Cluster Computing and Grid 2005 Works in Progress

This is the second in a two-part series () of works-in-progress articles taken from a special session, which was part of the Cluster Computing and Grid 2005 conference (http://www.cs.cf.ac.uk/ccgrid2005), held in Cardiff, UK. The session was organized by Mark Baker (University of Portsmouth, UK) and Daniel S. Katz (Jet Propulsion Laboratory, US). For more information, you can contact the session organizers or the authors of the articles.

Grimoires: A Grid Registry with a Metadata-Oriented Interface

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The Grid is an open distributed system that brings together heterogeneous resources across administrative domains. Grid registries let service providers advertise their services, so users can use these registries to dynamically find available resources. However, existing service registry technologies, such as Universal Description, Discovery, and Integration (UDDI), provide only a partial solution.

First of all, such technologies have limited support for publishing semantic information. In particular, services aren't the only entities that need to be classified—for example, we would also want to define classifications for individual operations or their argument types. Second, only service operators can provide information about services, and in a large and disparate environment, it's impossible for operators to foresee all the information that users might use to find resources. Third, UDDI uses authentication techniques for security that aren't particularly suited for the large-scale nature of Grid systems.

To address these problems, we're developing a registry called Grimoires (http://www.grimoires.org) for the myGrid project (http://www.mygrid.org.uk) and the Open Middleware Infrastructure Institute (OMII, http://www.omii.ac.uk) Grid software release. Figure 2 shows our registry's architecture, which we've implemented as a Web service. It has two major interfaces—UDDI and metadata. The registry is UDDI v2 compliant, and you can access the UDDI interface using any UDDI client, such as UDDI4j (http://www.uddi4j.org). To access the metadata functionalities, you need to use a Grimoires client.
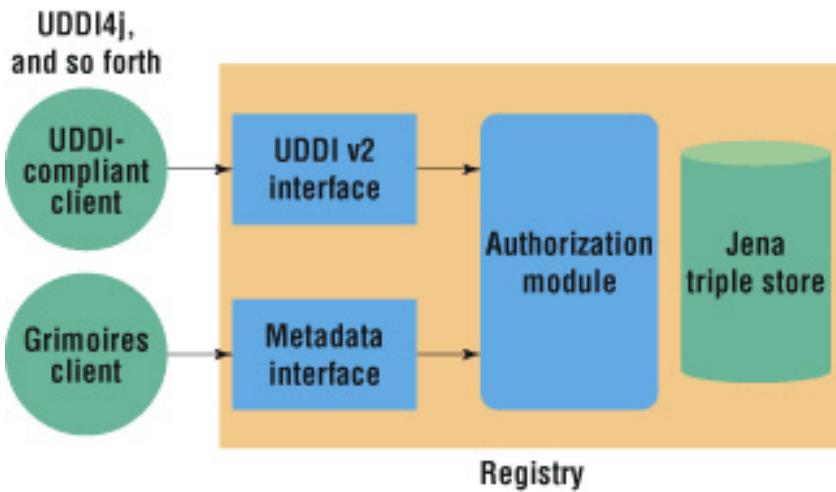
Figure 2. The Grimoires architecture. (UDDI is Universal Description, Discovery, and Integration.)

Our registry has several unique features:

- *Registration of semantic descriptions.* Our registry can publish and inquire over metadata attachments. These attachments are extra pieces of data that provide information about existing entities in the registry. Currently, the registry supports annotations to UDDI BusinessEntity, BusinessService, tModel, and BindingTemplate, and to WSDL (Web Services Description Language) operations and message parts. Thus, using Grimoires, users can annotate BusinessService with service ratings and functionality profiles and attach semantic types of operation arguments to WSDL message parts.
- *Multiple metadata attachments.* Each entity can have an unlimited number of attachments, and each piece of metadata can be updated without republishing the entity or other metadata attached to the same entity. This efficiently captures ephemeral information about services, which changes often.
- *Third party annotations.* Both service operators and third parties can publish metadata, so users with expert knowledge can enrich service descriptions in ways that the original publishers might not have conceived.
- *Inquiry with metadata.* Grimoires supports multiple search patterns. It ranges from simple searches that return a list of metadata attached to the specified entity to more complex searches that return entities that match a certain criteria.
- *Signature-based authentication.* UDDI uses a username and password credential scheme. However, Grid environments typically use certificate-based authentication.

OMII provides an implementation of SOAP message signing and verification that conforms to Web Services security standards. By deploying Grimoires in the OMII container, the registry can authenticate users using X509 certificates. This makes it easier to integrate Grimoires into existing Grid security infrastructures, and it provides an important building block—certificate-based authentication—for the single sign-on capabilities that many Grid applications require.

For more information, please visit www.grimoires.org.

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