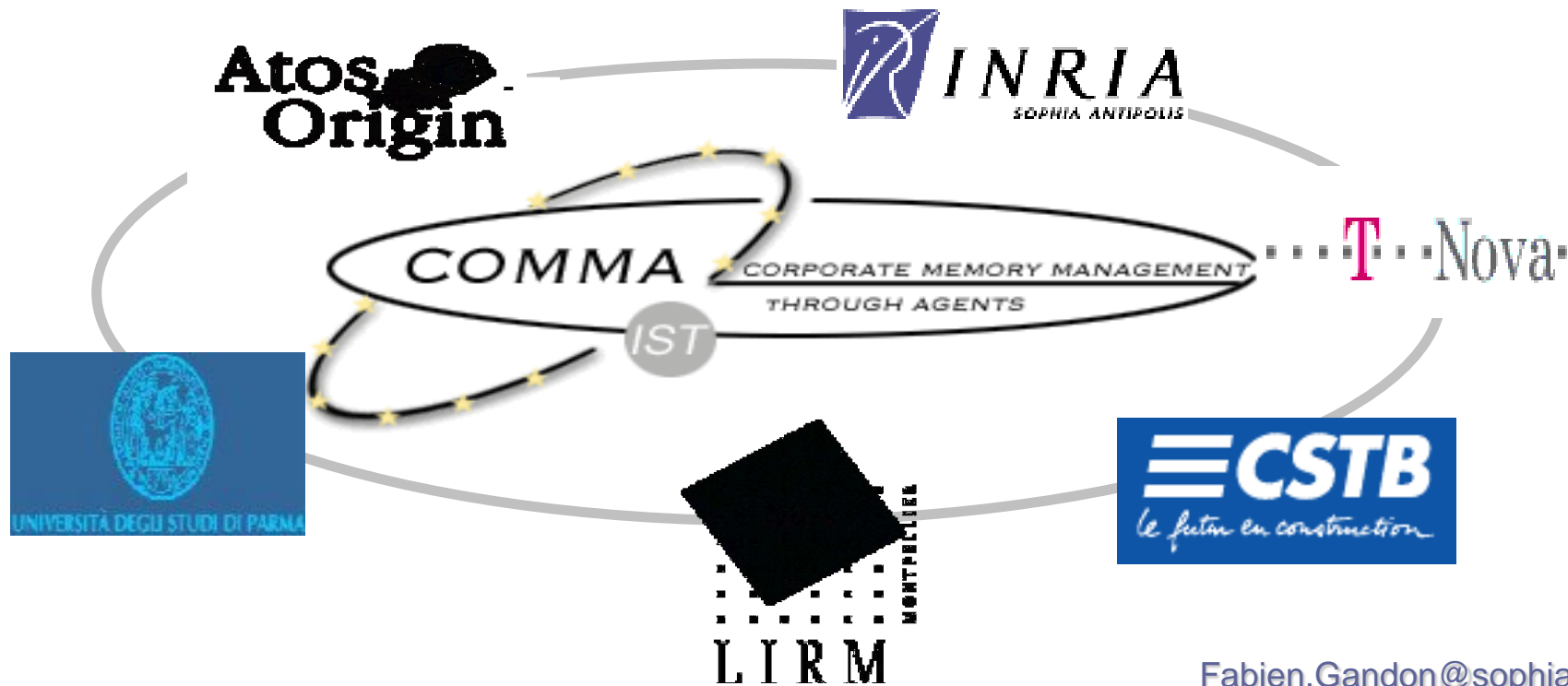


Semantic Web and Multi-Agent Approach to Corporate Memory Management



Semantic Web and Multi-Agent Approach to Corporate Memory Management

◆ Corporate semantic Web

- RDF(S) framework and its XML syntax
- Ontology-based annotated memory

◆ Multi-agent management system

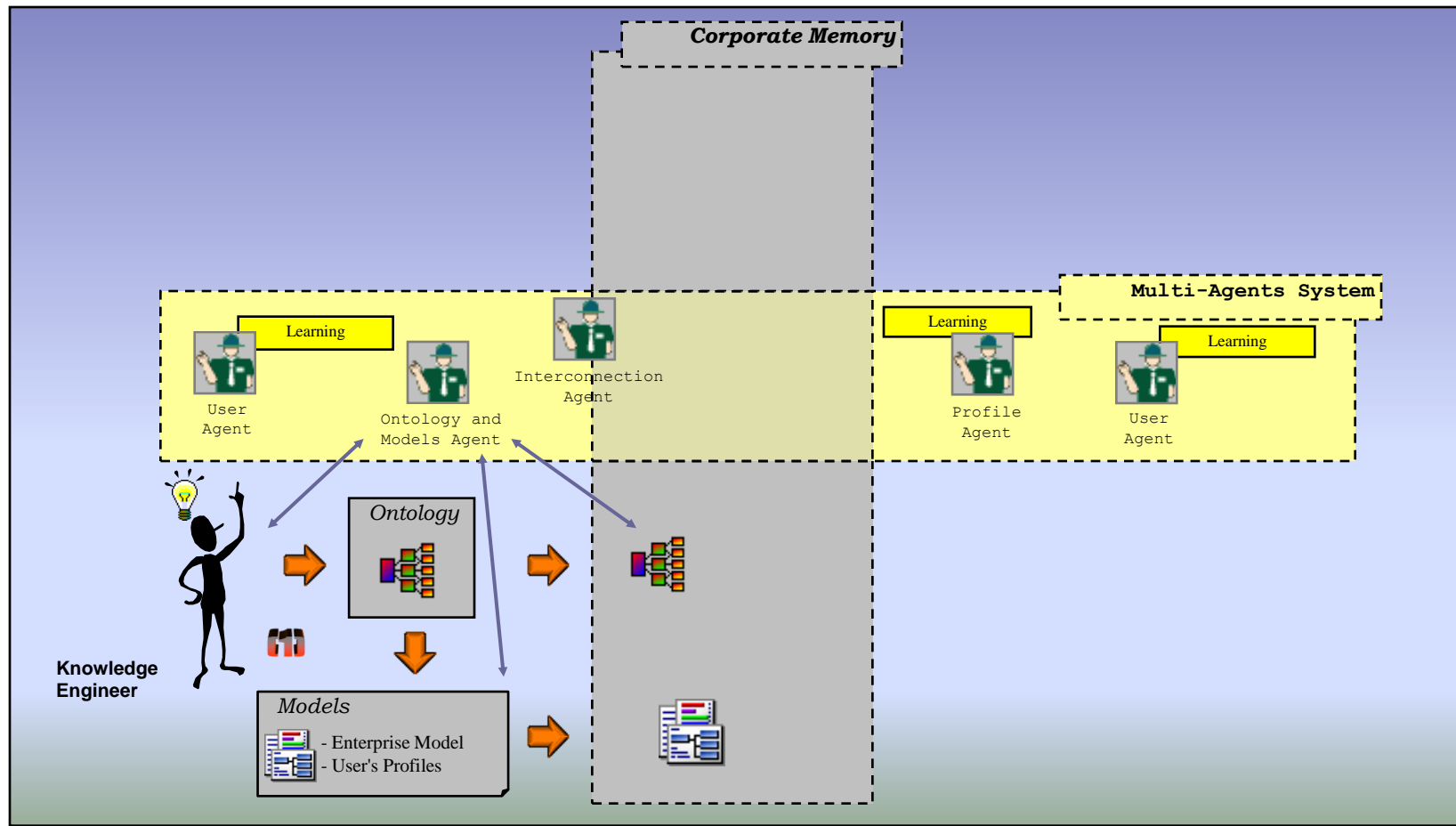
- Top-down organisational function analysis
- Roles and interactions
- Agent types implementation and configuration

