SERVO Earthquake Science Grid

SERVOGrid (http://www.servogrid.org) is a project led by JPL and involving Brown University, Indiana University, UC Davis and Irvine and the University of Southern California. It is a prototype for a future international project iSERVO – the International Solid Earth Research Virtual Observatory – linking Australia, China, Japan and the USA.

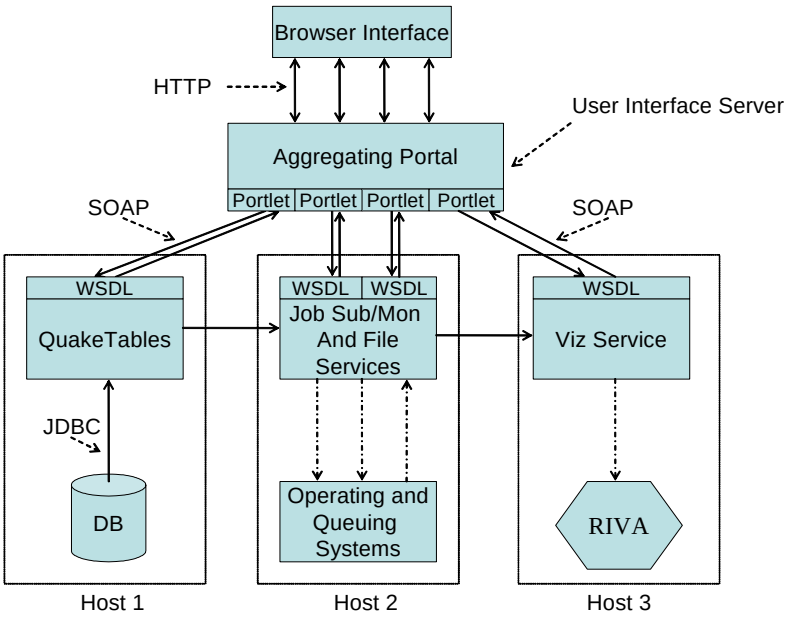

Figure 1 SERVO Grid is built using component-based portals and Web Services. This shows a job submission and management service linked to data service (Fault database Quaketables) and a visualization service. The user interfaces to this set of Grid Services is provided by an aggregation portal whose portlet architecture supports a component model of user interfaces illustrated in fig. 2.

The architecture of SERVOGrid is shown in fig. 1 and it is built in terms of the Web Service Grid architecture described in http://www.nesc.ac.uk/technical_papers/UKeS-2004-05.pdf. SERVOGrid offers services that support simulation codes wrapped as services, job submission and monitoring, file management, workflow (or the composition of multiple services), databases and GML (Geography Markup Language) based observations. Initial application codes wrapped as services include mesh generation, data-mining and a variety of simulation codes including Virtual California from UC Davis, GEOFEST from JPL and Finley from the University of Queensland in Australia. SERVOGrid is architected as a Grid of Grids with component Grids supporting data, job execution, visualization and Geographical Information services (GIS). A data transport layer supports fault tolerant high performance streaming compatible with Web Service standards such as SOAP and reliable messaging. The OGC (Open Geospatial Consortium) Web Feature and Map services have been prototyped and will be extended to a full GIS Grid. An ontology layer allows intelligent linkage of services with a Semantic Grid architecture.

We have used the OGCE (Open Grid Computing Environment) collaboration approach to build portlet-based user interfaces integrating Grid services from several different sources.

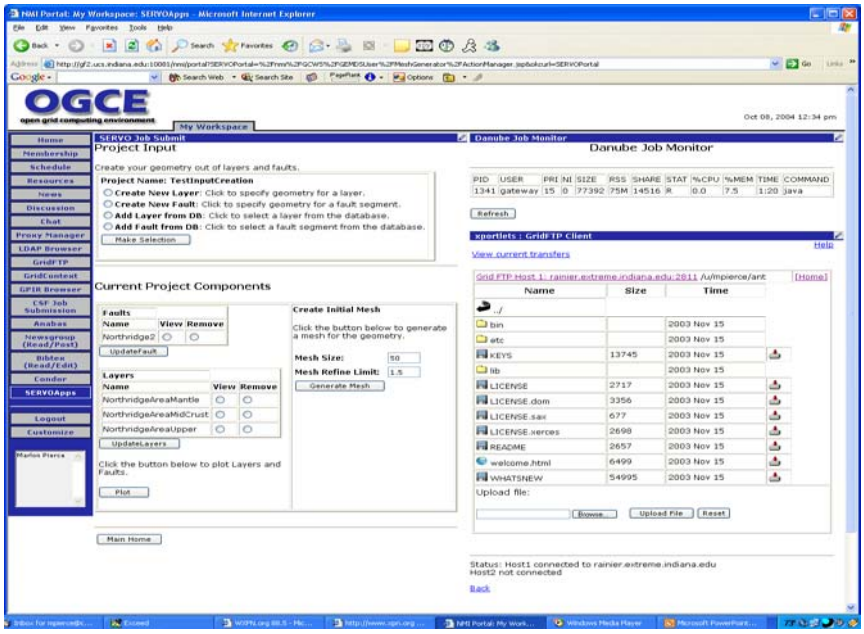

Figure 2 A component-based portal can include Grid, Web Service and collaboration features from several sources.

Web Service systems have an important design feature: services are decoupled from the user interface components. This enables us to build (in principal) a number of different user environments that can interact with the same remote service, including command line shells, graphical desktops, and web portals. Browser-based computing portals are typical of this sort of user interface and have been the subject of research and development work for a number of years. Currently this field is undergoing a revolution as component-based portal systems are being widely adopted. Standard portlet component programming interfaces are now being used by both corporate and open-source developers.

This portlet approach enables reusability of components: portals may be built out of standard parts that aggregate content and functionality from many different sources. Figure 2 shows a portlet based browser portal system. Portlets developed for SERVOGrid (job submit on left and job monitor on upper right) are combined with a generic GridFTP portlet contributed from the Open Grid Computing Environments (OGCE) Collaboratory. The left menu bar shows several more OGCE portlets for Grid and collaboration tasks. The portlet and modular Web Service Grid architecture allows SERVOGrid to be configured to support education, research or emergency planning and response.

The iSERVO extension raises important issues for security and access control and will require international agreement in areas such as the needed services and their interfaces and granularity. Although the SERVOGrid architecture is very general, we will initially customize the portal and services to a beginning set of motivating important applications.