



# *Corporate Memory Management through Agents*

# Introduction to the CoMMA Project



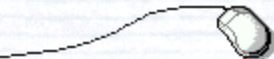
- ▶ **CoMMA IST European project - February**
- ▶ **Objective** : Provide a corporate memory management framework
  - ▶ **Corporate Memory**: An explicit, disembodied and persistent representation of knowledge and information in an organization, in order to facilitate their access and reuse by members of the organization, for their tasks.
  - ▶ **Management Framework**: A supporting structure around which one can build a system insuring coherent integration and exploitation of the dispersed knowledge
- ▶ **Specificity**:
  - ▶ New Employee & Technology Monitoring
  - ▶ Integration of several emerging technologies



# Plan of the presentation :

- ▶ Corporate Memory Materialization
  - ▼ XML and MAS : Metadata approach
  - ▼ RDF and MAS : Annotation approach
  - ▼ Conceptual Graphs to handle RDF annotations
- ▶ MAS: Organizational approach
  - ▼ Overall Architecture
  - ▼ Organizing sub-societies
  - ▼ Dedicated sub-societies
- ▶ Summarize the claims
- ▶ CoMMA: Overview of the System

# Corporate Memory Materialization



## ▶ Corporate Memory

- ▼ Delimited scope & Community identity
- ▼ Ontology & Ontological commitment
- ▼ Describe user model & enterprise model
- ▼ Annotate the corporate memory

Corporate  
memory

XML

RDF

CGs

CORESE

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Architecture

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User society

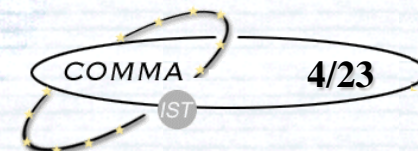
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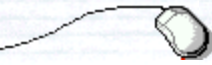
## ▶ CM Materialization quality: Keystone of MAIS

- ▼ Ontology quality → Model quality
- ▼ Ontology & Model quality → Commitment quality
- ▼ Commitment quality → Annotation quality
- ▼ Annotation quality → Inference quality
- ▼ Inference quality → Usability of the MAIS

## ▶ Here technical choices but DC techniques



# XML and MAS : Metadata approach



- ▶ XML: Extensible Markup Language
  - ▶ Nested structure data and documents
  - ▶ Extensible (<Tag> </Tag> ... new tags)
  - ▶ Create & access via internet-based networks
  - ▶ Text format & Human understandable
  - ▶ Machine understandable: distribute workload
  - ▶ DTD & XML Schema: formally define document
  - ▶ Style sheets: document manipulation beyond styling
- ▶ Other forthcoming interesting features
  - ▶ Addressing and linking
  - ▶ Querying languages
- ▶ Standard in industry → Good candidate

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# RDF and MAS : Annotation approach

**Idea:** If the corporate memory becomes an annotated world, agents can use the semantics of these annotations and through inferences help the users exploit the corporate memory.

## ▶ RDF : Resource Description Framework

- ▼ Describe Web resources properties
- ▼ Annotation internal/external to documents
- ▼ RDFS: RDF Schema (to formalize ontology)
- ▼ XML syntax & Close to object models

## ▶ Process :

- ▼ Ontology of CM concepts & relationships
- ▼ Annotation of CM resources
- ▼ Annotation-based CM exploitation

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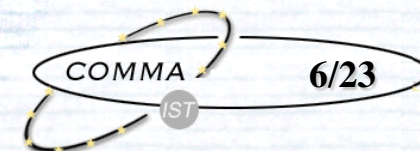
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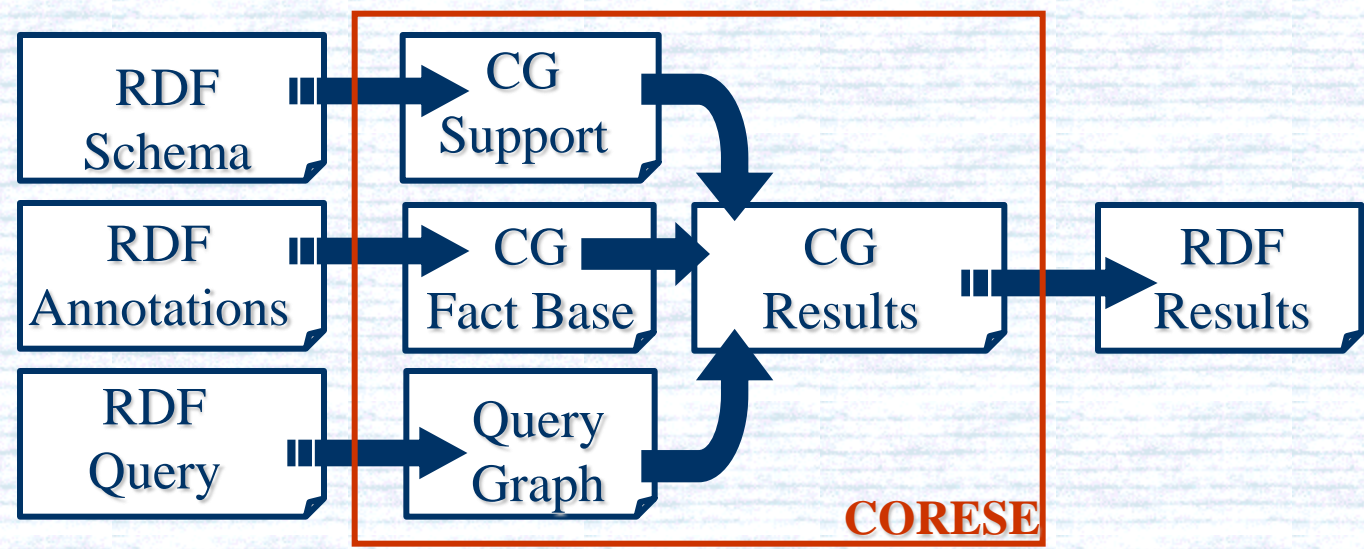


