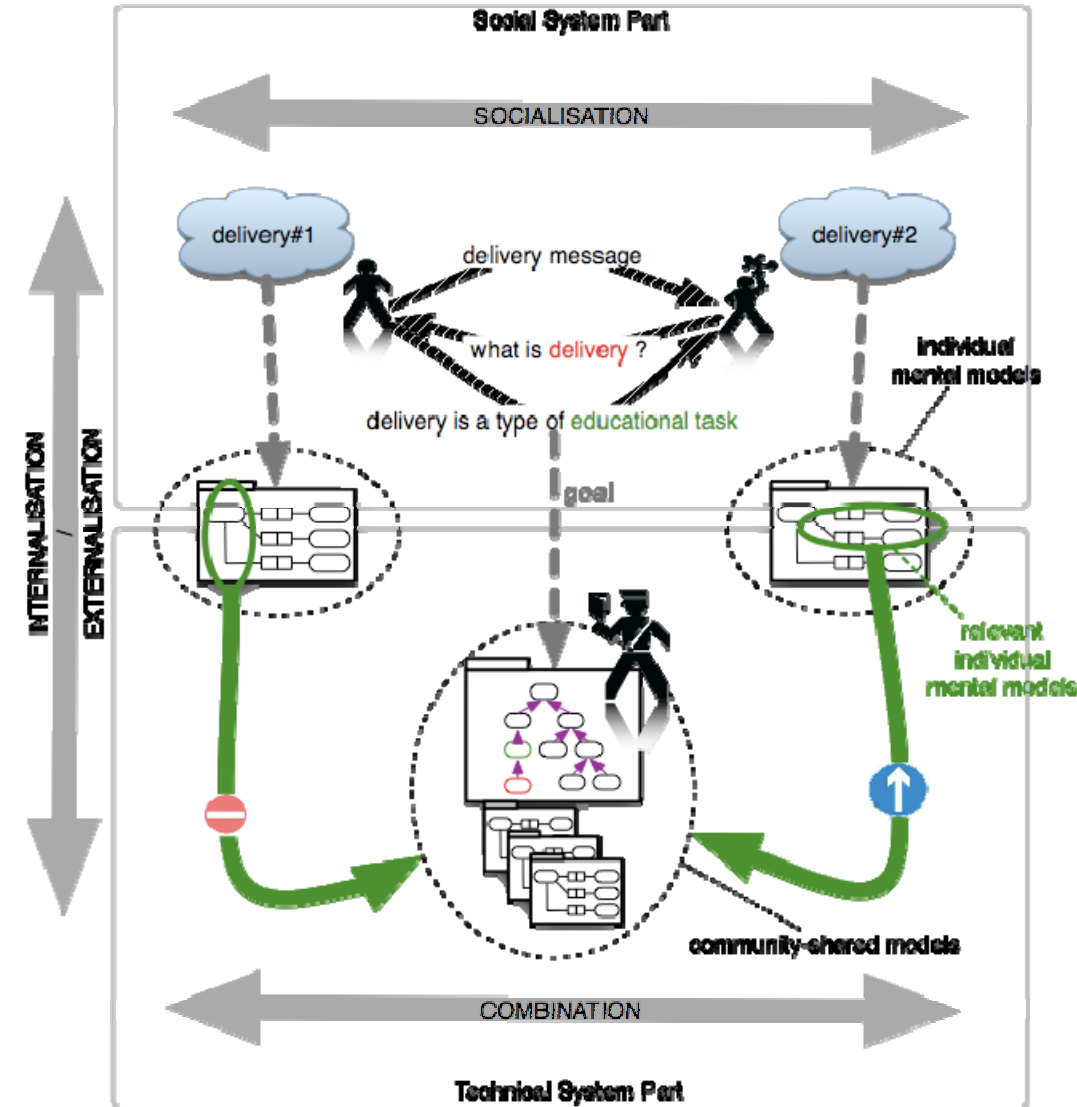
# Lexon (within given *context*)



# 3D-AH Lexons



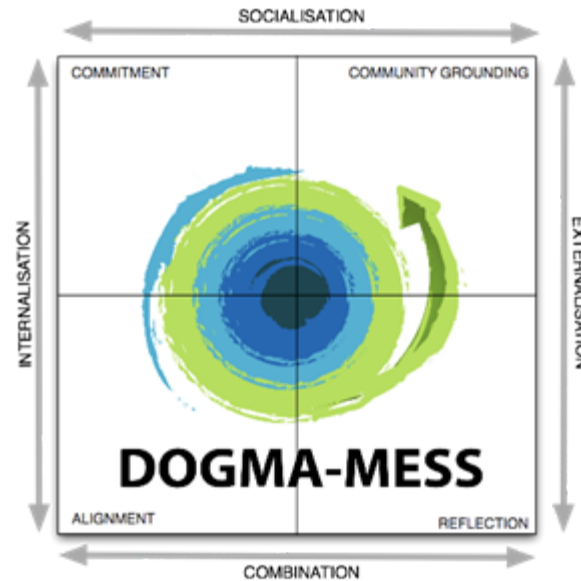
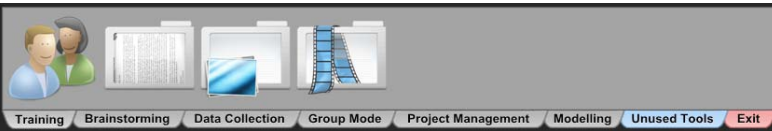
# Mind the Gap!!!



