A dedicated architecture of the local spatial data infrastructure aiming at regional climate change analysis using modern web mapping technologies is presented. It includes a model of storing big sets of regional georeferenced data, software components handling geospatial datasets, metadata catalog describing in detail using ISO 19115 and CF-convention standards datasets used in climate researches, computational and mapping web services to work with geospatial datasets based on OGC Web Services standards, and geoportal as a key element of thematic regional spatial data infrastructure providing software framework for dedicated web applications development as well.

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Introduction

Environmental georeferenced datasets (meteorological databases, modeling and reanalysis results, etc.) produced by various scientific and commercial organizations as results of research projects have differences in sets of parameters contained, file formats, syntactic and semantic models used, complicating development and use of common universal terminology. Taking also into account that their size might constitute up to tens terabytes for a single dataset, studies in the area of climate and environmental change require a special software support based on SDI approach providing environmental geodata access, processing and visualization services, including thematic end user applications. Using of OGC Web-services (WMS, WFS, WCS, WPS, etc) allows to develop thin GIS clients (including web clients) providing just end user interaction and graphical presentation of calculation results. As WPS provides unified interface to software geoprocessing libraries for any GIS client application including browser based one, it is apparent that this approach to georeferenced data processing and visualization looks the most promising both for creation of local spatial data infrastructures and corresponding thematic applications. Below an architecture of the local SDI for regional climate change analysis is presented.

General description

The simplified architecture diagram consists of 3 basic tiers:

1. Geospatial dataset storage structured according to the conventional standards datasets used in climate researches, computational support of regional climate change studies, as well as providing its publication according to OGC CSW (Catalog Service Web) 2.0 specification.
2. Modular computational core as a standalone software product to work with geospatial datasets based on OGC standards: WMS, WFS, WCS, WPS. WPS plays a key role as a service providing standardized external interface over the Internet while configuring and running computational core according to the end user formalized tasks.
3. Geoserver repository containing such cartographical layers as generally used maps (state boundaries, climate zones, land cover, etc) and satellite images to be used as base layers in thematic researches.

Browser based tier of client-side web-applications stands for GIS functionality available for end user. To implement thematic applications based on geospatial web services within the framework of local SDI the following open source software has been selected:

1. OpenLayers JavaScript library, providing basic web mapping functionality for the thin client such as web browser.
2. GeoExt/ExtJS JavaScript libraries for building client-side web applications. The result web application interface is similar to the interfaces of such popular open source desktop GIS applications, as uDig, QuantumGIS etc.

The last tier is optional and serves as an example of universal end user application employing local SDI capabilities.

The sample algorithm of local SDI application looks like the following:

- End user starts Web-GIS client and selects dataset(s) required searching geoportal metadata catalog;
- implicitly creates an XML task for the required data retrieval or calculations using web interface functionality;
- web portal wraps up an XML task into the standard form to call the corresponding WPS service;
- WPS runs the computational core, puts results obtained into local Geoserver repository and makes it available over OGC web services;
- end user obtains calculation results via WFS/WMS/WCS.

Conclusion

Presented architecture of the local spatial data infrastructure provides flexible information-computational support of regional climate change researches based on modern Web-GIS technologies.

Figure 1. General architecture of the local thematic SDI