# Conceptual Graphs to handle RDF annotations



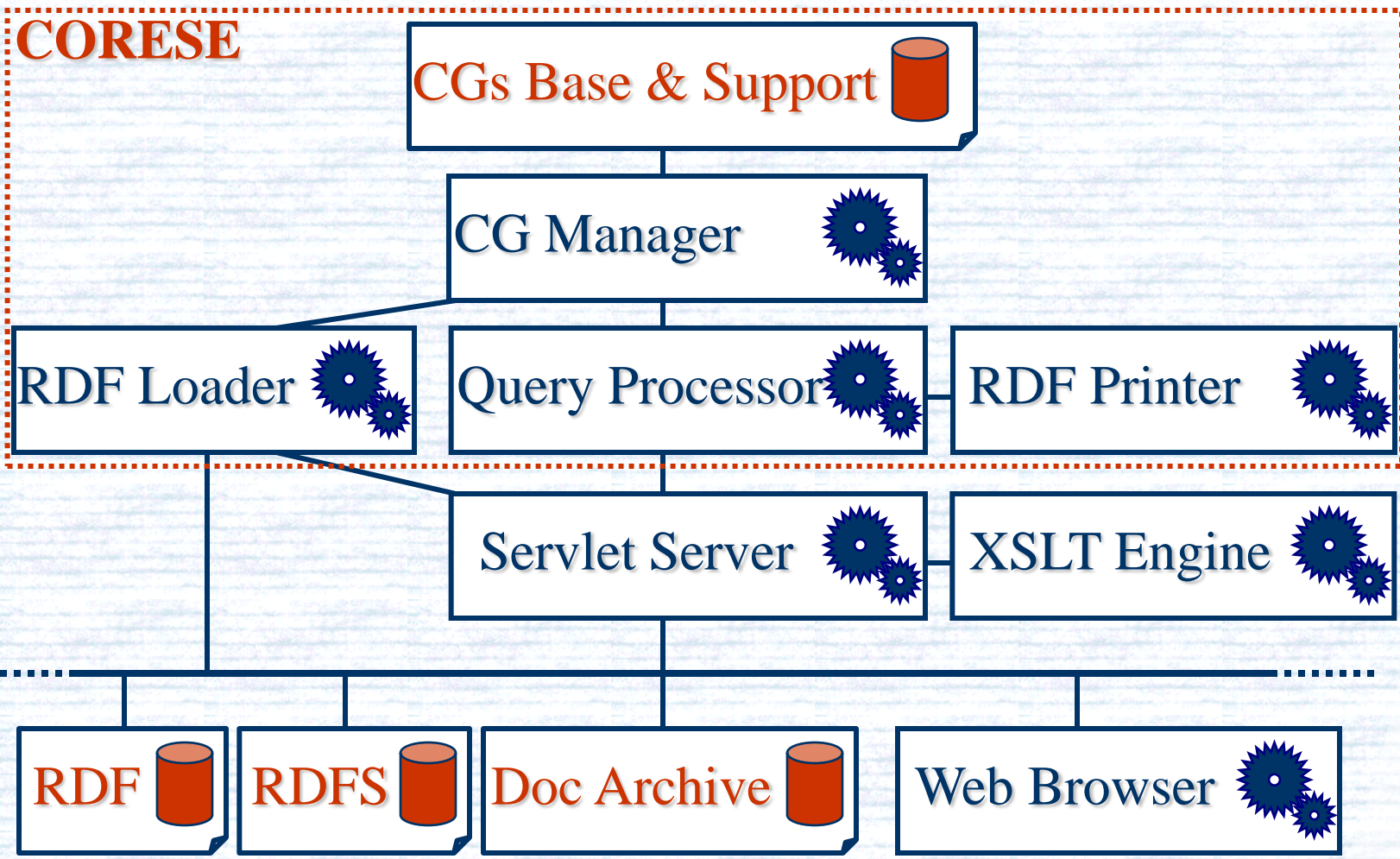
- ▶ Why RDF ↔ Conceptual graphs?
  - ▾ Combine assets
    - ▾ RDF Standard for resource description
    - ▾ Conceptual graphs formal model
  - ▾ Available query & inference mechanisms for CGs
  - ▾ Adequacy between the two models

