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Abstract

Service-oriented grid is a type of grid environment which makes extensive use of existing and emerging standards from all segments of the Web services community. Ontology, as a knowledge representation tool, can normally be used to semantically represent such type of grid. However, knowledge representation of a grid environment is not an easy task since the concept of grid covers many computing and communication areas. In this paper, we present a new approach to use and organise descriptions of grid entities to represent service-oriented grid environments. The main objectives are 1) to describe an extended service-oriented grid model; 2) to propose a schematic multiplex description architecture for managing individual descriptions to represent complex and different knowledge of grid; and, 3) to demonstrate the implementation of a kernel ontology for high-level representation of service-oriented grids.

Service-Oriented Grid Model

Grid is a vague term, which may be simply described as a kind of infrastructure for resource sharing across different administrative domains. Service-oriented grid is a type of grid environment, which makes extensive use of existing and emerging standards from all segments of the Web services community. In a service-oriented grid, service plays a key role in sharing of distributed resources. In order to capture an abstract view of service-oriented grid, we consider it from two points of view – provisioning and use of services (see Figure 1).

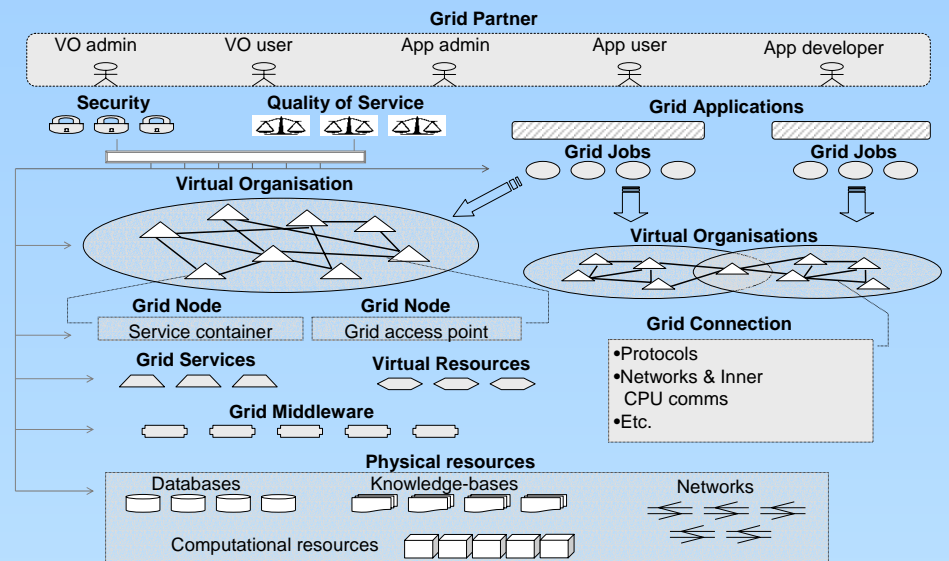


Figure 1. Overview of the Proposed Service-Oriented Grid Model

Schematic Multiplex Description Architecture for Knowledge Representation of Grids

Knowledge representation of an entire grid environment is not an easy task since the concept of grid covers many computing and communication areas. To present such an environment, various description techniques and/or languages may also lead to a heterogeneous description environment. We propose a Schematic Multiplex Description Architecture (SMDA) to support knowledge representation of any grid environments, as shown in Figure 2.

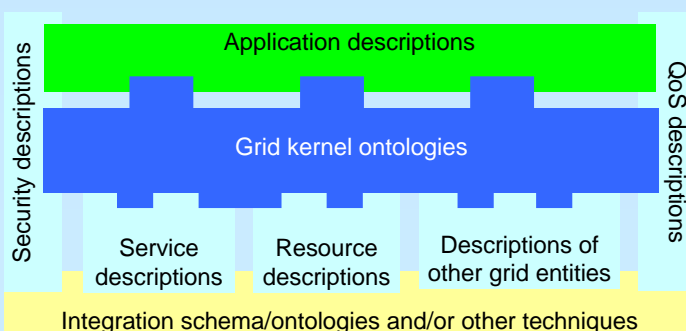


Figure 2. Schematic multiplex description architecture for knowledge representation of grids

Implementation of a Kernel Ontology for Service-Oriented Grids

We have implemented a kernel ontology for service-oriented grids as a proof-of-concept to represent at a high level the semantics for the generic architecture of service-oriented grids. The kernel ontology is expected to link grid sub-domain descriptions to support the knowledge-based coordination between grid components and to maximally reduce the ontology interoperability work in adapting the rapid development of grid technologies. Figure 3 presents the class hierarchy of the kernel ontology.

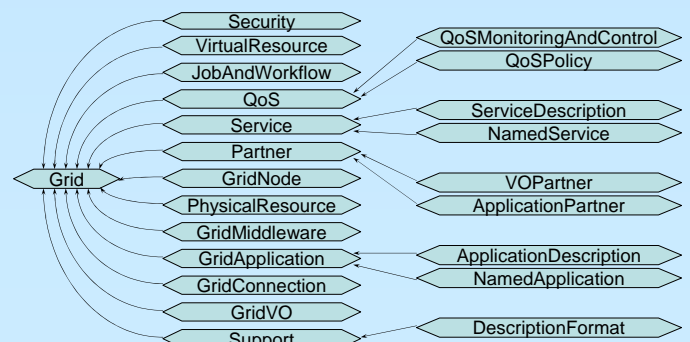


Figure 3. Class hierarchy of the kernel ontology for service-oriented grids