Knowledge Services for Distributed Service Integration

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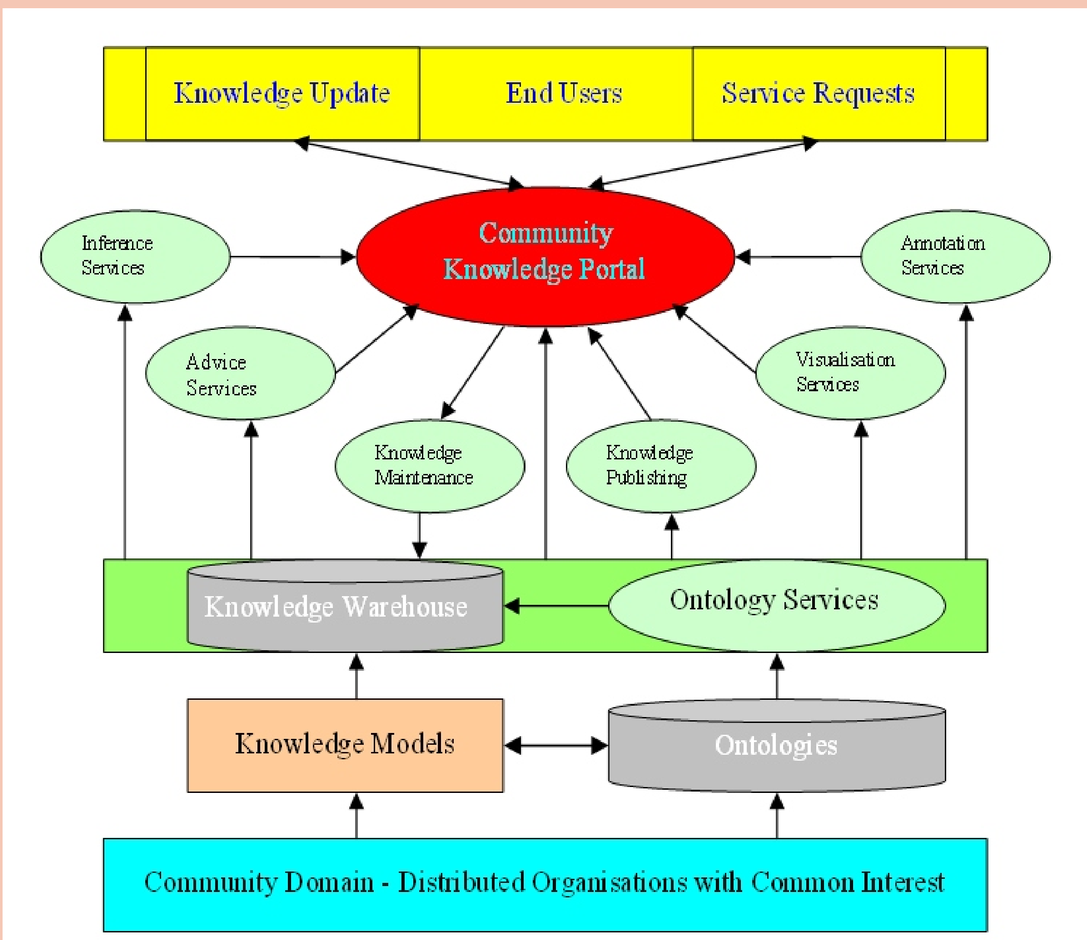
Geodise
Http://www.geodise.org

