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Tools and Applications in enviroGRIDS Project for Spatial Data Processing of Black Sea Catchment Basin

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Overview

EnviroGRIDS (Black Sea Catchment Observation and Assessment System supporting Sustainable Development) [1], is a 4-years FP7 Project aiming to address the subjects of ecologically unsustainable development and inadequate resource management. The project develops a Spatial Data Infrastructure of the Black Sea Catchment region. The geospatial technologies offer very specialized functionality for Earth Science oriented applications as well as the Grid oriented technology that is able to support distributed and parallel processing. One challenge of the enviroGRIDS project is the interoperability between geospatial and Grid infrastructures. The enviroGRIDS system resources are accessible to the large community of users through the BSC-OS Portal that provides Web applications for data management, hydrologic models calibration and execution, satellite image processing, report generation and visualization, and virtual training center.

Impact

The BSC-OS Portal provides a set of tools and applications to the users interested in environmental studies and predictions. The regular users visualize the reports generated by the specialists as results of executing environmental scenarios. The input materials for the reports are built up by the specialists by running hydrological models of the Black Sea catchment area and by processing related satellite data. All data sets required for building up the hydrological models, environmental scenarios, and spatial models are provided and entered into the system by the data providers.

EnviroGRIDS functionality gathers services provided by various technologies such as SWAT related modules [2], Collaborative Working Environment (CWE) [3], Uniform Resource Management (URM) [4], gProcess and ESIP Platforms [5], and experience on other research projects like GiSHEO, SEE-GRID-SCI, and EGEE.

EnviroGRID system is developed on the gLite middleware available on EGEE, SEE-GRID and enviroGRIDS VO infrastructures.

Main references for further information:
[1] enviroGRIDS Project, http://www.envirogrids.net/
[2] Soil and Water Assessment Tool, Official SWAT Web site, http://www.brc.tamus.edu/swat/index.html
[3] Manca S., Soru C., Cau P., Meloni G., Fiori M., A multi model and multiscale, GIS oriented Web framework based on the SWAT model to face issues of water and soil resource vulnerability. Presentation at the 5th International SWAT Conference, August 3-7, 2009
[4] Karel Charvat, Stepan Kafka, Marek Splichal, Maris Alberts, Andra.Martinsone, Petr Horak, Martin Vlk, Peteris Bruins, URM Concept for Sharing Information Inside of Communities, WCCA 2008, Tokyo
[5] Gorgan D., Bacu B., Rodila D., Pop P., Petcu D., Experiments on ESIP - Environment Oriented Satellite

Data Processing Platform, in Earth Science Informatics Journal, Springer, Vol.3/4, ISSN: 1865-0473, pp. 297-308, (2010).

Description of the work

The portal publishes through the Web applications the geospatial functionality and the high power computation supported by the Grid technologies. The portal consists of a set of Web applications through which the users access the system resources such as spatial data, hydrologic models, environmental scenarios, data processing tools, visualization facilities, environmental reports, and training materials. There are five categories of users such as data providers, earth science specialists, decision makers, citizens, and system administrators.

The main user application categories provided by the portal are: Data management –provides the user with spatial data management and operations. The user may enter data and metadata, visualize, modify, update, and remove spatial data from the data repositories; Hydrologic model management –provides the Earth Science specialists with hydrologic model configuration, scenario and model development, model calibration and scenario running. One of the water quality models that are used is SWAT (Soil Water Assessment Tool) [2]. SWAT is a model designed to estimate impacts of land management practices on water quantity and quality in complex watersheds; Satellite data processing –the specialist may process satellite data and images in order to search for relevant information (e.g. land cover, vegetation, water, soil composition, etc); Data visualization and report –the specialists visualize various spatial data in different formats and views and compose environmental reports for decision makers and citizens; Decision maker and citizen applications –provide the decision makers with the interactive and graphical tools to access the private environmental reports. The user may visualize data that make possible statistical analyses and predictions; Virtual Training Center –supports the development of Earth Science oriented training materials based on the Grid processing.

URL

enviroGRIDS Project, http://www.envirogrids.net/

Conclusions

The demonstrations mainly concern on the features and usability of the tools and applications highlighting environmental scenarios. They reveal the issues and the experiments on interoperability between geospatial and Grid platforms in order to support high power computation requirement applications. The SWAT model covers the huge area of the Black Sea Catchment region. It is a very complex model that requires the high performance resources of the Grid.

The experiments have revealed the potential of the Grid related technologies. New user interaction techniques and platform interoperability are the main directions of the future research work.

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