Web mapping system for complex processing and visualization of environmental geospatial datasets

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Environmental geospatial datasets (meteorological observations, modeling and reanalysis results, etc.) are used in numerous research applications. Due to a number of objective reasons such as inherent heterogeneity of environmental datasets, big dataset volume, complexity of data models used, syntactic and semantic differences that complicate creation and use of unified terminology, the development of environmental geodata access, processing and visualization services as well as client applications turns out to be quite a sophisticated task.

According to general INSPIRE requirements to data visualization geoportal web applications have to provide such standard functionality as data overview, image navigation, scrolling, scaling and graphical overlay, displaying map legends and corresponding metadata information. It should be noted that modern web mapping systems as integrated geoportal applications are developed based on the SOA and might be considered as complexes of interconnected software tools for working with geospatial data. In the report a complex web mapping system including GIS web client and corresponding OGC services for working with geospatial (NetCDF, PostGIS) dataset archive is presented. There are three basic tiers of the GIS web client in it:

1. Tier of geospatial metadata retrieved from central MySQL repository and represented in JSON format

2. Tier of JavaScript objects implementing methods handling:

— NetCDF metadata

— Task XML object for configuring user calculations, input and output formats

— OGC WMS/WFS cartographical services

3. Graphical user interface (GUI) tier representing JavaScript objects realizing web application business logic

Metadata tier consists of a number of JSON objects containing technical information describing geospatial datasets (such as spatio-temporal resolution, meteorological parameters, valid processing methods, etc).

The middleware tier of JavaScript objects implementing methods for handling geospatial metadata, task XML object, and WMS/WFS cartographical services interconnects metadata and GUI tiers. The methods include such procedures as JSON metadata downloading and update, launching and tracking of the calculation task running on the remote servers as well as working with WMS/WFS cartographical services including: obtaining the list of available layers, visualizing layers on the map, exporting layers in graphical (PNG, JPG, GeoTIFF), vector (KML, GML, Shape) and digital (NetCDF) formats.

Graphical user interface tier is based on the bundle of JavaScript libraries (OpenLayers, GeoExt and ExtJS) and represents a set of software components implementing web mapping application business logic (complex menus, toolbars, wizards, event handlers, etc.). GUI provides two basic capabilities for the end user: configuring the task XML object functionality and cartographical information visualizing. The web interface developed is similar to the interface of such popular desktop GIS applications, as uDIG, QuantumGIS etc.

Web mapping system developed has shown its effectiveness in the process of solving real climate change research problems and disseminating investigation results in cartographical form.