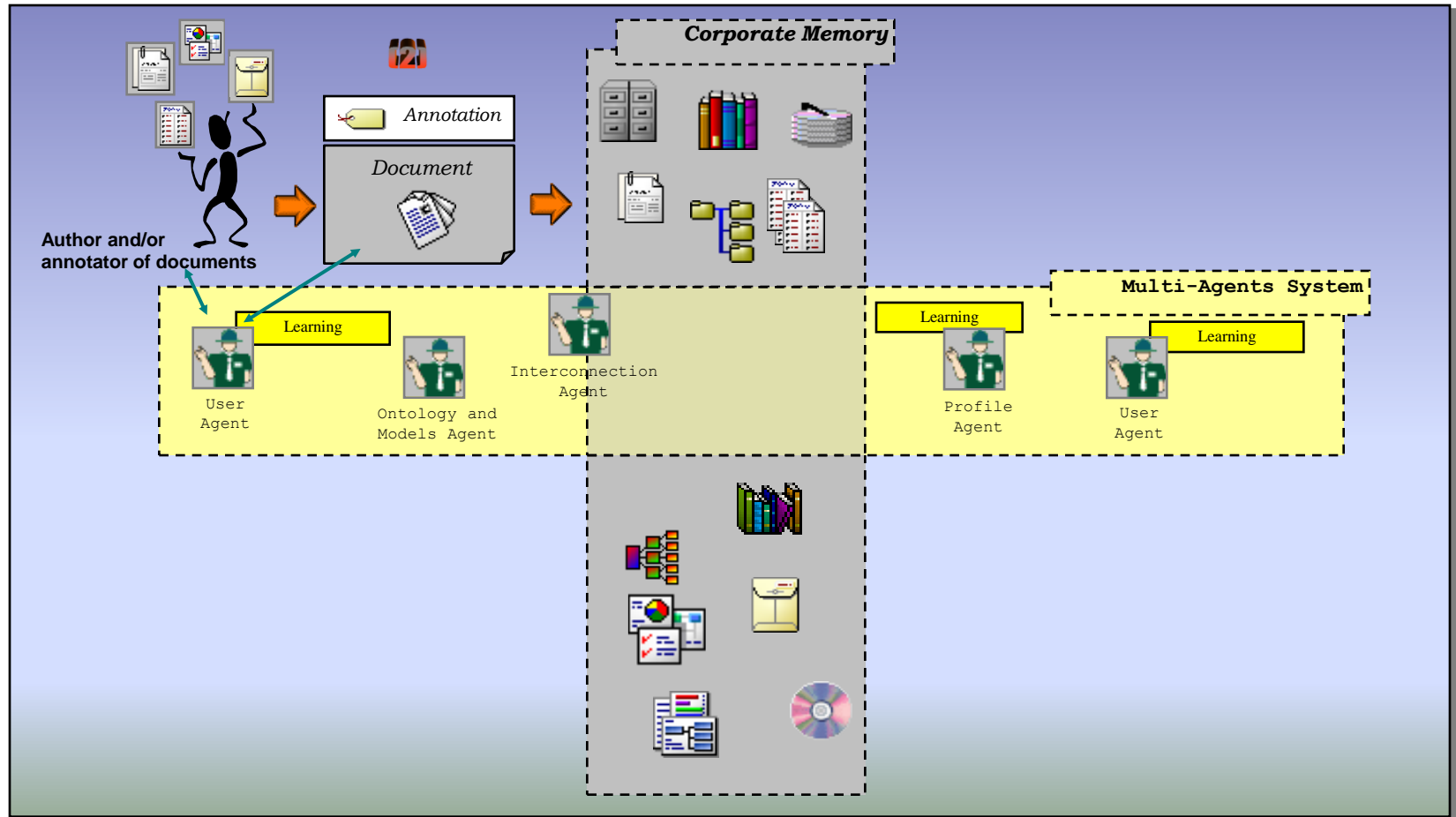
◆ Knowledge and information management:

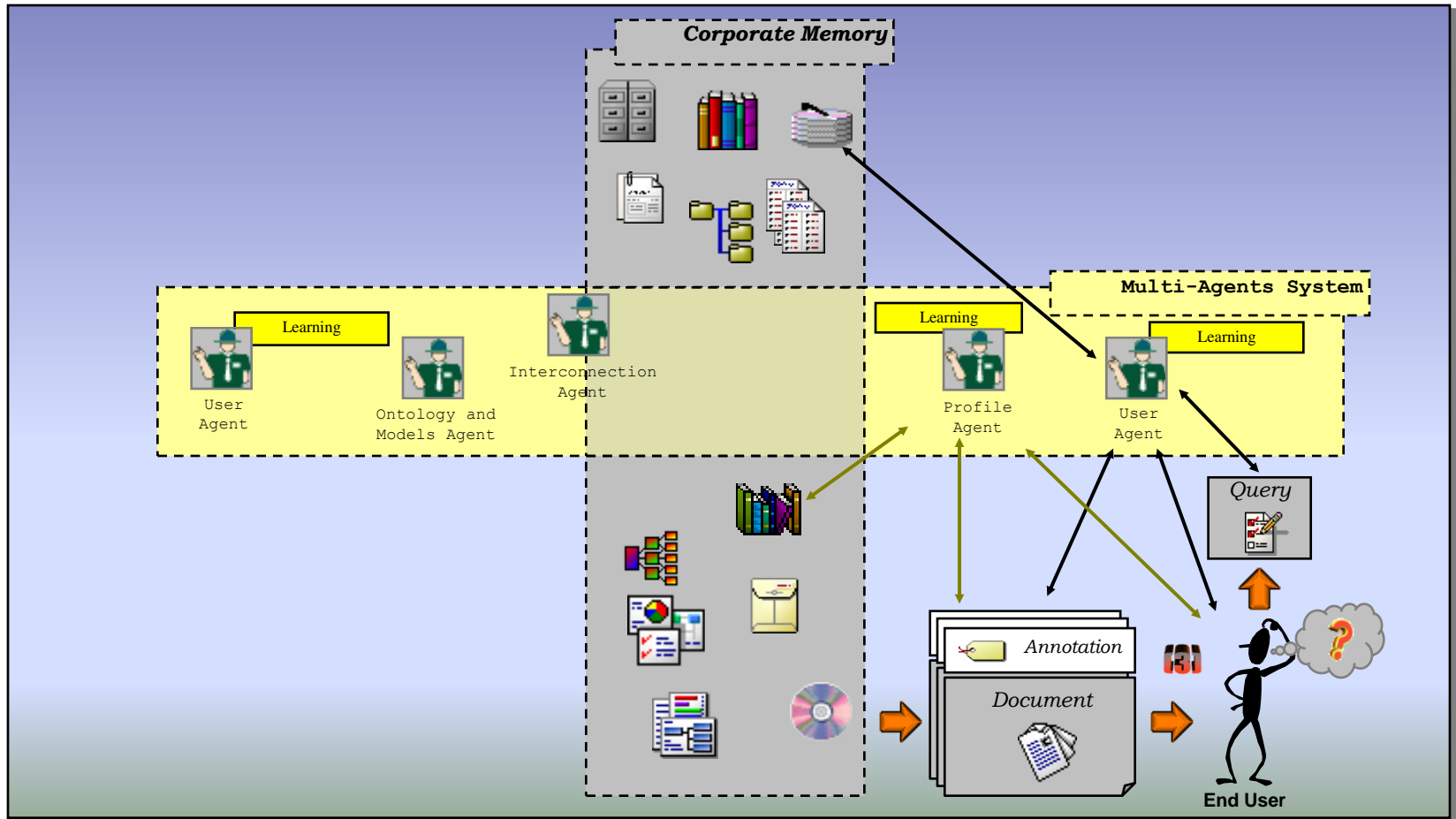
- **Needs:** improve reaction time & address turnover
 - Persistent memory: store and/or index knowledge
 - Nervous system: capture and diffuse knowledge
- **O.M.:** an explicit and persistent representation and/or indexing of knowledge in an organization, in order to facilitate its access and reuse by members of the organization, for their individual and collective tasks.
- **Current trend:** reuse internet and web technologies to build intranets and intrawebs
 - Same advantages: standardised technology, browser unique access means, distributed architecture, etc.
 - Same drawbacks: human-understandable but only machine readable; problem of retrieval, automation,...

