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EarthServer – an FP7 project to enable the web delivery and analysis of 3D/4D models

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EarthServer aims at open access and ad-hoc analytics on big Earth Science data, based on the OGC geoservice standards Web Coverage Service (WCS) and Web Coverage Processing Service (WCPS). The WCS model defines "coverages" as a unifying paradigm for multi-dimensional raster data, point clouds, meshes, etc., thereby addressing a wide range of Earth Science data including 3D/4D models. WCPS allows declarative SQL-style queries on coverages. The project is developing a pilot implementing these standards, and will also investigate the use of GeoSciML to describe coverages. Integration of WCPS with XQuery will in turn allow coverages to be queried in combination with their metadata and GeoSciML description. The unified service will support navigation, extraction, aggregation, and ad-hoc analysis on coverage data from SQL. Clients will range from mobile devices to high-end immersive virtual reality, and will enable 3D model visualisation using web browser technology coupled with developing web standards. EarthServer is establishing open-source client and server technology intended to be scalable to Petabyte/Exabyte volumes, based on distributed processing, supercomputing, and cloud virtualization. Implementation will be based on the existing rasdaman server technology developed.

Services using rasdaman technology are being installed serving the atmospheric, oceanographic, geological, cryospheric, planetary and general earth observation communities. The geology service (http://earthserver.bgs.ac.uk/) is being provided by BGS and at present includes satellite imagery, superficial thickness data, onshore DTMs and 3D models for the Glasgow area. It is intended to extend the data sets available to include 3D voxel models. Use of the WCPS standard allows queries to be constructed against single or multiple coverages. For example on a single coverage data for a particular area can be selected or data with a particular range of pixel values. Queries on multiple surfaces can be constructed to calculate, for example, the thickness between two surfaces in a 3D model or the depth from ground surface to the top of a particular geologic unit. In the first version of the service a simple interface showing some example queries has been implemented in order to show the potential of the technologies.

The project aims to develop the services available in light of user feedback, both in terms of the data available, the functionality and the interface. User feedback on the services guides the software and standards development aspects of the project, leading to enhanced versions of the software which will be implemented in upgraded versions of the services during the lifetime of the project.