FCA
&
Mobile Semantic Web 2.0

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Outline

- Web 2.0 – Mobile Web – Semantic Web
  - Tagging Task
- FCA
- SinNet Social Network.
  - Foundations
  - Architecture
- Semantic Tasks
- Conclusions and Future works

Web 2.0

- Web 2.0

  - Tagging

  - Mashups

  - Social networks
  - …

Mobile Web 2.0

- Ubiquity & Mobility

- Content generation with spatial, temporal and/or personal features.

- Automated meta-tagging task

Mobile Web 2.0

- **Difficoulties**
  - Private Telecomm channels
    - Different legal terms, limitations, etc…
  - Infrastructure, costs, hardware archs,…
  - Different behaviours
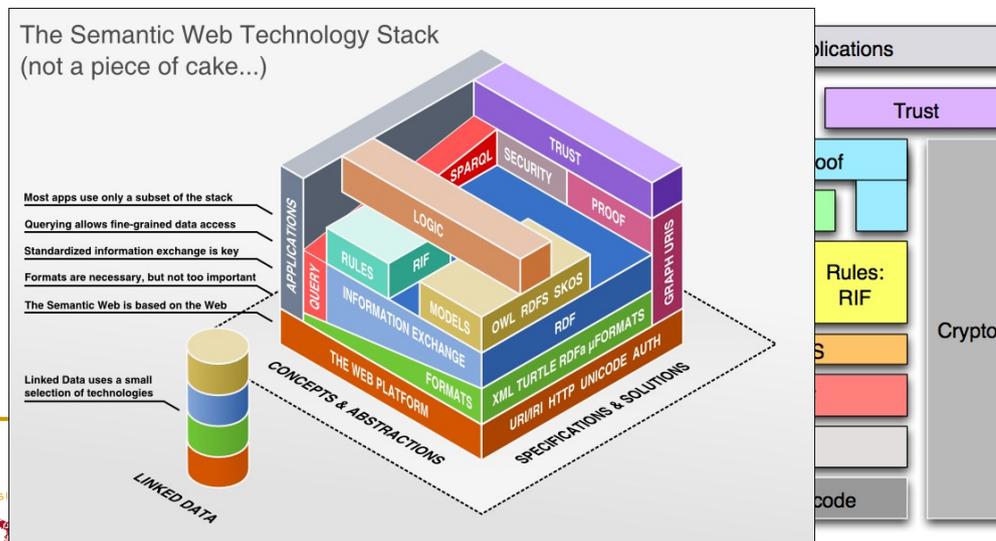   - Mobile users vs. Desktop users
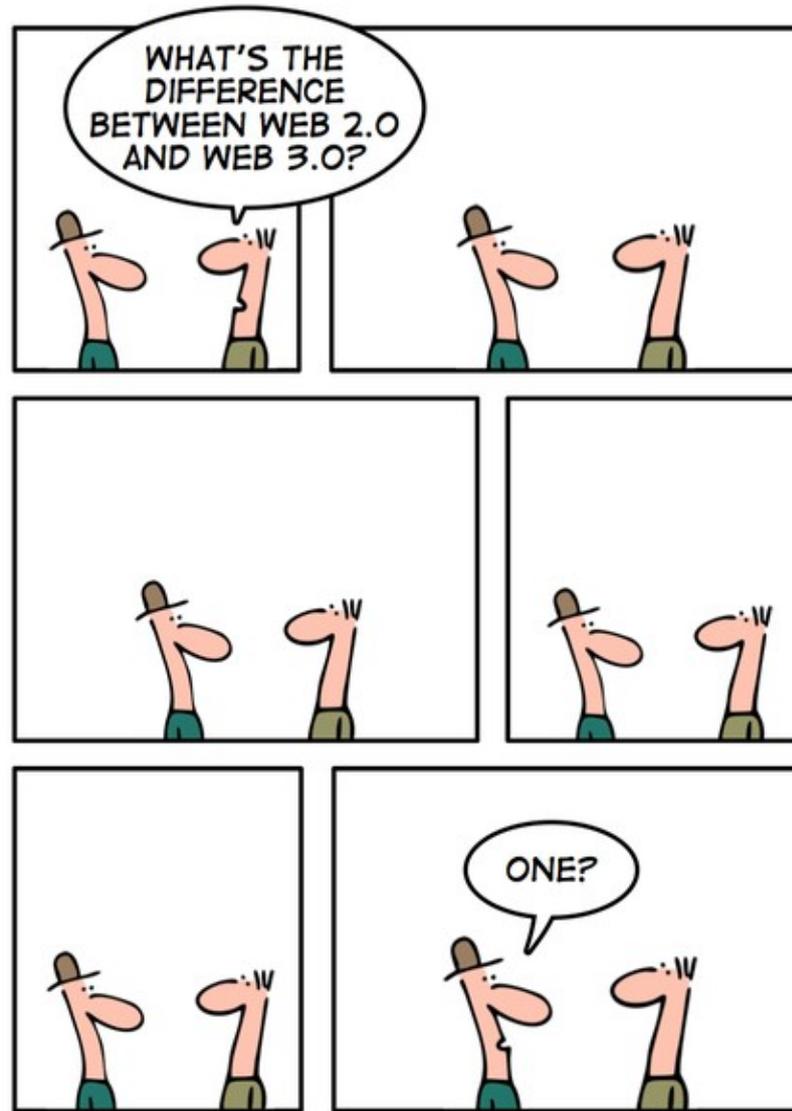 - Usability
  - MMS and SMS channels

mobileOK®

Semantic Web

- Idea

Semantic Web … How??

- Semantic Web → Machine readable

- Information → Ontologies → KNOWLEDGE

- Metadata → Semantic Web

The Semantic Web Technology Stack (not a piece of cake...)

Most apps use only a subset of the stack
Querying allows fine-grained data access
Standardized information exchange is key
Formats are necessary, but not too important
The Semantic Web is based on the Web

Linked Data uses a small selection of technologies

2.0 … 3.0 ???

Web 2.0 – Mobile Web – Semantic Web

FCA

- **Contexts**
  - Objects = Multimedia Content set
  - Attributes = Tags set
  - Relation = 1-0 relationship

- **Stem Basis.**
 - Inference as a Production system

- **Lattice**
  - Ontologies

FCA Reasoning

- Armstrong rules

- Theorem: Let L be a implicational basis for M, and L an implication.
  Then　　　M |= L　　　if and only if　　　L |=$_A$ L

- Definition: Stem Kernel Basis
- Idea: Production Systems

SinNet - Mobile Social Network

- An experimental Mobile Social Network

- It's NOT based on **Internet Mobile**

- Collective intelligence must be implemented by a *MAS*
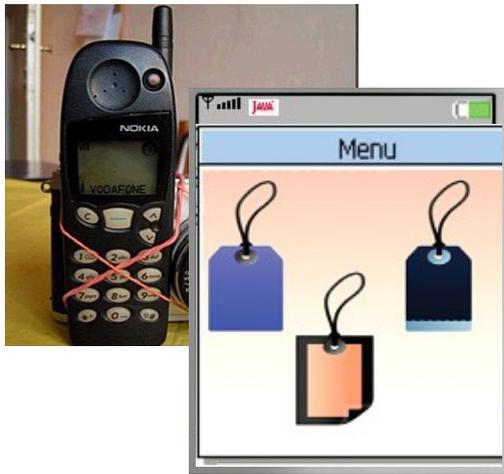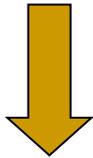
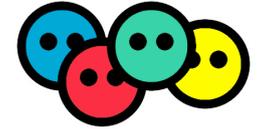- *MAS* manage semantically the user-generated content