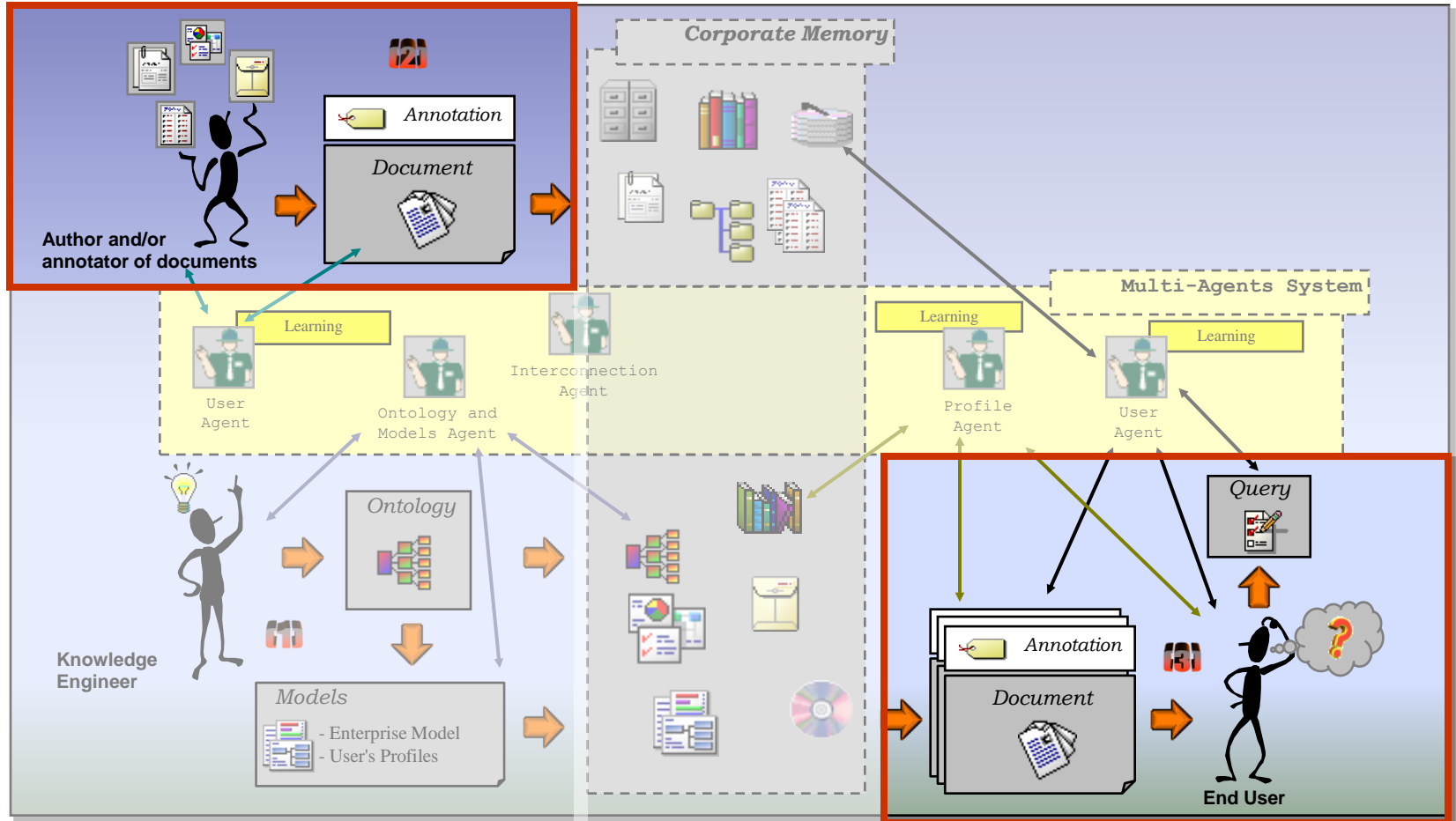
◆ Corporate Memory Management through Agents:

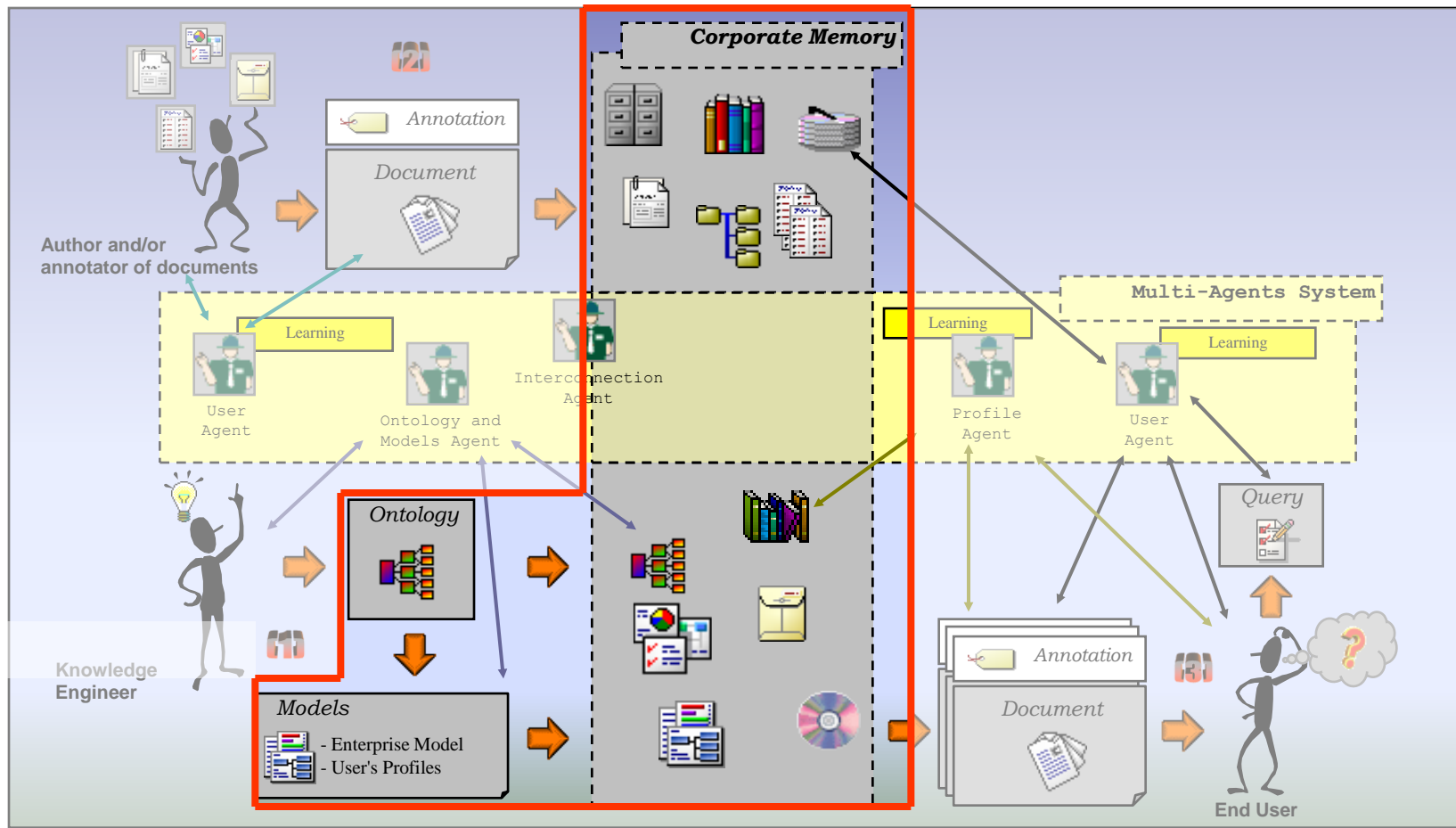
- Assist new employee integration
- Support technology monitoring activities



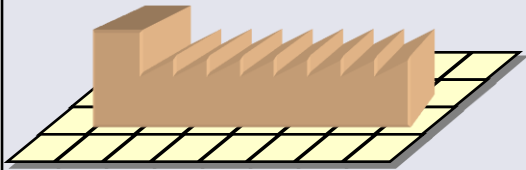
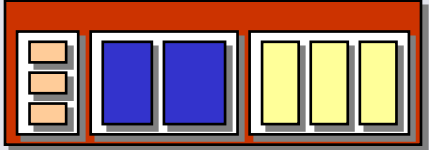
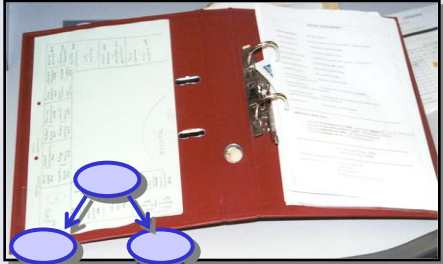









◆ **Ontology**: explicit partial account of concepts used in the corporate memory management scenarios and their relations

