Enhancing Grid Usage through Semantic Metadata

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- Introduction
- The knowledge Base
- The Semantic Grid System
- Conclusion

The Problem of Grid Resource Sharing

- Increasing amount of installed applications in Grid environments causes:
  - Increasing difficulty of finding a desired application, but also...
  - Increasing chances of software pieces interchange in response to a user application requirement;
- How to explore such reuse opportunities?

The Semantic Approach

- Definition of Grid Ontologies
  - To improve the reuse, sharing, and integration of software and computational resources on the grid;
  - Inference of information from axioms defined in ontologies.

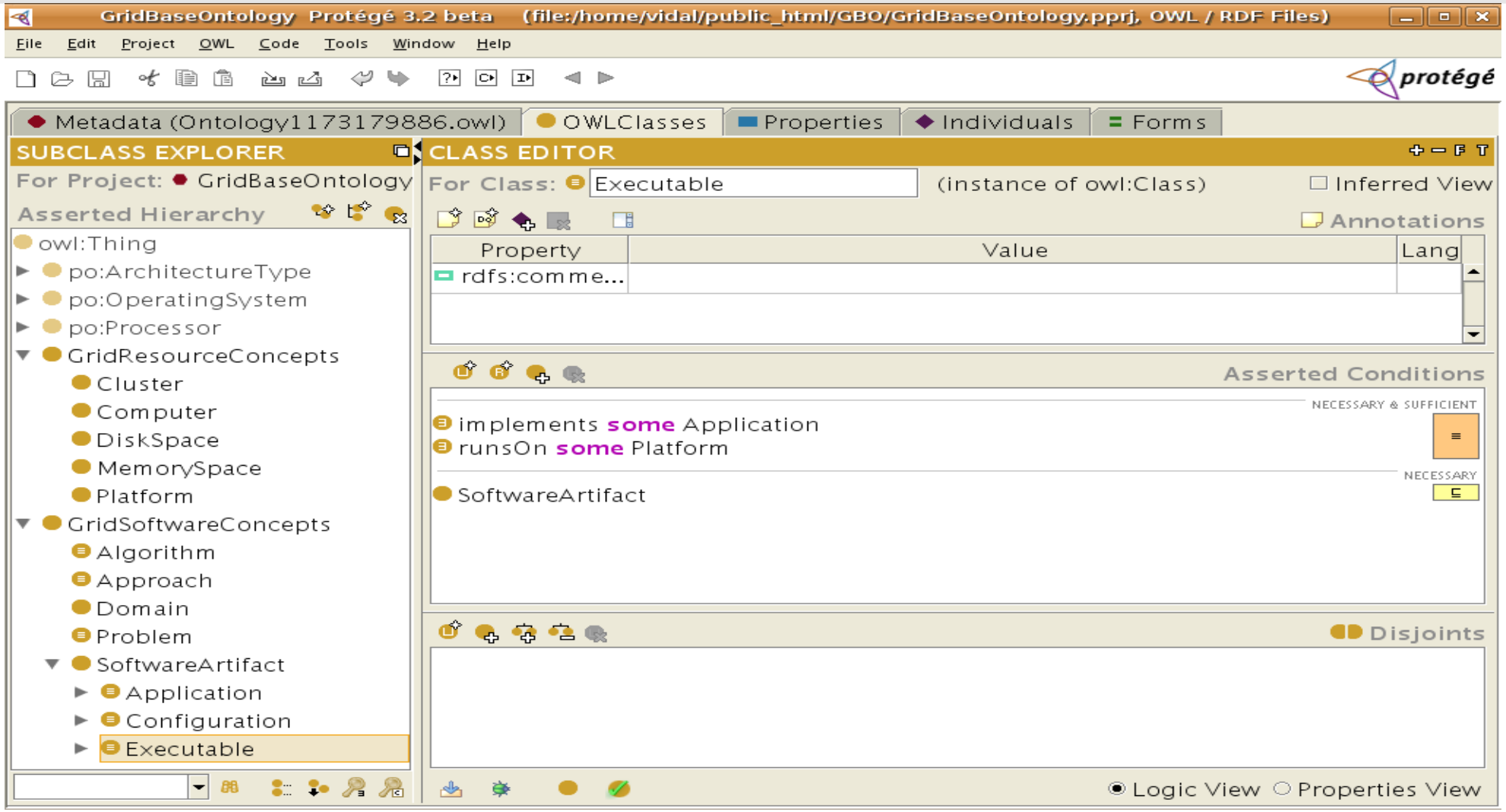
The Semantic Approach

- Definition of Grid Ontologies
  - Using the W3C-recommended OWL-DL description language;
  - Using the Pellet reasoner for inference tasks;
  - Protégé-OWL to ease ontology description;
  - The opportunistic grid middleware, InteGrade, is the base for a prototype implementation.