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# CORESE : Conceptual Resource Search Engine

▶ Prototype of search engine (Notio + VRP)



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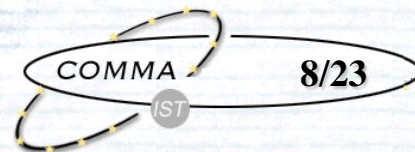
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▶ CORESE modules to be integrated in agents





# MAS: Organizational approach

## ▶ Multi-Agent Information Systems

- ▶ Population of agents
  - ▶ Provider agents\*
  - ▶ Requester agents\*
  - ▶ Middle agents\*
- ▶ Distant across the network & allocated to different resources
- ▶ Exchange & exploit information thanks to a shared ontology

(\*roles)

## ▶ Agent assets

- ▶ Flexible distribution through loosely-coupled software components
- ▶ Semantic-level message passing, natural in a KM environment

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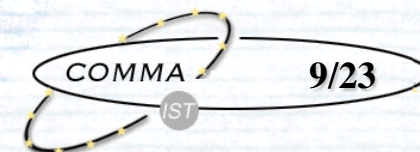
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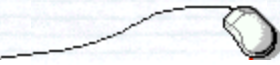
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# Overall Architecture



## ▶ Architecture / Configuration:

▼ Architecture: Agent kinds and their relationships  
*Fixed at design time*

▼ Configuration: Exact topography of a given MAS  
*Fixed at deployment time*

▼ One functional architecture → Several possible configurations : adapt to corporate environment

## ▶ Deployment choices driven by the corporate information landscape topography:

▼ Organization layout (org. charts, locations...)

▼ Intranet network (topography, security...)

▼ Interest area (providers, requesters...)

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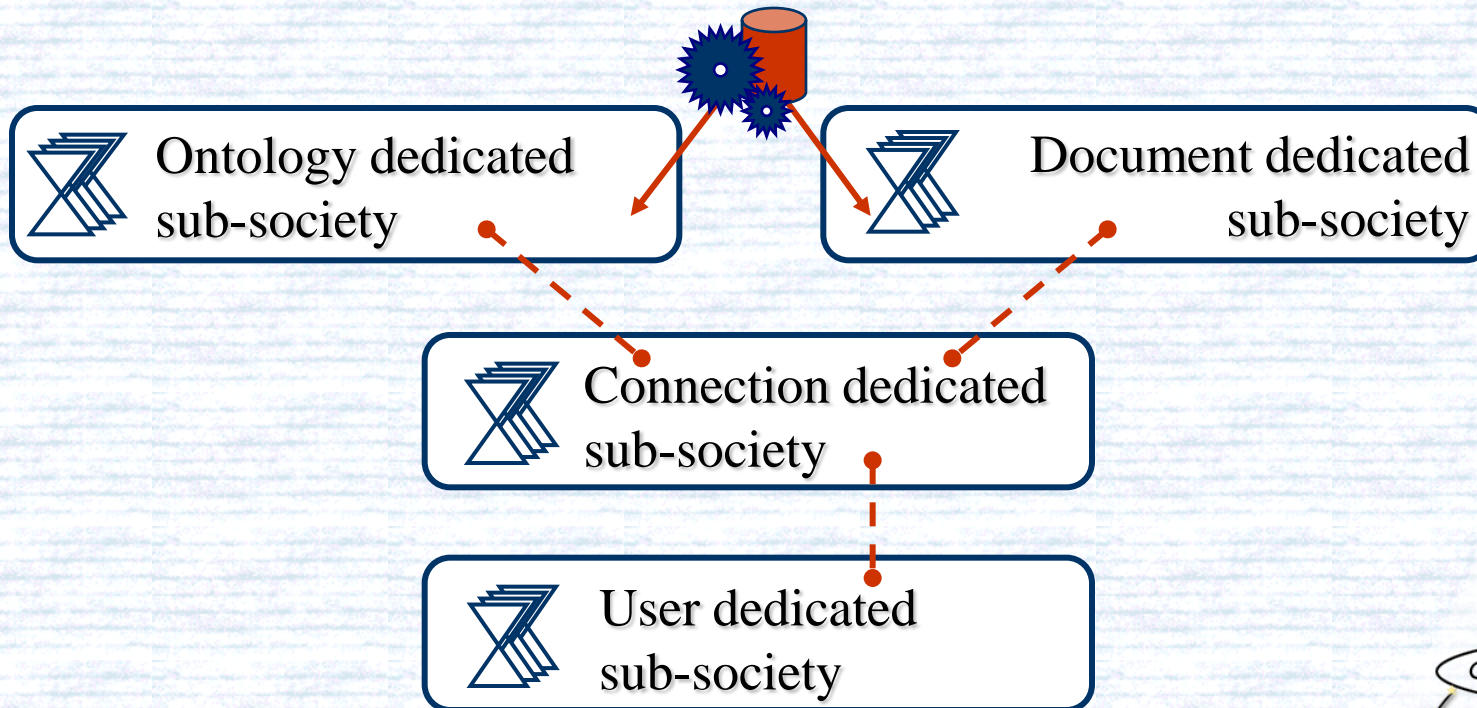
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# Overall Architecture