   	<p>Organizational Entity (X) : The entity X is or is a sub-part of an organization.</p> <p>Person (X) : The entity X is living being pertaining to the human race.</p> <p>Include (Organizational Entity: X, Organizational Entity / Person Y) : the organizational entity X includes Y as one of its members.</p> <p>Manage (Person: X, Organizational Entity: Y) : The person X watches and directs the organizational entity Y</p>	<p>Person(Rose) Person(Fabien) Person(Olivier) Person(Alain)</p> <p>Organizational Entity(INRIA)</p> <p>Organizational Entity(Acacia)</p> <p>Include(INRIA, Acacia)</p> <p>Manage(Rose, Acacia)</p> <p>Include(Acacia, Rose) Include(Acacia, Fabien) Include(Acacia, Olivier) Include(Acacia, Alain)</p>
--	---	--



a - Reality

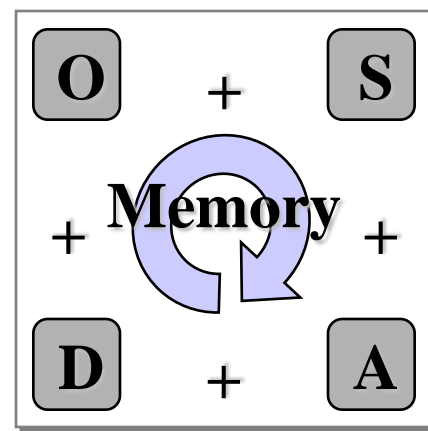


b - Ontology



c - Situation & Annotations

- ◆ **RDF: Resource Description Framework**
 - Describe Web resources through semantic annotations
- ◆ **RDFS: RDF Schema**
 - Describe ontology used for annotations
 - Minimalist and extensions *iff* necessary
- ◆ Memory components:
 - Ontology in RDFS (O'CoMMA)
 - Description the Situation in RDF:
 - User Profiles (annotate person)
 - Organization model (annotate groups)
 - Annotations in RDF describing Documents
- ◆ **Toward a corporate semantic web**
 - Annotated world for agents (quickly intelligent)
 - Annotated documents (manipulation at semantic level)
 - Annotated persons & organizational entities



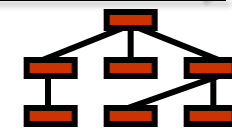
→ context awareness

Relation	Domain	Range	View	Super Relation	Other Terms	Natural Language Definition	Sy	Tr	Re	Pr
Manage	Organizational Entity;	Organizational Entity;	Organization	Relation	;	Relation denoting that an Organizational Entity (Domain) is in		Tr		EO
Attribute	Domain	Range Type	View	Super Relation	Other Terms	Natural Language Definition				Pr
Designation	Thing;	literal (string)	*	;	;	Identifying word or words by which a thing is called and classified or distinguished from				Us
Class	View	Super class	Other Terms	Natural Language Definition		Pr				
Thing	Top-Level;	;	;	Whatever exists animate, inanimate or abstraction.		Us				
Event	Top-Level; Event;	Thing;	;	Thing taking place, happening, occurring; usually recognized as important, significant or unusual		Us				
Gathering	Event;	Event;	;	Event corresponding to the social act of a group of Persons assembling in one place		Us				

Conceptual Vocabulary

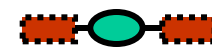
Concepts - subsumption

ex: *document* ← *report*



Relations - signature & sub.

ex: *person* ← (*author*) — *document*



Terms & natural language definitions

ex: 'bike', 'cycle', bicycle' - (*bicycle*)



(2) From semi-informal to semi-formal

(3) RDF(S)

Internal

Observations

Interviews

Documents

&

Scenarios

Reuse

External Expertise

(Meta-) Dictionaries

External

Looking for something Fabien ?

computer science :

artificial intelligence, AI, AI / computer graphics / HCI, H.C.I. human-computer interaction / network / programming / simulation / software engineering

service :

administration, administrator / advertising, advertisement / commerce / consulting / development / education / finance / human resources / insurance / legal / marketing / research / restoration, food / transport / travel

document :

abstract / advertisement, publicity, promotion / article / book / chart / firm / illustration / index / journal / logo / magazine / map / music / newspaper / person, person, person, person / newspaper, magazine, forum, conference / presentation / official document / presentation / proceedings / profile / reference document / report / research / translation, spread sheet / thesis / transparency, slide / transparency show / web page, web site / web site

person, human, human being :

integration, services actor / professional / student / technology, monitoring actor

Searching for a concept :