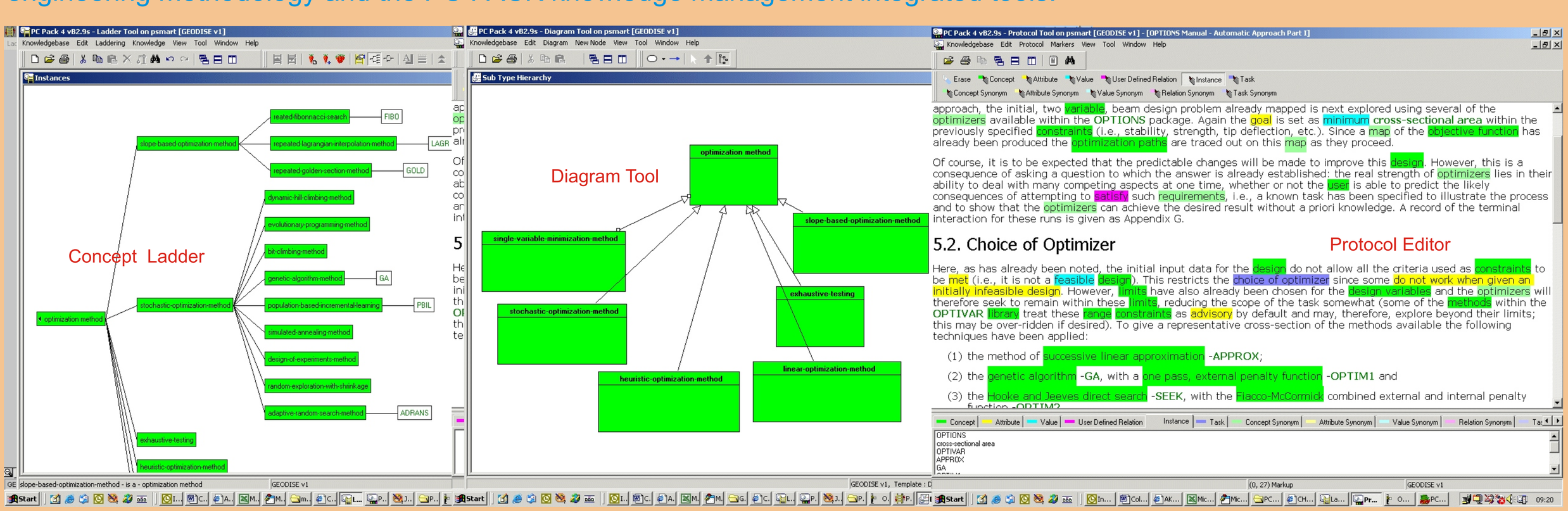
While computing increasingly addresses collaboration, sharing and interaction with the powerful support of the emerging distributed computing infrastructures such as web services and Grid technologies, there is a growing demand for ontology and knowledge technologies to provide semantic support for service integration, the sharing and coordinated use of knowledge across distributed, heterogeneous, dynamic virtual organisations. We have developed and partially implemented an architecture to provide knowledge services. It has been applied to Grid-enabled design search and optimisation (Geodise).

Distinguishing features of the architecture:

- Tackling the six challenges of knowledge management life cycle in an integrated framework.
- A layered modular structure with each component dealing with a specific aspect of knowledge engineering process.
- Supporting the exploitation of different techniques and tools. Each of them can be updated while others kept intact.
- Using ontologies to generate machine-interpretable semantically-enriched content and also knowledge bases.
- A knowledge portal provides mechanisms for knowledge maintenance and resource control.
- Service-oriented approach - separating domain knowledge from operational knowledge.
- Easy knowledge reuse and sharing through web service technology over the Internet.
- Flexible - adding knowledge any time through portal.
- Extensible - plugging in new functions as knowledge services.
- Robust - adopting new techniques/tools while keeping the system functioning.



Knowledge acquisition and modelling lay the foundation for the knowledge service architecture, which produces ontologies and the types of template and structure where knowledge can be held. It has been carried out by the CommonKADS knowledge engineering methodology and the PC PACK knowledge management integrated tools.



