

# Virtual Research Environments and e-Social Science

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## Extended Abstract

Staff at the Universities of Lancaster, Oxford, Portsmouth, and Daresbury Laboratory (CCLRC), are working together on the technical implementation of Virtual Research Environments, [1]. This work forms part of the JISC funded Virtual Research Environments Programme, [2]. JISC notes:

“The purpose of a VRE is to help researchers in all disciplines manage the increasingly complex range of tasks involved in carrying out research. A VRE will provide a framework of resources to support the underlying processes of research on both small and large scales, particularly for those disciplines which are not well catered for by the current infrastructure”.

The JISC VRE Roadmap document stresses the use of a Service Oriented Architecture (SOA) approach to VRE provision. This implies that we need to make framework extensions that will accommodate emerging authentication and authorisation systems and SOAP-based interaction with remote services such as Web services based on WS-I and WS-RF standards, as well as content and service aggregation based on WSRP standards and peer-to-peer technologies. This approach will create an adaptable and extendable “plug and play” framework, that overcomes the potential bottleneck associated with the usual monolithic method of portal deployment.

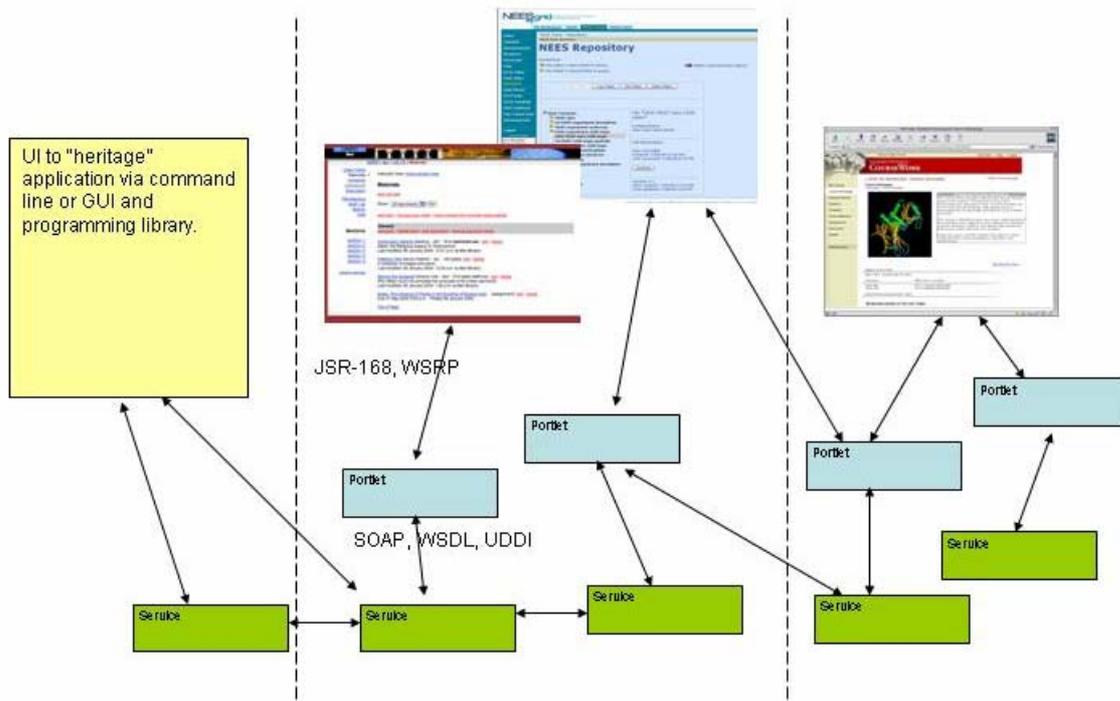


Figure 1 Clients and distributed services

Figure 1 shows how clients (researchers) and distributed services can be linked together using software based on emerging standards.

Our choice of Sakai [3] as a hosting framework for various Grid enabled research tools and services follows a technical survey by Allan et al. [4] and conclusions from the international *Portals and Portlets 2003* workshop held at NeSC 14-17<sup>th</sup> July 2003 [5]. The Sakai Project arose from a group of developers at several major research and teaching institutions in the USA, (Michigan, Indiana, MIT and Stanford) and activities of the Grid Computing Environments research group of GGF. The institutions named are working with the uPortal developers with additional funding from the Mellon and Hewlett Foundations.

Sakai plans to be WSRP and JSR-168 compliant by the summer of 2005, making it ideal as a hosting framework for the plugging in service-based tools. Some of the VRE tools and Grid services we want to expose are UK adaptations of those directly available from Sakai and OGCE [6]. The e-Collaborative tools that come with Sakai such as, calendar, discussion, chat, resource pages and work-group allocation, which have already proved to be equally applicable in research and development activities.

