

# Come together, right now

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## Semantic Matching of Grid Resource Descriptions

### Grilles des données

Course of lectures of Jean-Marc PIERSON and  
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Lecture of Pascal BIHLER ([pb@bi-on.de](mailto:pb@bi-on.de))



crossgrid



# Summary

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- Introduction
- Grid Resource descriptions
  - Globus Toolkit GLUE-Schema
  - Unicore
- Bringing two worlds together
  - Deriving ontology
  - Mapping problems
- Criticism & Conclusion
- Questions/Discussion

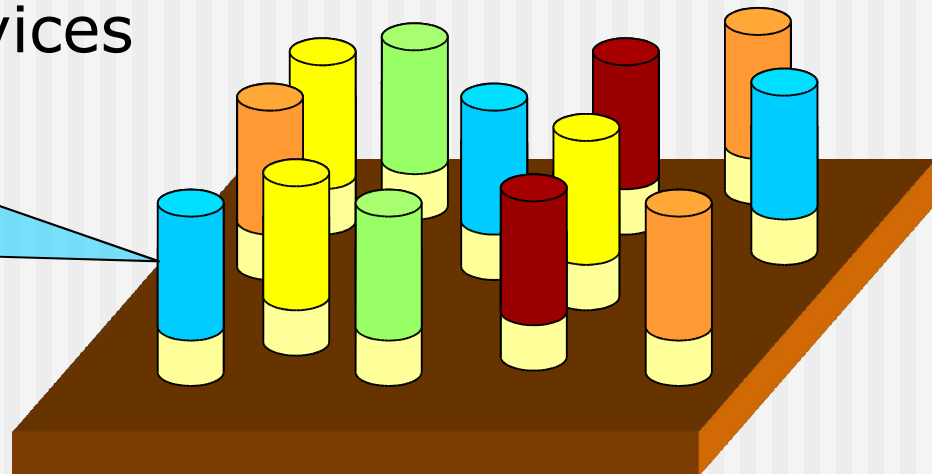


# Introduction 1

- Virtualization is main grid concept
  - Virtualization of the user concept
    - Digital certificates
  - Virtualization of grid resources
    - OGSA Services

## Resources

- Virtualization
- Optimization
- Management



# Introduction 2

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- When interconnecting grids (VOs), different resource descriptions in subgrids are already established:
  - Globus (GT2/GT3) GLUE schema
  - Unicore Incarnation Database (IDB)
  - OGSA services (just beginning to be described)
  
- Need of a semantic translation service for interoperable brokers => Uniform Access

# Resource Description 1

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- Globus Toolkit
  - Protocols for resource description and resource discovery
  - Meta-Directory Service MDS-2 (LDAP)
  - DataTAG project
  - GLUE
    - Grid Laboratory Uniform Environment

