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EarthServer: Use of Rasdaman as a data store for use in visualisation of complex EO data

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The European Commission FP7 project EarthServer is establishing open access and ad-hoc analytics on extreme-size Earth Science data, based on and extending cutting-edge Array Database technology. EarthServer is built around the Rasdaman Raster Data Manager which extends standard relational database systems with the ability to store and retrieve multi-dimensional raster data of unlimited size through an SQL style query language.

Rasdaman facilitates visualisation of data by providing several Open Geospatial Consortium (OGC) standard interfaces through its web services wrapper, Petascope. These include the well established standards, Web Coverage Service (WCS) and Web Map Service (WMS) as well as the emerging standard, Web Coverage Processing Service (WCPS). The WCPS standard allows the running of ad-hoc queries on the data stored within Rasdaman, creating an infrastructure where users are not restricted by bandwidth when manipulating or querying huge datasets.

Here we will show that the use of EarthServer technologies and infrastructure allows access and visualisation of massive scale data through a web client with only marginal bandwidth use as opposed to the current mechanism of copying huge amounts of data to create visualisations locally. For example if a user wanted to generate a plot of global average chlorophyll for a complete decade time series they would only have to download the result instead of Terabytes of data.

Firstly we will present a brief overview of the capabilities of Rasdaman and the WCPS query language to introduce the ways in which it is used in a visualisation tool chain. We will show that there are several ways in which WCPS can be utilised to create both standard and novel web based visualisations. An example of a standard visualisation is the production of traditional 2d plots, allowing users the ability to plot data products easily. However, the query language allows the creation of novel/custom products, which can then immediately be plotted with the same system. For more complex multi-spectral data, WCPS allows the user to explore novel combinations of bands in standard band-ratio algorithms through a web browser with dynamic updating of the resultant image. To visualise very large datasets Rasdaman has the capability to dynamically scale a dataset or query result so that it can be appraised quickly for use in later unscaled queries. All of these techniques are accessible through a web based GIS interface increasing the number of potential users of the system.

Lastly we will show the advances in dynamic web based 3D visualisations being explored within the EarthServer project. By utilising the emerging declarative 3D web standard X3DOM as a tool to visualise the results of WCPS queries we introduce several possible benefits, including quick appraisal of data for outliers or anomalous data points and visualisation of the uncertainty of data alongside the actual data values.