SinNet - Mobile Social Network
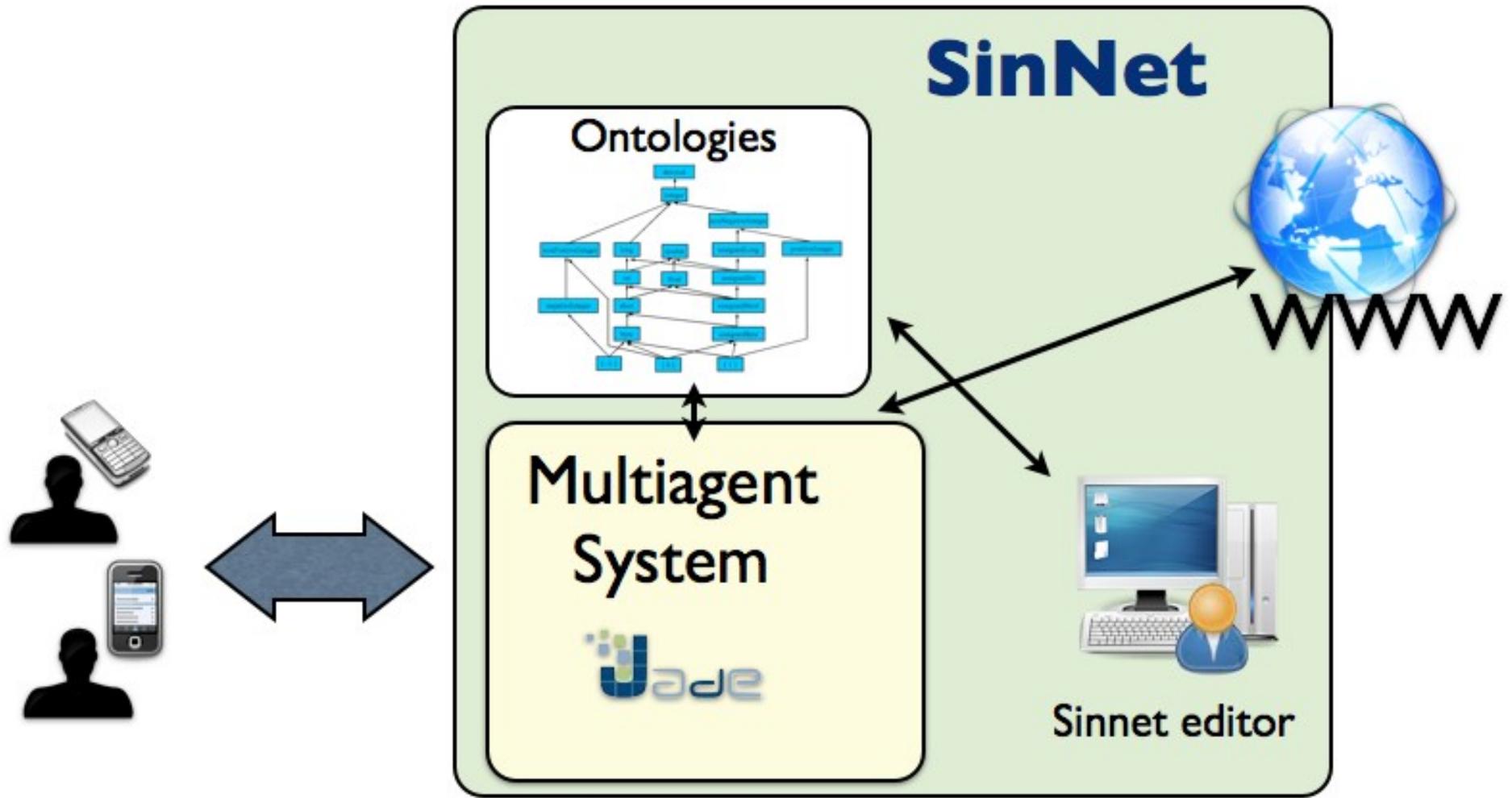
How does it work?
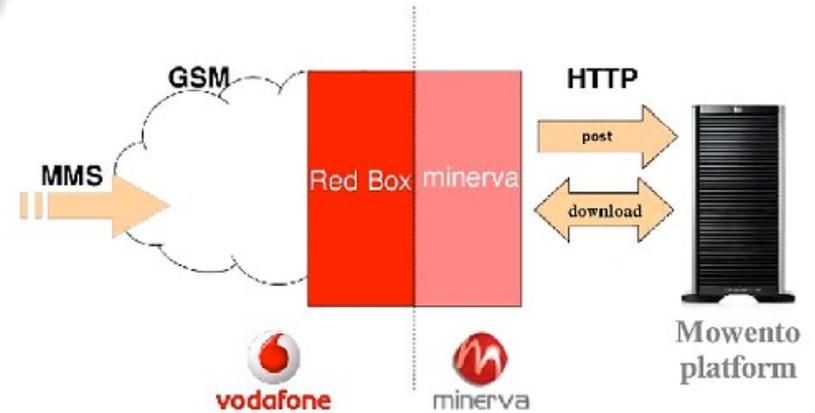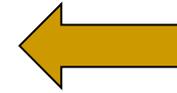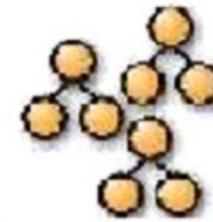
Why MMS/SMS channels?

- **All operators offer the service**

- **Available (most) around the world**

- **All cell phones support it**

- **Internet conection is**
    - (still) expensive
    - Infrastructure is weak

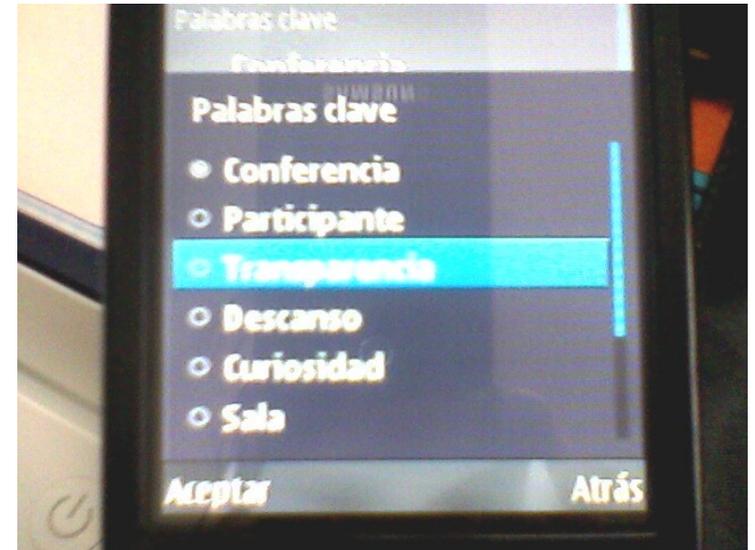# SinNet - Mobile Social Network

- Events
  - Conferences, workshops or commercial fairs.

- Intensive FCA development.

- Initial ontology
  - 200 photos (objects) handly tagged

SinNet - Mobile Social Network

- **Mobile Application**

- **Web**

- **Multiagent System**

- **Minerva Platform**

SinNet Mobile Application

- Version 1: Mowento

- Mobile App: Java
  - (a few features)

- Web: Symphony framework
  - General purpose

- Multiagents: Weak integration

- Minerva: fully functional and integrated

Implemented by Fernando Gómez, Francisco Perez & Carlos Perez (*)

SinNet Mobile Application

- ## Version 2: SinNet

- ## Mobile App: Java

  - ### Capture, modular, XML menus, …

- ## Web: Elgg framework

  - ### Social networks purpose

- ## Multiagents: More integration

- ## Minerva: *… but...

Implemented by Jesús Giraldez (*)

SinNet Mobile Application

- Version 3: XXXXXX
- Design stage.

- Mobile App: Java & iOS (&Android ??)
  - Support internet, where available
- Web: Elgg framework
  - New modules (iFOAF)
- Multiagents: Fully integration
- Minerva:?????

SinNet Mobile Application

- **Non High-level devices**
- **Supported as much as possible**
- **Easy to programming**
  - Easy Extendable

- **JAVA J2ME**
  - Extendable to JADE Agents.

SinNet Mobile Application

- Non High-level devices
- Supported as much as possible
- Easy to programming
  - Easy Extendable
- JAVA J2ME
  - Extendable to JADE Agents.

- "S & S" Philosophy
  - Max. 3 clicks!

SinNet Mobile Application (v2)

- User need to publish an event

- Starts application

- And capture it

SinNet Mobile Application

- **Fill the most important field**
  - Title!

- **Most of fields are optionals**

- **Even, they have a default value inserted**

SinNet Mobile Application

- Tagging task starts

- Application offer to the user a menu system to (only) click

- Depth is controlled (max. 3)

- Can finish before

SinNet Mobile Application

- Last menu level, User can choose several tags

- Anytime, user can add a new tag

SinNet Mobile Application

- **Select the privacy**
  - (new)

SinNet Mobile Application

- **Review all fields**

- **Send**

Web Application

http://elgg.org/

Web Application

Multiagent System

- **The MAS manage ALL processes into Mowento:**

  - Document management activities
    - Formats conversion, …

  - Intelligent activities
    - Extract the concept's lattice
    - Complete the user's tagging
    - Calculate the minimal paging
    - Microdiffusion (FOAF)
    - Knowledge Conciliation

Multiagent System

- Knowledge Heterogeneity
- Different users & different ontologies
- There exist several limitations to collaborative tagging
  - The first one is that a tag can be used to refer to different concepts;
  - Users can create its own labels

