Geoportals and geo-products for a Romanian SDI

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kadaster

ANCPI

AGENȚIA NAȚIONALĂ
DE CADASTRU ȘI
PUBLICITATE IMOBILIARA

Responsibility for this document

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Approval for issue

<person(s)>

Executive Summary

As part of the PHARE Twinning project of the National Agency for Cadastre and Land Registration (NACLR) and the Dutch Kadaster International an operational prototype is developed according to the principles of INSPIRE and international spatial standards. The prototype is meant to demonstrate the set up of a Geoportal and it's functioning.

There are two Geoportals set up. One will act as a National Geoportal for discovery of spatial information. The other is a organisational Geoportal (data delivery or download portal) to provide information and access to the geo-products of the ANCPI.

For the National Geoportal the selection of the data to be included is defined by trying to describe a real world use case. In cooperation with the 0inistry of Development, Public works and Housing a collection of data sets is identified to be used in the process of regional planning. The area selected is the municipality Faurei in the county of Braila. For this area data were available from a earlier project in a digital format.

The ANCPI Geoportal is set up a a webshop portal to find, view, display metadata and to create a shopping list ready to be ordered. Since the Geoportal will act as a demonstrator no real order and payment service is included.

To built the portal available Open Source and/or freeware software components were used to show that creating web services is possible without the help of licensed market GIS products. For the client application the Luigi Framework of Alterra - Wageningen UR is used, a customisable freeware software product for front end web applications. Except for the web client all components are easy to configure with the help of manuals available on the Web.

Since all data has to be published in catalogue services the proper metadata had to be created and included in the metadata repository used by the metadata server. This process showed to be very helpful to show the relevance of creating metadata. The data and map services are meant to show the use of Geoportals and are neither complete nor quality checked. The portals can be accessed by the following URL's:

National Geportal prototype: **http://195.138.192.248/geoportalul/bin/index.html**
ANCPI Geoportal prototype: **http://195.138.192.248/ancpiportal/bin/index.html**

While realizing the prototype a number the experiences resulted in a number of recommendations described in chapter 6 of this document. An overall conclusion is that Geoportals as a base for the Romanian SDI will work when set up according to the principles the prototype is designed. The little number of datasets included in the prototype indicates there is still a lot of work to do. Especial the transformation of existing data in properly structured digital spatial data sets will take a lot of effort. But there is a lot of ambition to develop a SDI in Romania.

Content

1   Introduction

1.1   General

Spatial data are nowadays of much interest for all kind of use. Since spatial data becomes more and more available there is a strong wish to distribute them. In the Internet era the World Wide Web is the place to do this. Websites offering spatial data are usually called Geoportals. There can be different types of Geoportals, but they do have in common that at a minimum they describe spatial information in a common way. It is good practice to use standards for describing spatial data so that they can be easily compared. All Geoportals combined form in this way a significant part of the spatial data infrastructure (SDI).

This document describes the development of Geoportals as they can be part of the Romanian NSDI and it includes some recommendations for geo product development.

Further, it describes the development of a prototype for the National Geoportal in more detail. The objective of the developing the prototype is to evaluate and discuss the required functionality for Romania's national Geoportal [1]. The prototype is built within the scope of the PHARE Twinning project of the National Agency for Cadastre and Land Registration (NACLR) or in Romanian the Agenţia Naţională De Cadastru Şi Publicitate Imobiliară (ANCPI) and the Dutch Kadaster International. In this document we use the acronym ANCPI to refer to the Agency. The prototype is meant to demonstrate the set up of a Geoportal and its functioning.

1.2   Input information

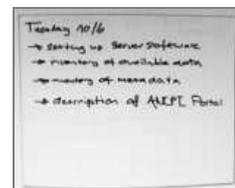The basic documentation used for this report is:

[1]	Prototype Geoportal Romania DRAFT Functionality 0.1 – Supply of Digital Cartographic Information and Photogrammetric Data. Author: Christiaan Lemmen. Date: May 10, 2008. File: *Prototype_Geoportal1.ppt*.	
[2]	Actionplan SDI prototype. Author: Jandirk Bulens. Date: June, 2008. File: *Action plan SDI prototype-v2-1.ppt*.	
[3]	Minutes of meeting Tuesday June 10, 2008. Jandirk Bulens.	
[4]	ANCPI Orthophoto Portal: www.ancpi.ro > Server imagini. Date of visit: July 28, 2008.	

[8]   ANCPI Maps and Plans ordering system: www.ancpi.ro > Harti si
      planuri. Date of visit: July 30, 2008.

2 Functionality of Geoportals

2.1 General

Many local and national governments are working towards making their geodata better findable and more accessible to potential users. Geoportals are expected to play a prominent role in these efforts. A Geoportal can be defined as a web site that presents an entry point to geo-products on the web. A more precise definition is impossible for two reasons: the gradual scale (what exactly is a geo-product, how much "geo" must there be in a portal in order for it to be called a Geoportal?) and the fact that the term is relatively new. As a consequence of being new, an universally accepted definition is gradually developing as it is being adopted by its' users and software producers. In practice though, the term Geoportal is used mostly for facilities specialised in geodata; a website specialised in geo-standards or GIS software is less likely to be called a Geoportal. There are Geoportals where geo-products can be directly accessed and there are those which only provide product information plus ordering instructions. Geoportal users can range from members of a single large organization (an intranet Geoportal), to members of a specific community, up to users from all over the world [5]. In this report we use the terms geo-products, geodata, spatial data as the specific objects to be found in Geoportals

In this report we distinguish two types of Geoportals: discovery Geoportals and data delivery or webshop Geoportals, see Figure 1. See sections 2.2 and 2.3 for details on these type of Geoportals.
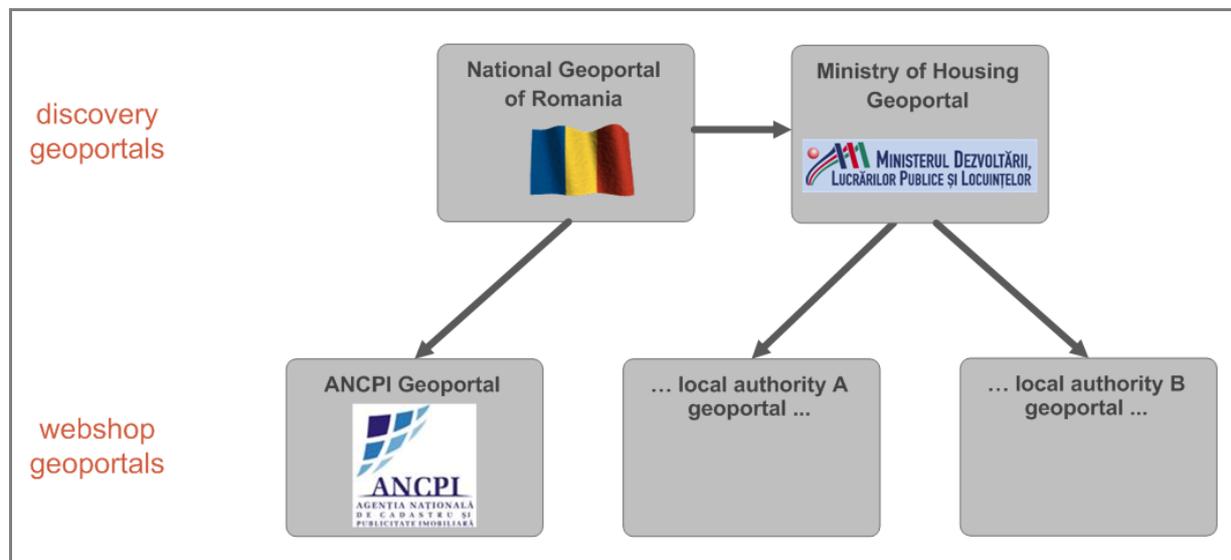

Figure 1 – The NSDI consists roughly of two types of Geoportals: a National Geoportal for the discovery of geo-products across Romania and data delivery or webshop Geoportals for organisation specific product catalogues and ordering functionality. The Ministry of Development, Public Works and Housing does not own geo-products but could aggregate all relevant geo-products of local authorities into a Ministry of Development, Public Works and Housing discovery portal.

