Semantic Reasoning Support for SCEC
Thomas Russ and Hans Chalupsky
Information Sciences Institute, University of Southern California

Semantic GRID Matchmaker

Problem: Matching Jobs with Resources
- Many of the simulation codes used by SCEC researchers are compute-intensive.
- The computational GRID provides resources that can handle large and time-consuming jobs, using supercomputers and computing clusters.
- How can appropriate resources be found to allow the jobs to execute?

Existing Approach (Condor [1])
- Exact match of attributes required. “Linux” does not match “Unix”.
- Flat space of keywords for specifying both jobs and computational resources
- Inflexible and difficult to extend to new characteristics and concepts.

Semantic Matchmaker [2]
- Declarative model encoded in a standard semantic web ontology language (RDFS) [5].
- Semantic matching of requests and resources by reasoning over the ontology using XSB [3]. For example Linux fulfills a requirement for Unix

Highlighted at SCEC mid-term review.

Recent Developments
- Changed reasoning engine from XSB to PowerLoom [4] to improve performance
- Designed bi-directional subsumption-based matching strategy: Jobs specify classes of resources which match against machine instances. Resources specify classes of jobs they will accept which match job requests.

PowerLoom Graphical User Interface

Making Ontology Development Accessible
- PowerLoom ontologies are encoded in a logical formalism that is powerful and expressive, but also obscure to non-specialists
- But ontologies need to be developed by domain experts who will not have the time or interest in becoming logic and representation specialists
- The graphical interface to PowerLoom makes ontology development more accessible to domain experts.
- Provides structured views which preserve the semantics but provide a more intuitive presentation of the information. The interface is similar to object-oriented programming environments.
- Deployed to SCEC/CME in the June 2004 build and available via Java Webstart.

PowerLoom Extensions for SCEC
- Integration with Tomcat web server
- Support for semantic web languages including RDF, RDFS and DAML+OIL [5]. This was used in moving the GRID matchmaker to PowerLoom.

Units and Dimensions Support Extended.
- Better integration with ontologies
- More meta-information available: Joules = mass * distance^2 / time^2
- Dimensional analysis is now supported.

References.