- Important: Solution must be reusable for other tagging-based WWW services. (like delicious)
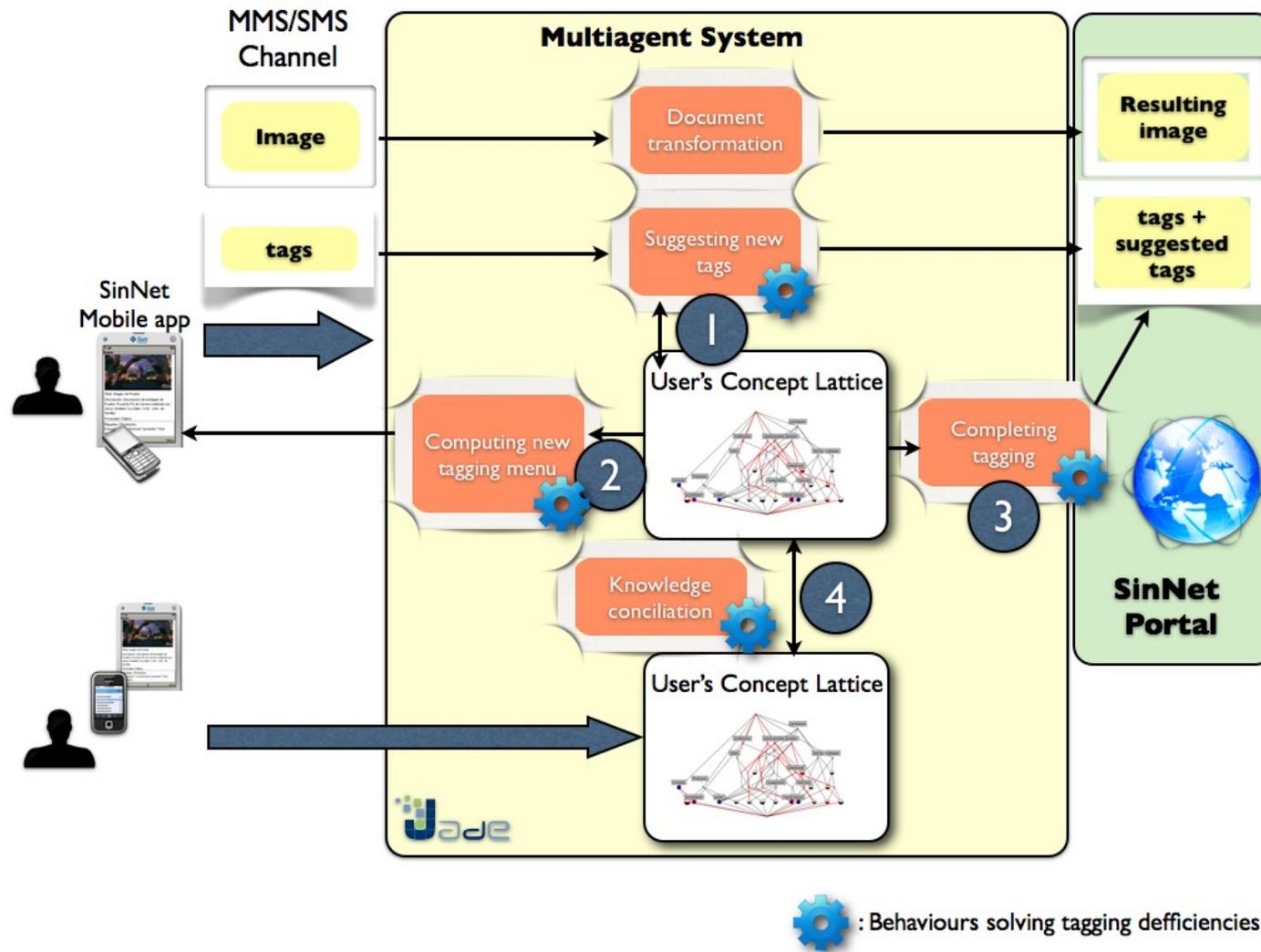
Minerva Platform
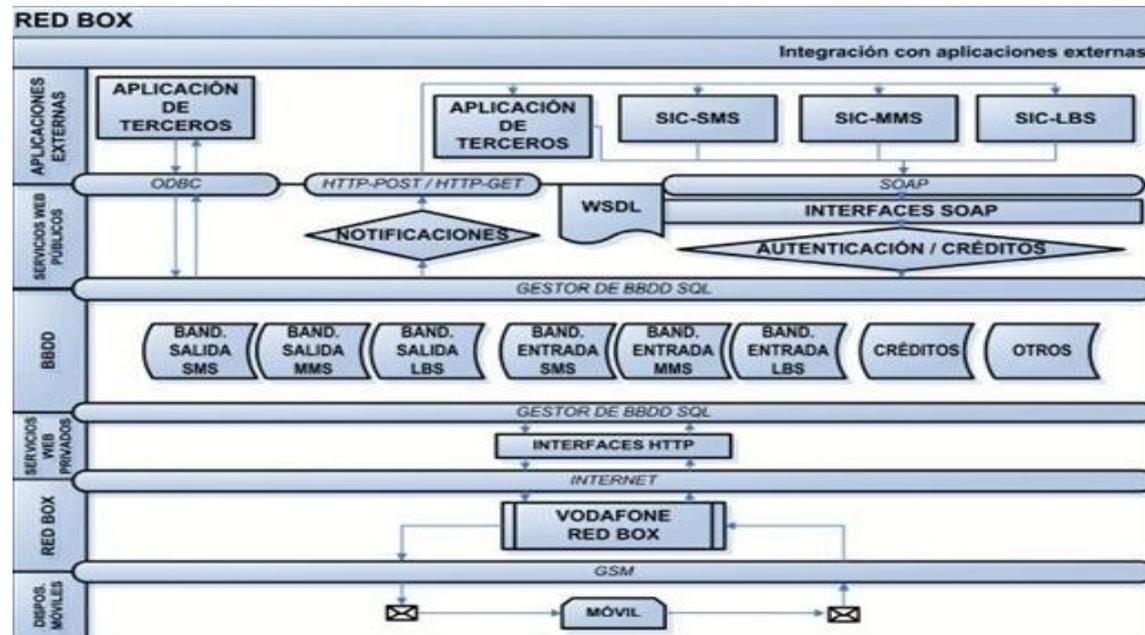
Semantic Tasks