2.2 Discovery portals

People looking for spatial data that have no clue where to find those data are best served with a national Geoportal that includes information on all available products across the country. The main function of such a portal is discovery of products and their specifications. Typical functionality within such a portal would be:

- search and browse for spatial data

- view search results

- refinement of search results

- view spatial data information: summary or all details

- preview data

- compare data

So, a discovery Geoportal contains elements of a search engine and a directory and the handling of search results tailored specifically to spatial data. Most standard software products for creating a Geoportal are of this type. Examples include ESRI's GIS Portal Toolkit (commercial software, [6]) and FAO's GeoNetwork (open source software, [7]).

Discovery portals should be designed to publish information about a large number of products. Therefore functionality to query efficiently and effectively the product catalogue is essential. A well-designed discovery portal will have functionality to both narrow and widen search results.

2.3   Data delivery or Webshop portals

Organisations that sell spatial data may sell them through the Internet. That means they need a website that serves as a webshop for their data. Geo-products sold through the web could be of any kind: digital maps, paper maps, consultancy services, training services, GIS books, etc. Any product or service can be described and offered for sale/use on a web page, including free products.

Within the Romanian NSDI a Geoportal for the ANCPI should be webshop portal (see Figure 1). A webshop portal includes at least a product catalogue. Organisations that charge money for their products or require that users sign an agreement before they are allowed to use their products will include registration functionality and possibly ordering functionality in their portals. INSPIRE (art. 14(4)) requires for public authorities that levy charges for viewing, download, or invoke services, the availability of e-commerce services.

The differences between a webshop Geoportal and a discovery Geoportal:

a. Webshop portals typically contain a small number of products compared to discovery portals.

b. As a consequence of a) the design could be tailored to showcase the products in an optimal fashion. The software of webshop Geoportals is often custom written.

c. As a consequence of a) webshops don't need extensive search functionality to query the product catalogue.

d. Webshop portals are often owned by a single geo-product producer, while a discovery portal is often a joint service of a group of organisations

e. As a consequence of d) a webshop is often integrated as a sub-site of a corporate website, while a discovery portal is often an entity itself.

f. When a user wants to obtain a geo-product a webshop will send the user to its ordering page while a discovery portal will redirect the user to another Geoportal: the supplier's Geoportal. The supplier can tailor that redirection to a specific product page by publishing the product page's URL in the metadata of his geo-products.

g. Pay service. For e-commerce purposes the user should be offered means to make the payment for the ordered products.

3 Architecture

3.1 Discovery portals

Discovery portals will typically re-publish information on spatial data that was published by original data suppliers. This means that discovery portals need a mechanism to collect product information of all products and spatial data suppliers need a way to publish their product information. In an NSDI this publish-and-collect mechanism is preferably automated. Data suppliers should publish their product information on-line through a catalogue web service (CS-W). These web services can be contacted by a software component of the discovery portals to collect the product information. This software component is often called a metadata harvester. The metadata harvester is scheduled to run periodically and update the collected metadata.

There are two possible architectures for a discovery portal with respect to metadata storage. The simplest architecture is to store the metadata in the Geoportals's own database (see Figure 2). This architecture allows easy and high performance access by the application server to the metadata. Further, the discovery portal could be designed to create custom indexes of the metadata to support more advanced search functionality.
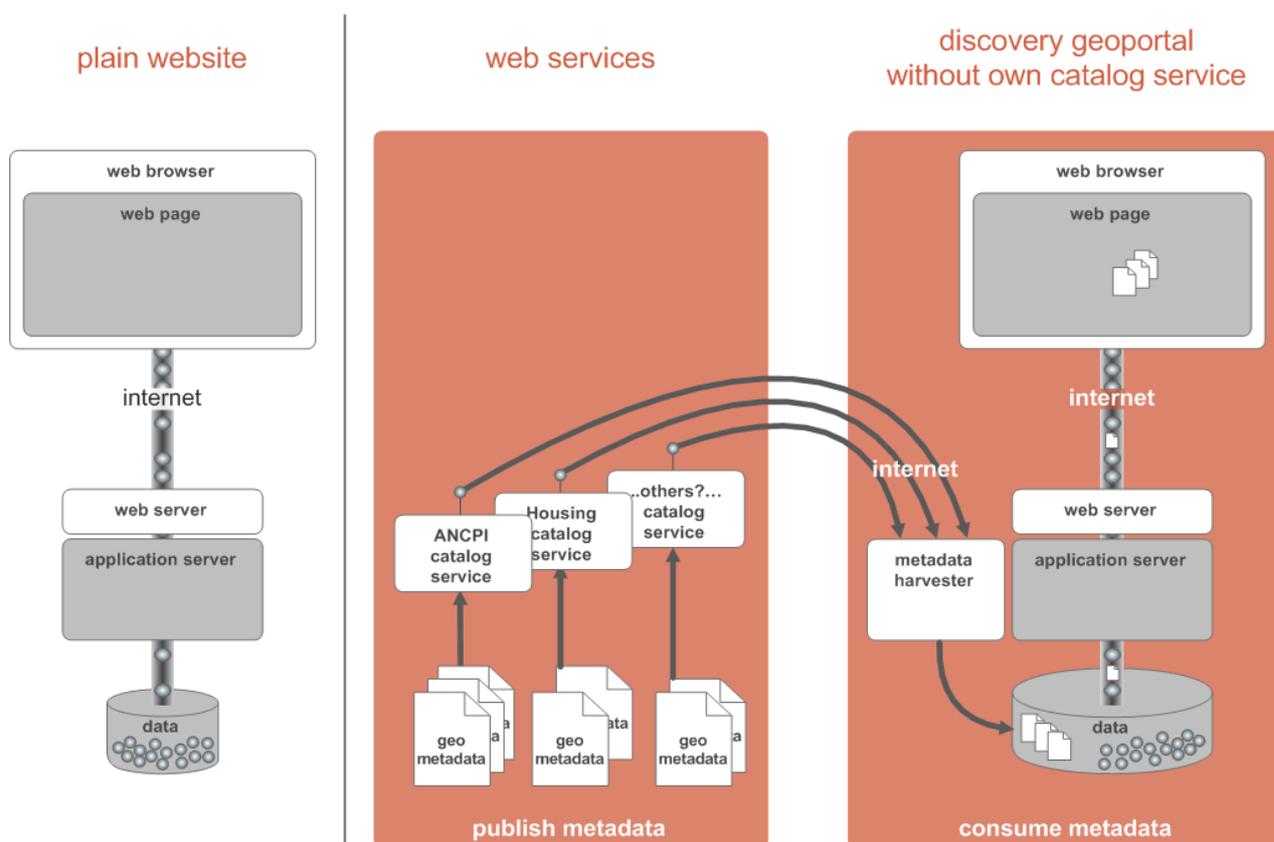

Figure 2 – Architecture of a discovery portal with geo metadata storage in the Geoportal's own database. For reference purposes the left side of the figure depicts the architecture of a plain website. See Figure 4 for a legend.

