DIRAC- A Framework for Coordination and Cooperation

Sanda Mandutianu, Sean Hardman, Chris Mattman

Caltech, Jet Propulsion Laboratory

sanda.mandutianu@jpl.nasa.gov

The Distributed InterRoperable Alaska Communities - DIRAC project enables coordination of organizations involved in building activities in the state of Alaska. The service oriented architecture allows for sharing collections of data and coordinated planning and execution of projects among participating agencies. An initial pilot project has been developed, providing the roadmap to achieve coordination, data and information sharing, and interoperability [1].

The architecture builds upon capabilities from distributed middleware architecture and resource discovery through metadata [2], from process management, and from resource management mechanisms.
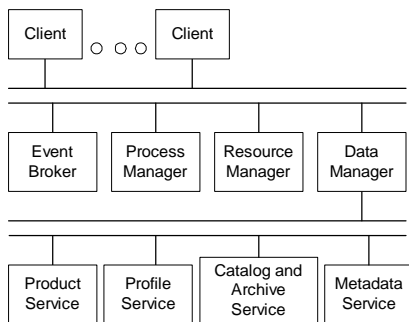

Fig. 1 System Architecture

The services are integrated into a common interoperability framework:

- The Event Broker: matches the requests for services with service providers. It monitors business events, such as time boundaries, changes in business environment, project life cycles or significant occurrences.
- The Process Manager: initiates and monitors business processes. It automates the process management as much as possible.
- The Resource Manager: allocates and maintains distributed resources for business processes.
- The Data Manager: consists of a framework of services [2] that enable the development of data architecture.
  - o Query Service: manages client queries to distributed services.
  - o Profile Service: manages descriptions of resources.
  - o Product Service: manages the interface between disparate data sources and the framework.
  - o Metadata Service: manages a series of registries for data dictionaries, data elements, and resource descriptions.
  - o Catalog and Archive Service: manages an active product storage and retrieval capability.

Resources are defined as definitions of systems, data collections or data items. Data resources are described by profiles that provide their location. The structure of a profile is described using a standard approach [3], [4].

The queries are also defined as structured documents [3]. The resources can be discovered, allocated, deallocated, added or removed. In a distributed environment there is usually no central repository for all resources. Every participant manages none or a limited number of resources. In addition to knowing about its local resources, it also has direct connection to other participants. If it needs a resource that is not under its direct management, it sends a request to its peers.

This architecture does not represent an effort to integrate all existing services via top-down control. The goal is to provide a bottom-up framework and tools to make these components integrate on whatever scale is appropriate for user needs. At the simplest level, it provides a means to align the data providers to common data standards, with the least intrusion to their own methods and means of representing data. At a higher end, it enables the coordination of local autonomous business processes.

References

1. DIRAC Pilot Project, Sanda Mandutianu, Sean Hardman, Chris Mattman, http://dirac.jpl.nasa.gov
2. OODT- Object oriented Data Technology, http://oodt.jpl.nasa.gov/
3. Dublin Core Element Set 1.1, "Dublin Core Metadata Element Set, Version 1.1: Reference Description", 2 July 1999. [http://www.dublincore.org/]
4. XML 1.0, "Extensible Markup Language (XML) 1.0 (Second Edition)," W3C Recommendation, 6 October 2000. [http://www.w3c.org/XML/]