1. Intelligent tags suggestions

3. Dynamic Menus

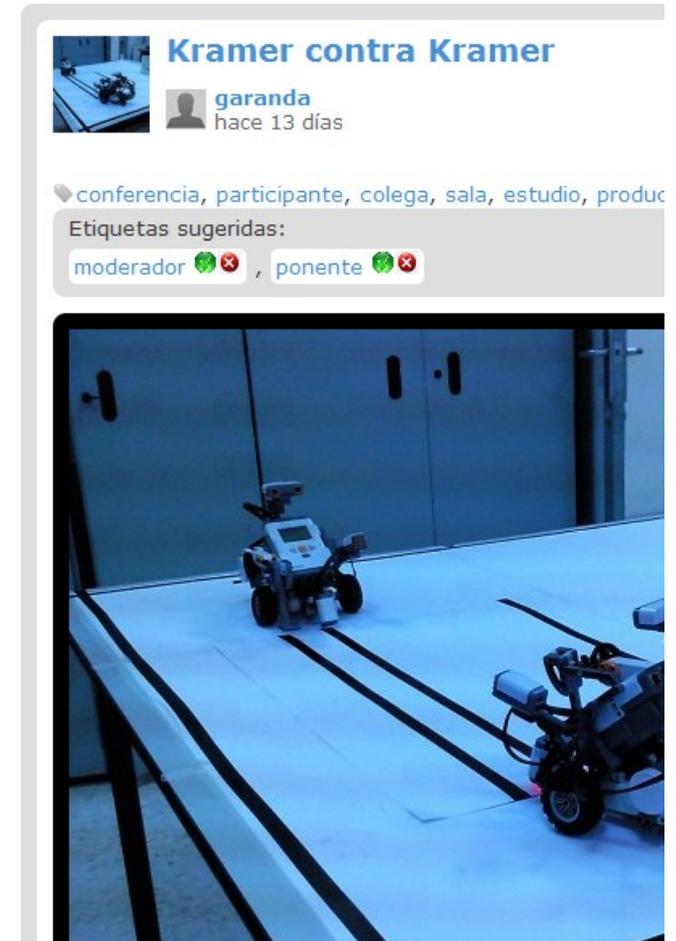5. Update old-tagged documents

7. User's knowledge conciliation

Semantic Tasks

Tags sugestion

- Use Stem basis as a Production system

- Infers new tags and…

- Are suggested to the user

- It can accept or reject

- Accepting all → the concept is in the most specific level

Gonzalo A. Aranda-Corral, Joaquín Borrego-Díaz, Fernando Gómez-Marín:
Toward Semantic Mobile Web 2.0 through Multiagent Systems. KES-AMSTA 2009: 400-409
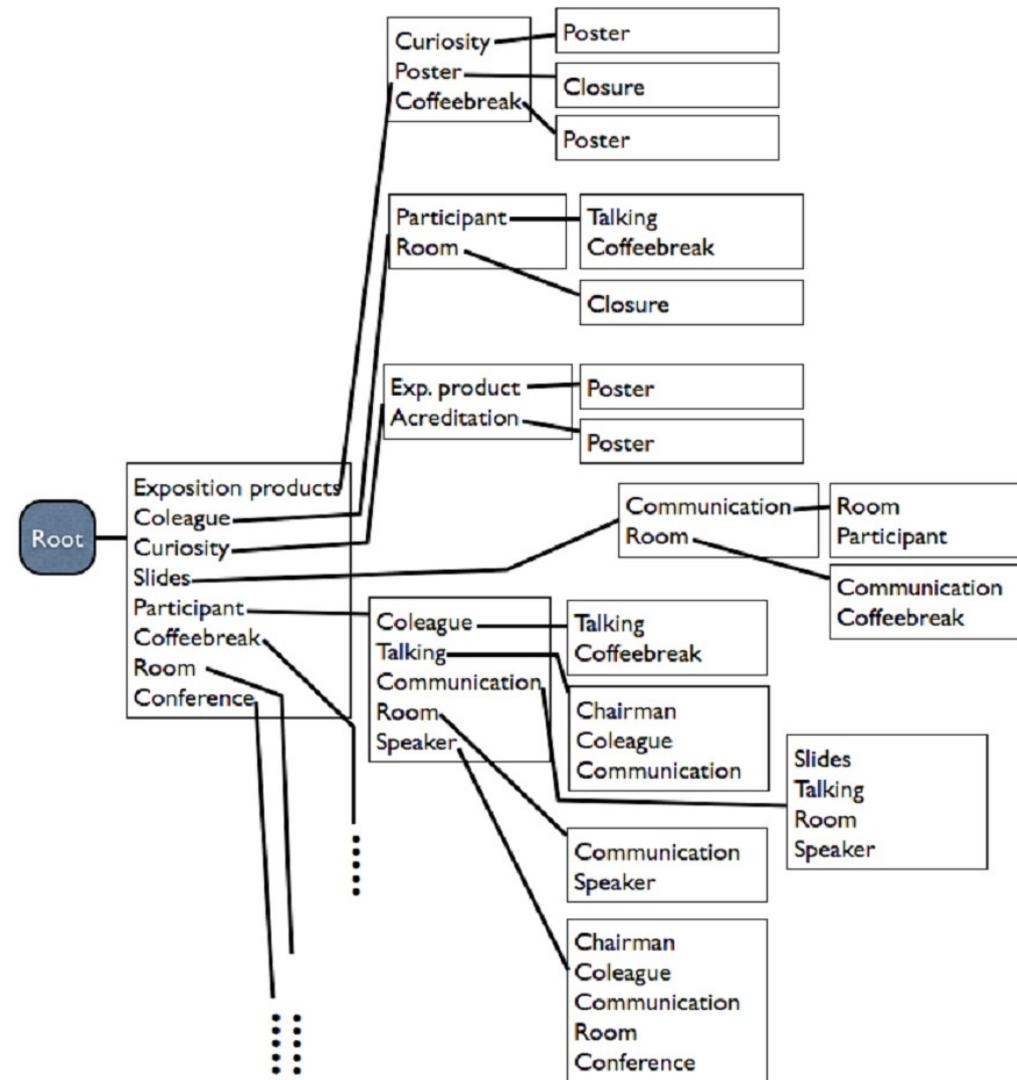
Dynamic Menus

- **Its extracted from an (hand-made) experiment**
  - 200 hundred photos on events
- **Aim:**
  - Minimize the clicks
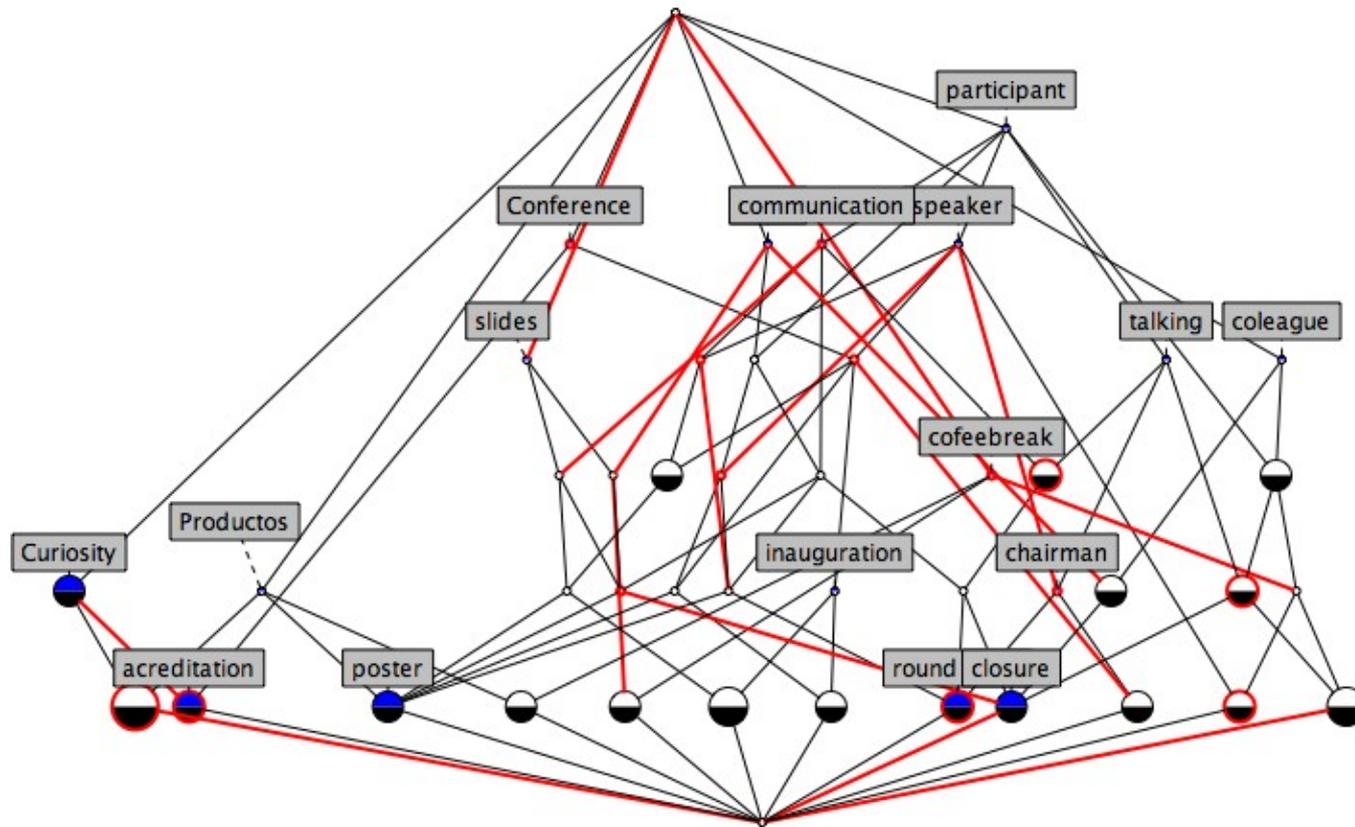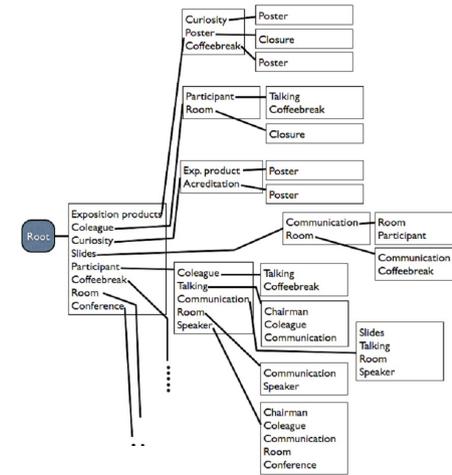 - High quality tagging
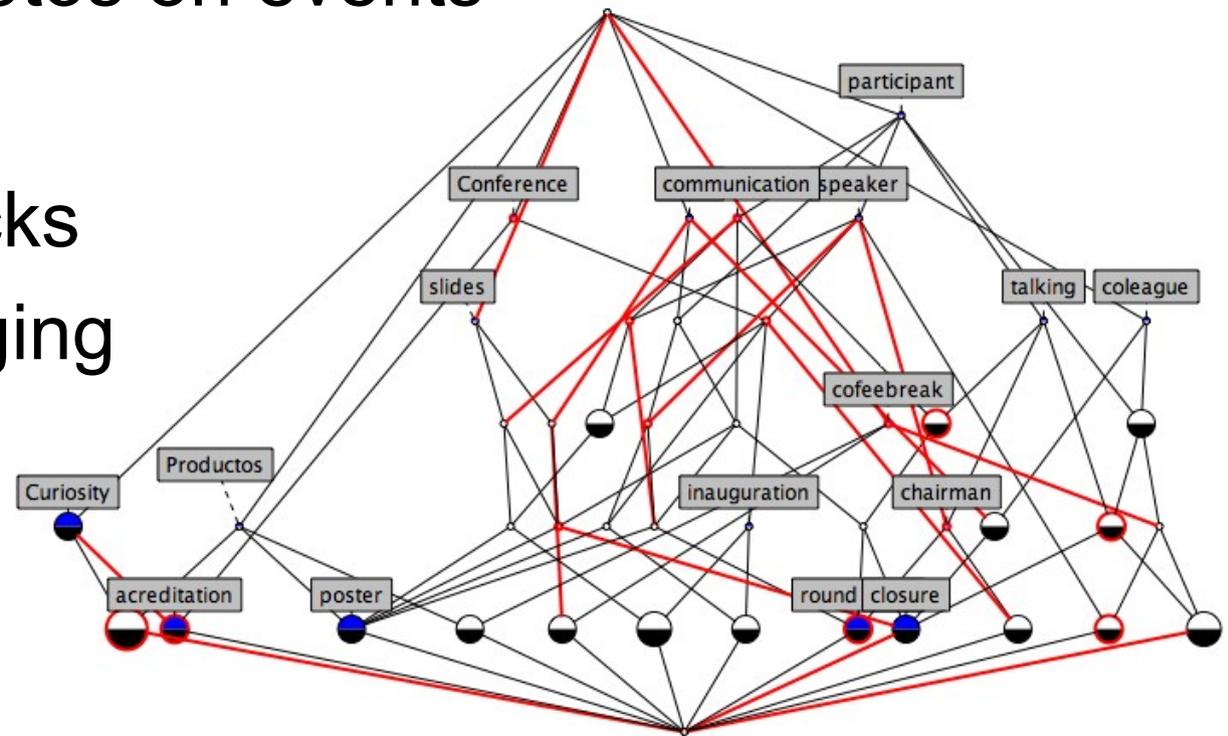
Menu-making

- Build the lattice

- Create its spawning tree
  - Own attributes

- Fill the "empty" concepts

Menu-making

Last menu level are:

Menu-making

- All of this is made at server

- Evolution
  - App accepts that server send a new menu version (XML)

- Future: we can personalize the menu
  - Create personal ontologies.

