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RapidSeis: Enabling User-Defined Seismological Waveform Data Processing over the Grid

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The objective of this JISC-funded pilot project was to remove perceived barriers to uptake of an application that performs analysis of seismic waveform data. The aim was to provide the seismological community with a simplified system that overcame important barriers such as installation and understanding of the analysis package, location and transfer of large amounts of input data and visualisation of results.

The project combined the expertise of three distinct teams. The Orfeus Data Centre provided discovery services and access management to distributed earthquake waveform data and metadata, supported by technologies such as webservices, SPARQL/RDF and a JSR-168 portal framework based on the WSRP portlet architecture. Analysis and visualisation of the waveform data were performed by SDX (Seismic Data eXplorer) developed at the University of Liverpool. SDX formed the core processing engine - this application's functionality can be extended via user-defined algorithms coded as plugins. The processing engine was supported by several webservice-enabled modules used for data and plugin exchange. The user, data and processing infrastructure were connected using the Rapid framework created by the UK National e-Science Centre. Rapid generates intuitive interfaces to the processing core in the form of two self-contained JSR-168 remote portlets. One portlet facilitated plugin creation, whilst the other allowed execution of plugin code within the processing core running on a campus or national Grid infrastructure. The RapidSeis system was deployed within a community gateway: the NERIES web portal.

Although RapidSeis originated within the seismological community we suggest it forms a framework which could be exploited in different domains or scientific gateways where users can discover data, store data within a cart and wish to apply specialised processing algorithms remotely through a web browser. Processing performed on Grid infrastructure is completely transparent: the execution portlet handles submission and scheduling. The processing algorithms can be created online, stored and shared between users of the community web portal. The data and algorithm metadata are described in RDF and exchanged within the architecture which is commonly geographically distributed.

Further investigation is required to improve the provenance metadata to enable better traceability of both data and processing activities. The API used by the plugin code also requires additional development and the user-interface could be made even more intuitive with further modification of the Rapid framework.