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GRID-DL – SEMANTIC GRID INFORMATION SERVICE

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Abstract: *The effectiveness of complex Grid systems strongly depends on the availability, accuracy and relevance of information on all connected resources, their characteristics and state. An access to this information plays a very important role in any Grid system, providing necessary information for other Grid components and users. We believe that application of semantic technologies can improve Grid utilization and enhance user interaction with the system. We present our vision of the semantic Grid resource information service.*

Keywords: *Grid, information service, semantics, ontology, OWL.*

1. INTRODUCTION

Grid computing proved to be effective and powerful instrument for modern data-intensive science and engineering. One of the distinct characteristics of grid system is extreme heterogeneity as every Grid site is unique with respect to their hardware and software composition.

Effective management and use of such complex system is entirely dependent on the availability, accuracy and relevance of information on all available resources, their characteristics and state. An access to this information should be as clear as possible for a wide range of users and at the same time sufficiently flexible and adaptive for a wide range of tasks.

Traditional Grid information services [1-4] tend to force users to comply with their semantics [5] and tend to be quite confusing and ineffective [6-7].

In order to address this issue we hypothesized [8] that semantic technologies, developing under the concept of the Semantic Web, can be effectively applied to Grid systems.

2. ARCHITECTURE

To test out and refine our ideas we have built a prototype of Semantic Information Service (Fig. 1).

We decided to design it as complementary information service to traditional MDS and BDII. Thus, an import manager occasionally pulls (1) data from GIIS or top-BDII server and using definitions of core TBox ontology assembles knowledge base filled with resource assertions. Optimized OWL reasoner [9] executes all processing and query subroutines. Users build their queries (4) to semantic information service either using definitions from default TBox ontology (2) or by means of custom domain ontologies that capture some specific knowledge relevant to the domain user works in or any of his arbitrary assertions. This way we allow user to make queries to Grid infrastructure from his point of perspective, adjusting to his terminology and aliases and at the same time bringing in all relevant domain knowledge. Domain ontology repository (3) is available as a common platform for collaborative domain ontology development and refinement.

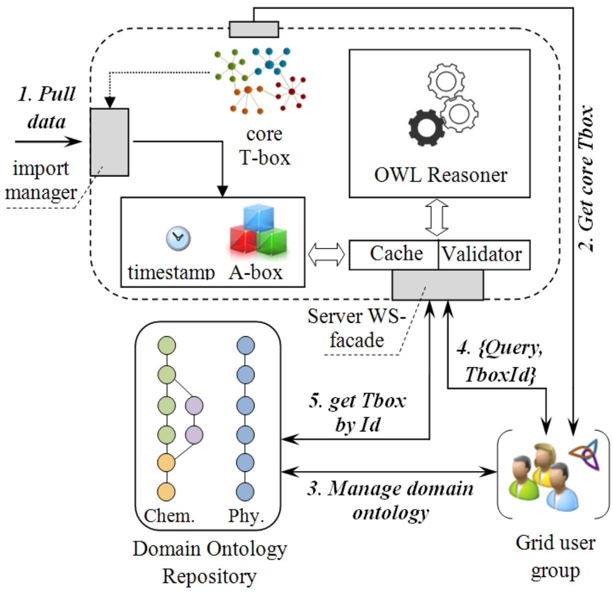

Fig. 1 – Sematic Grid information service architecture

This component is build using distributed revision control system with an emphasis on speed and advanced branching and merging capabilities. For implementation we consider use Mercurial revision control systems [10].

Ontology development is carried out by *Protégé* editor [11] with a plug-in that will interface it with Domain ontology repository.

Users perform resource querying by specifying ontology IDs of their choice that will be retrieved by information service from domain ontology repository, validated and used by OWL reasoner when processing knowledge base.

This way users can perform queries to Grid infrastructure using their terminology they are accustomed to, share it with other users and continue to build-up more and more concepts to fully describe grid environment from their perspective.

It would be possible to define a set of programs and their resource requirements and make search query such as "find all Grid resources that satisfy the requirements of the program X". Or search for resources necessary to perform some specific tasks (i.e. "what resources on the Grid capable of solving my problem X?").

3. CONCLUSION

Application of semantic technology opens up many possibilities and prospects for further improvement of the basic elements of Grid systems, promoting the emergence of new models of user interaction with them. We set a goal for "intellectualization" of key Grid systems to promote it to a larger audience of users that sometimes have difficulties adjusting to way Grid is operated. We also think that semantic technologies will help us scale our systems more easily and allow us to integrate different Grid implementation under umbrella of interlinked ontologies.

A source code of presented prototype is freely available for application and improvement [12].

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