Retagging old documents

- Large quantity of (tagged) documents
- A new tag appears…Re-tagg old documents by hand???

Theorem 7. *Let M_0 as in section 6 with $A_0 = A \setminus \{p\}$. Assume that $\mathcal{L}$ is a stem basis, built by attribute exploration with expansion test. Let*

$$\Omega = \{Y_1 \subseteq A_0 \; : \; there \; exists \; Y \subseteq A_0 \; s.t. \; Y_1 \rightarrow Y \cup \{p\} \in \mathcal{L}\}$$

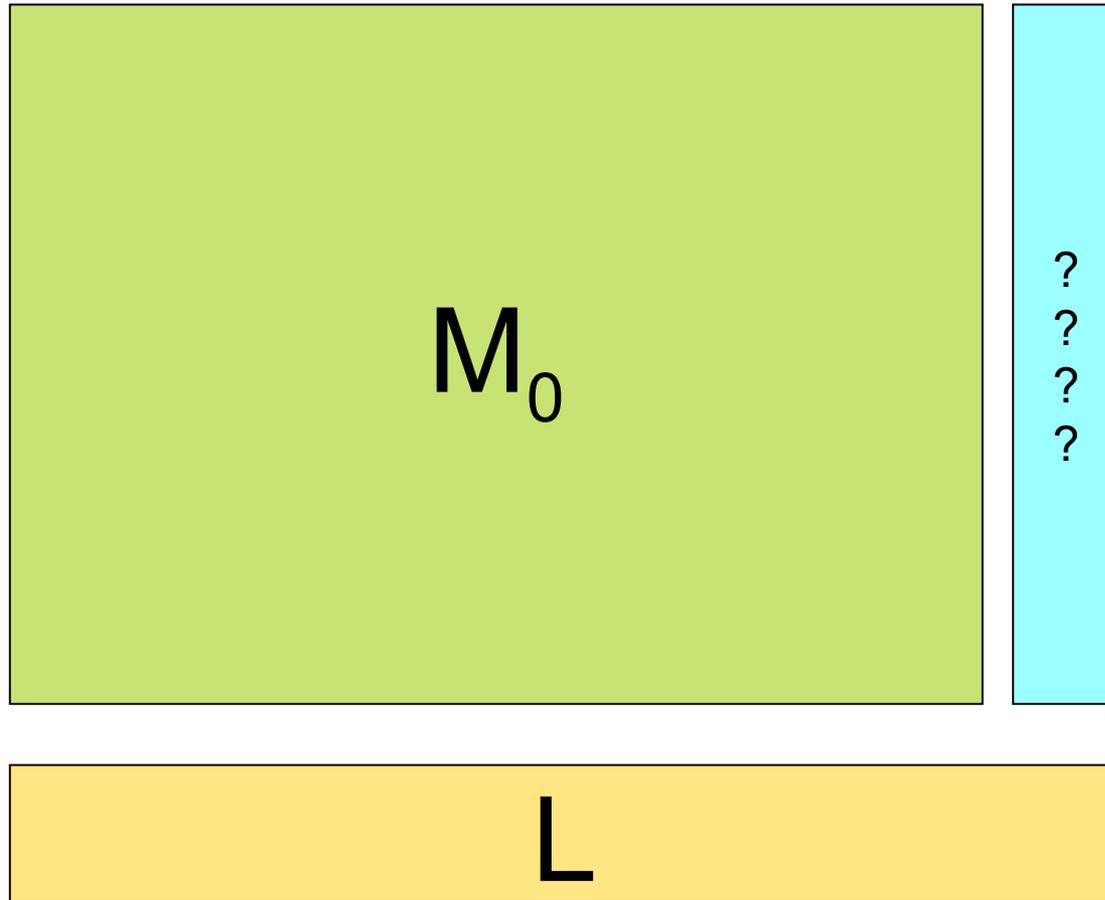*If M_c is the expansion of M_0 to A by defining the intent w.r.t. $\{p\}$ by*

$$p \in \{o\}' \quad \Longleftrightarrow \quad v_o(\bigvee_{Y \in \Omega} \bigwedge Y) = 1$$

then $\mathcal{L}$ is a stem basis for M_c.

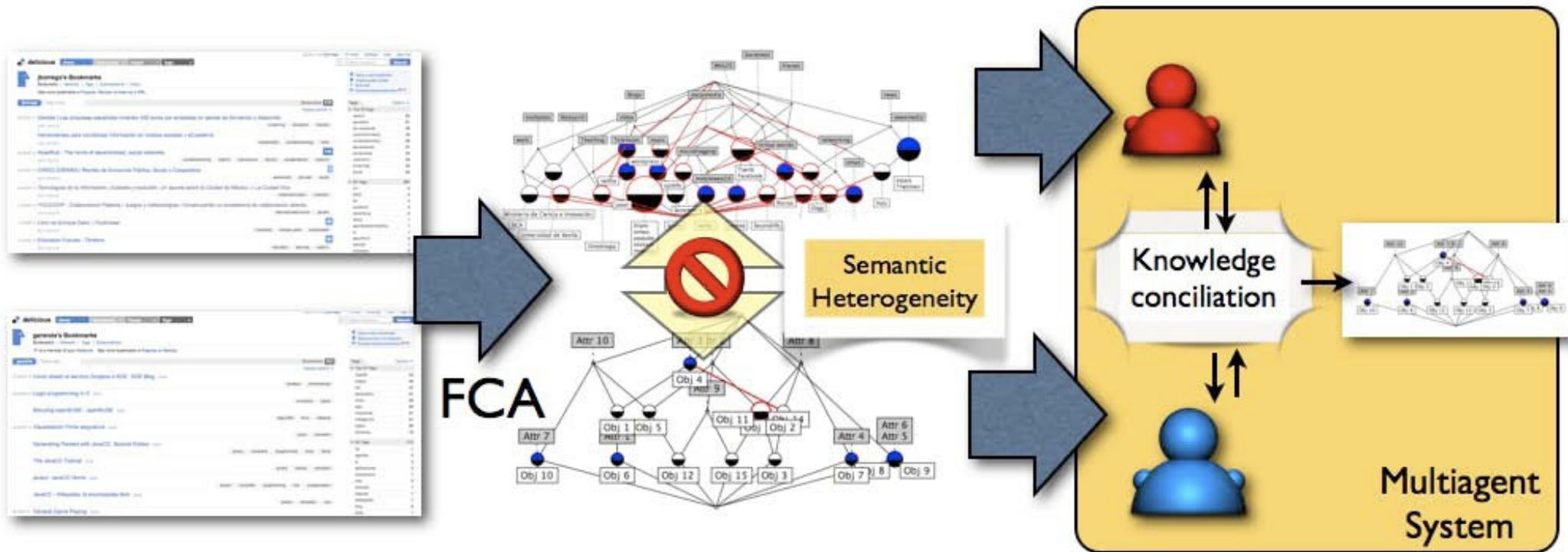Extending Attribute Exploration by Means of Boolean Derivatives. CLA 2008.

