www.earthserver.eu

EarthServer

Big Earth Data Analytics

Mission: to establish standards-based ad-hoc analytics for Earth science data
- directly manipulate, analyze, & remix any-size geospatial data
- scalable to Petabyte/Exabyte volumes

Approach: integrated query language for all spatio-temporal coverage data
- nD vector + raster + meta data & beyond: image time series, point clouds, trajectories, meshes, (iso) surfaces, solids, TINs, and more
- Server: extending pre-existing *rasdaman* array database
- Clients: from smart phone to immersive virtual reality

Goal: to advance OGC standards-based coverage technology
- OGC Web Coverage Service (WCS) + OGC Web Coverage Processing Service (WCPS) + W3C XQuery

rasdaman raster data manager

OGC™ Open Geospatial Consortium, Inc.

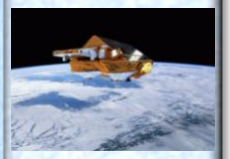
Project brief:

Title: EarthServer - *European Scalable Earth Science Service Environment*

Start date: Sep 1, 2011
Duration: 36 months

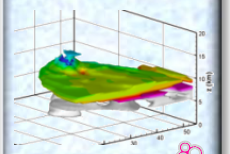
Budget: 5.85 m€
EU Grant: 4.00 m€

Cryospheric Science *landcover mapping*



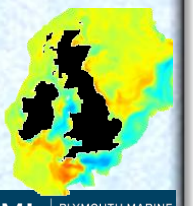
Airborne Science *high-altitude long-endurance drones*

Atmospheric Science *climate variables*

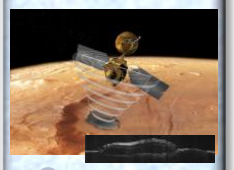


Geology *geological models*

Oceanography *marine model runs + in-situ data*



Planetary Science *Mars geology*



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Operational Services for the Earth Science Community
- 1D to 5D data sets (x/y/z/t plus "abstract" dimensions), each 20+ TB
- Ad-hoc filtering and processing, including automated distributed fusion
- front-end to existing archives - no new repositories needed

Main Innovation
- Integrated coverage, feature, and metadata queries, including all OGC coverage types
- Transparent queries over heterogeneous file archives and databases
- Paving the way for Petabyte services: cloud distribution, parallelization, supercomputers
- Comprehensive OGC standards support for coverage data and services

Partners

Jacobs University, EOX, rasdaman raster data manager, British Geological Survey, CPOM, NASA, PML Plymouth Marine Laboratory, MEEO Meteorological Environmental Earth Observation, Consiglio Nazionale delle Ricerche, Fraunhofer

Advisory board: OGC, ESA, IEEE

e-infrastructure

SEVENTH FRAMEWORK PROGRAMME

EU FP7-INFRA project 283610

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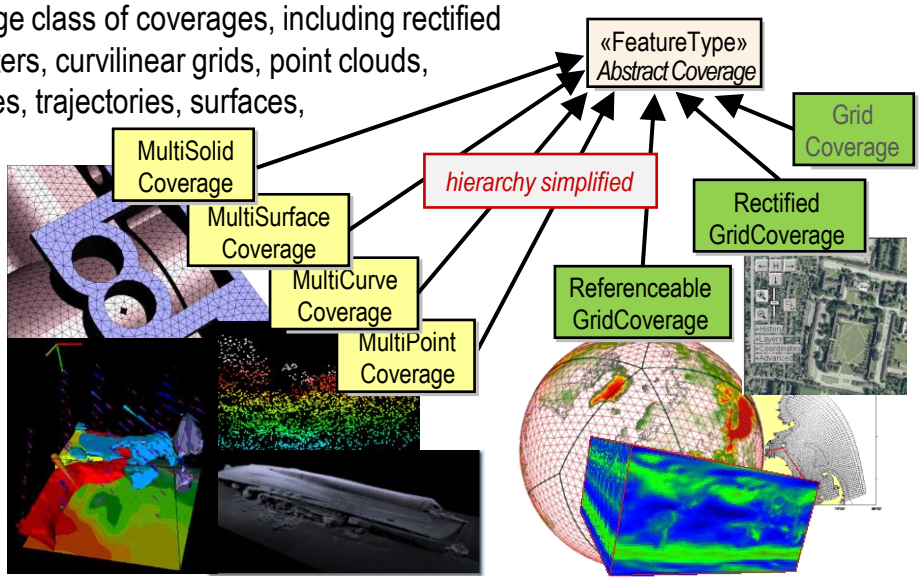
OGC Standards:

-The Coverage Data Model

A Unifying Exchange and Service Paradigm

ISO 19123 defines coverages, simplifying, as a “space-time varying phenomenon”. This abstract definition, which is too high-level to define interoperability concisely, is refined by the OGC GML 3.2.1 Application Schema for Coverages [OGC 09-14r1] to an interoperable re-presentation of a large class of coverages, including rectified and non-rectified rasters, curvilinear grids, point clouds, TINs, general meshes, trajectories, surfaces, and solids, as illustrated in the figure to the right.



EarthServer contribution

In EarthServer, high-performance, scalable database support will be established for the GML coverage types.

-The Coverage Service Model

Server-side processing capabilities are of steadily growing importance for geo services. Quality of service can be distinctly improved when shifting from a paradigm of data stewardship to service stewardship. This in particular as the sheer amount of data increasingly prohibits a simple “data shipping” from the server for client-side processing.

The OGC Web Coverage Processing Service (WCPS) standard [OGC 08-068r2] resembles a high-level, declarative query language on nD spatio-temporal geo raster data of unlimited volume. As such, it defines syntax and sem-antics for ad-hoc search, extraction, aggregation, and analysis of coverages containing multi-dimensional sensor, image, or statistics data.

The following example shows the flavor of the WCPS language, see [Baumann, Geoinform-atica 2009] for an extensive discussion of concepts, expressive power, and design decisions. The query is "*From MODIS scenes M1, M2, and M3, the absolute of the difference between red & nir, in HDF-EOS - but only those where nir exceeds 127 somewhere inside region R*”:

```
for $c in ( M1, M2, M3 ),
    $r in ( R )
where some( $c.nir > 127 and $r )
return encode( abs( $c.red - $c.nir ), "hdf-eos" )
```

EarthServer contribution

In EarthServer, WCPS will be extended to the new coverage model and integrated with XQuery.