## ► Macroscopic-Level

- ▼ Problem: Engineering interaction & organization of the MAS to match the requirements
- ▼ Started from the tasks to be performed
- ▼ Role analysis first level: 4 dedicated sub-societies



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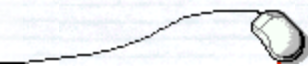
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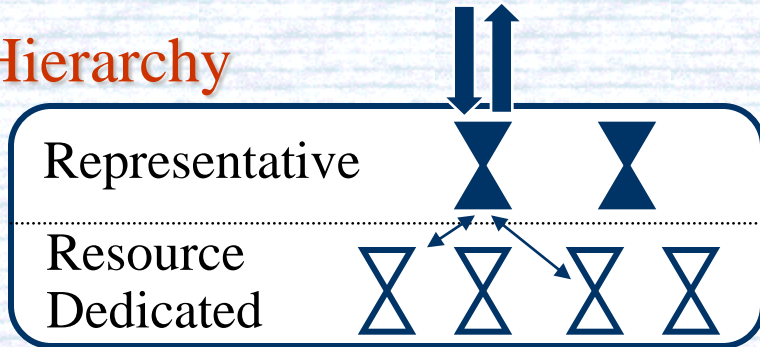
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# Organizing sub-societies

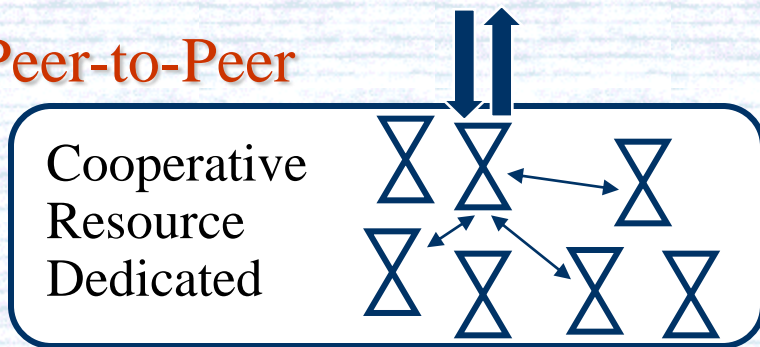


## Hierarchy



- Distribute roles
- ☺ Distribute WL
- ☹ Increase NL

## Peer-to-Peer



- Distribute only content
- ☺ WL& NL
- ☹ Redundancy

## Replication



- Complete replication
- ☺ Redundant & less NL
- ☹ Content replicated

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**Sub-societies organization**

Ontology society

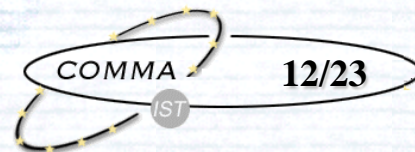
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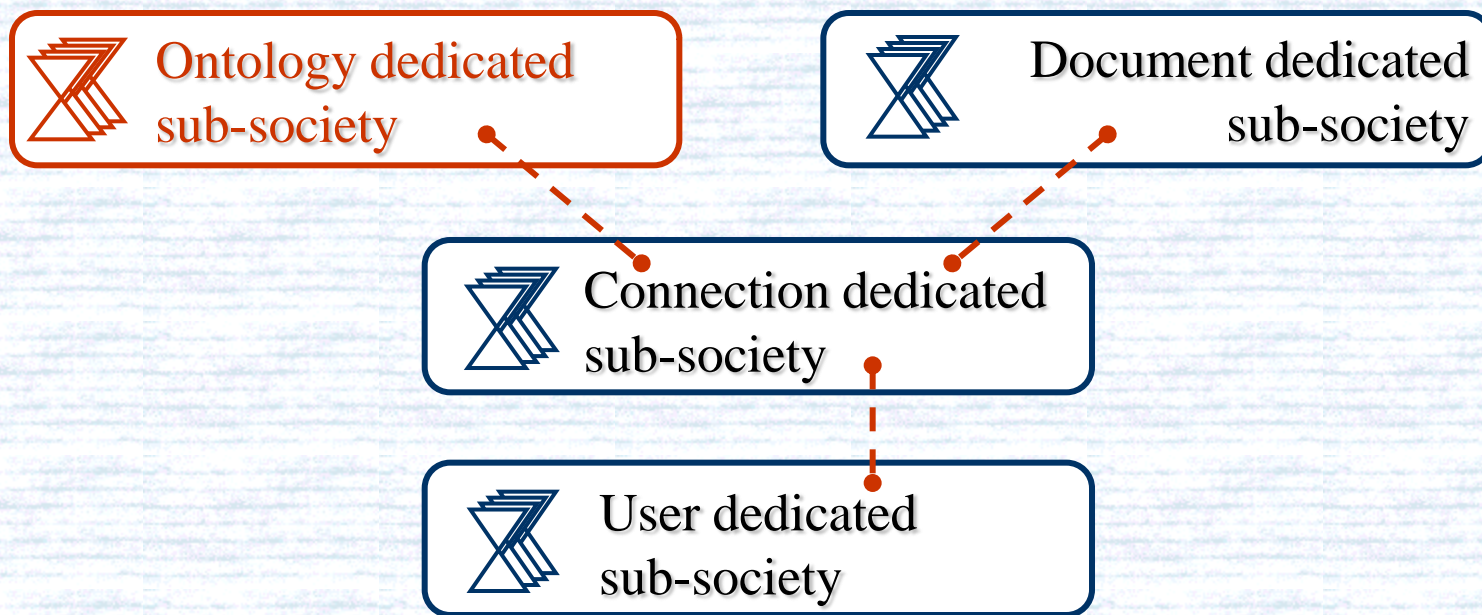
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# Dedicated sub-societies (ontology)