Another possible architecture is to pair the Geoportal with an additional software component: a catalogue web service. This service stores the metadata and can be accessed in a similar fashion as the suppliers web catalogue services (see Figure 3). The additional catalogue

service only aggregates the contents of other catalogue services. To allow third parties to build new geo-products or services based on the information in this additional catalogue, it should be made publicly accessible.
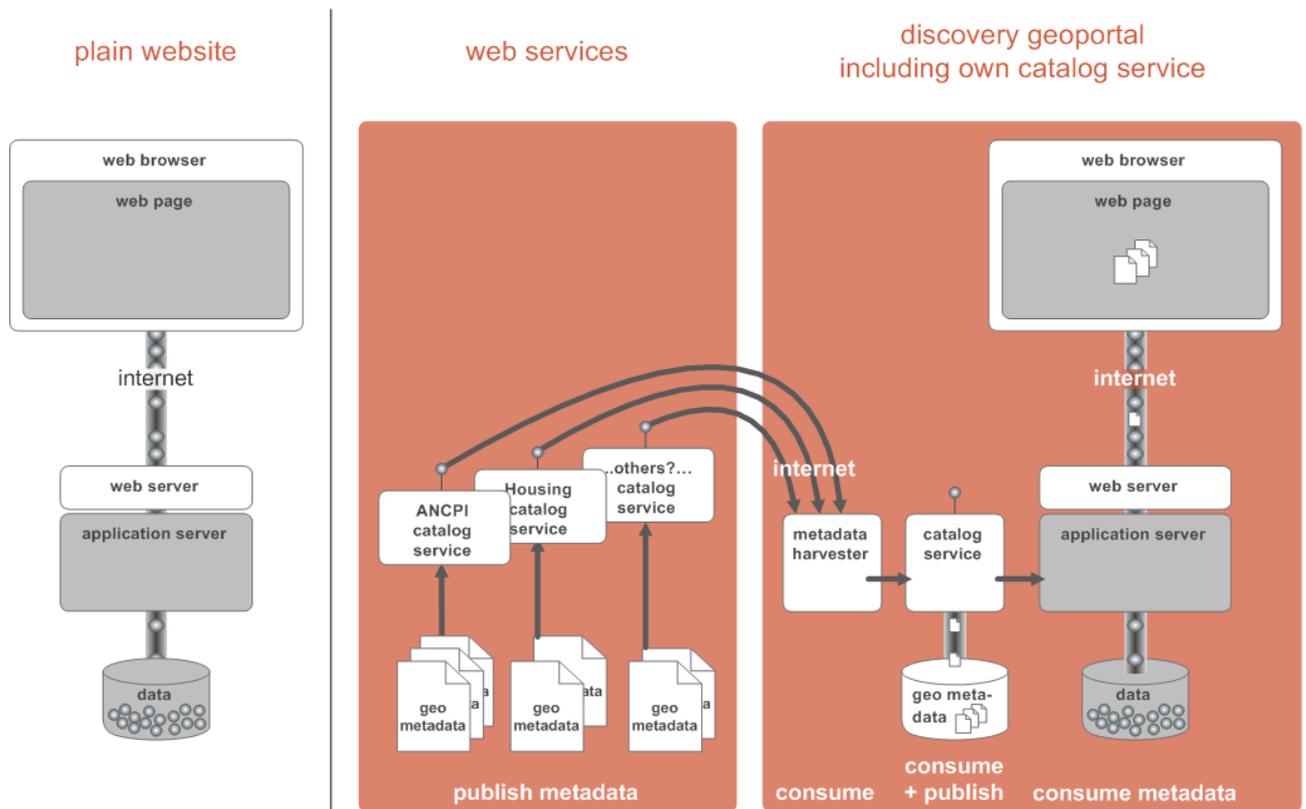

Figure 3 – Architecture of a discovery portal with metadata storage by an additional software component: a catalogue web service.

This catalogue both consumes and publishes metadata by aggregating metadata of other catalogues and re-publishing it for use by the discovery portal and third parties. For reference purposes the left side of the figure depicts the architecture of a plain website. See Figure 4 for a legend.
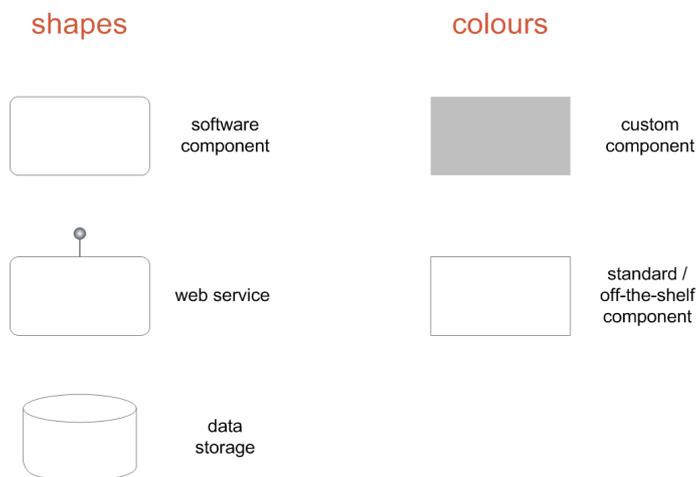
Figure 4 – Legend for Figure 2, Figure 3 and Figure 5