person in English

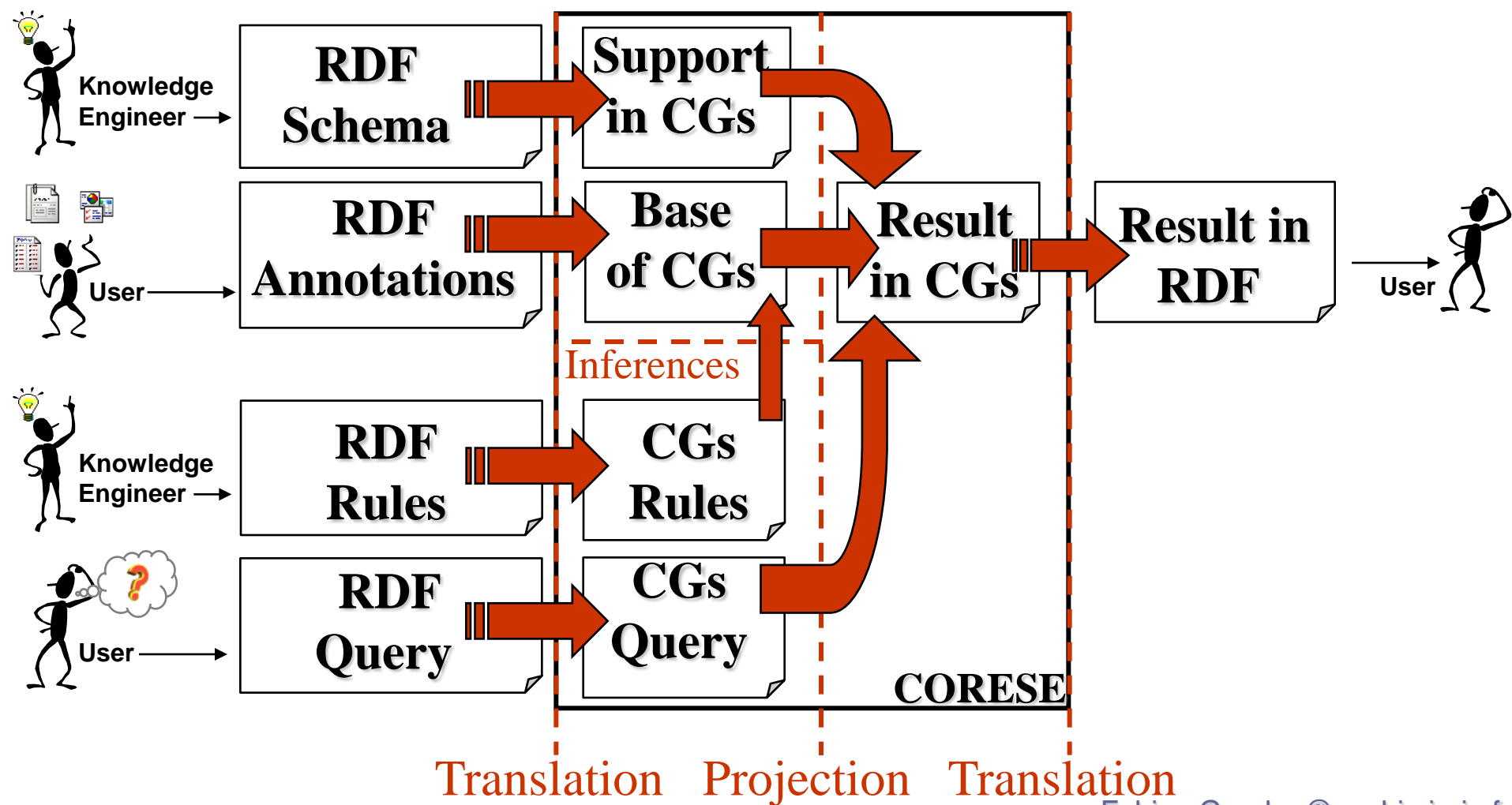
(1) Scenarios and Data collection

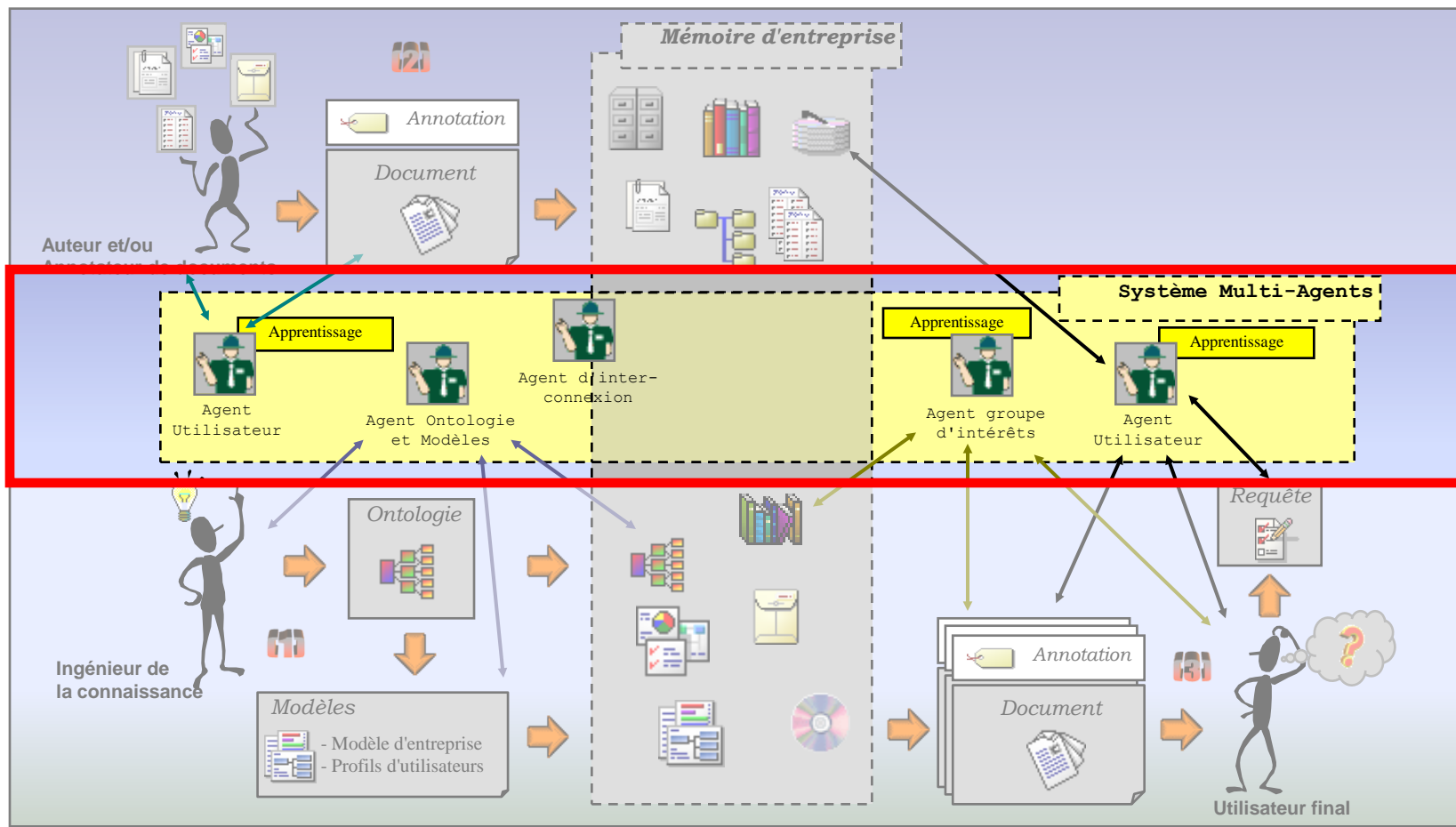
(4) Navigation and Use

Use & Users

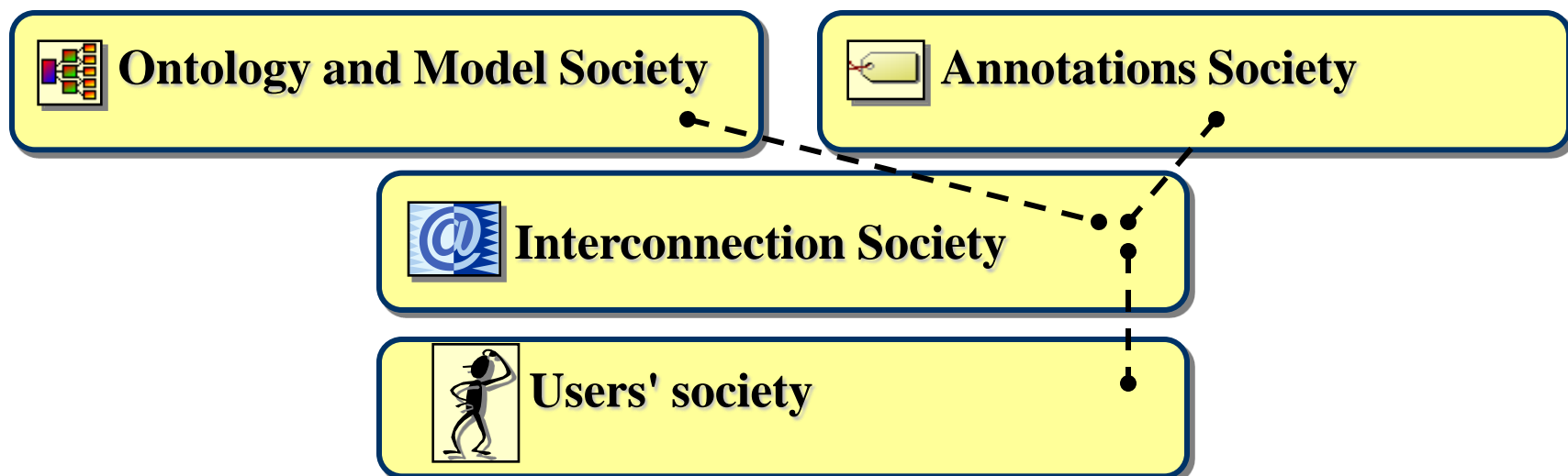
◆ CORESE: COncceptual RESources Search Engine

- RDF(S) for schema, annotations, rules⁽⁺⁾, queries⁽⁺⁾
- Light weight component & API

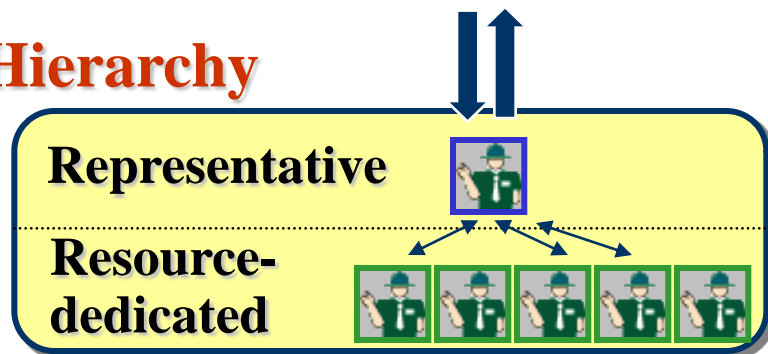




- ◆ **Agent paradigm adequacy:**
 - Agent collaboration → Global capitalization
 - Agent autonomy & individuality → Local adaptation
- ◆ **CoMMA** is an heterogeneous multi-agents information system
- ◆ From **Macroscopic** to **Microscopic**
 - Functional analysis for high level functions: societies
 - Four aspects in our scenarios: ontology and model availability, annotation management, user management and yellow pages services.



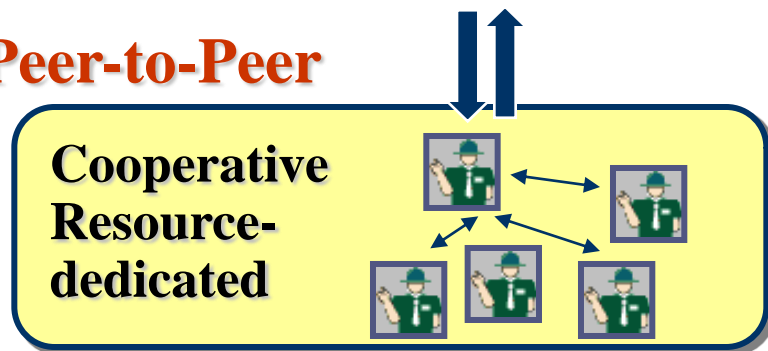
Hierarchy



Distribute roles

- ☺ Distribute WL
- ☹ Increase NL

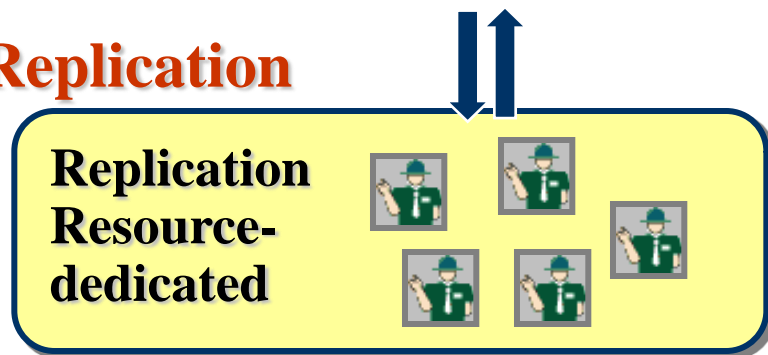
Peer-to-Peer



Distribute only content

- ☹ WL & NL
- ☺ Redundancy

Replication




Complete replication


- ☺ Redundant & less NL
- ☹ Content replicated

 **Ontology and Model Society**


Ontologist Agents




 **Annotations Society**


Archivists 


.....