- key to scalability: align only concepts relevant for ongoing *socialisation*
- different stakeholders can *externalise* their perspectives by branching off from the main version of the ontology
- divergent perspectives serve as input for the alignment process (*combination*)
- the explicit reflection of stakeholders on perspectives allows us to capture the evolution process completely, and validate the ontology against these (*internalisation*)



# Bridging the Gap...



stijn	0	4 weeks 6 days ago
chrdebru	1	6 weeks 2 hours ago
stijn	0	6 weeks 1 day ago
stijn	0	6 weeks 1 day ago
stijn	1	6 weeks 3 days ago
ytang1	1	7 weeks 1 day ago
stijn	1	7 weeks 1 day ago

**Tag Cloud**

Acknowledge  
AmiE commitment  
development  
DOGMA DOGMA-  
MESS Dogma  
Studio Eclipse  
FAQ Java manual  
meaning negotiation  
methodology  
ontology Prolix  
proposal RoadMap  
preparation  
sysadmin c-tex Trip  
Report



# The Role of STARLab in 3D-AH



- The Challenge:
  - The multidisciplinary nature of 3D-AH requires new collaboration approaches. The main challenge that we are currently facing is that different terminologies are being used for the same concepts and methods by different groups working in isolation.
  - Communication becomes more difficult, unnecessary duplication of effort follows, and cross-fertilization between applications is reduced.



# The Role of STARLab in 3D-AH

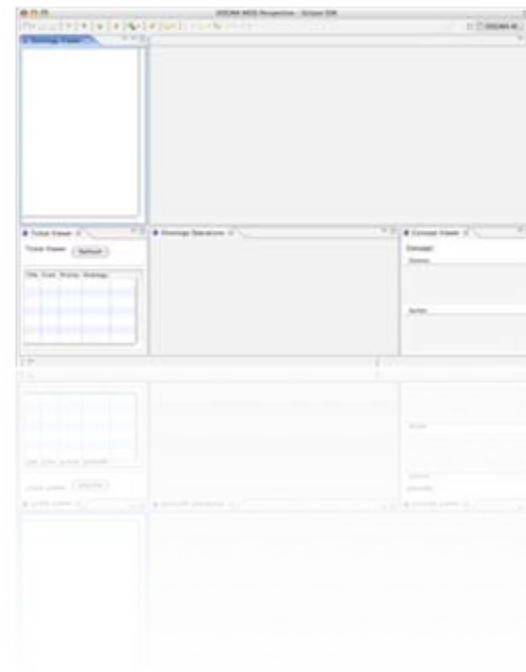


- The Solution:
  - The solution to this problem could be the collaborative creation of ontologies using the DOGMA methodology (Developing Ontology-Guided Mediation Application).
- STARLab's main objective is to exploit the ontology in order to retrieve the associated information with the visualized structures.
- The information is currently retrieved using the 3D-AH collaborative platform and the ontology-wiki hosted at STARLab's servers.

[http://starlab.vub.ac.be/3dahwiki/index.php/Main\\_Page](http://starlab.vub.ac.be/3dahwiki/index.php/Main_Page)

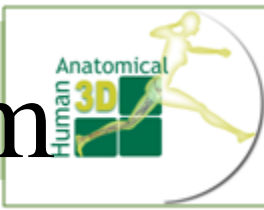


# Our Tools...





# The 3D-AH Collaborative Platform



- The multidisciplinary nature of 3D-AH requires innovative collaboration approaches
- HCS was deployed as a mining and communication platform for the needs of the 3D-AH consortium.
- HCS consists of the following categories:
  - Training
  - Brainstorming
  - Data Collection
  - Collaborative Mode
  - Sketching & Editing
  - Scheduler