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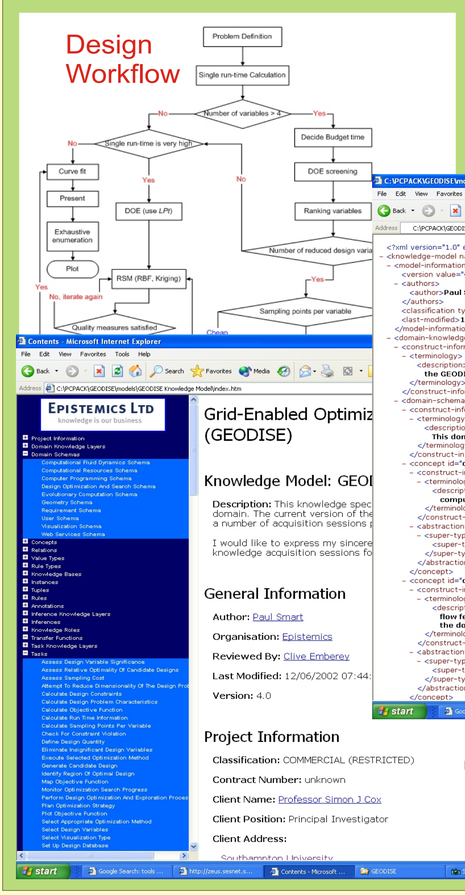
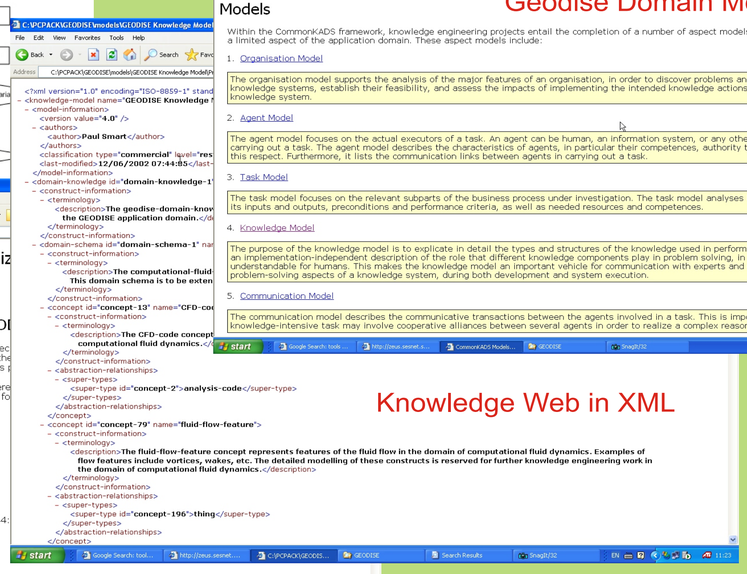
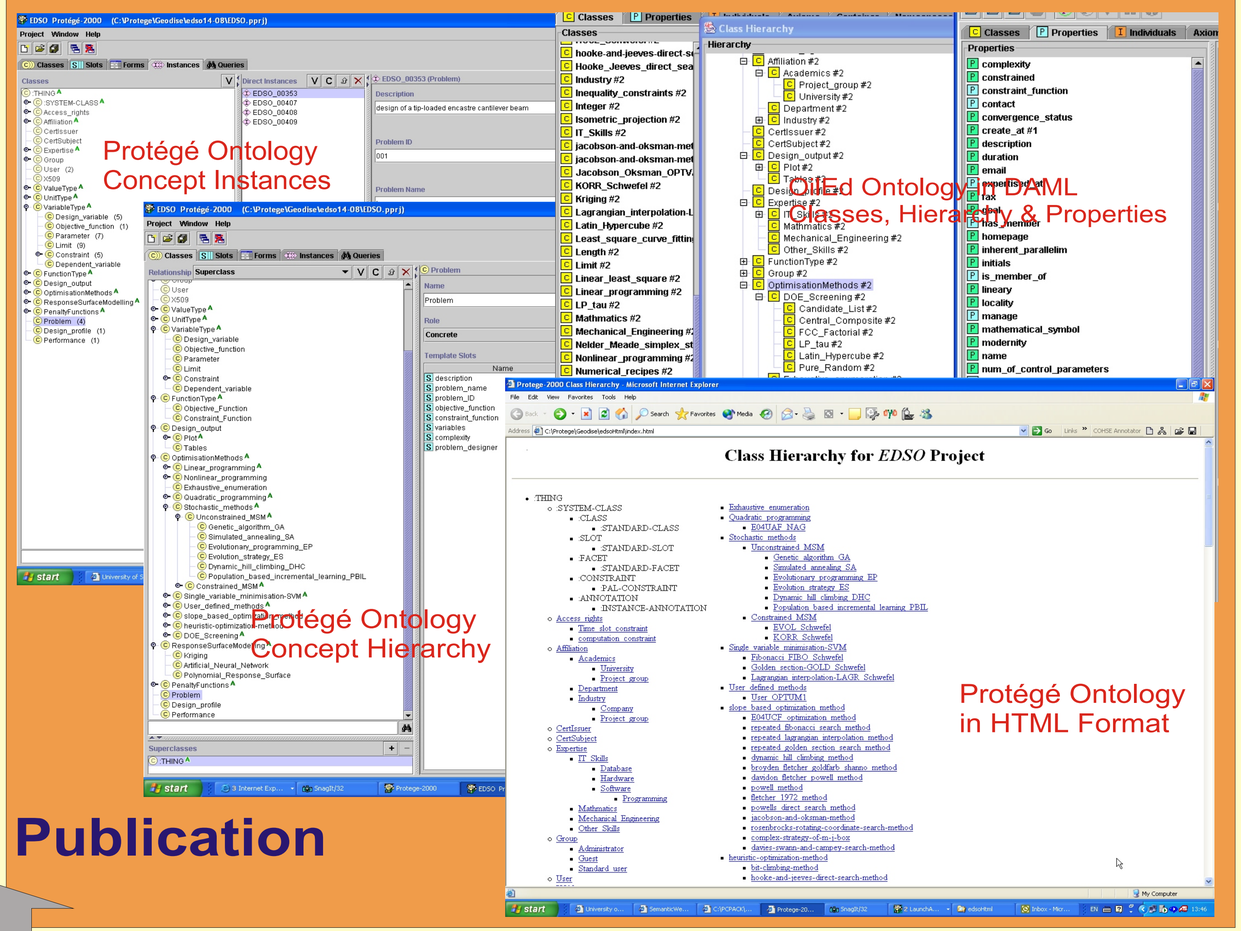
Knowledge representation and publishing is to represent knowledge in a well-structured, well-indexed form and make them ready for sharing and use. Geodise domain knowledge has been represented in CommonKADS task models, concept hierarchy and a design workflow and published in the form of knowledge web and XML format.