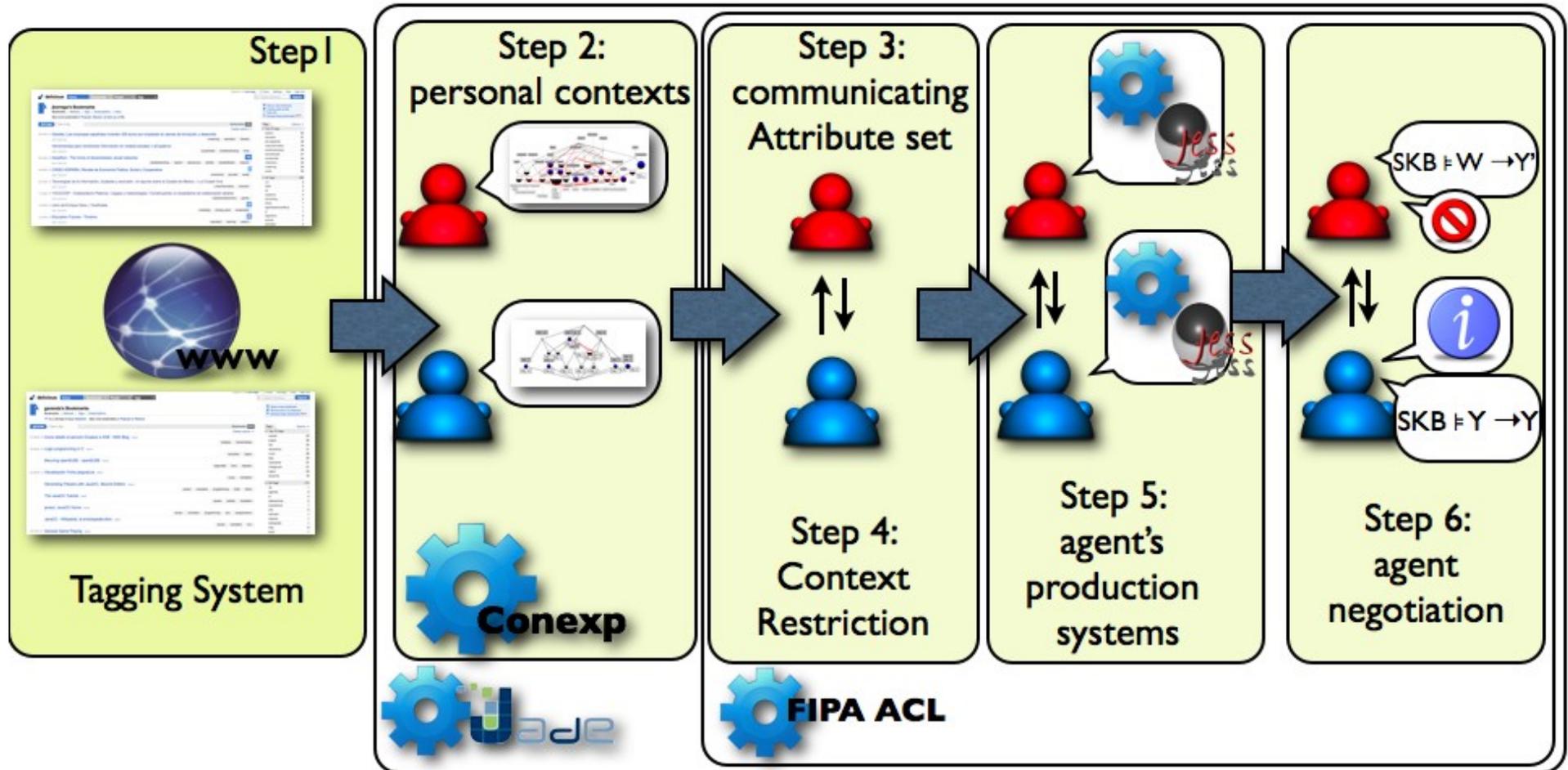# Retagging old documents

(under CWA)

M_0

? ? ? ?

L

Conciliation: Agent-based solution

- **Not Users**

Gonzalo A. Aranda-Corral, Joaquín Borrego-Díaz: Reconciling Knowledge in Social Tagging Web Services. HAIS (2) 2010: 383-390
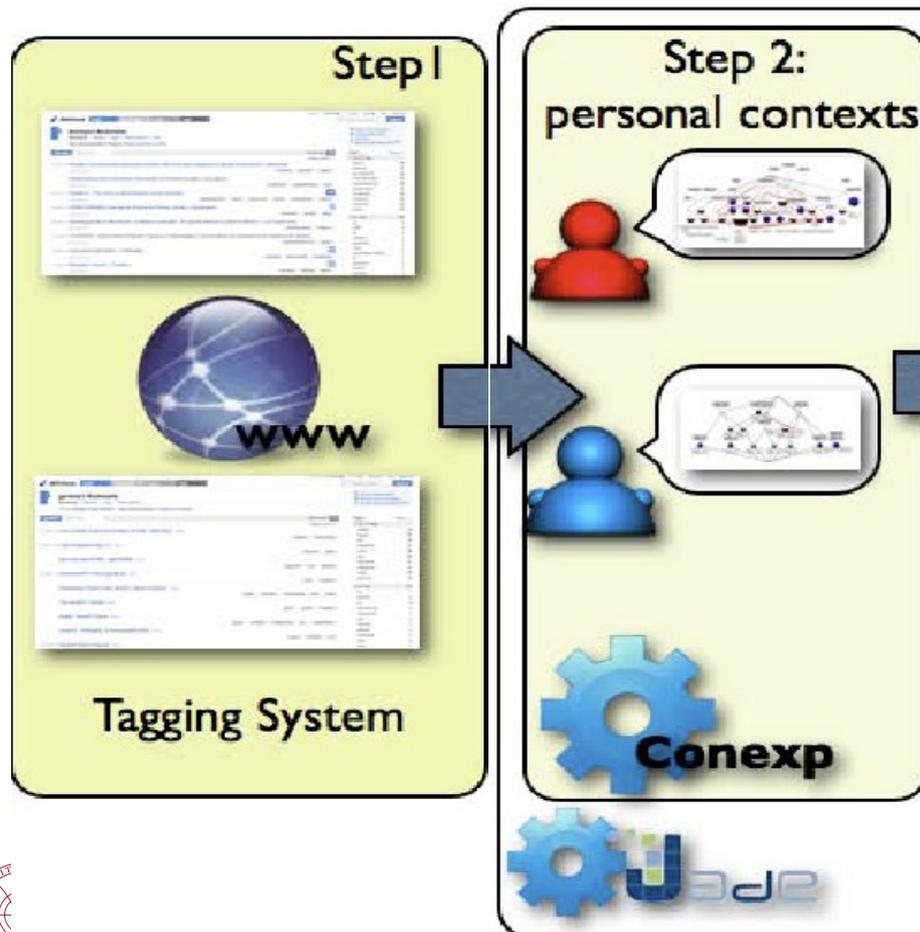
Concilation

Methodology

- ## Connect to Delicious (or SinNet)
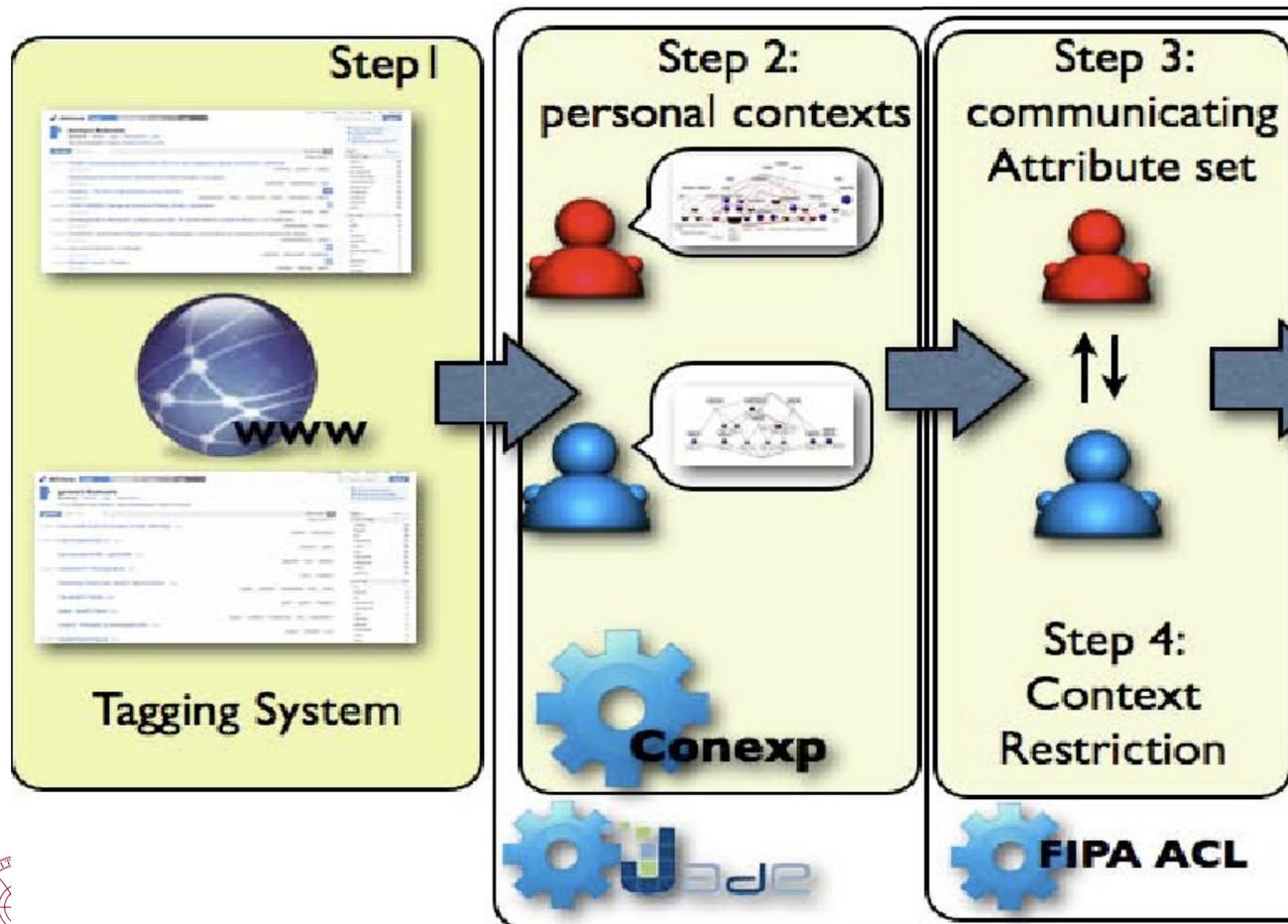 - Delicious Yahoo API
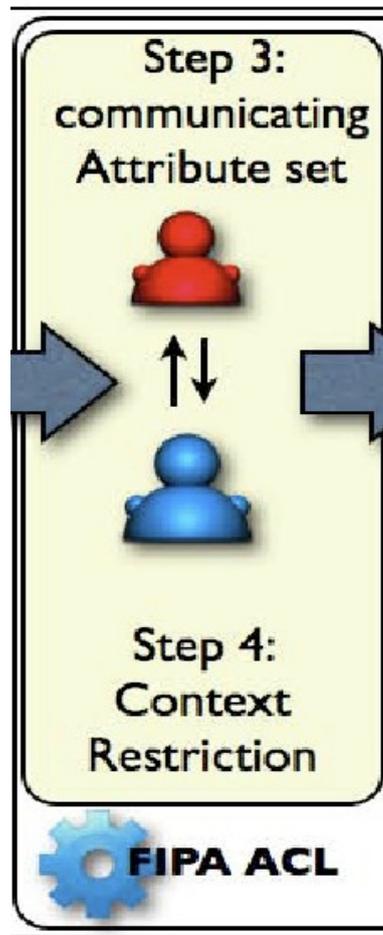
Methodology