# Resource Description 2



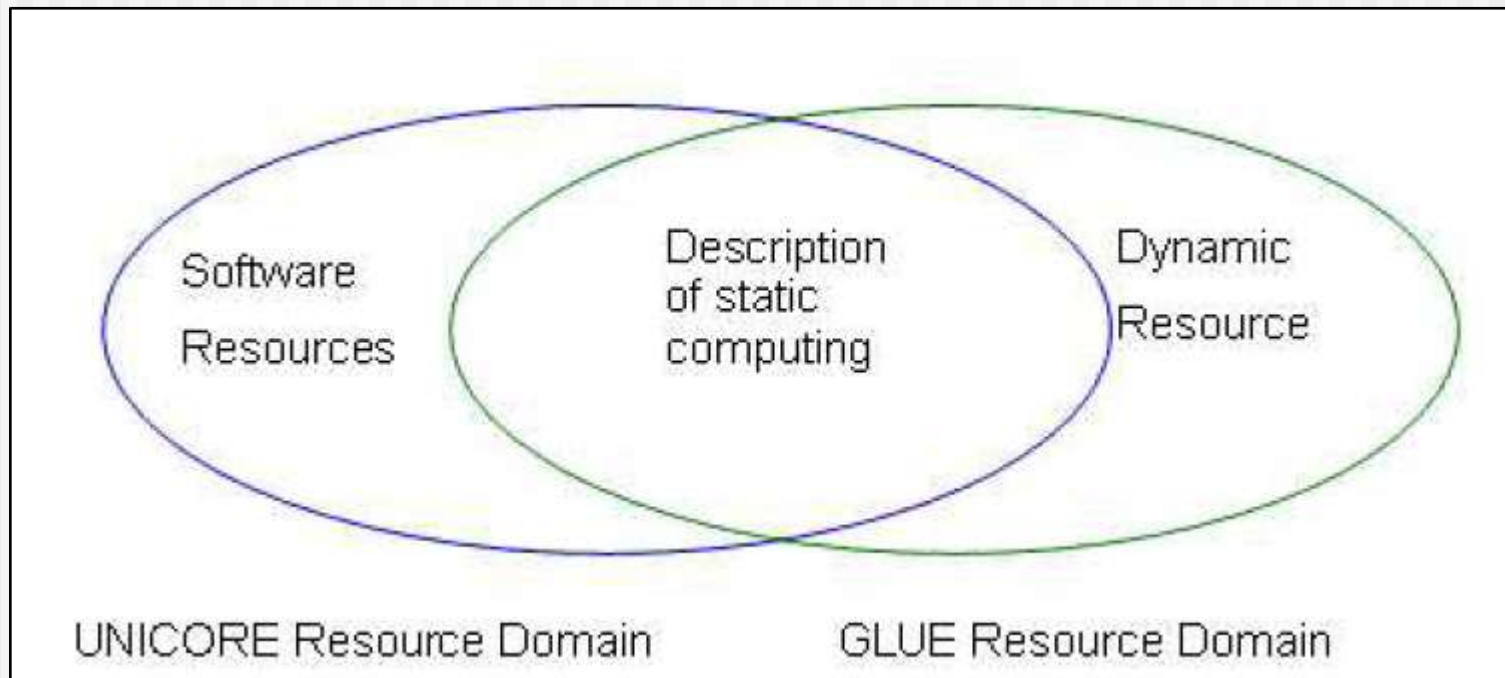
## ■ Unicore



- Universe of workflows
- Resource discovery language = implementation language
- Hierarchy of Java-Classes
  - Abstract Job Objects (AJO)
  - Resource virtualization as "Vsite"
  - Incarnation Data Base (IDB) containing translation information