3.2   Data delivery or Webshop portals

The architecture of data delivery or webshop portals differs from discovery portals because they include distinct different functionality. Data delivery portals have a website part and a web services part (see Figure 5). The website part of the portal is the access point to all information for humans, while the web services are the access points for software applications. The web services include map services (WMS) and/or feature services (WFS) to publish geodata and a catalogue service (CS-W) that publishes the metadata of that geodata.
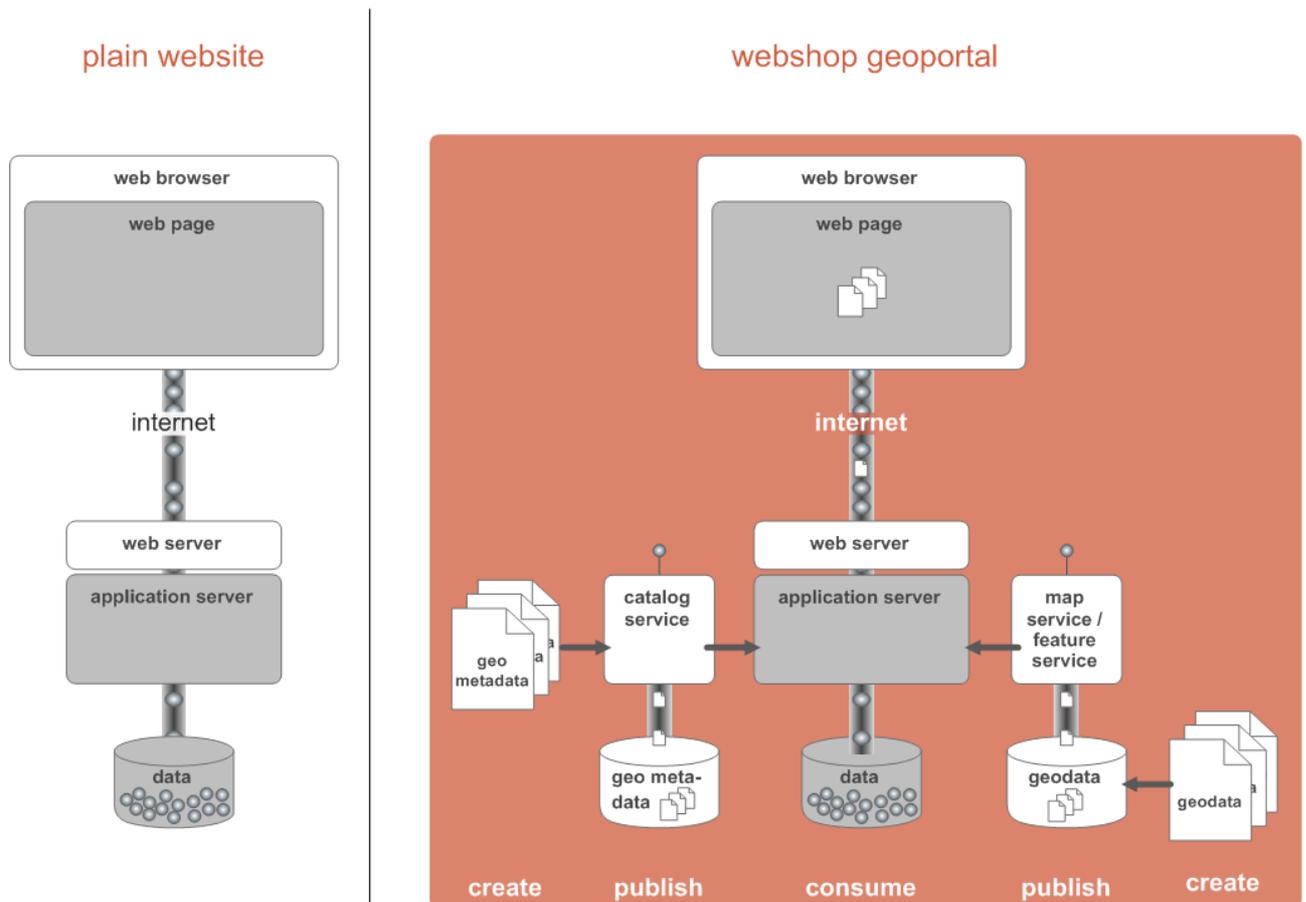
Figure 5 - Architecture of a data delivery portal. For reference purposes the left side of the figure depicts the architecture of a plain website. See Figure 4 for a legend.

People typically use the website to find a geo-product they need. If that geo-product concerns an on-line map or feature service, they will copy its corresponding URL and use that to connect their GIS application of choice to the service. Once that map or feature service has been discovered they need not visit the Geoportal's website again, but instead connect to the service directly from their GIS.

Another way for people to browse the catalogue of the webshop portal is to connect their GIS to the catalogue web service. Most professional GIS are able to connect to catalogue services that support standard interfaces like OGC's Catalogue Service for the Web (CS-W).

4 Geoportals within the Romanian NSDI

4.1 National Geoportal (discovery portal / to be created)

The National Geoportal of Romania should become the first place where people start their search for a geo-product within Romania. It is typically a discovery portal that aggregates the information of all catalogue web services around the country. The PHARE Twinning project aims to realise a working prototype of the National Geoportal in 2008. The prototype will mainly exist of a catalogue with a free format search engine and a map viewer to preview available map and feature services. For the prototype a limited amount of map and data services are provided for the selected study area of the city of Faurei in Braila County.

The goal of the prototype is to evaluate and discuss the required functionality for Romania's National Geoportal [1]. The development of the prototype is documented in chapter 7 of the NSDI report of the project. The national Geoportal will only show digital available datasets, being vector data, scans and aerial photographs.

4.2 ANCPI Geoportal (Data delivery portal / to be extended)

The current ANCPI Geoportal is part of the ANCPI website. It offers maps and plans [8] (see Figure 6 for an impression). Static images give an overview of the available geodata and users can order the data through downloadable forms that should be printed and sent to ANCPI by fax, email or mail. Payment is done through conventional money transfer methods. Finally, ordered data will be sent to the customer on CD or DVD.
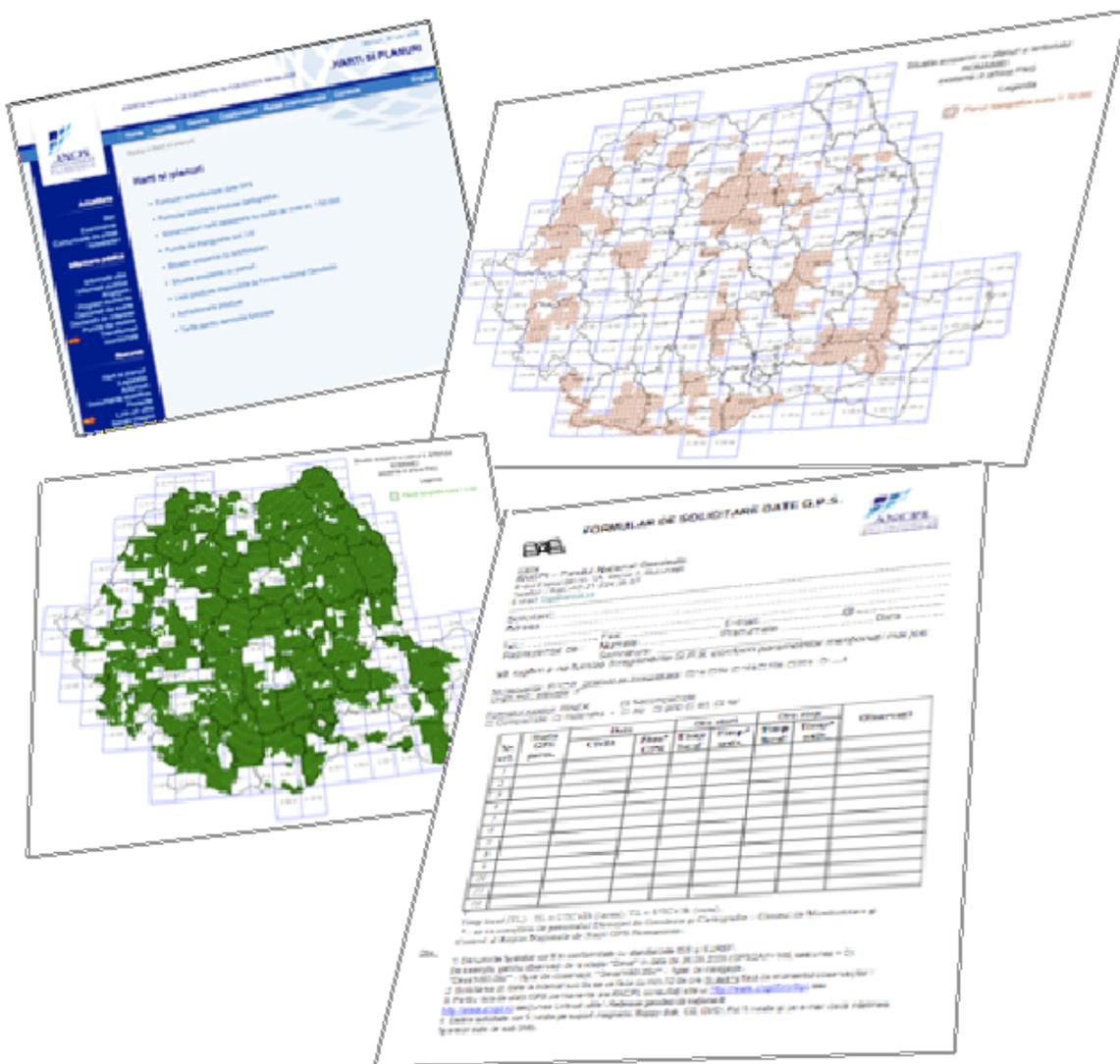
Figure 6 – Screenshots of parts of the ANCPI Geoportal [8]