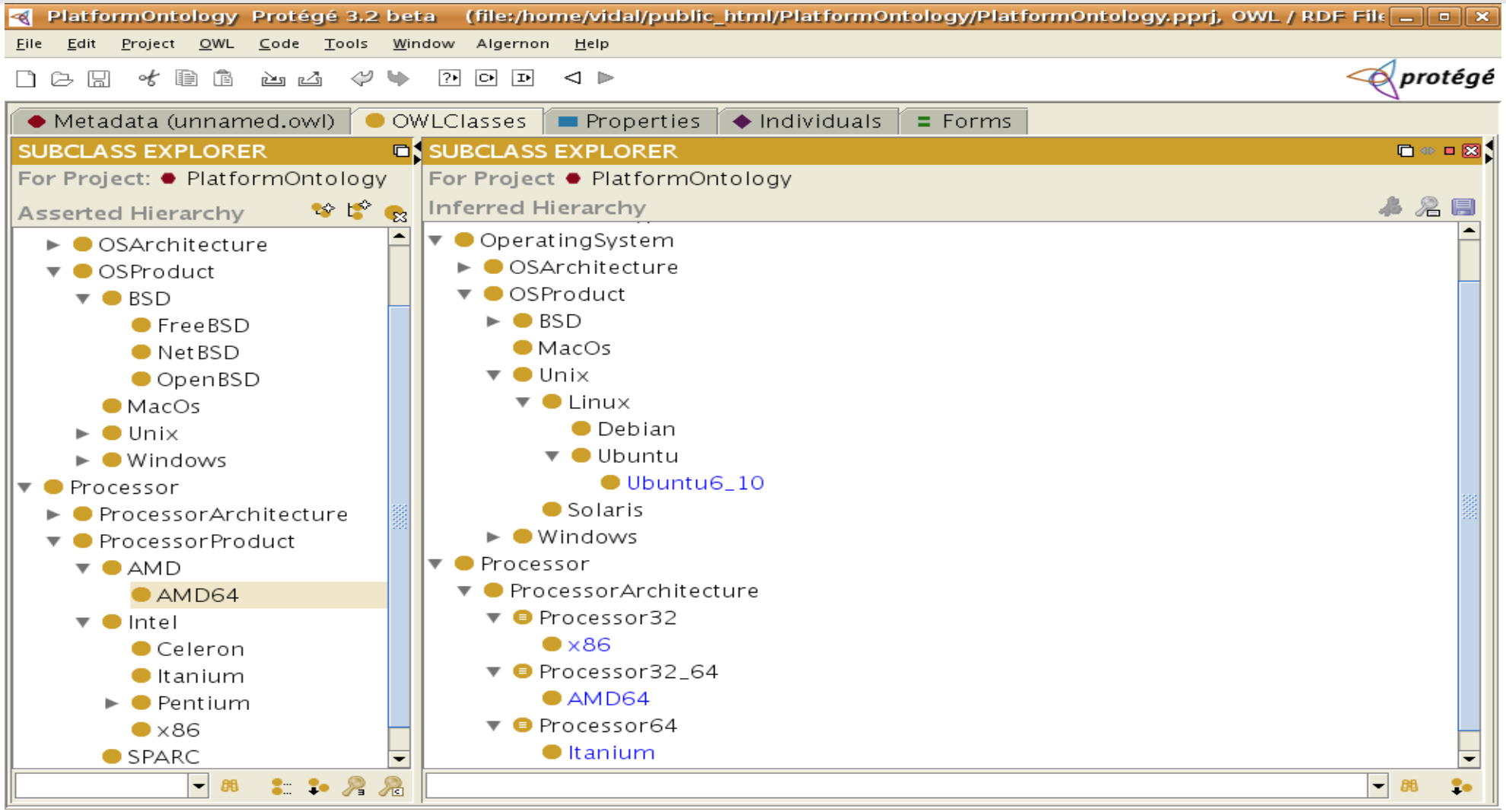
Defining the ontologies

- Set of related ontologies, connected between them through the OWL *import* mechanism;
  - *upper-level ontologies*
    - higher level of generality;
  - *ancillary ontologies*
    - auxiliary domain specific concepts;
  - *concrete grid ontologies*
    - grid environment specific concepts

