Eldas (Enterprise Level Data Access Services)

Edikt, National e-Science Centre
University of Edinburgh, Edinburgh, U.K.

In January 2004, Edikt released version 1.0 of Eldas: Enterprise Level Data Access Services. Eldas enables users to access distributed data resources by using a Web Service or Grid Service interface. The importance of such flexibility is revealed due to the evolution of the Web Service Resource Framework (WSRF) specifications. The decoupling of Eldas’ interfaces from its underlying functionality means that migrating between the different specifications is a trivial task. Eldas software is of commercial quality: it is robust, easy to deploy and well documented.

In this paper, we discuss the modular and extensible design of Eldas, and how version 1.0 of our software has been implemented. We finish with an overview of the functionality to be included in future releases of Eldas.

Design Issues and Considerations

The design of Eldas has been based on well documented and used design patterns and Java 2 Enterprise Edition (J2EE) methodologies. The following requirements have driven the design of our software:

Ease of Use: Developing data access services adhering to OGSI specifications is a complex and error-prone task. The Eldas team realised from the outset that software users are much more likely to adopt our software if it is easy to setup, deploy and use.

Robustness: Edikt believed that adopting design patterns and adhering to J2EE methodologies would make Eldas robust and easy to maintain software of high quality.

Extensibility: One of the motivating factors behind Eldas is to provide the eScience community with enhanced data access services, for example to integrate federated databases used by astronomers. Enhanced data services would be facilitated by careful consideration of our architecture and producing a modular design.

Machine Independence: To ensure machine independence, Eldas has been developed using J2EE, where the services themselves are implemented using Enterprise Java Beans. Using Java, Eldas will be supported on Windows XP, Solaris and Linux.

Interface Independence: Although Web Services and Grid Services differ in various aspects, Edikt has always considered the most significant difference to be that Grid Services have state and lifetime. Hence, using Java, a grid proxy is implemented to provide grid-based access to Eldas, and a web interface is implemented to provide web-based access to that same Eldas service. In more general terms, our software architecture allows us to separate our business logic from the interfaces used to invoke these services. It is relatively trivial for Eldas to include support for Grid Services, Web Services or indeed other interfaces. This is particularly prescient given the migration of the OGSI specifications to Web Service Resource Framework (WSRF), as supporting the new specifications requires minimal revisions to Eldas’ presentation layer without disrupting our core functionality. Decoupling Eldas’ business functionality from its interface makes Eldas attractive to both the Grid and Web Service communities.

Multiple Data Access: Research scientists and industry use different database management systems and file systems to store their data. To support a broad range of database types, our design isolates database-specific code into single component, which leaves a reusable Eldas core that is common to whichever data the user needs to access.
Eldas 1.0 Implementation

The Eldas design and implementation addresses the above requirements. Eldas 1.0 includes all core server functionality, extensive documentation and deployment tools. We also provide client command line interfaces (CLI) and a graphical user interface (GUI). Eldas Grid Services are facilitated by using the Globus Toolkit 3 framework. Eldas 1.0 runs in the JBoss application server (AS) and supports connection to MySQL databases. Eldas, MySQL and JBoss are all free to download and use. We now detail the implemented features.

Easy of Use: Eldas 1.0 comes as two separate, downloadable Java Archive (JAR) files: one for the server and one for the clients. These JAR files are self-extracting, executables, removing the need for any third party, operating system specific extraction tools. Deploying the server and installing the clients simply involves a few button-clicks of the associated GUI, instigating automated tasks, allowing for a straightforward deployment process.

Robust: Using design patterns and J2EE methodologies, coupled with a strong software production infrastructure, has allowed us to maintain software quality and robustness throughout the product life-cycle.

Extensible: Eldas 1.0 core functionality has been carefully designed to be readily extensible by using J2EE layering principles. For example, to migrate from the Globus Toolkit 3 will require Edikt to modify one Java component.

Machine Independent: Eldas is Java based and as such should run on any OS which supports Java. Specifically, we have tested Eldas 1.0 server and clients extensively and support Eldas on Windows XP, Solaris and Linux.

Interface Independent: Eldas 1.0 is accessible via both a Grid Service and Web Service interface, the former as a result of building on Globus Toolkit 3. As indicated earlier, however, it is a simple task for Eldas to support invocation of services using other interfaces for example when migrating from OGSI to WSRF.

Multiple Data Access: Database connectivity has been implemented in one component. Therefore support for other data resources can be extended easily in future Eldas releases. Eldas 1.0 supports MySQL.

User Interfaces: A number of user interfaces are available with the Eldas Client distribution. There are command line interfaces for both Grid and Web Services, and a graphical Query Tool for Grid Services. The Grid Service clients support both bulk return and streaming of results. The Eldas Query Tool is very simple to use, and we have included source files for our CLI as examples of how easily the user can create their own.

Eldas 1.0+ Functionality

There are plans to significantly extend Eldas functionality in future releases. This additional functionality will be driven by our users’ requirements. Naturally we will endeavour to improve the documentation, performance, robustness and ease of use. The following highlights some of the additional functionality to be included in Eldas 1.1 and beyond.

Interfaces: We are closely following the evolution of the WSRF specification. As stated previously, Eldas will be able to modify its interfaces with ease to match any new specifications.

Data Resources: Eldas presently supports MySQL. There are immediate plans to extend our support to IBM’s DB2 and Microsoft’s SQLServer. Other data resources will be supported as our users require them.
Application Servers: Eldas can currently be deployed in JBoss. Work is underway to support deployment of Eldas in both IBM WebSphere and SunONE application servers.

Operating Systems: Depending on user demand, we will consider extending support to additional operating systems, such as Mac OS X.

Flat Files and Binary Files: There are immediate plans to support flat file access. In addition, there are plans to support binary file access using BinX, also distributed by Edikt.

Stored Database Procedures: Users have already requested this additional database functionality; this will be available in Eldas 1.1.

Security: Presently our security is delegated to the database and application server. Enhanced security using HTTPS and SSL will be provided in future releases.

Streaming Web Services: We are investigating a favourable model which will allow Eldas to stream results via a Web Service interface. This may well take the form of a lightweight version of stateful, dynamic Web Services.

Eldas Query Tool: We are in the process of deciding how much to extend the Eldas Query Tool. This will largely be driven by user feedback: whether or not there is sufficient demand, or would our users rather write their own clients.

Data Transport: This will be a major functional addition, for example using GridFTP.

Joins: We are designing enhanced data services to enable complex, large scale joins between distributed databases.

Distribution

Eldas 1.0 Server and Client distributions can be downloaded from http://www.edikt.org/eldas.