- ▶ The Ontology dedicated sub-society :
  - ▾ Queries on hierarchy of concepts & relations
  - ▾ Queries on terms, synonyms, possible views



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 Ontology dedicated sub-society

Zoom on actual choice



Replication



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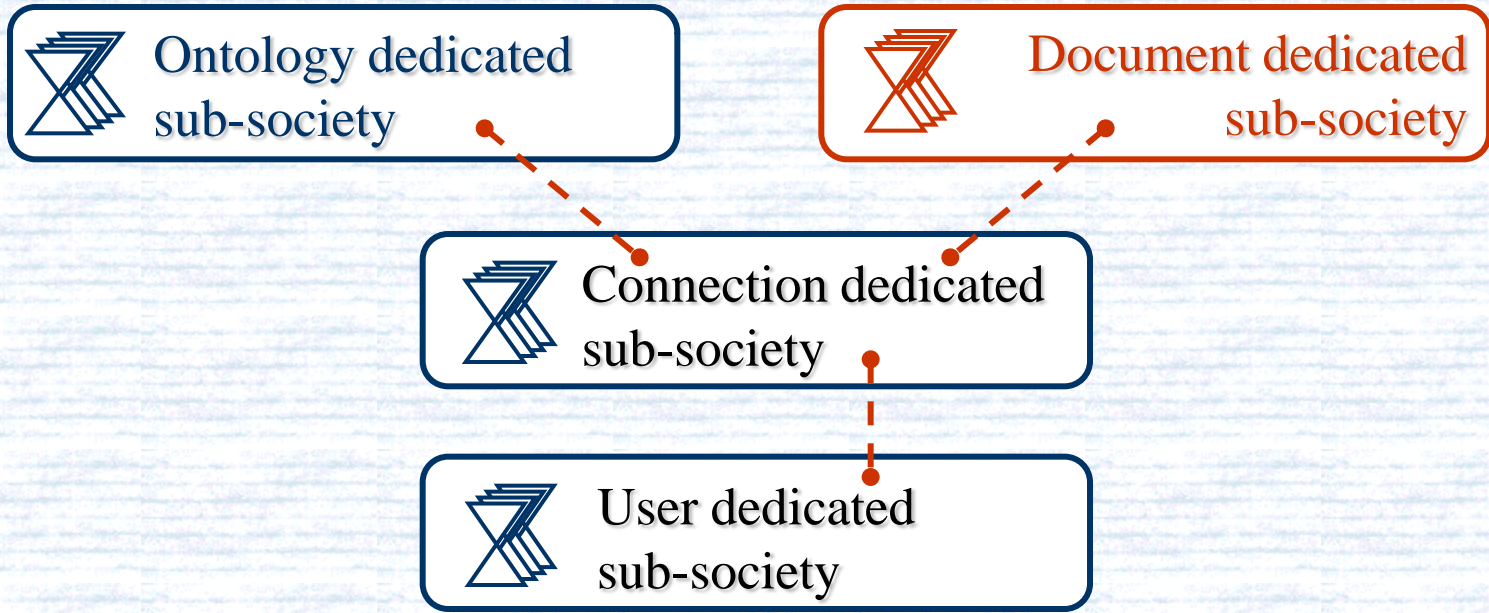
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- ▶ First trial choice because ‘ontology stable’
- ▶ Other choices to maintain and support the ontology consensus