In the USA, several large multi-partner science projects, such as the National Earthquake Simulation Grid and the Collaboratory for Multi-Scale Chemistry Simulations, have already adopted CHEF, the precursor of Sakai, as a VRE. For users, the Sakai portal looks like a familiar Web site, with a typical menu on the left hand side which takes the user to different tools and resources, and tabs at the top linked to different project areas. Researchers, who normally use point-and-click GUI packages and Web sites such as Google for their work, will find the transition from these to Sakai easy to handle.

At CCLRC Daresbury the same portal technology is being deployed for other purposes, supporting projects like e-HTPX, e-Minerals and e-Materials and developing HPCPortal v3.0 for the National Grid Service (NGS).

The social sciences are not yet clear what e-Science tools they need, their requirements are being elucidated by a series of Agenda Setting Workshops. These tools will differ depending on the type of research being undertaken. For instance, the VRE tools that could be developed to support the research processes of a quantitative social scientist might include functionality such as:

- Provide seamless access to many archived data sets, like those used in social research publications and suggest on the most appropriate data for their research needs;
- Re-estimate models from other researchers on these data sets, and explore the consequences of dropping or adding new variables to the analysis;
- Quickly formulate (check the identification etc) and estimate any new models or combinations of existing models that might be relevant and if so required across multiple datasets;
- Match our research questions to information held in existing digital resources. Searching for new explanations;
- Integrate multiple sources of data and text to help fill in missing data and ideas.

The tools to be able to achieve this are a long way off. However researchers today need to provide the flavour of the kind of research tools and activities becoming available in five or so years time. This will help in finding the resources and drive to fully develop the appropriate tools and services. A portal framework such as Sakai can be effective in bringing together a set of interfaces to existing tools with a common “look and feel”.

The VRE tools we are working on as part of our JISC-funded demonstrator project include:

- **Search Tools:** Context-based Information Retrieval, Collection Cross search, Google Web service interface, Application Discovery, Scientific Data Query, UDDI tools as appropriate.
- **Collaboration/ Discussion:** IRC (Internet Relay Chat), Blog, Research Scheduler, Video Conferencing, Distributed Whiteboard, Distributed Display.
- **Analysis Tools:** Scientific Calculator, Active Spreadsheet, Statistical Computing, Data Management, Simple Visualisation, Grid Information, Network Information, Grid computing.
- **Publication/ Documentation:** Word Processor, Distributed Presentation Tool, Bibliography Builder, XHTML Editor, Latex Processor, Simple Interactive Plotting, Project Publication, Application Publishing.
- **Others:** Portal Statistics, Personal Information Manager, Shopping Cart, Bugzilla, CVS, Authorisation Policy Management.
- **Training and Awareness:** Research Assistant and Personal Information Guide (PIG), CopperCore Tool, Tool Templates, Documentation Manager, Helpdesk interface.
- **Security Tools:** Digital Certificate management, MyProxy server upload and download, Shibboleth server interface, PERMIS authorization policy management tool, Encryption tool for collaboration services.

None of the learning assessment or grading activities that come with Sakai will be deployed, but course content management may be.

As an example of a tool specifically designed for Social e-Scientists, our VRE will deploy a Resource Discovery Tool [7], which will assist authors of e-Research tutorials in producing materials (Learning Design/ Content sequencing). This Resource Discovery Tool will integrate three components: LDCue; RELOAD and Coppercore. The LDCue tool being developed at Lancaster will provide a list of potentially suitable learning object URIs, as a function of the metadata provided (based on IMS and Dublin Core). LDCue will be designed to work alongside an authoring tool such as RELOAD, developed with JISC funding at Bolton Institute and University of Strathclyde. The RELOAD tool is an IMS Learning Desing (IMSLD) authoring tool (see <http://www.reload.ac.uk/> ) which facilitates the creation of learning objects, in the form of IMSLD scripts. RELOAD produces an XML file. Users of the material can play back the scripts in CopperCore (<http://coppercore.org> ).

The project's firm intention is to release early and release often to the community, with the aim of having a new tool available in every release. To accomplish this, we will seek widespread community input to expose existing tools and services as SOAP based Web services for use within the VRE. There will be a permanently-available demonstrator at <http://redress.lancs.ac.uk:8080/portal> under "VRE Demonstrator" which will have increasingly complex functionality as the project reaches maturity.

In the first part of our presentation, we describe our application areas as well as our original motivation for taking up portal technologies; this part of the paper also includes a description of the hurdles we need to jump. We then move on to describe a range of emerging portlet toolkits, standards and services and outline how these can be used to fulfill some of the needs of e-Social Science. In the next part we detail our experiences using these emerging technologies; here we also provide examples and discuss implemented services and what else is needed, such as a Web service front to the Economic and Social Data Service [9]. In the final part we draw a number of conclusions about using Sakai and other VRE frameworks to deliver e-Research in the Social Sciences and outline our future work plans.

## **References**

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