Mediators 

 **Interconnection Society**

Federated Matchmakers

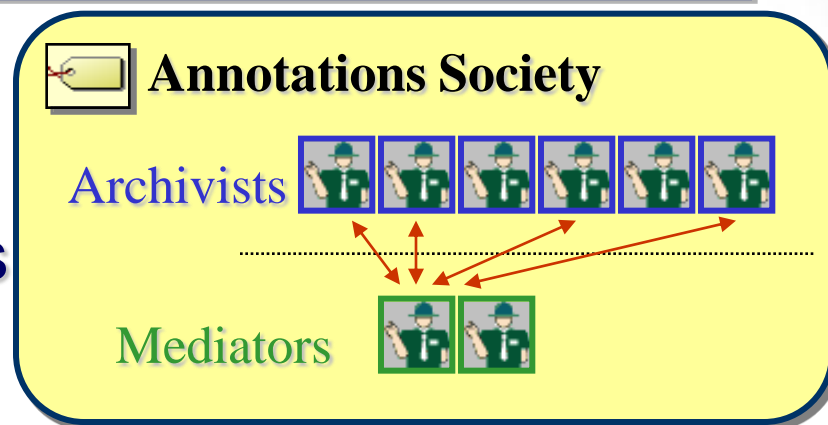


 **Users' society**

Interface Controllers  Profile Managers  Profiles Archivists 

◆ The annotation-dedicated sub-society:

- Distributed local sources
- Archive annotations on documents of the O.M.
- Search & retrieve references matching queries

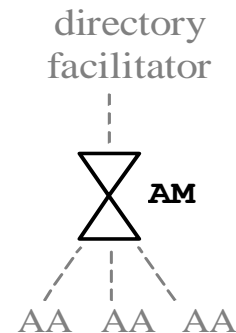


◆ **Hierarchy:** to federate two aspects of the society

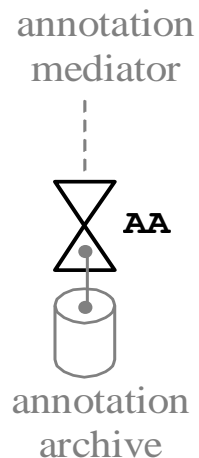
- Mediator role (manage social behavior):
 - supervising distributed query solving process
 - managing allocation of new annotations
 - monitoring new annotations to trigger push functions
- Archivist role (manage local behavior):
 - attached to & exploits local base
 - answers to query & proposes archiving services

◆ Role cards of E. Kendall for object oriented software engineering

role model	Annotation Mediator role in the Annotation-dedicated society
responsibilities	handle distribution of annotations over the archivists both for new annotation submissions and query solving processes
collaborators	Directory facilitator, User Profile Manager, Ontology Archivist, Annotation Archivist, Corporate Model Archivist
external interfaces	RDF annotation manipulation interface
relationships	-
expertise	query and submission management
interactions	Query-Ref, Contract-Net, Subscribe, Request; FIPA ACL
others	-



role model	Annotation Archivist role in the Annotation-dedicated society
responsibilities	store and query the annotations of the memory
collaborators	Directory facilitator, Annotation Mediator, Ontology Archivist
external interfaces	RDF annotation manipulation interface
relationships	also part of the roles in Corporate Model Archivist and User Profile Archivist
expertise	annotation archiving and querying
interactions	Query-Ref, Contract-Net; FIPA ACL
others	-

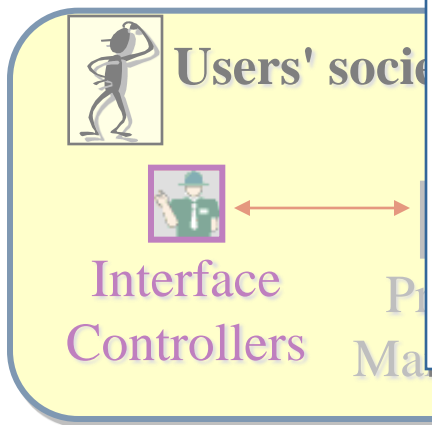
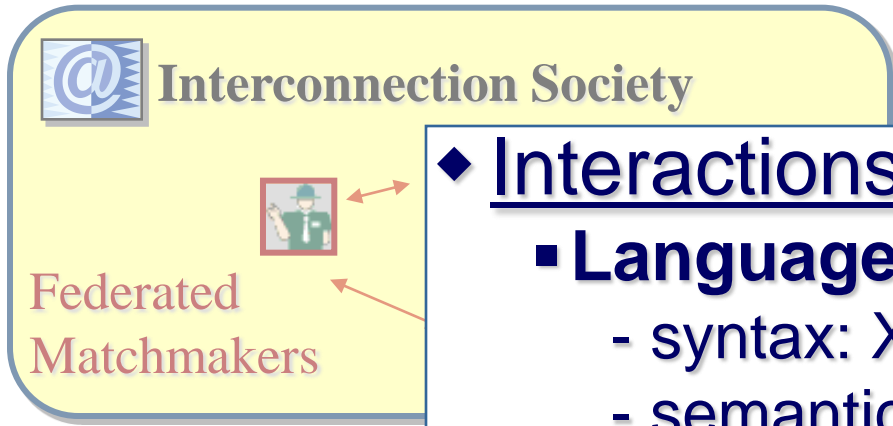
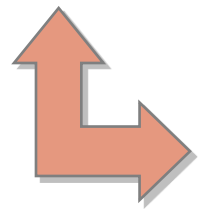
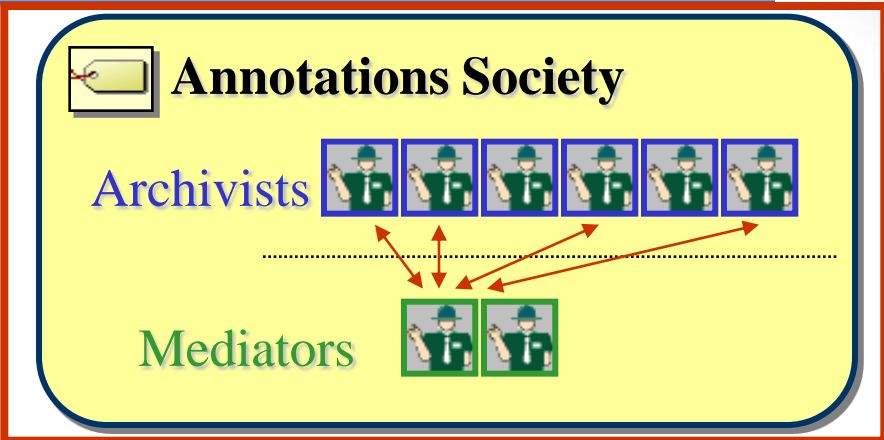
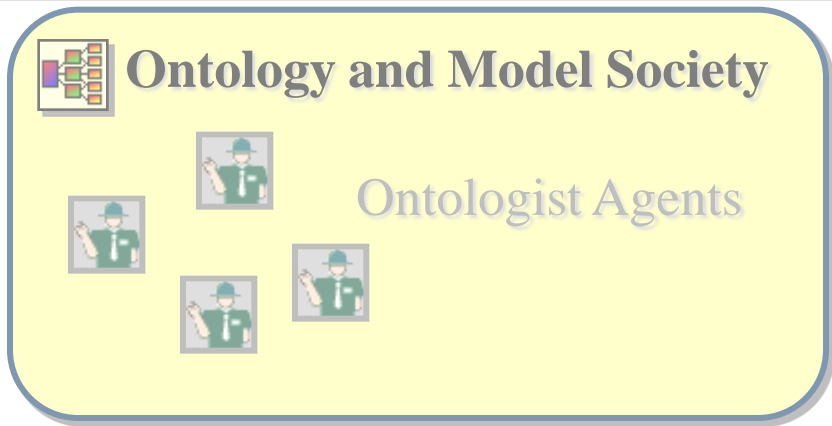


◆ Roles characteristics :

	Ontology Archivist	Enterprise Model Archivist	Annotation Archivist	Annotation Mediator	Directory Facilitator	Interface Controller	User Profile Manager	User Profile Archivist
Reactive	N	N	N	N	N	N	N	N
Complex Mental State	N	N	N	N	N	N	N	N
Graceful Degradation	Y	Y	Y	Y	Y	Y	Y	Y
Temporally continuity	Y	Y	Y	Y	Y	N	Y	Y
Autonomy								
Goal-oriented	N	N	N	Y	N	N	Y	N
Collaborative	Y	Y	Y	Y	Y	Y	Y	Y
Flexible	N	N	N	Y	N	N	Y	N
Proactive	N	N	N	N	N	N	Y	N
Personality	N	N	N	N	N	N	N	N
Communication	Y	Y	Y	Y	Y	Y	Y	Y
Adaptability								
Learning	N	N	N	N	N	N	Y	N
Customizable	N	N	N	N	N	Y	Y	N
Mobility	N	N	N	N	N	N	N	N
Visual representation	N	N	N	N	N	Y	N	N
Veracity	Y	Y	Y	Y	Y	Y	Y	Y
Benevolence	Y	Y	Y	Y	Y	Y	Y	Y
Rationality	Y	Y	Y	Y	Y	Y	Y	Y