In order to become a part of a modern NSDI, the functionality of the Geoportal of ANCPI should be extended to include web services: web map services (for e.g. the orthophotos), web feature services (for e.g. the cadastral parcels) and a web catalogue service. The ANCPI Geoportal can be gradually extended in time by performing a phased development:

Phase A

a. Consolidate the existing Geoportal and improve data delivery web software.

b. Realise new web map services and/or web feature services for high priority geodata. In time new digital datasets will become available. As expressed by the Ministry of Development, Public Works and Housing there is a strong need for the 1:5,000 scale vectorised topographic maps in their daily practice (regional level).

c. Create proper metadata for the new services and for the geodata and publish it in a web catalogue service.

d. Add an extra plain text page to the ANCPI Geoportal with information on the new web services, including an explanation how to connect to web services from commonly used professional GIS applications and what the URL's of the services are. For a description of

the maps and the geodata simply hyperlink to the web page already present in the Geoportal.

Phase B

e. Evaluate the use of the web services realised in phase A and the changes made to the Geoportal website.

f. If d) reveals problems with the web services, correct the problems. Additionally, realise web map services and/or web feature services for low priority geodata.

g. If d) reveals problems with the metadata, correct the problems. Additionally, create metadata for the new services and for the geodata and publish it in the web catalogue service.

h. Redesign the website's product information pages to load metadata from the web catalogue service instead of the website's database. In this way duplicate maintenance of metadata is abolished.

4.3   ANCPI Orthophoto Portal (discovery portal / to be extended)

The current Image service created in the past with the help of Denmark is a good example of an electronic service for delivering data. Because of the size on disk of the images appropriate software is needed to achieve acceptable performance. For this service, commercially available software is selected to do the job. Since no OGC standards are used, the service is only available within this web application. Using the OGC standards at this stage will probably result in low performance. Therefore, this will be no option now. When more experience is gained worldwide with the OGC/ISO standards this could change. Options should be investigated to extent the current service in a way that the data also can be directly obtained using the internet by fully automated electronic means.

5 The Prototype

5.1 Context of use

For the design of the prototype we wanted the use to be well defined. Describing a use case for a major user of spatial data in Romania could do that. The case involves the design a new neighbourhood in a municipality within the urban planning process. There have been several discussions with the Ministry of Development, Public Works and Housing how to describe the use of the Geoportals in this use case. The Ministry stated that for regional planning a lot of spatial data is needed. This work is usually done by the regional offices (the Ministry plays a coordinating role in these activities), so it was not possible to have the use case described in more detail. Since time was lacking, no efforts were made to involve the regional people from the study area. Instead, we used the available knowledge within the context of use to define a number of datasets, which could be necessary in the process. The datasets are presented in 5.6.1 .

Important however was the recognition by the ministry of Development, Public Works and Housing of the relevance and usefulness of Geoportals in Romania. Also they expressed a strong wish to have topographic data available in vector format on a scale of 1:5000. This could be a major product to be marketed by the ANCPI in the future.

5.2 Users

For the prototype we aim at first on the professional user (source: [3]). We identified this user group when trying to describe the context of use (see 5.1) with the Ministry of Development, Public Works and Housing. Secondly, the expected use of a National Geoportal will not be for the general public. The information provided is mostly for all organisations dealing with spatial data. This can be organisations from many different domains like utilities, environment, industry, public safety, local authorities, academia and so on.

Another type of professional users is the intermediary party. Indirectly intermediary providers offering tailor made websites can serve the general public with spatial datasets. These providers use the information to be found on the National Geoportal to create value added services.

5.3 Metadata of geodata

Metadata are used to publish the information about data sets on the Internet so that users can find them. Because there are many data providers for spatial data it is good practice to use a standardised format to publish the metadata in. There are several standards in use of which Dublin Core Metadata Initiative (DCMI) is the most well know and used. The standard is most commonly used in the archives domain (libraries and so on). For the spatial domain there are more specific demands and requirements so the OGC and ISO have created standards on this topic. There is a metadata standard for spatial information by ISO in ISO19115. INSPIRE adopted this standard and defined a profile, a subset of all the elements in the standard, as a minimum requirement to publish spatial data in Europe. And there is a implementation specification of metadata in ISO19139.

The metadata is published in catalogues. The catalogues, set up as services, can be access points to search for specific datasets. Also these services are set up by using standards. OGC has defined a standard for catalogue services (CS-W).

For the prototype we applied these standards as much as possible. The metadata are created and most of the elements are filled out for the National Geoportal. For the ANCPI

portal we decided to use a limited number of elements, since a lot of the datasets are not available using web services and sometimes also only available in an analogue format. The elements used for all metadata descriptions are at least:

ID	Metadata file identifier
Name	Identification Information.MD_DataIdentification.Citation.CI_Citation.Title
Short description	Identification Information.MD_DataIdentification.Abstract
Scale	Identification Information.MD_DataIdentification.Spatial resolution
Format (vector/grid/scan/analog)	Distribution information.MD_Distribution.Distribution format.MD_Format
Owner/publisher/provider	Identification Information.MD_DataIdentification.Point of contact.CI_ResponsibleParty (role)
Topic category*	Identification Information.MD_DataIdentification.Topic category
Keywords (use GEMET)	Identification Information.MD_DataIdentification.Descriptive keywords
Pricing	Identification Information.MD_DataIdentification.Resource constraint.MD_Constraints.Use Limitations
Links	Identification Information.MD_DataIdentification.Supplemantal information

The element TopicCategory is used to make a division in different type of data sets.