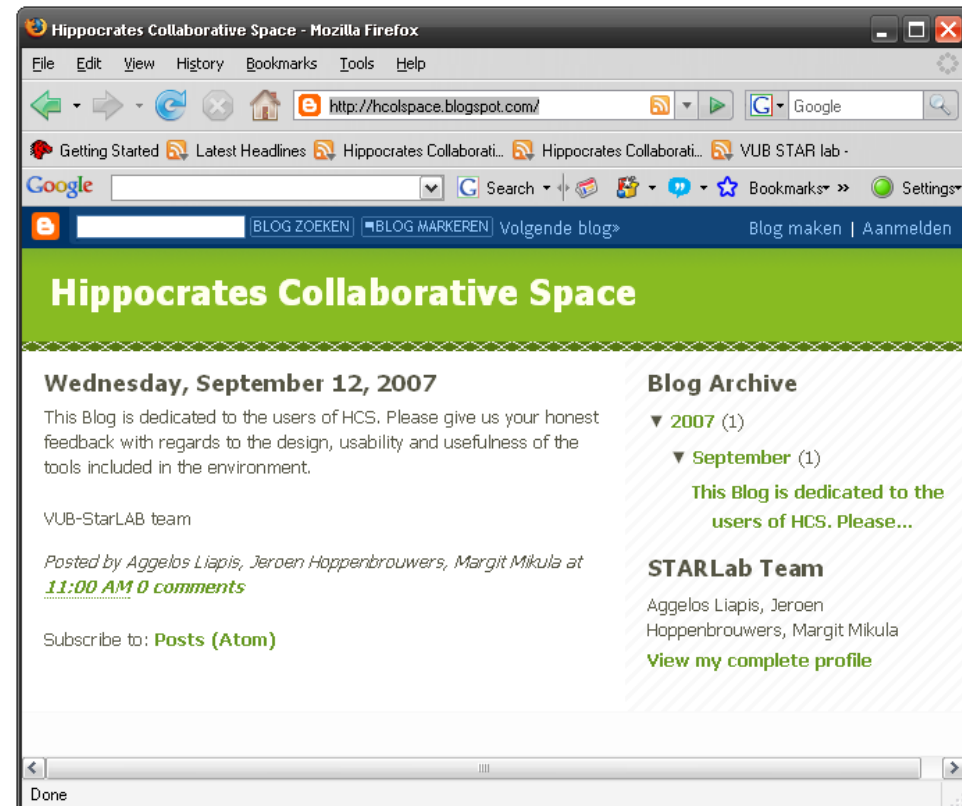
# HCS Blog



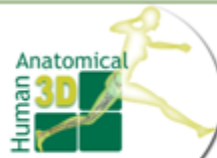
- The HCS blog was dedicated to the 3D-AH consortium
- The purpose of the Blog is to encourage collaboration amongst the partners of the consortium



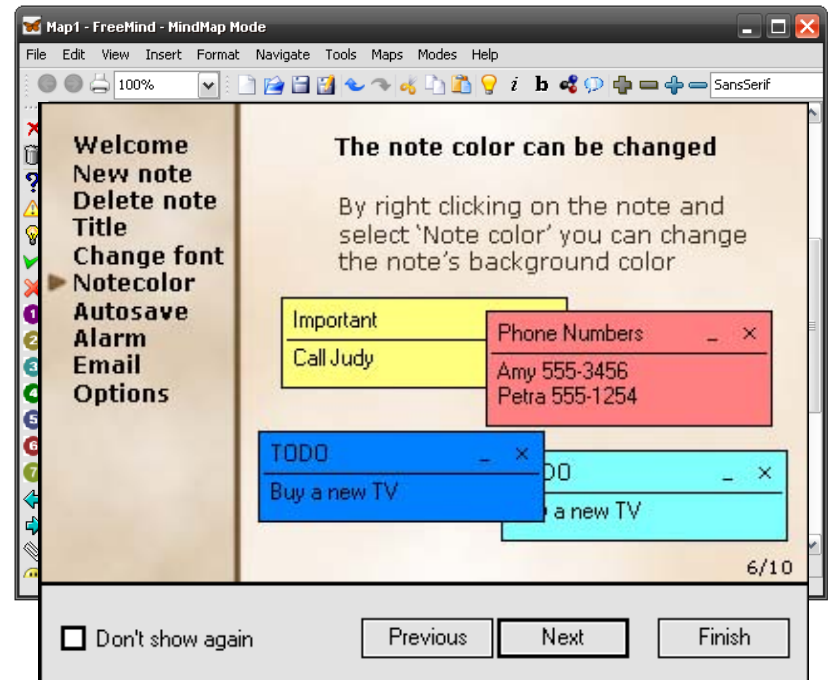
HCS Blog



# Brainstorming



- HCS provides users with two brainstorming tools:
  - Mind mapping tool
  - Post-it notes tool