◆ To summarize: Architecture

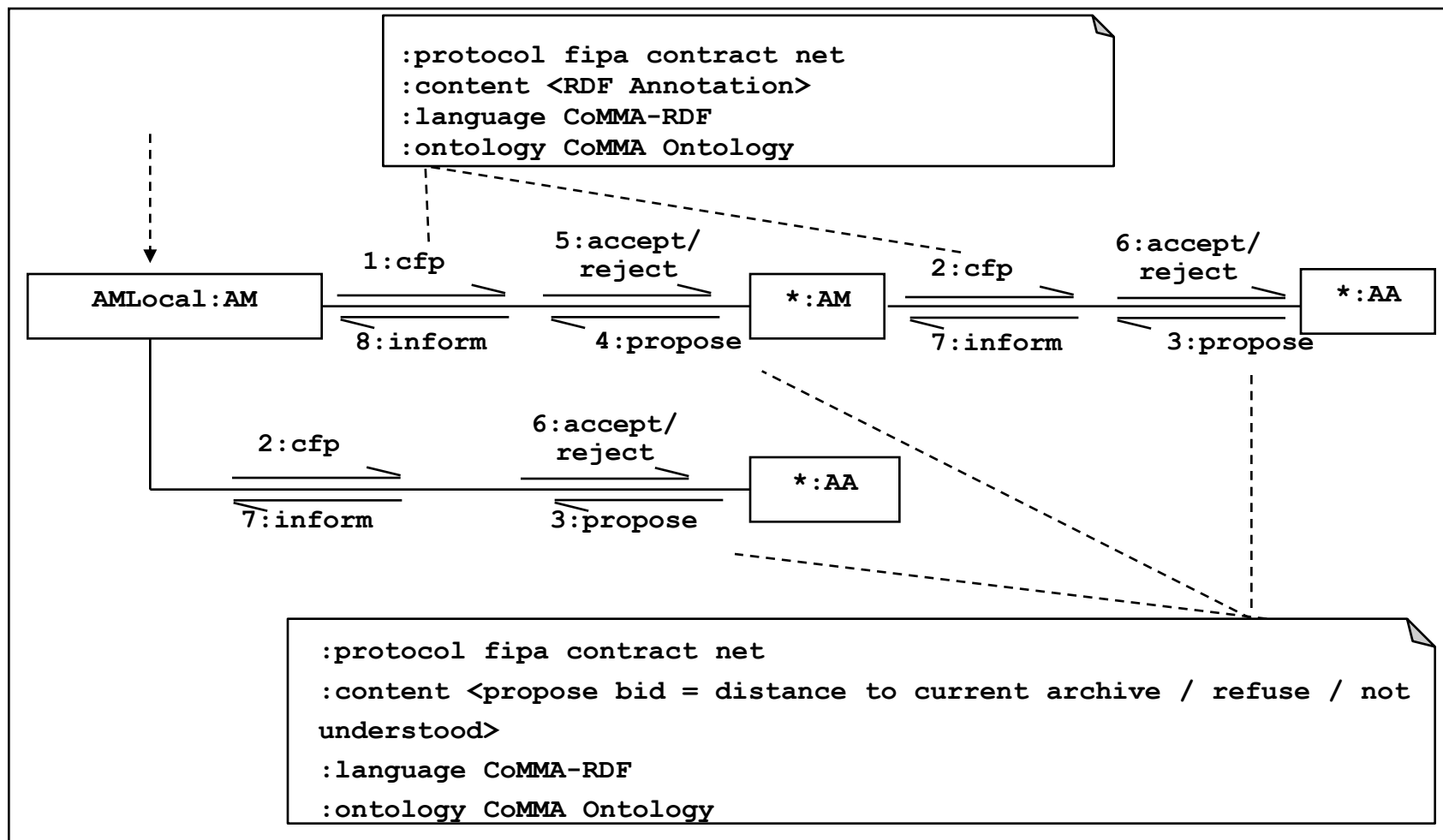
- Societal level functionalities → Functional sub-societies
- Functional sub-societies → Functional roles
- *Next step : role interactions supporting the chosen organizational structures*



- ◆ Interactions specification:**
- **Language**
 - syntax: XML + RDF + SL
 - semantic: ontologies
 - **Protocol**
 - Acquaintance graphs
 - Messages sequences
 - based on scenarios and derived use-cases

◆ C-Net : Annotation allocation

- Mediator & Archivists discuss best place to archive
- Contract-net (CfP, Proposal, Accept/Reject):



- Proposals are based on pseudo semantic distance over ontology space

◆ Types & Behaviors of Agents

Ontology Archivist

Enterprise Model Archivist

Annotation Archivist

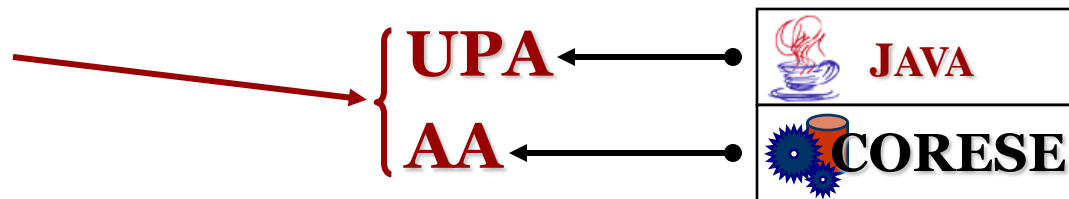
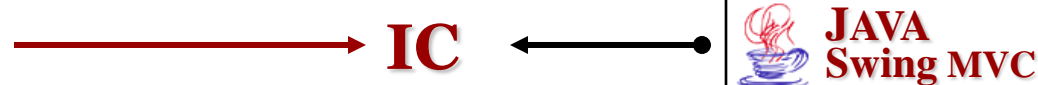
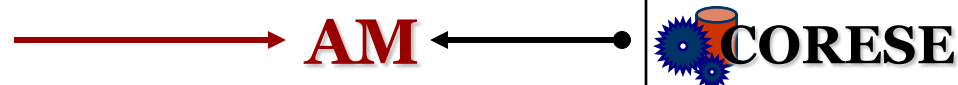
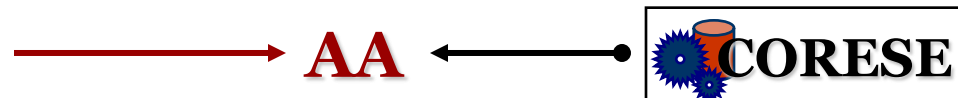
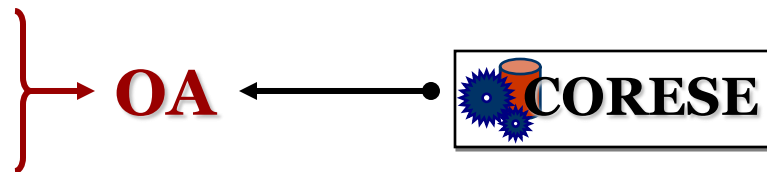
Annotation Mediator