- Extract data and create the knowledge

User	jborrego	garanda
Language	381	137
Bookmarks	358	536

Methodology

- Communicating languages and
- Context reduction

Methodology

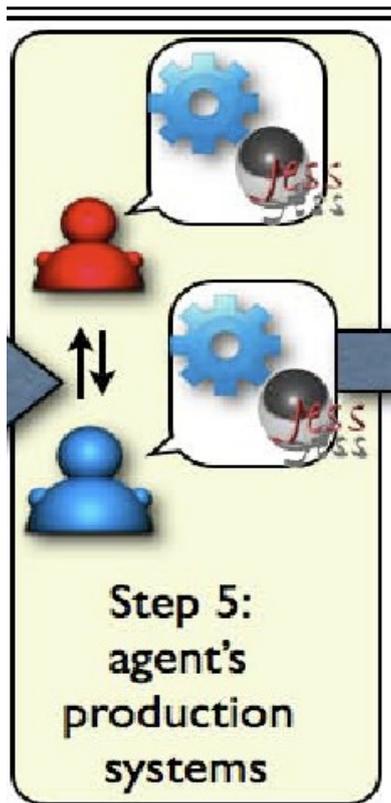| User	jborrego	garanda
Common Tags	19	
Bookmarks	131	114
Implications	11	11

Methodology

- **Create its own production system**
  - Common language, not common objects
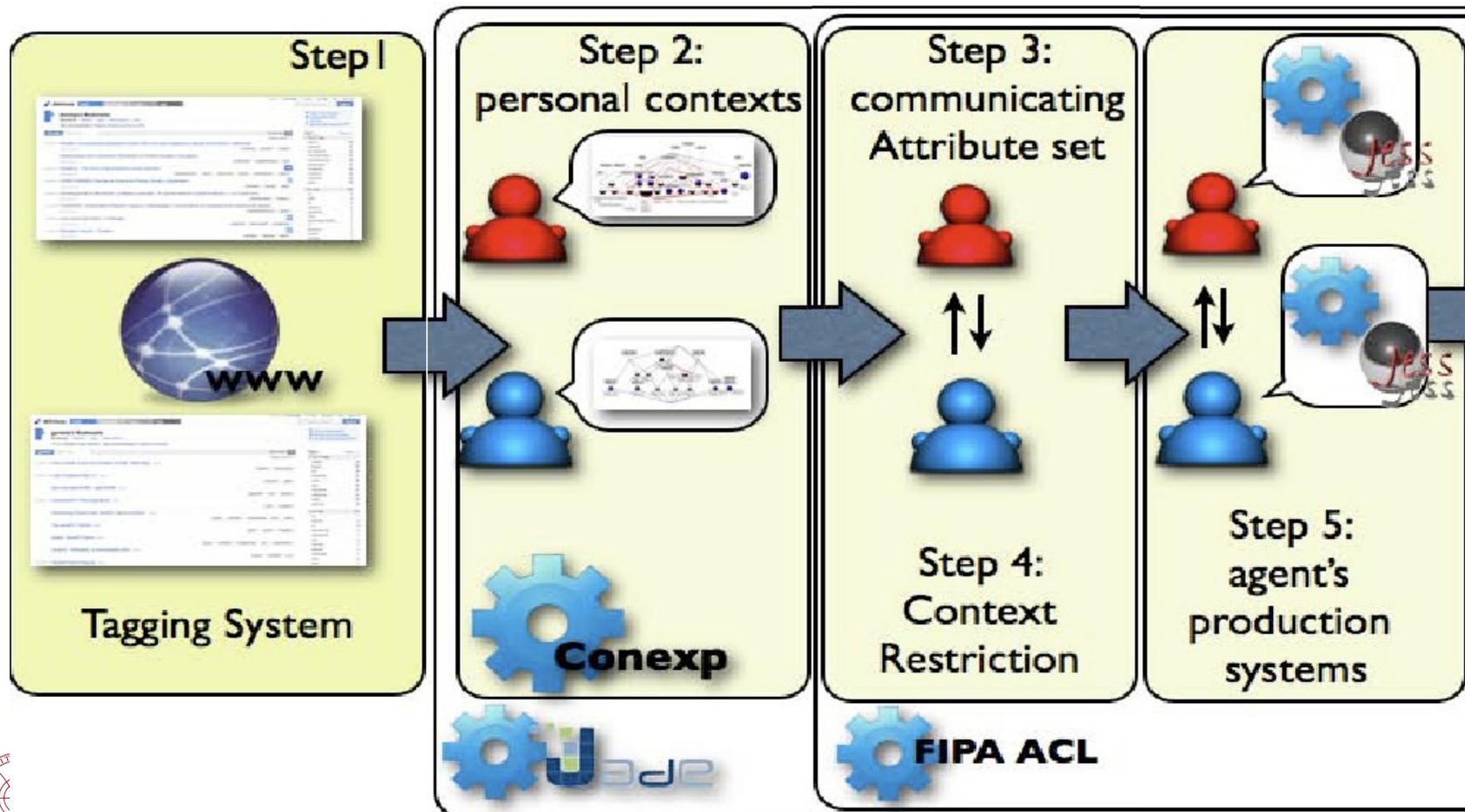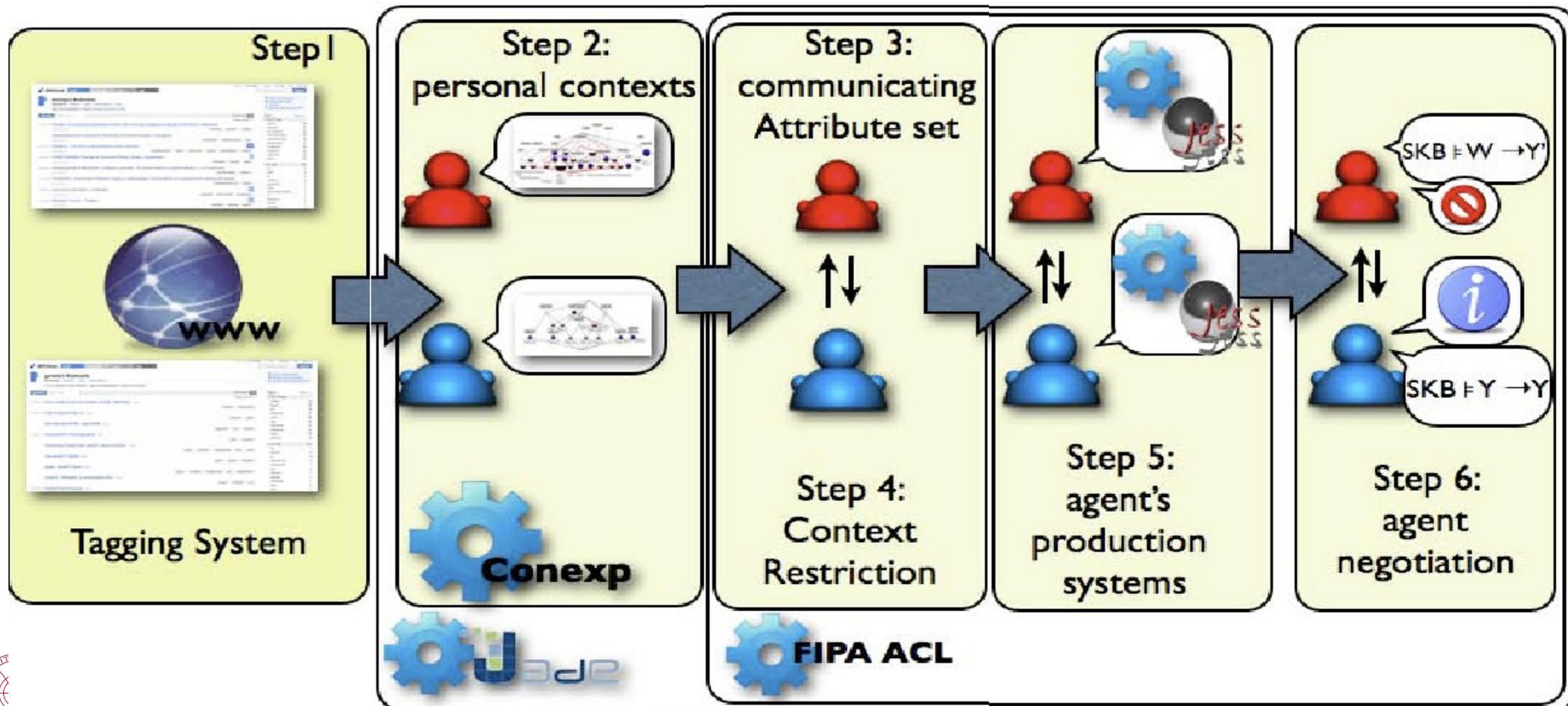
Methodology