For editing we used the tool CatMDedit developed by the The Advanced Information Systems group of the University of Zaragoza and GeoSpatiumLab S.L. There had to be some modifications (adding values to the used thesauri) to make to tool suited for the Romanian data sets. Once the metadata was created it was stored in a metadata data base of the eXcat, the server component for serving the metadata.

5.4   Functional requirements

We have two types of Geoportals represented in the prototype, a discovery Geoportal as the National Geoportal (NSDI), and the data delivery Geoportal for the ANCPI. This very quickly tells us what the most important functionality should be. Functionality for finding and viewing spatial information will be identical in both types of Geoportals.

5.4.1   National Geoportal

For the discovery Geoportal the functionality should be:
- Finding spatial information. A search engine must be able to find the correct datasets given certain search criteria. The search will be done on the metadata base and makes use of the information as is recorded by the element of the metadata description
- Showing result of the search. A hit list with the relevant information must be given to give the user an overview of available data sets.
- Previewing the results. Since we deal with spatial information, the user will view maps. A map viewer will show the maps found.
- Combine previewed maps with own or other maps. It should be possible to show te results with own maps or other maps relevant fir the user. Data sets can be added if the comply to the same rules as the data to be found in the catalogue as map or feature services.
- The catalogue used by the National Geoportal must contain all information of available data sets of Romania. Therefore metadata harvesting functionality must be present to collect all metadata records in what we can call the National Registry (the harvested metadata in the database of the CS-W of the National Geoportal). For this functionality data providers should offer their catalogue locations (URL's of their CS-W) to the registrar. For this prototype this is not elaborated in the design.

5.4.2   ANCPI Geoportal

Being a data delivery or webshop portal there should be some more functional requirements:
- Viewing a shelf with the products being a product catalogue showing the obtainable geo-products
- Search for specific products based on keywords entered by the client.
- Viewing each product in more detail. The description (metadata) must be consulted and if possible the dataset can be viewed, either being a sample or the real data
- Creating a shopping list with the geo-product to be purchased. The list can be modified by the user based on information given by the product provider.
- A cash register being a way of paying for the products, for the prototype it is not possible to have this functionality operational, but the prototype must give insight how this should work.
- Insight in quality of the product and the right to use the product.
- Delivery service. How to obtain the product that is requested.
- Counter for additional help and/or information or to give feedback to the product owner. A way of contacting the right people, by e-mail, phone and so on.

5.5   User interface design

5.5.1   General lay-out National Geoportal

Home page of the National Geoportal [1]:
- URL National Geoportal: http://195.138.192.248/Geoportalul/bin/index.html. This should be changed in a genuine domain name once the portal is available for the general public.
- Front page
  - logos and shield of INSPIRE and Romania
- Discovery page. Direct access to the catalogue with a free format search input field. This page contains different sections:
  - Free format text search in the CS-W
  - Hit list for browsing results
  - Preview results in map viewer
- Map viewer page. We used Luigi, an Internet GIS application framework. This is a free available software component of Alterra to view spatial services. The component contains the following components
  - Mapviewer in which Map/Feature/Catalogue OGC services can be added
  - Overview window
  - Legend of connected data services. If the service is providing different styles by Styled Layer Descriptions this can be changed in this section
- About page
  - Logos of the involved organisations creating the prototype
- Help page
  - This page is not realized.

5.5.2   General lay-out ANCPI Geoportal

Home page of the ANCPI Geoportal [1]:
- URL ANCPI Geoportal: http://195.138.192.248/ancpiportal/bin/index.html. This is a part of the ANCP website but for demonstration purposes it is designed as a stand-alone website.
- Front page
  - logo of the ANCPI
  - Short introduction to what to find on the Geoportal
- Product page.

- o Products available from the ANCPI. According to the OGC/ISO and INSPIRE guidelines we used a division in categories using the metadata element TopicCategory. For each category a separate tab is used if there are products in that category:
  - boundaries
  - elevation
  - environment
  - imageryBaseMapsEarthCover
  - inlandWaters
  - location
  - planningCadastre
  - society
  - structure
  - transportation
  - utilitiesCommunication

  The user can make a selection of the product(s) he or she wants to obtain. The selection can be previewed if there is a preview available and the selected items will be the input for the shopping cart page.
  - o Shopping Cart section. This page will show what product are selected and will give the user the opportunity to make changes in the selection:
    - Adding, Viewing, Removing.
    - Ordering information. Will give information on pricing of the product. Since this is a prototype no direct calculation on the price will be made.
    - Confirmation e-mail (only demonstration purposes)
- Direct access to the catalogue with a free format search input field. This page contains different sections:
  - o Free format text search in the CS-W.
  - o Hit list for browsing results.
  - o Preview results in map viewer, if a preview is available.
- Terms and Conditions
  - o Disclaimers and rights of use for the data of the ANCPI.
- Map viewer page. We used Luigi, an Internet GIS application framework. This is a free available software component of Alterra to view spatial services. The component contains the following components:
  - o Mapviewer in which Map/Feature/Catalogue OGC services can be added.
  - o Overview window.
  - o Legend of connected data services. If the service is providing different styles by Styled Layer Descriptions this can be changed in this section.
- About page
  - o Logos of the involved organisations creating the prototype
- Help page
  - o This page is not realized.

5.6 Geodata

The data used for the prototype are selected based on the discussions held with the Ministry of Development, Public Works and Housing (see 5.1). This objective was to have a specified use case in which the data of the ANCPI would be used. Since the actual work is done on the regional and local level it was difficult to define the use case. Nevertheless we had a good overview of possible data to be used. Also these data are usually collected on the regional and local offices and were not available at the National level. For that reason a specific study area is used for which in an earlier project data were made available.