# Dedicated sub-societies (document)

- ▶ The Document dedicated sub-society :
  - ▾ Archive documents & annotations of the OM
  - ▾ Search & retrieve references matching the queries



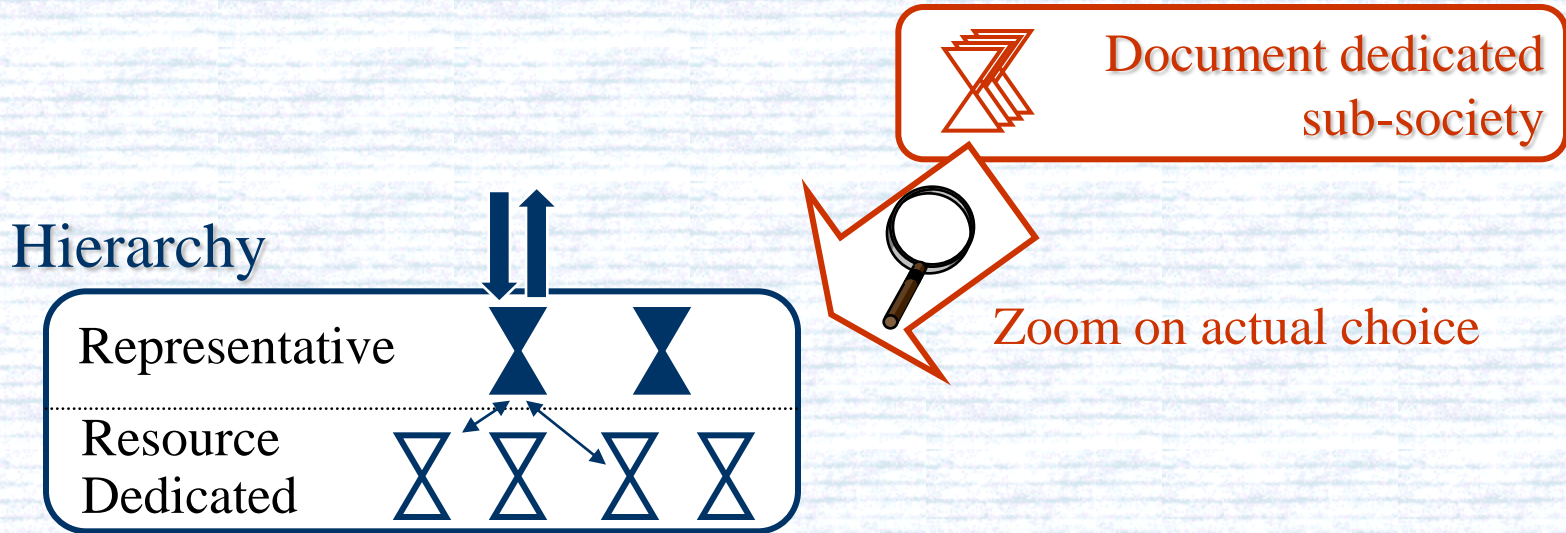
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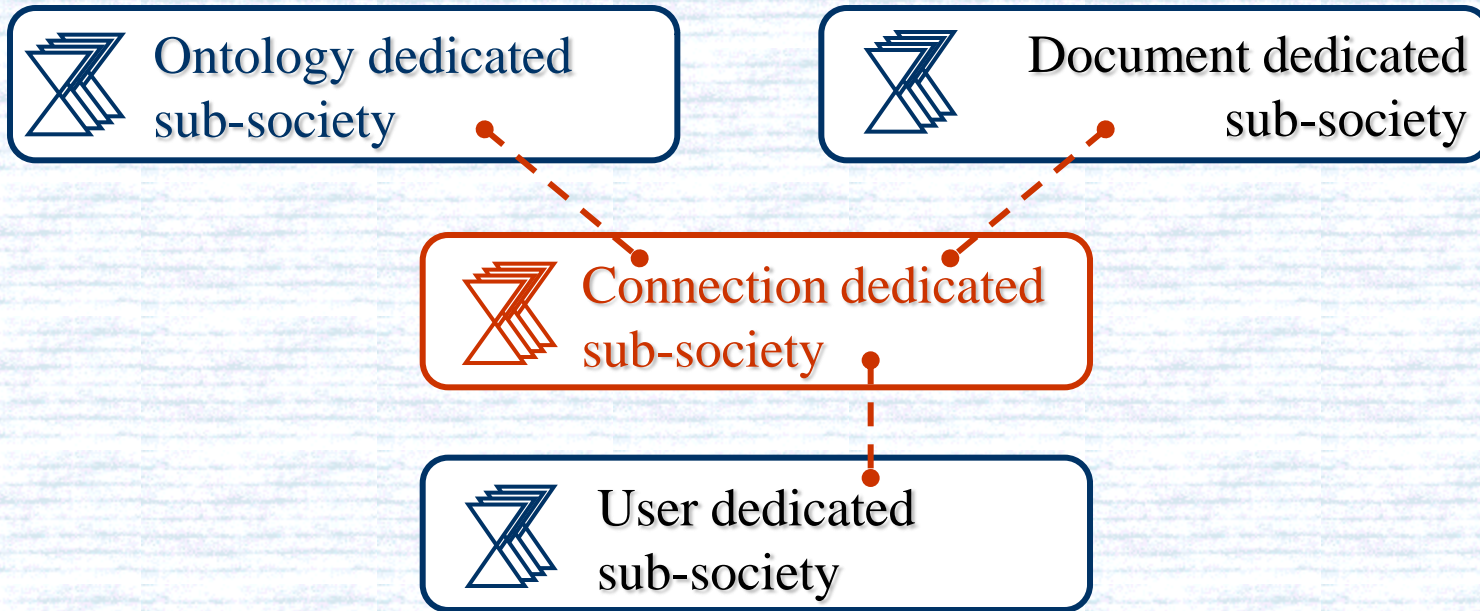