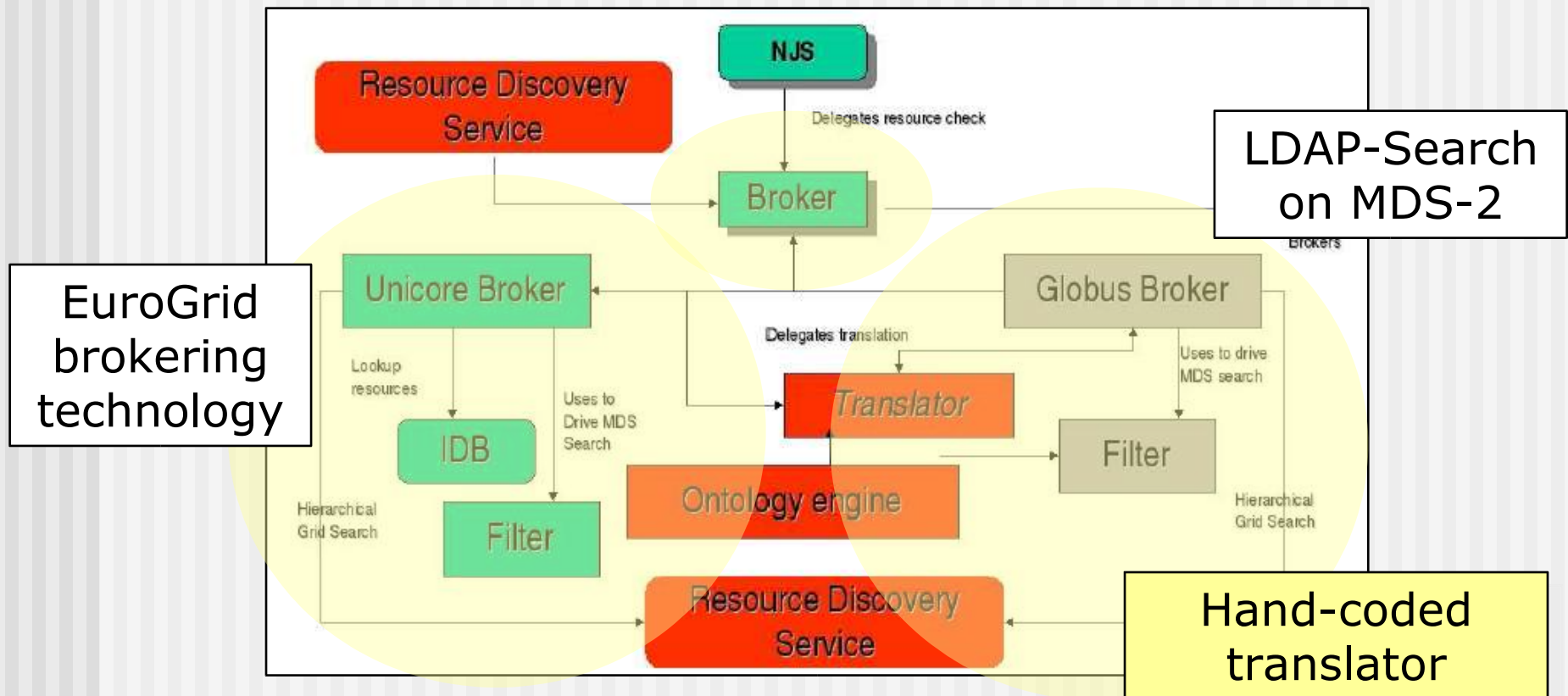
# Resource Domains

- Description domains not congruent  
=> Match intersection



# Implementation

- Integrate in existing broker arch.



# Ontology processing 1

- Create and map the ontology descriptions semi-automatically

## Unicore



AJO Classes



Javadoc



Unicore Ontology



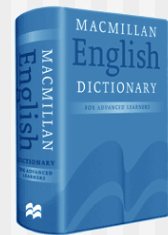
## GLUE



GLUE Documentation




Globus Ontology



Common Ontology

# Ontology Processing 2

- Used software: PCPack The logo for Epistemics, consisting of a blue circular graphic with three overlapping circles and the text "Epistemics" in a blue, sans-serif font, with the tagline "knowledge is our business" in a smaller, grey, sans-serif font below it.
- Knowledge tools to support the acquisition and use of knowledge.
  - **Analyzing** knowledge from text documents
  - **Structuring** knowledge
  - **Acquiring** and **validating** knowledge from experts
  - **Publishing** and **implementing** the knowledge
  - **Re-using** knowledge across different domains
- Tool to derive Unicore/GLUE-Ontologies:
  - Ladder tool (creates hierarchies of knowledge)



# Mapping problems

- Different views of the world
  - Unicore: Point of view of requesting user
  - GLUE: Point of view of resource providers

Unicore Ontology	Globus Ontology
Priority Value	Priority
Maximum Memory Capacity Request	Host Virtual Main Memory Available
	Subcluster Virtual Main Memory Available
	Host RAM Main Memory Available
	Subcluster RAM Main Memory Available

# Mapping algorithm

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- Unicore -> Globus
  1. PCPack-Ontologies -> compacted XML Format
  2. Load XML into main memory
  3. Try to map Unicore resource checks into XPath queries for GT3
  4. If mapping exists, use XPath query, if not, try to search in Index Service for a virtual resource