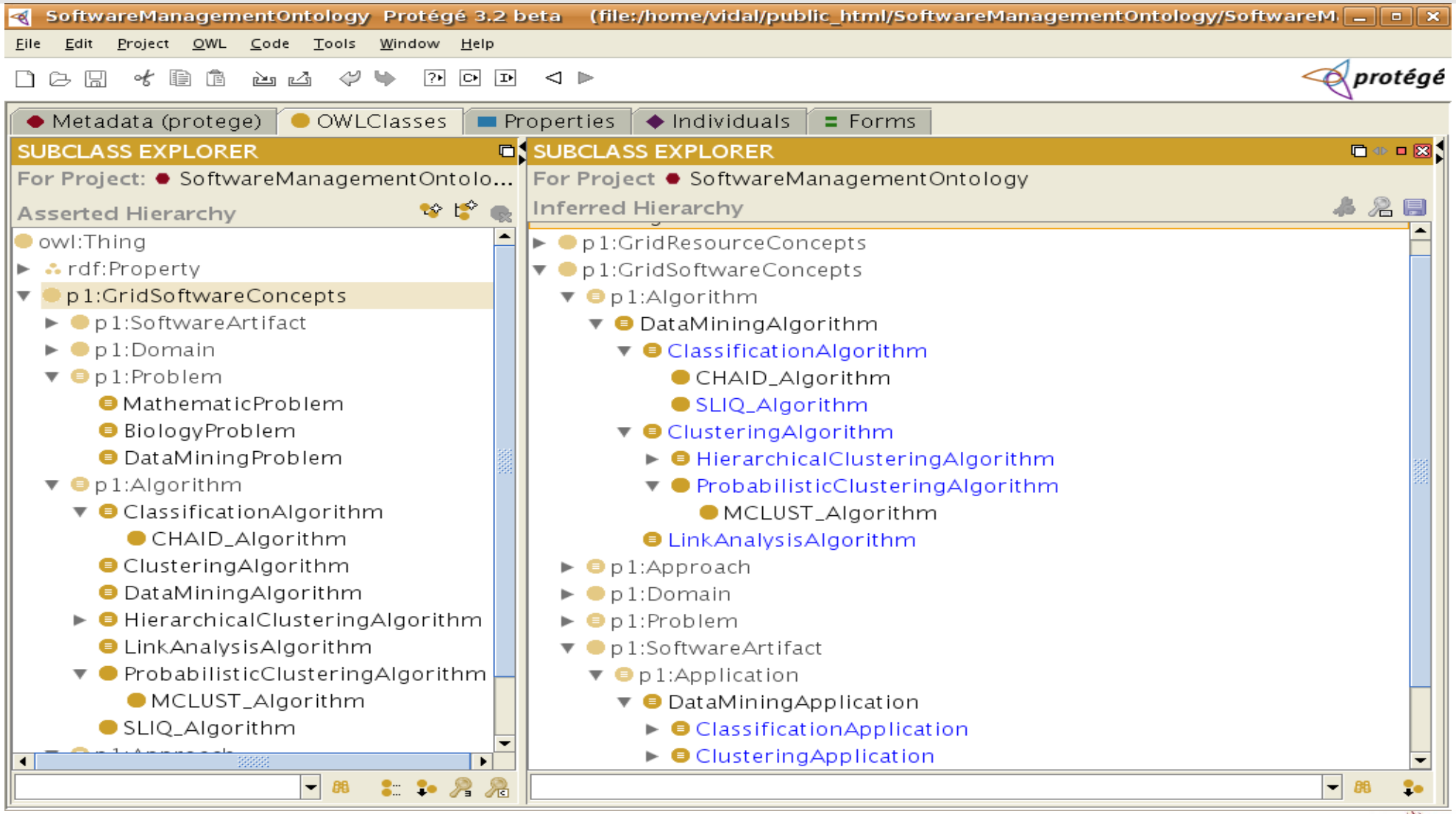
Upper level ontology – Grid Base Ontology