Ontologies serve as the conceptual backbone for knowledge sharing and management in the above integrated architecture for knowledge services.
We have developed ontologies for design search and optimisation using both Protégé and OilEd ontology tools.



Knowledge Publication

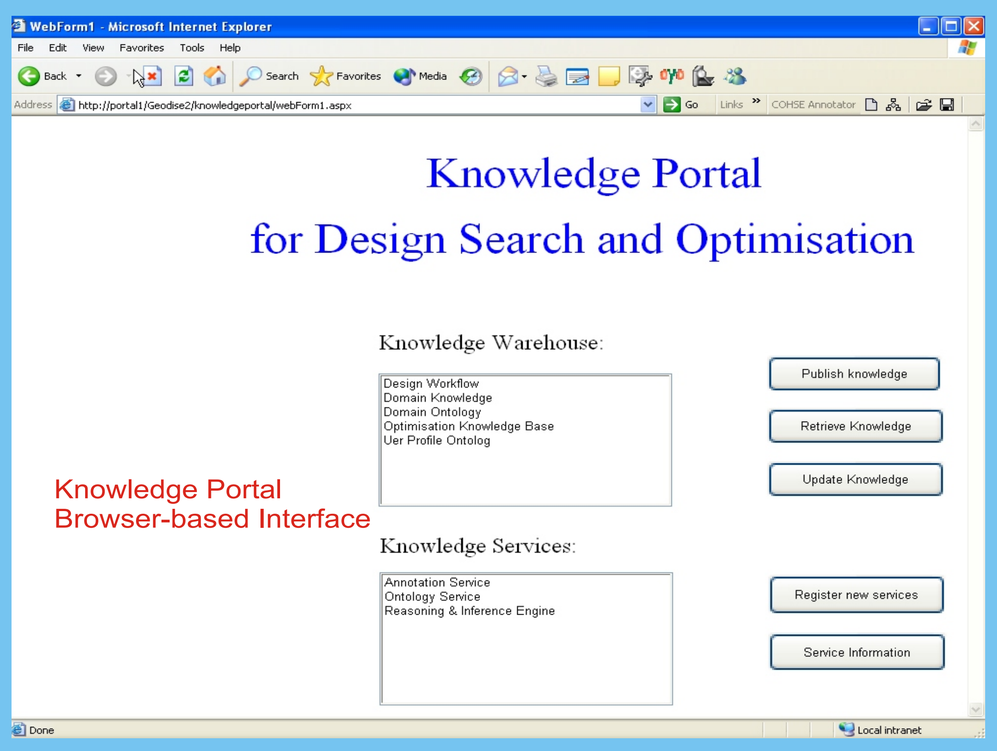
Knowledge Services

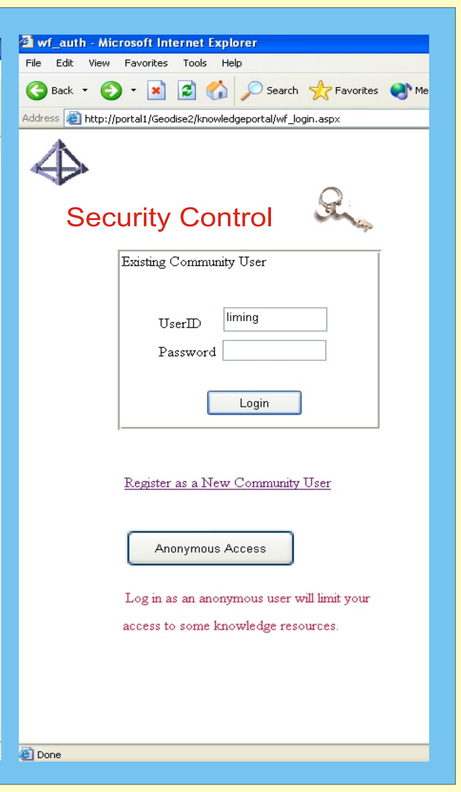