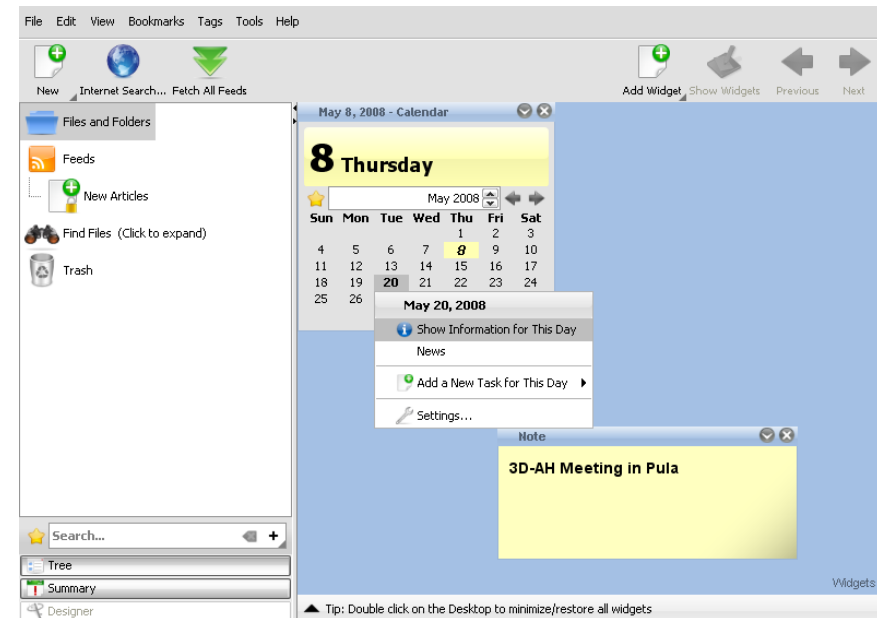
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Toggle Folded	Space
Remove Reminder	
Icons	▶
Format	▶
Insert	▶
Physical Style	▶



# Data Collection Category



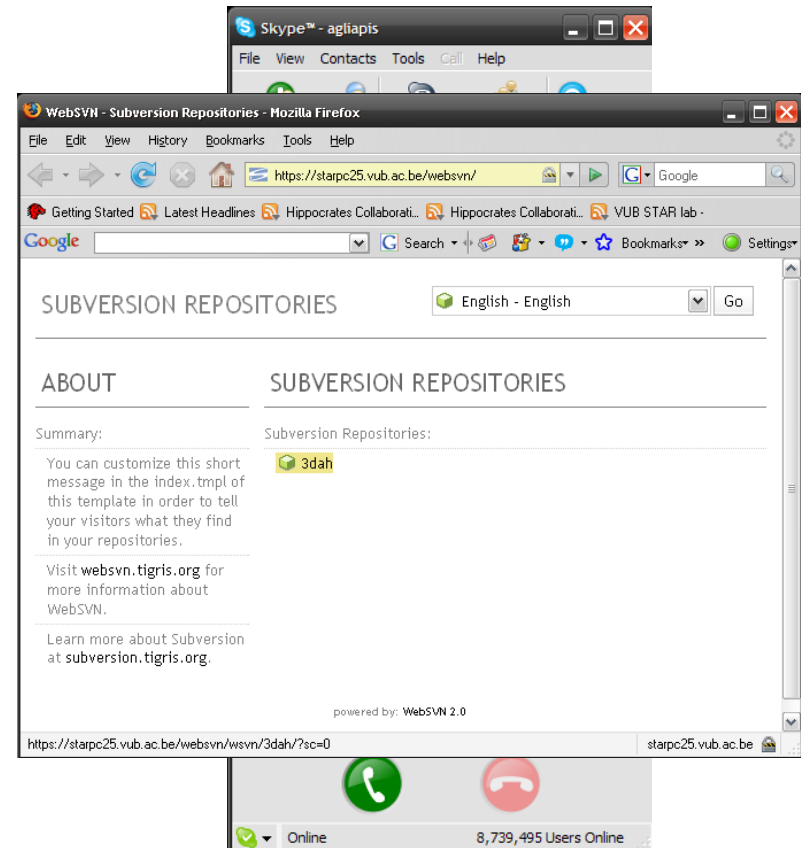
- The data collection category consists of an advanced RSS reader tool which features services such as:
  - To-do manager
  - RSS feed reader
  - Notepad
  - Simple image viewer/editor
  - Widgets (calendar, sticky notes etc.)
  - Internet search (Google, Wikipedia etc.)
  - Document import/export
  - Plugins
  - Backup function
  - Custom file labels (tags, rating etc.)