5.6.1 Geodata for the National Geoportal

Datasets for Făurei (Town in Brăila county in east of Romania)
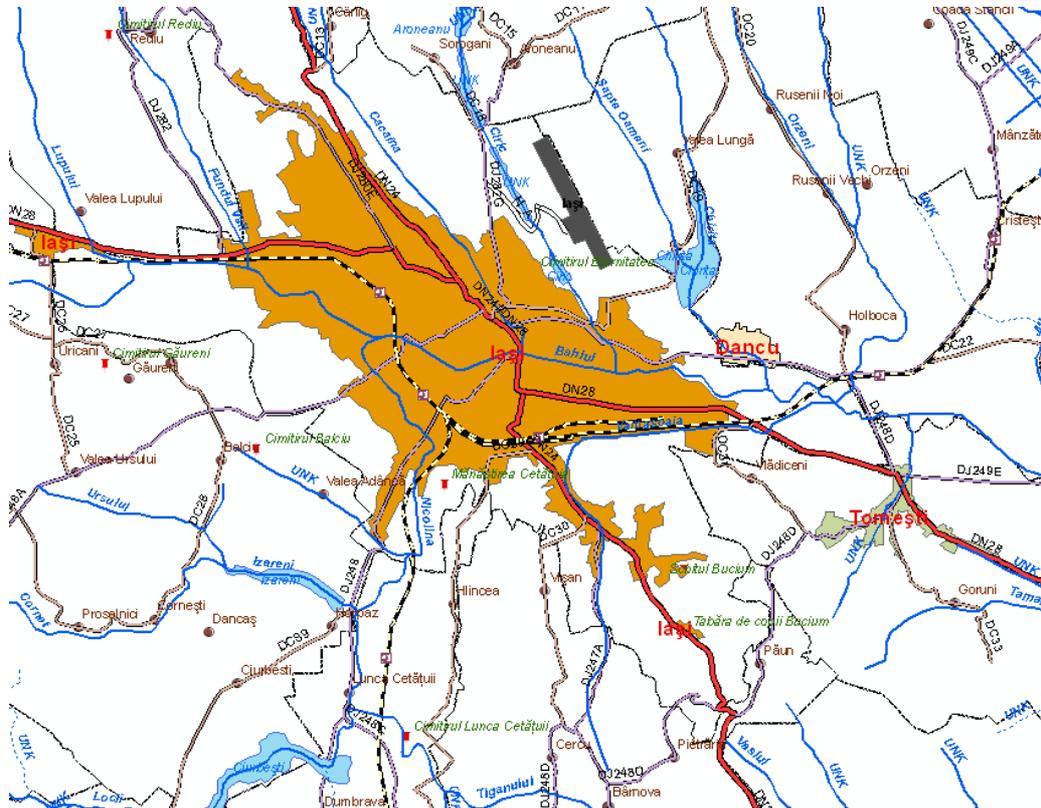
Vector format

Figure 7 Map scale 1: 250 000

Layers name	Layers descriptions	Geometry	Main Attributes
Polbndl	Administrative boundary	line	Type (primary, secondary) (county, administrative unit-UAT)
Polbnda	Administrative boundary	polygon	Name
BuildupA	Settlement	polygon	Name Type (village, commune, city, town, residence county) SIRUTA
BuiltupP	Settlement	point	Name Type (village, commune) SIRUTA
BuildP	Buildings	point	Name Type(cemetery, farm, other)
Raillrdl	Railroads	line	Type1

			(single, double) Type2 (main, branch)
Raillrd	Railroad stations	point	Type of stations (main station, secondary station,) Name
RoadL	Roads	line	Type (primary/secondary route local road) Name
WatercrsA	River	poligon	Name Information like navigable and operational,perennial.
WatercrsL	Rivers (Watercourse)	line	Type 1 (natural, man made) Type 2 (perennial, intermittent) Name
SpringC	Source river	point	
LakeresA	Lakes	polygon	Type (perennial, non-perennial) Name
DamL	Dam/Weir	line	Type (dam, weir)
Exitc	Border train station	point	Name
Landmrkp	Amphitheatre / stadium	point	Name
MisaeroP	Control Tower	point	Type
RunwayL	Runway	line	
AirfldA	Airport	polygon	Name Type (international)

Cadastre data

Product name: CADATA
Type: vector
Format: shape

Layers name	Layers descriptions	Layers descriptions (en)	Geometry	Main Attributes
cale_ferata	Căi ferate	Railroads	line	
cladiri	Clădiri	Buildings	line	
corp_prop	Parcele	Parcels	line	
denumire_strazi	Denumire stradă	Street name	point	
drum	Drumuri	streets	line	
nr_cadastral	Număr cadastral	Cadastre number	point	
nr_postal	Număr poştal	Postal code	point	

Raster format

Topographical maps
Product name: TOPO_5000

Type file: TIF
Name: L_35_103_A_c_3_I_t.tif

Figure 8 scanned maps sample for the 1:5000

Orthophoto for 1:5000
Product name: ORTO_5000c
Type: ecw
Name: BRAILA.ECW (Access (URL): ecwp://iws.ancpi.ro/mosaics_5000/BRAILA.ECW)
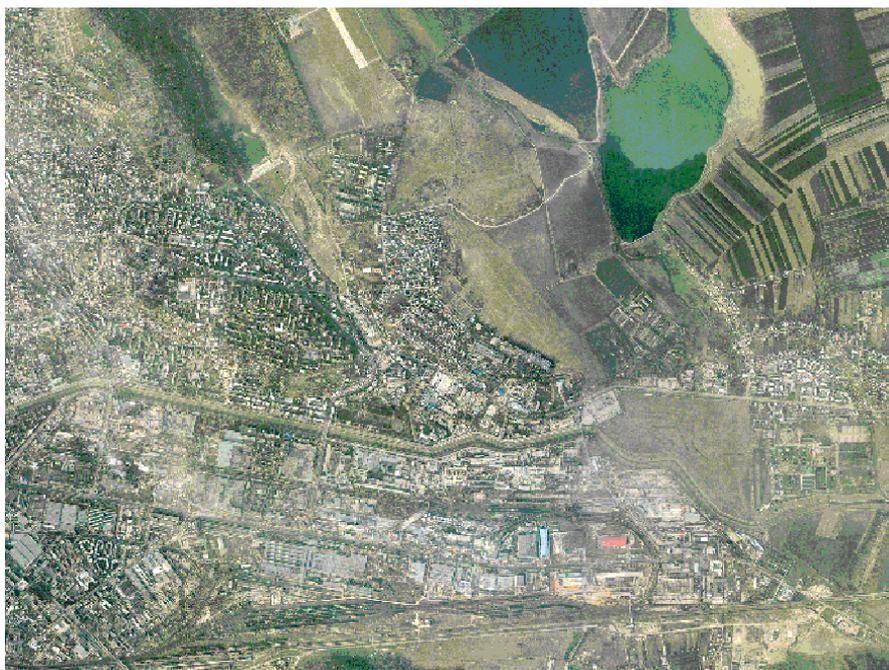
Figure 9 samples for the orthophoto 1:5000.
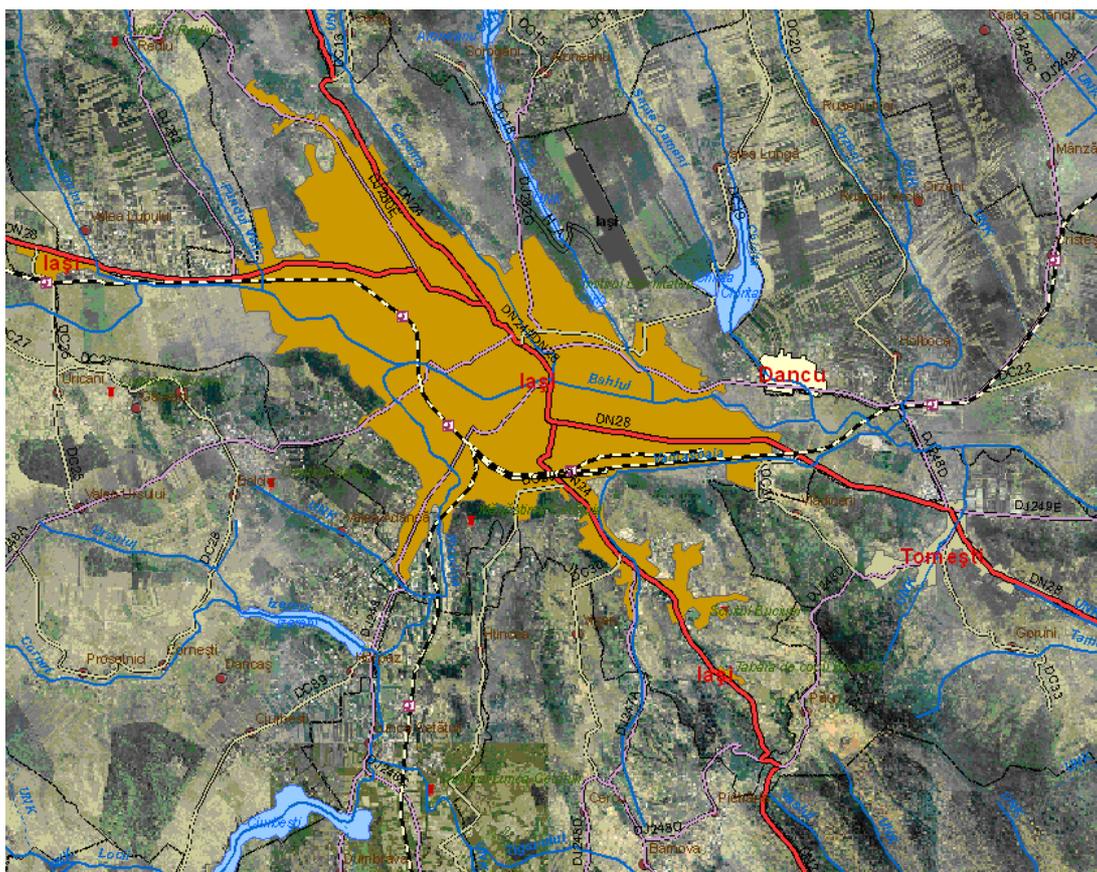
Figure 10 Sample of a hybrid map with combined data layers