The aim of knowledge portal is:

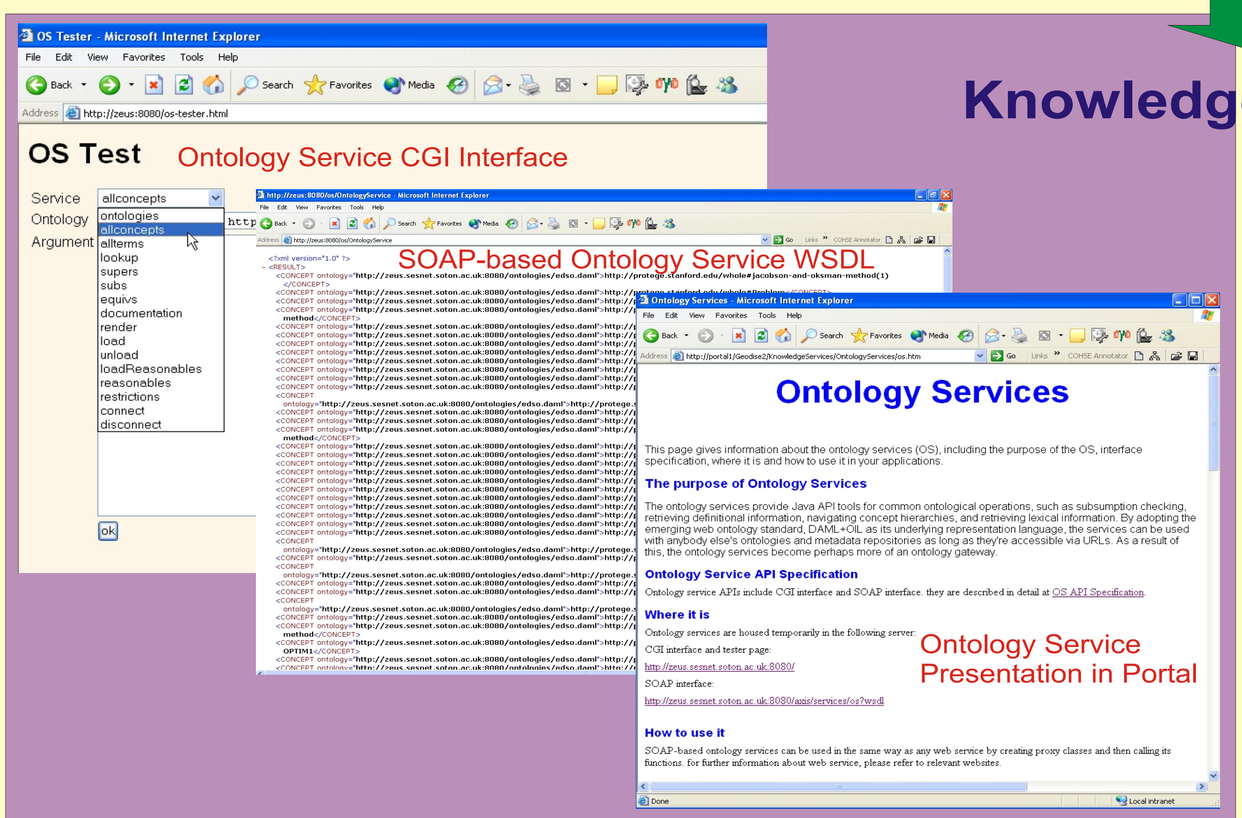
- To make knowledge available and accessible
- To provide tools for knowledge reuse and exchange
- To provide security infrastructure
- To manage knowledge resource
- To support online forum and maintain mailing lists
- To disseminate the latest advance of the domain