- ▶ Archivist: attached to & exploit local repositories
- ▶ Mediator: distribute queries & combine partial results



# Dedicated sub-societies (connection)

- ▶ The Connection dedicated sub-society:
  - ▶ Yellow pages service for agent capabilities.
  - ▶ Federation allows configuring the MAS.



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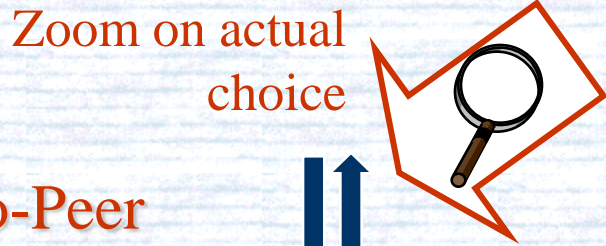
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Java framework for MAS development  
An Open Source project, © CSELT



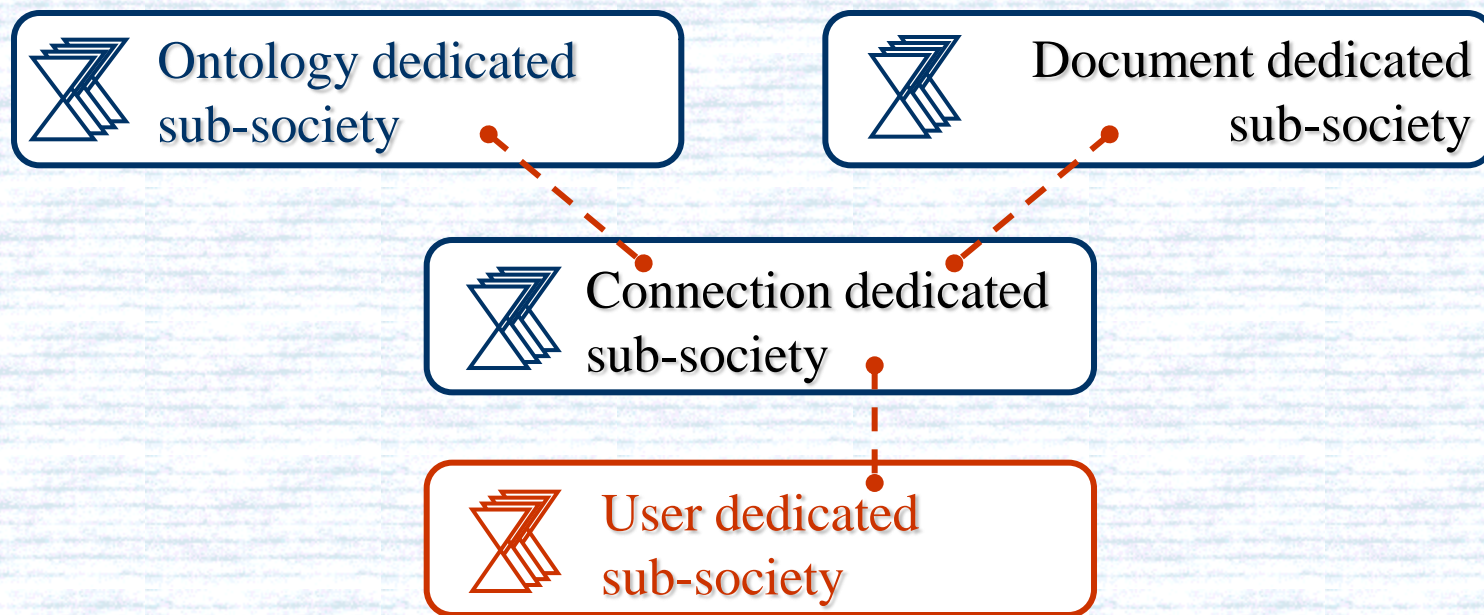
Peer-to-Peer



▶ Cooperating matchmakers

# Dedicated sub-societies (user)

- ▶ User dedicated sub-society:
  - ▶ Requester & not related to one resource type
  - ▶ Two main roles : GUI Mgnt & User Profile Mgnt