# Collaborative Mode



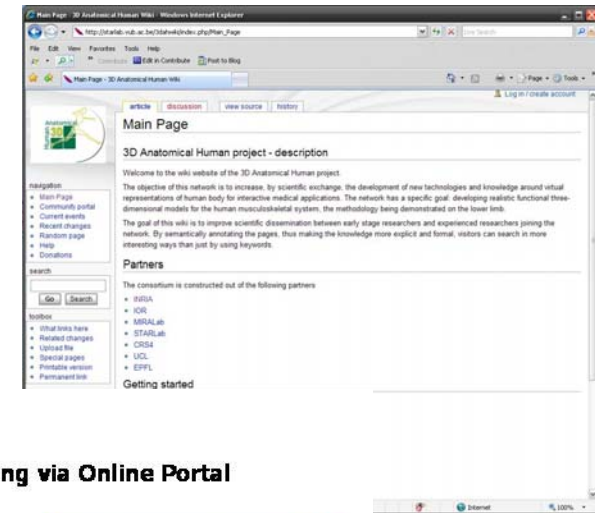
- Collaborative Mode consists of the following tools and services
  - SKYPE
  - Host & Join a meeting via VNC
  - Record meeting
  - Online file repository



# Semantic Media Wiki

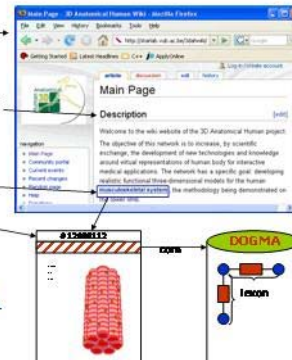


- The semantic wiki allows some semantic links between concepts by using some rules.
  - For example in the xml configuration, a URL attribute is specified dynamically: the link is constructed from the name of the structure by using the search capability of wiki.
- If the group ligament is selected, a page can be retrieved by searching the word ligament. URL:  
<http://starlab.vub.ac.be/3dahwiki/index.php/Ligament>
- A browser is then automatically opened to display the page pointed by the url. The wiki can be fed by other partners which can bring thus their knowledge into the application.