Federable DF

Interface Controller

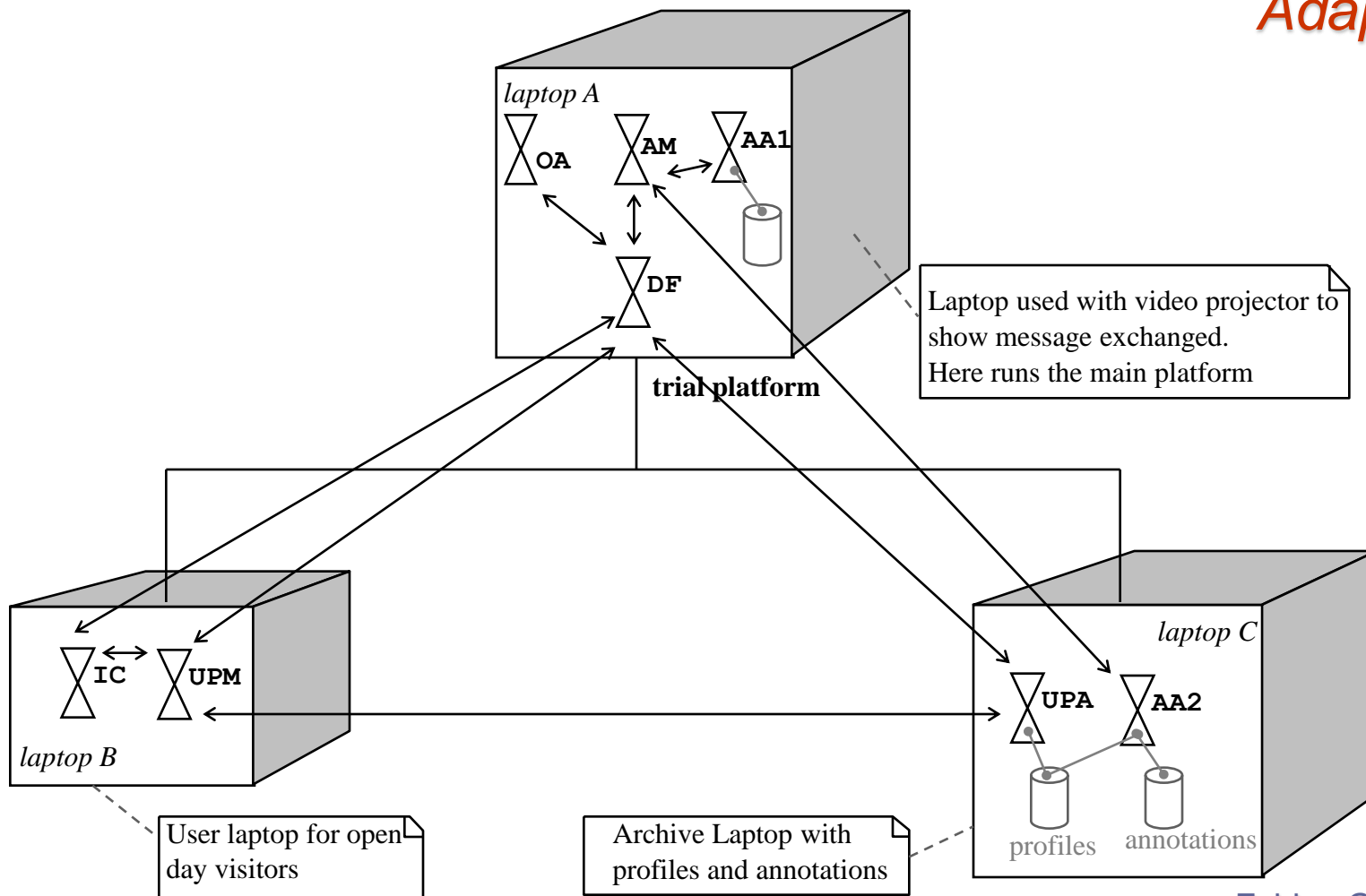
User Profile Manager

User Profile Archivist



**Organization + Roles + Protocols + Behaviors +
Competencies = Multi-Agent Architecture**

- ◆ **Architecture:** Agent kinds and their relationships
Fixed at design time
- ◆ **Configuration:** Exact topography of a given MAS
Fixed at deployment time
- ◆ **One architecture** → **Several configurations**
Adapt to context



◆ Results of CoMMA:



- ☹ Ergonomics problems
- ☹ Not a complete solution
- ☹ Monolithic solution evaluation problem
- ☹ No large-scale evaluation (groups of 4/6 users)
- 😊 Usability and usefulness recognized
- 😊 Not a formal approach but running proof of concept
- 😊 Developers appreciation of ontology-agent approach
- 😊 Industrial interest in the development of the prototype

◆ Results ∈ Ph.D. to be defended end of October

◆ On going improvements in the team:

- pseudo distance & decomposition algorithms
- Web mining wrappers: semi-automatic annotation
- Ontology mapping: connect 2 corporate semantic webs
- Ontology reuse and integration and NLP tools

Searching for a concept :

Look for terms : in English

The screenshot shows a web browser window titled "CoMMA Home Page". The main content area features the text "CoMMA HOME" in a large, serif font. On the left side, there is a vertical navigation menu with several buttons: "Home", "Ontology", "Look for information" (with a sub-menu containing "New query" and "Previous query..."), "Add information" (with a sub-menu containing "New indexation" and "Previous indexation..."), "Comments", "Any problem ?" (with sub-buttons "Contact us" and "About CoMMA"), and "Quit". At the bottom of the page, there are two sections: "Profile" with an "Edit user profile" button, and "Registration" with buttons for "Register to a COI", "Register as new comer", and "Register to a news gro...". The CoMMA logo is located in the top left corner of the page content.

The screenshot shows the 'Sniffer Agent' window with the following components:

- Title Bar:** sniffer0@fapollo:1099/JADE - Sniffer Agent
- Menu Bar:** Actions, About
- Toolbar:** Contains icons for file operations (trash, folder, copy, paste, save, print, refresh, stop, play, home) and a 'JADE' logo.
- Left Panel (AgentList):**
 - AgentPlatforms
 - "fapollo:1099/JADE"
 - Main-Container
 - localUPA@fapoll
 - ams@fapollo:10
 - df@fapollo:1099
 - localIC@fapollo:
 - localUPM@fapol
 - RMA@fapollo:10
 - localOA@fapollc
 - profileAA@fapol
 - localAA1@fapoll
 - sniffer0@fapollo
 - localAA2@fapoll
 - AM@fapollo:109
 - sniffer0-on-Main

- Main Area (Contract-Net):**
- A diagram showing nodes: 'Other' (grey), 'localIC' (red), 'localIUPM' (red), 'AM' (red), 'localAA1' (red), 'localAA2' (red), and 'profileAA' (red).
- Vertical lines connect 'Other' to 'localIC', 'localIC' to 'localIUPM', 'localIUPM' to 'AM', 'AM' to 'localAA1', 'localAA1' to 'localAA2', and 'localAA2' to 'profileAA'.
- A '0' is visible next to the 'Other' node.
- Status Bar:** No Message

The screenshot shows a web browser window titled "CoMMA Home Page". The main content area is a large, empty white rectangle. The page is organized into several sections:

- Header:** The CoMMA logo is on the left, and the text "CoMMA HOME" is centered in a large, serif font.
- Left Sidebar:** A vertical column of buttons and sections:
 - Home:** A button.
 - Ontology:** A button.
 - Look for information:** A section header.
 - New query:** A button with a magnifying glass icon.
 - Previous query...:** A button.
 - Add information:** A section header.
 - New indexation:** A button with a document icon and a plus sign.
 - Previous indexation...:** A button.
 - Comments:** A button.
 - Any problem ?:** A section header.
 - Contact us:** A button.
 - About CoMMA:** A button.
 - Quit:** A button.
- Main Content Area:** A large, empty white rectangle.
- Footer:** Two columns of buttons:
 - Profile:** A section header.
 - Edit user profile:** A button.
 - Registration:** A section header.
 - Register to a COI:** A button.
 - Register as new comer:** A button.
 - Register to a news gro...:** A button.

sniffer0@fapollo:1099/JADE - Sniffer Agent

Actions About

AgentPlatforms

- "fapollo:1099/JADE"
 - Main-Container
 - localUPA@fapoll
 - ams@fapollo:10
 - df@fapollo:1099
 - localIC@fapollo:
 - localUPM@fapol
 - RMA@fapollo:10
 - localOA@fapollc
 - profileAA@fapol
 - localAA1@fapoll
 - sniffer0@fapollo
 - localAA2@fapoll
 - AM@fapollo:109
 - sniffer0-on-Main

JADE

Other	localIC	loca IUPM	AM	localAA1	localAA2	profileAA
0						

No Message

The screenshot shows a web browser window with three ontology instances listed vertically. Each instance is represented by a colored box (light blue, light green, and light blue) containing structured data. The data is organized into sections: a header line with a copyright symbol, a 'target:' section, an 'organizational entity' section, an 'is interested by:' section, and a 'knowledge management' section. The 'title:' field is also present in each instance.

© **transparency show** <http://www-sop.inria.fr/acacia/personnel/Fabien.Gandon/cstb.ppt> (?)

target:

© **organizational entity**

is interested by:

© **knowledge management** (U)

title: Presentation of CoMMA to the CSTB

© **transparency show**
<http://www-sop.inria.fr/acacia/personnel/Fabien.Gandon/research/ekaw2000/ekaw.ppt> (?)

target:

© **organizational entity**

is interested by:

© **knowledge management** (U)

title: Presentation of CoMMA Methodology at EKAW2000

© **presentation** <http://fapoll0:8080/comma/doc/CoMMATerms.avi> (?)

target:

© **organizational entity**

is interested by:

Thank you !