- ## Stem Kernel Basis

Step 5: agent's production systems

```
User A
(tutorial) (robotics) --> (ai)
(twitter)   --> (social) (web2.0)
                (socialnetworking)
(facebook) --> (haskell) (tutorial)
```

```
User B
(twitter) (blog) --> (social) (web2.0)
(tutorial) (twitter) --> (web2.0)
(facebook) --> (twitter)
```
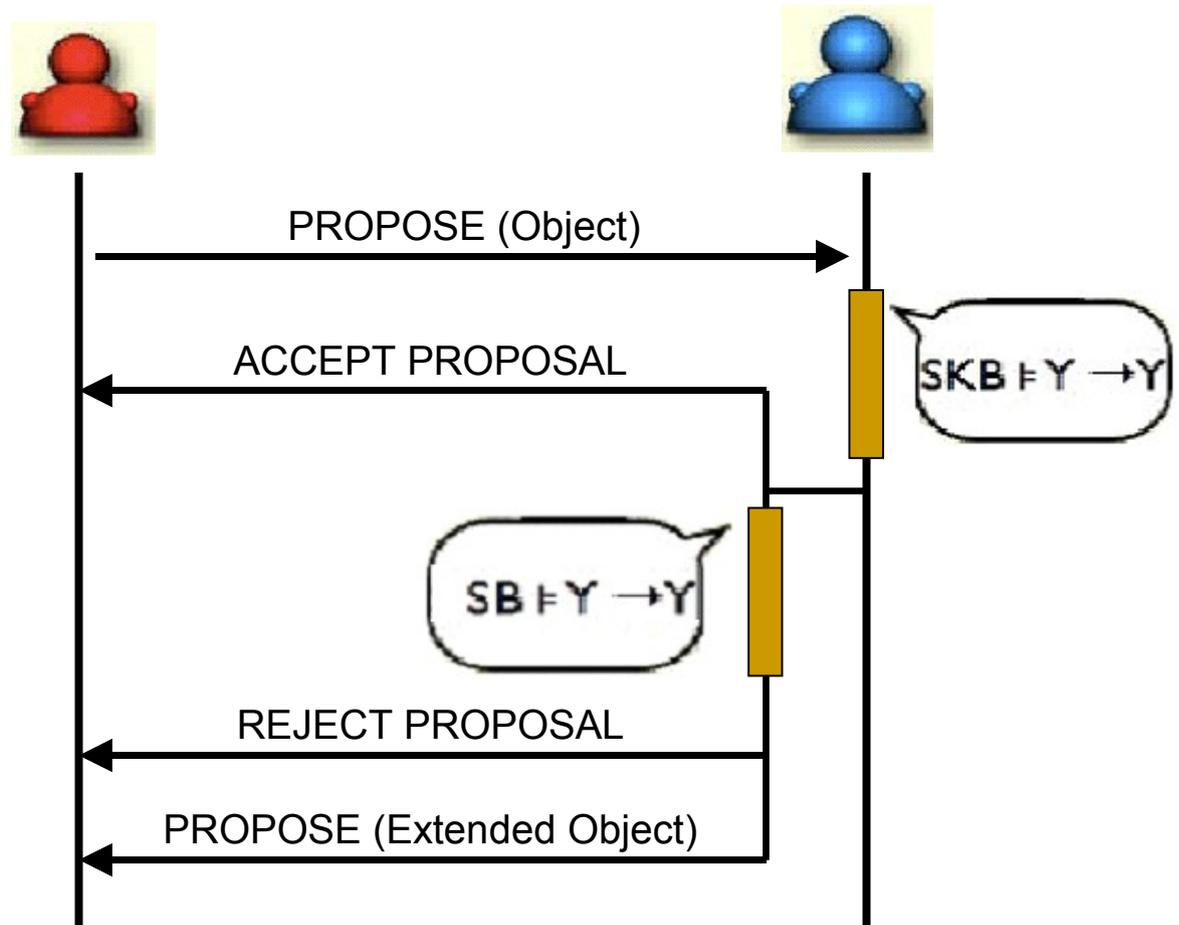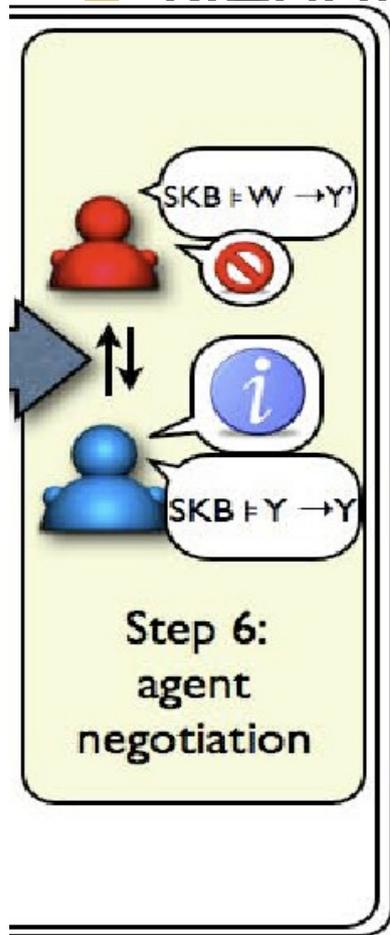
Methodology

- Negotiation

Methodology

- Negotiation

Methodology

- ## Negotiation

 - ☐ Initial massive sending

  - ☐ Extendable to multiple agents

SKB ⊢ W →Y'

SKB ⊢ Y →Y

Step 6:
agent
negotiation
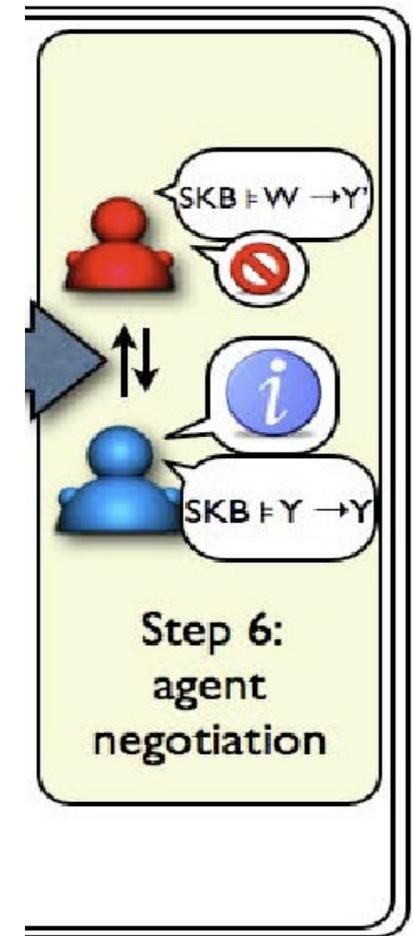
Methodology

- **Negotiation**

	Conciliation
Language	19
Bookmarks	245
Implications	21

```
(tutorial) (robotics) --> (programming) (ai) (haskell) (blog)
(tutorial) (programming) (haskell) (blog) --> (ai)
(twitter)  --> (social) (web2.0) (blog) (socialnetworking)
(facebook) --> (social) (twitter) (tutorial) (haskell)
               (web2.0) (blog) (socialnetworking)
```


SKB ⊨ W →Y'

SKB ⊨ Y →Y

Step 6:
agent
negotiation
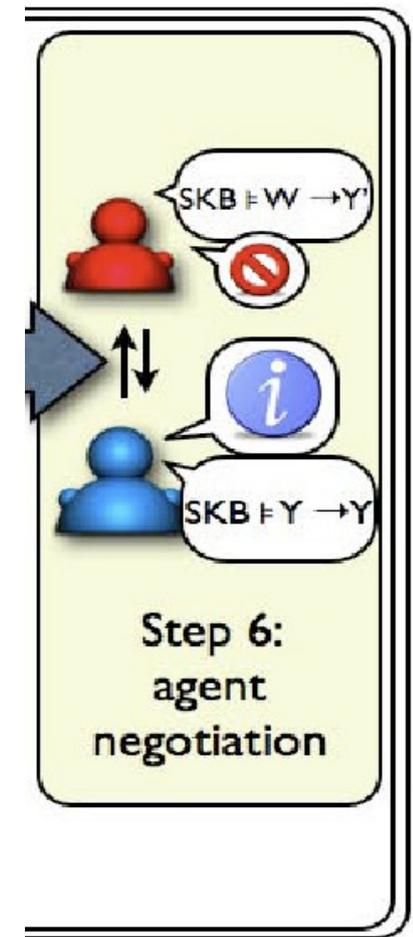
Future works

- (Intelligent)Micro-dissemination

- Conciliation:
  - Method extensions for consensus ontologies (if popular tags for new documents are stable from some instant, as Delicious)

Thanks!

Any Question?

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