Ancillary ontology – Platform Ontology



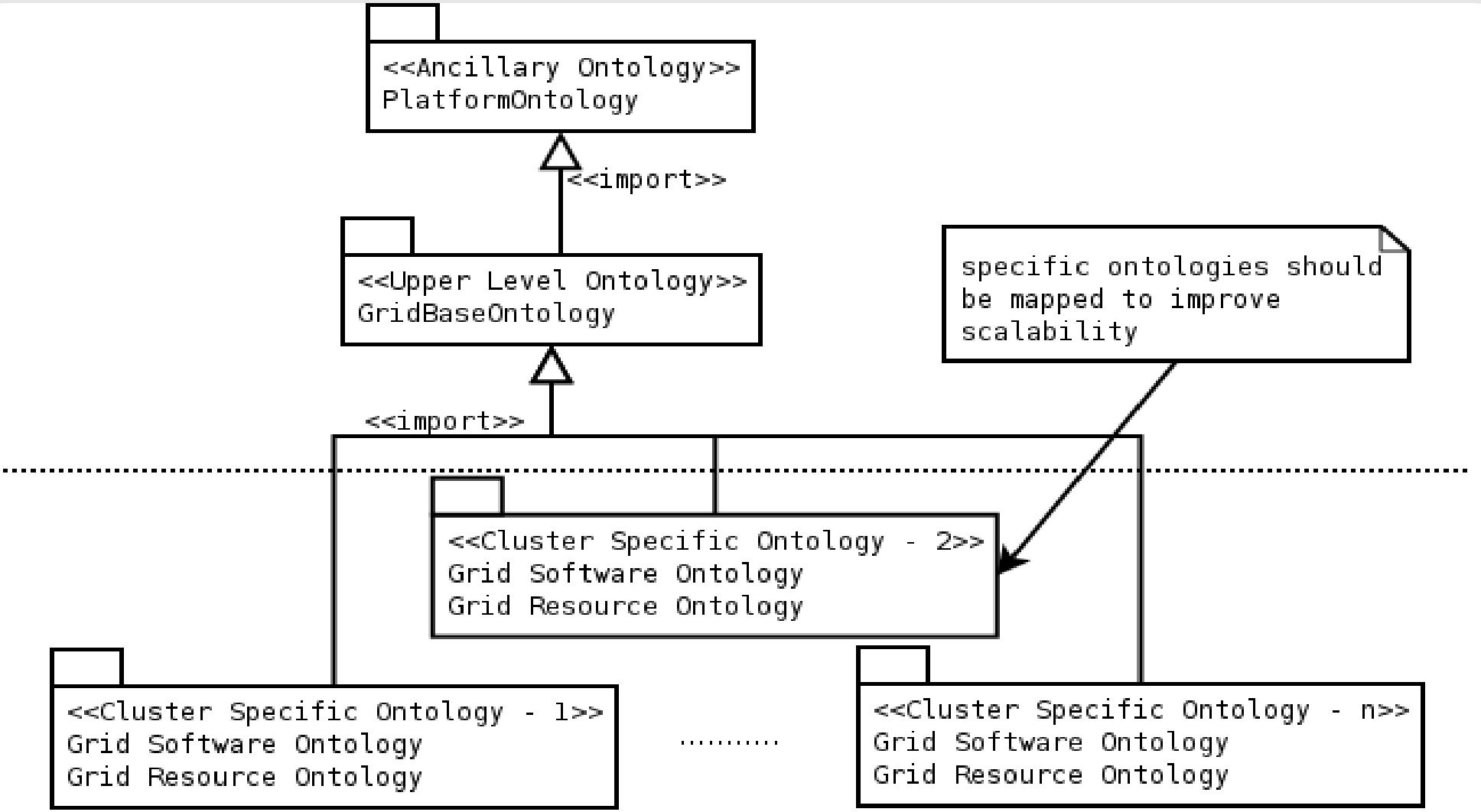
Concrete ontology – Software Management Ontology



Exploring the ontologies

- Fundamental taxonomy encompassing the main concepts related to grid systems;
- Inference knowledge from previously defined axioms and incomplete information, e.g.:
  - subsumption inference in advance, in conformance with an intelligent policy;
  - query languages and mechanisms;
    - SPARQL;
    - OWL-QL

Extending the ontologies



Grid Ontologies Applicability

- New infered subsumed hierarchies to obtain new inferred knowledge;
- Ontology-based applications can be built around the KB to cover different domain problems;
- More efficient query results from inferred class hierarchies;
- improve application and grid resource matching.