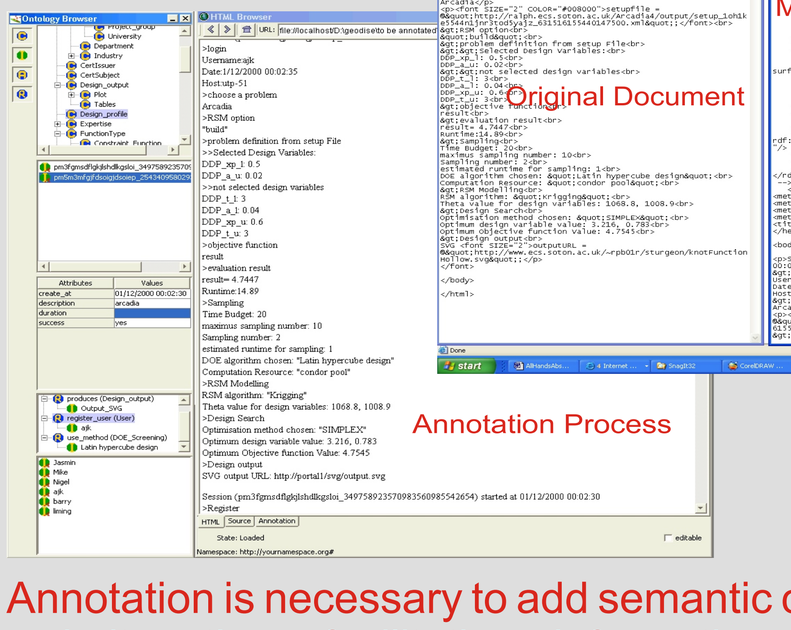
Current functions of knowledge portal include:

- Security mechanism
- Knowledge publication
- Service registration
- Knowledge retrieval and update
- Service application information
- Resource management via version control









Ontology service provides a Java API giving full access to any DAML+OIL ontology that is available over the Internet. The API is exposed through both a SOAP-based web service and a CGI interface for common ontological operations, such as subsumption checking, navigating concept hierarchy and retrieving concept and attributes.

Annotation is necessary to add semantic content to document or website, thus facilitating information sharing, reuse and automatic machine processing. We have used OntoMat-Annotizer annotation tool in Geodise to annotate the workflow for particular design problems and then save them in a knowledge base. The semantically enriched archive can then be queried, indexed and reused later to guide future designs.