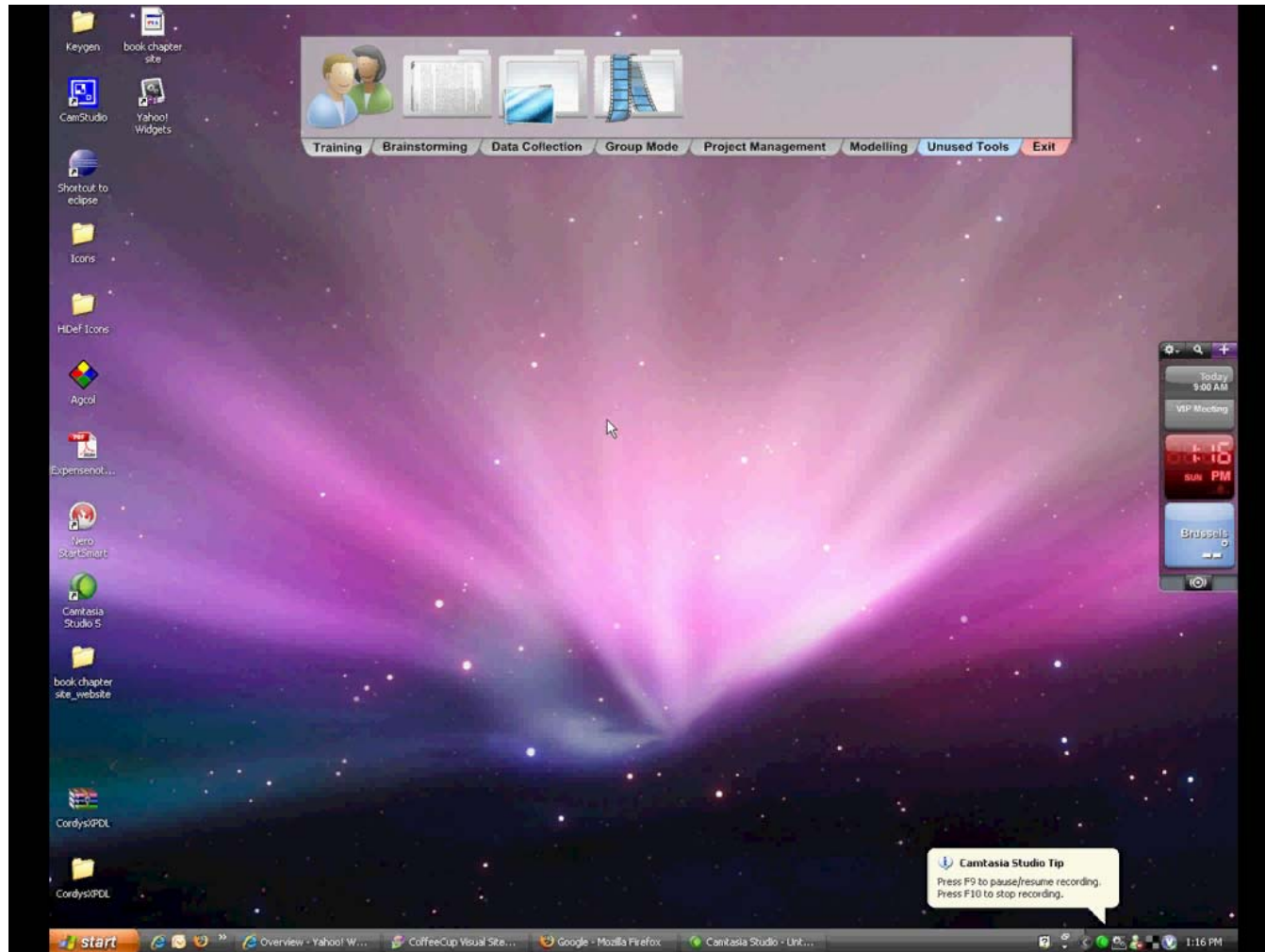


## Information Sharing via Online Portal

- Main Online Portal for collecting information for ontology;  
<http://starlab.vub.ac.be/3dahwiki>
- Create new wiki-stubs & extend existing stubs with your knowledge
- Use semi-wiki functionalities, like annotation of hyperlinks (make attributes)
- Later there could be a possibility to communicate with DOGMA Server - special database for ontologies  
<http://starlab.vub.ac.be/website/dogma.studio.server>