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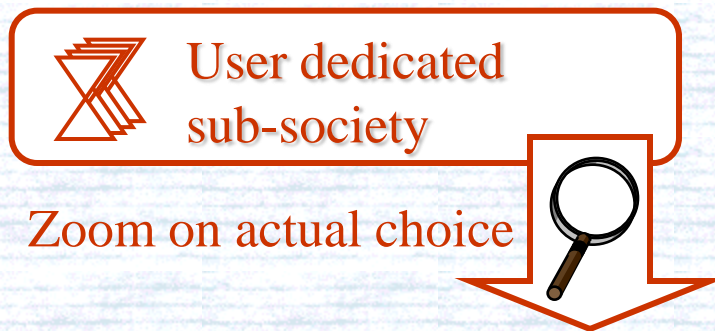
User society

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# Dedicated sub-societies (user)

- ▶ User dedicated sub-society:
  - ▶ Requester & not related to one resource type
  - ▶ Two main roles : GUI Mgnt & User Profile Mgnt
  - ▶ Symbolic learning techniques
  - ▶ Completely different society
  - ▶ Introduce new roles for customization
    - ▶ Collaborative filtering
    - ▶ Automatic annotation generation



- ▶ UIM, UPM, PA, PIGM, EID... *c.f. Paper*

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# Summarizing the claims

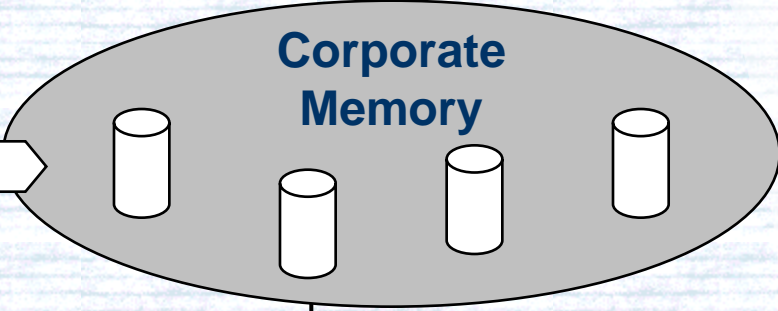
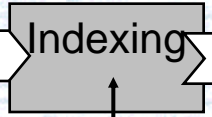
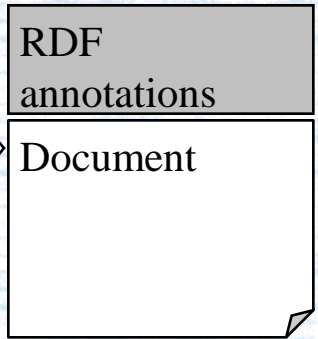
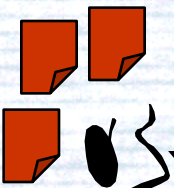
- ▶ Corporate memories are heterogeneous and distributed information landscapes
- ▶ Stakeholders are a heterogeneous and distributed population
- ▶ Exploitation of CM involves heterogeneous and distributed tasks

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<u>CM Materialization</u>	<u>CM Exploitation</u>
<b>XML:</b> Standard, Structure, Extend, Validation, Transform	<b>Multi-Agent System:</b> Modularity, Distributed, Collaboration
<b>RDF:</b> Annotation, Schemas	<b>Machine Learning:</b> Adaptability, Emergence
<b>Corporate Memory</b>	<b>Management through Agents</b>

# CoMMA: Overview of the System

Document Author



Corporate memory

XML

RDF

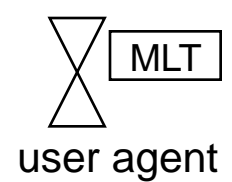
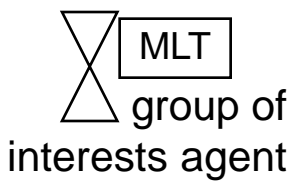
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Multi-Agent System

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Sub-societies organization



Ontology society

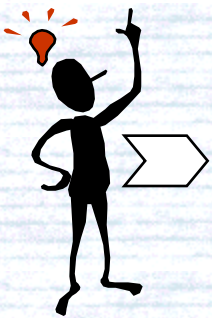
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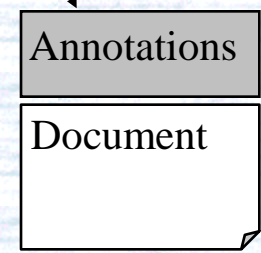
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Ontology Author

**Knowledge models :**  
- Enterprise Models  
- User Models *RDF ontology*



Employee





*Thank*

*You !*

**Acknowledgements to the CoMMA consortium**