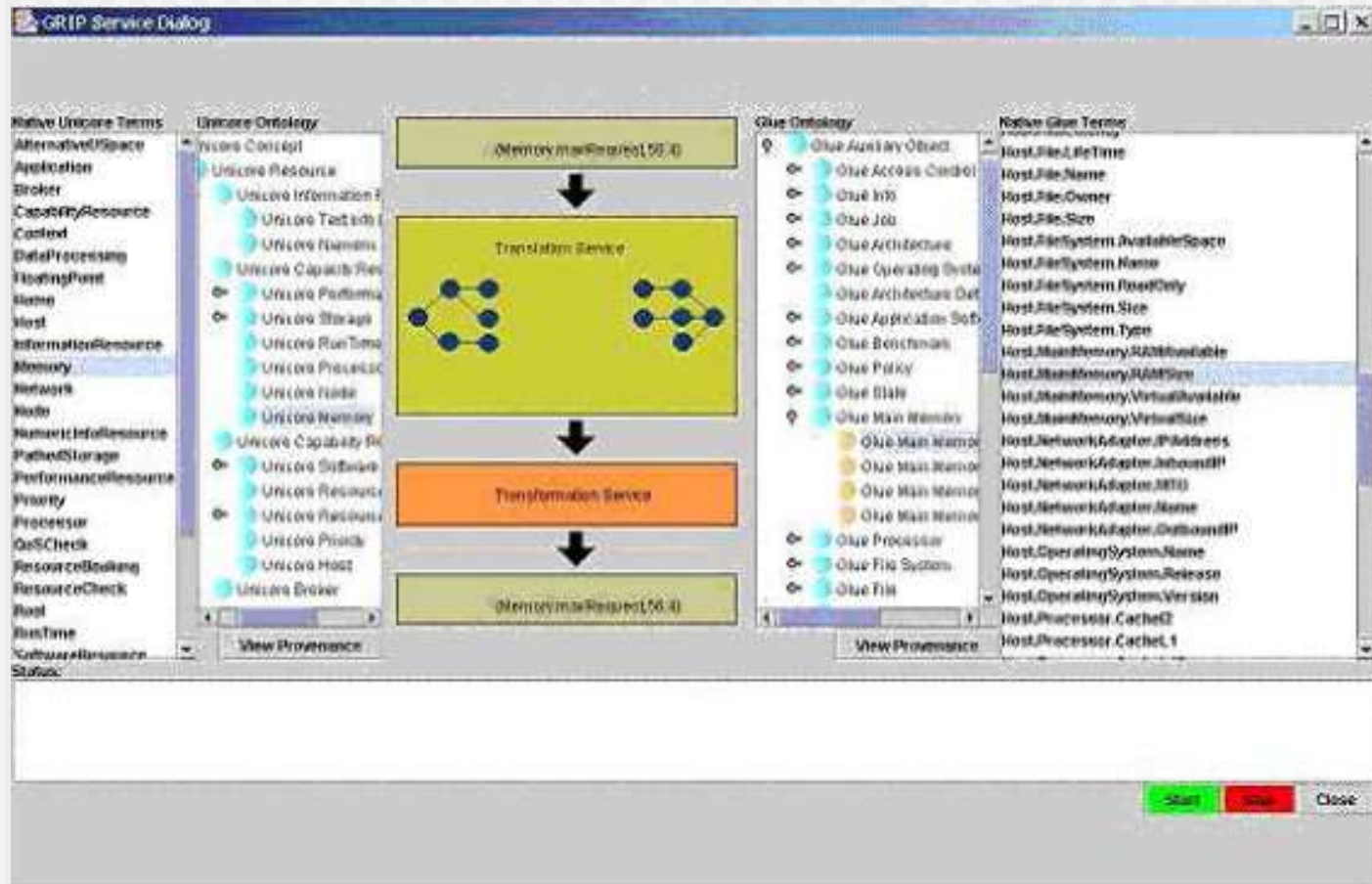
=> “Ontological Translator” tool is used for the mapping process

# Ontological Translator 1



```
<translator>
  <domain name="Unicore">
    <element name="e11" id="1" native="uni1">
      <attribute ... />
    </element>
    ...
  </domain>
  <domain name="GLUE">
    ...
  </domain>
  <mapping name="Map1" from="Unicore" to="GLUE">
    <map from="e11" to="e12" />
    ...
  </mapping>
</translator>
```

# Ontological Translator 2



# Critics / Conclusion

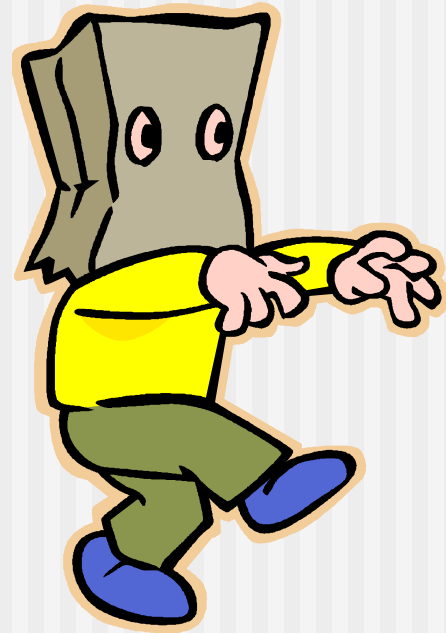
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- The authors are right saying:  
*This is only a start, only a small subset ... can be mapped...  
However, it is a necessary start...*
- Paper/work is unfortunately small and sometimes uncompleted
- Straight forward solution, originality only in deriving ontology from documentation
- No focus on integration of prototype into broker implementation
- No experimental results (eg percentage of translatable requests)
- Semi-Automatic approach applicable in extended grids? (scalability/performance not mentioned)

# Thank you...

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- Thank you very much for your attention.
- Any questions left?
- Feel free to ask...



# Bibliography/Images

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