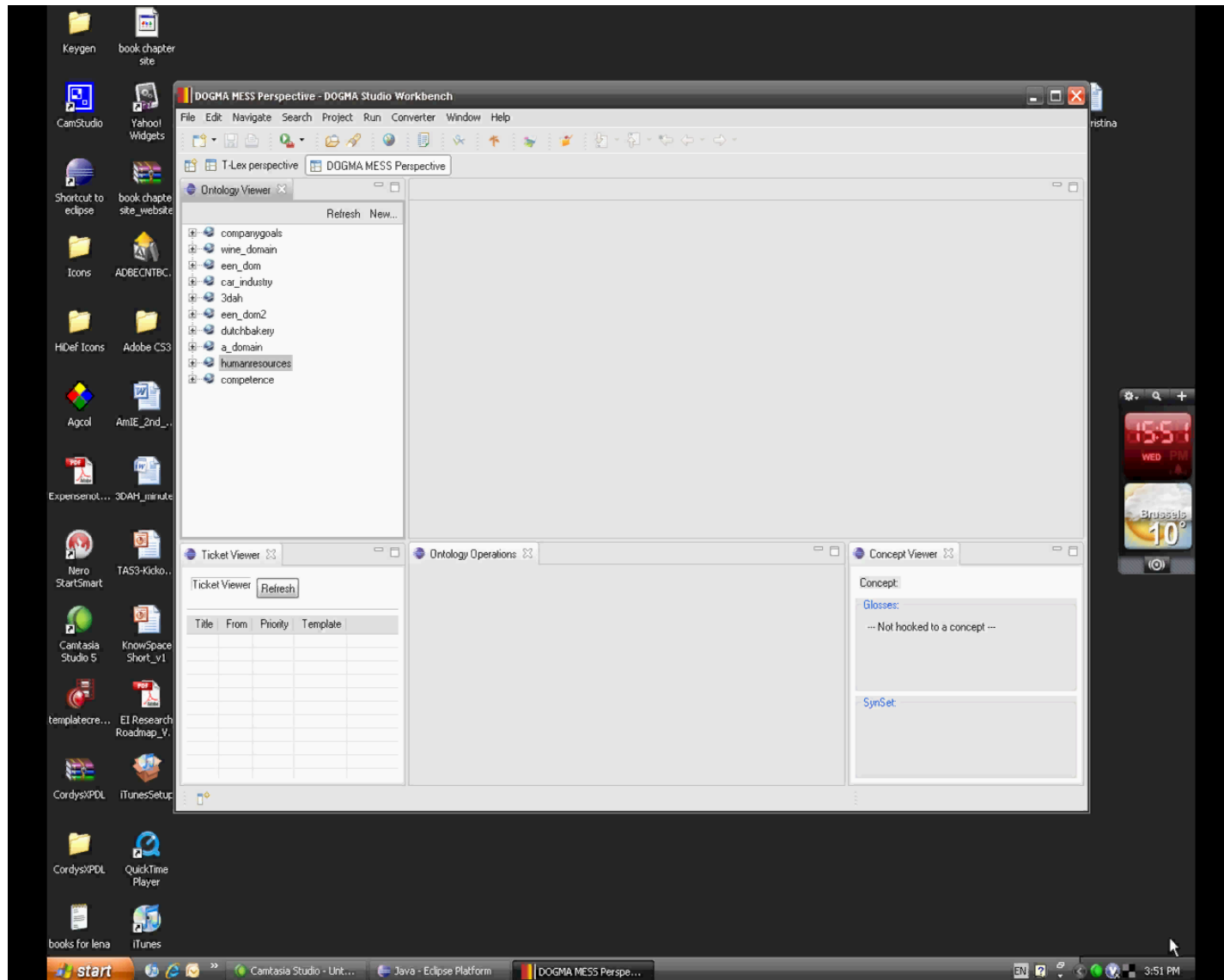


# OMOGENIA





# DOGMA Workbench



# 3D-AH Collaboration Days



## 3D – Anatomical Human « COLLABORATION DAYS »

Organisation: Margit Mikula – VUB Vrije Universiteit Brussel, STARlab

### Invitation to Brussels/Belgium

30.1. - 1.2. 2008



The objective of the “3D-AH COLLABORATION DAYS” is to enhance collaboration within the 3D-AH research network and share experience and methods in ontology-development for the network. The “3D-AH COLLABORATION DAYS” are a discussion & knowledge exchange platform for Experienced Researchers (ER) and Early Stage Researchers (ESR) and international, selected experts in Computer Science and Biology related fields.

As part of the “3D-AH COLLABORATION DAYS” a cultural program is offered which includes trips through the capital of Europe, to the Leonardo da Vinci exhibition, together with the opportunity to sample traditional Belgian cuisine and beverages.



Vrije Universiteit Brussel

Semantics Technology & Applications  
Research Laboratory  
**VUB STAR.Lab**

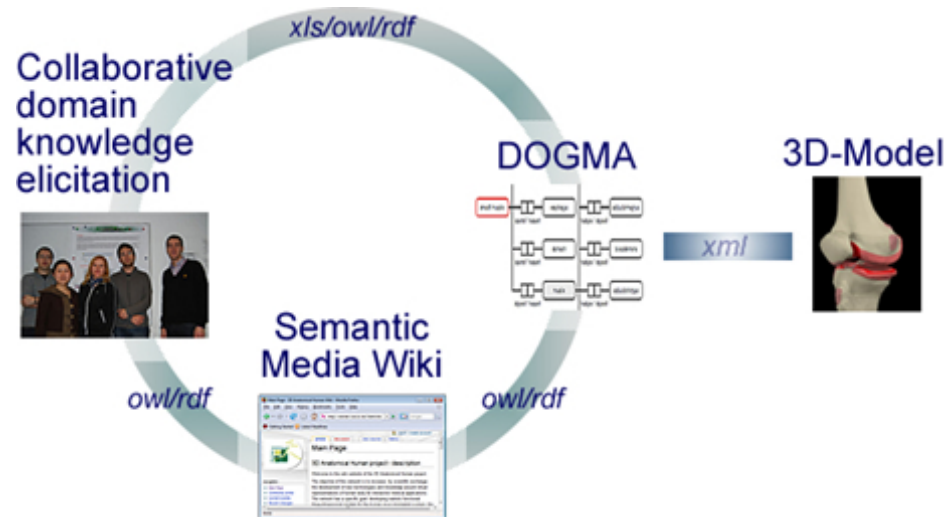


# 3D-AH Collaboration Days



## Participants:

- Aggelos Liapis, STARLab
- Margit Mikula, STARLab
- Jerome Schmid, UNIGE
- BailiangChen, UCL
- Francois Chung, INRIA
- Anders Sandholm, EPFL

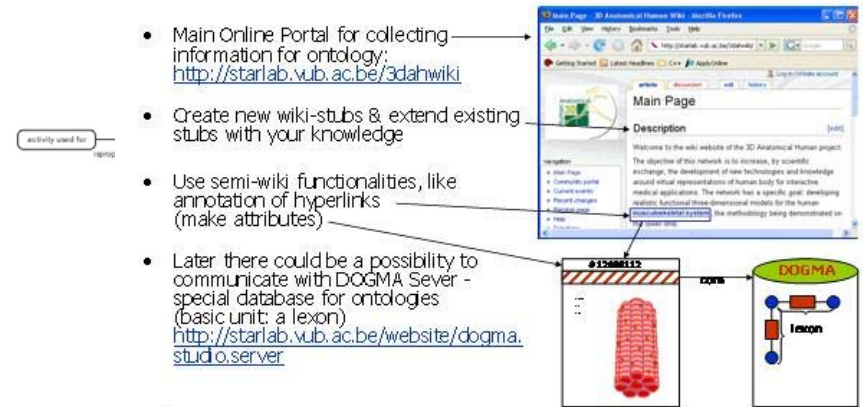


# 3D-AH Collaboration Days

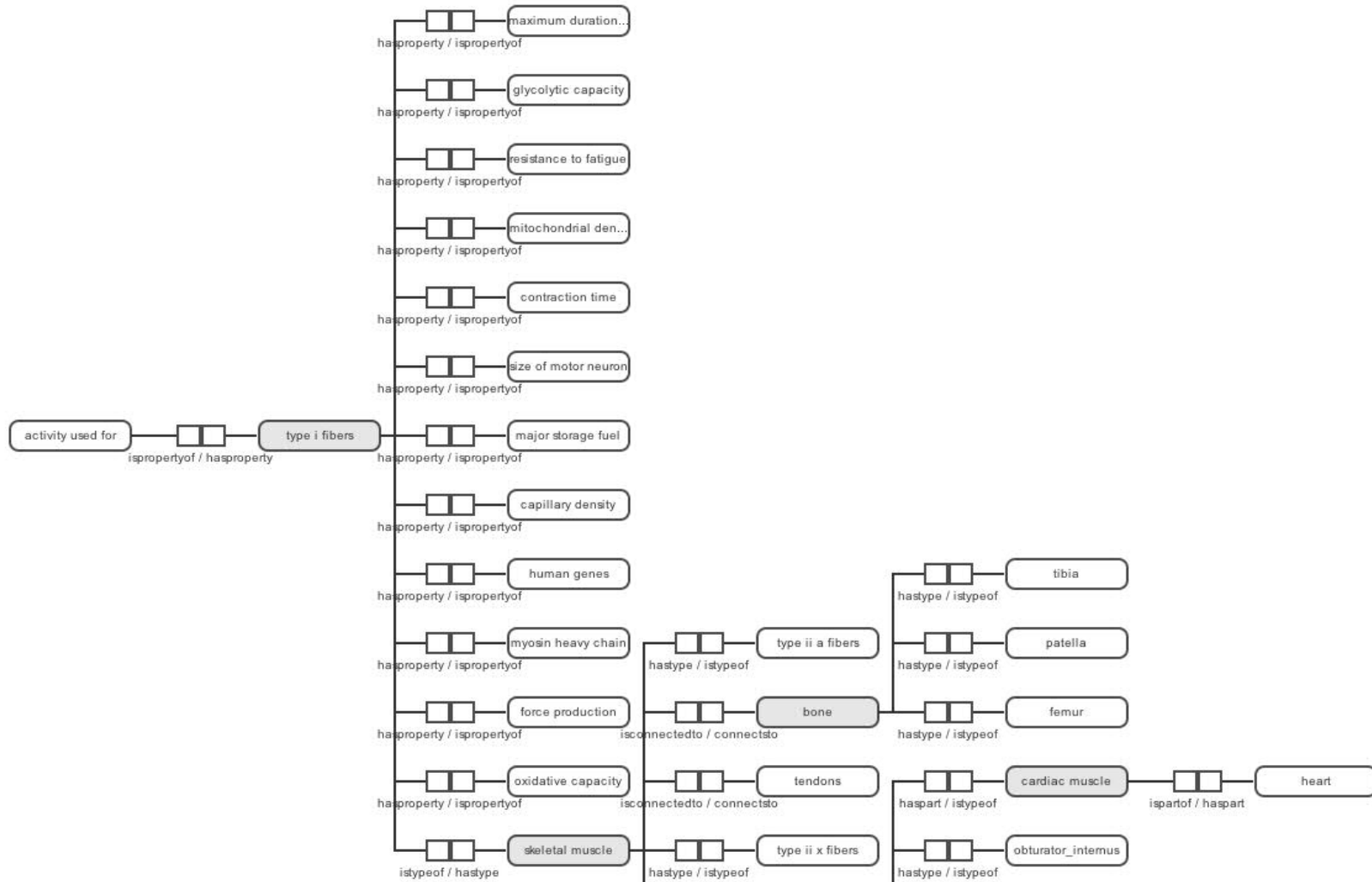
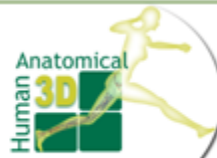


- During the 3D-AH collaboration days workshop organised by VUB-STARLab an ontology was created by the 3D-AH consortium using the DOGMA methodology giving full relational information.
- Initially concepts were defined in a collaborative effort in the form of lexons and imported into DOGMA via excel.
- An RDF export was then used to power the Semantic Media Wiki.

## Information Sharing via Online Portal



# The 3D-AH Ontology...



# Our Approach...



- In our approach, we have used the Semantic Media Wiki as knowledge collection and collaboration tool.
- The main ontology contributions are:
  - Collaborative implementation of an ontology
  - Cross reference data from various domains
  - Publish/edit/store/retrieve these data
  - Image annotations from which 3D-modellers gain relevant info to create realistic 3D-models
  - Creation and population of the Semantic Media Wiki



# Summary



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- The DOGMA Methodology
- Our Tools:
  - HCS
  - Semantic Wiki
  - OMOGENIA
  - DOGMA Workbench
- 3D-AH Collaboration Days
  - Participants
  - The 3D-AH Ontology