5.6.2   Geodata for the ANCPI Geoportal

There are many data sets which are distributed through the ANCPI. Most of them are owned, some distributed only. INSPIRE defined categories to structure the type of data sets. To be interoperable in the prototype we used these categories to present the data. The metadata element TopicCategory is used for this purpose. The categories are the following:

Data (metadata element → TopicCategory)
- boundaries
- elevation
- geoscientificInformation
- imageryBaseMapsEarthCover
- inlandWaters
- location
- planningCadastre
- *farming*
- *biota*
- *environment*
- *oceans*
- *health*
- *economy*
- *intelligenceMilitary*
- *climatologyMeteorologyAtmosphere*

- *society*
- *structure*
- *transportation*
- *utilitiesCommunication*

Most likely the first 7 categories will be used for the data sets provided by the ANCPI. For the prototype we used a selected set of data sets in order to be able to demonstrate the use.

The examples shown in the National Geoportal are also included in the ANCP catalogue, Additional here are examples of datasets included in the catalogue. The examples are not available yet as webservices.

Aerial photos

Hydrography. Scans of analog maps.
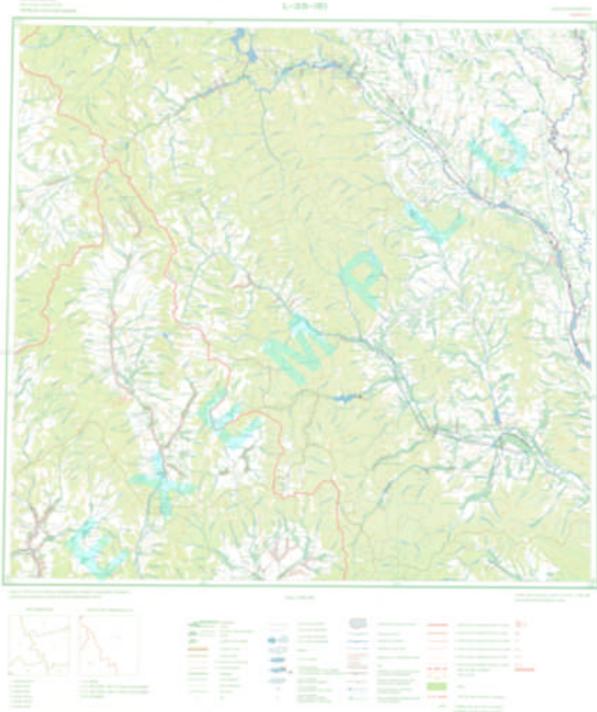
Cad levelling maps

Topographic map 1: 5.000 (scans)

legend
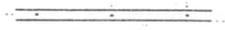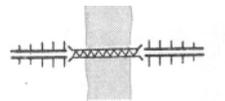
Frontiera de stat		Punct geodezic	
Limită de judeţ		Reper de nivelment în clădire	
Şosea		Baraj de pământ	
Cale ferată		Mlaştină	
Pod de beton		Stufăriş	
Pod metalic		Curbă de nivel	
Linie electrică		Ruptură de teren	
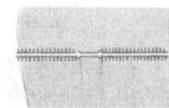
Location data provided by the ROMPOS GPS system launched in 2008. Data are provided mostly to surveyors for three different accuracy levels.

```
demorinex - Notepad
File  Edit  Format  View  Help

     2.10               OBSERVATION DATA    G (GPS)           RINEX VERSION / TYPE
Topcon Tools                               20-JUN-08 16:14    PGM / RUN BY / DATE
BAIA                                                          MARKER NAME
                                                              MARKER NUMBER
-Unknown-               -Unknown-                             OBSERVER / AGENCY
LP02396                 -Unknown-            -Unknown-        REC # / TYPE / VERS
CR13737                 ASH700936D_M     SNOW                 ANT # / TYPE
  4093761.1211   2007793.4681   4445129.7394                 APPROX POSITION XYZ
         0.0815         0.0000         0.0000                 ANTENNA: DELTA H/E/N
     1       1                                                WAVELENGTH FACT L1/2
  2008       6      18      23      59   59.9610000     GPS   TIME OF FIRST OBS
  2008       6      19      23      59   30.0000000     GPS   TIME OF LAST OBS
     30.000                                                   INTERVAL
     31                                                       # OF SATELLITES
      7    C1     P1     P2     L1     L2     D1     D2        # / TYPES OF OBSERV
   G 2    965    965    965    965    965    965    965        PRN / # OF OBS
   G 3    802    802    802    802    802    802    802        PRN / # OF OBS
   G 4   1005   1005   1005   1005   1005   1005   1005        PRN / # OF OBS
   G 5    805    805    805    805    805    805    805        PRN / # OF OBS
   G 6    759    759    759    759    759    759    759        PRN / # OF OBS
   G 7    730    730    730    730    730    730    730        PRN / # OF OBS
   G 8    767    767    767    767    767    767    767        PRN / # OF OBS
   G 9    733    733    733    733    733    733    733        PRN / # OF OBS
   G10    951    951    951    951    951    951    951        PRN / # OF OBS
   G11    746    746    746    746    746    746    746        PRN / # OF OBS
   G12    846    846    846    846    846    846    846        PRN / # OF OBS
   G13    824    824    824    824    824    824    824        PRN / # OF OBS
   G14    962    962    962    962    962    962    962        PRN / # OF OBS
   G15    891    891    891    891    891    891    891        PRN / # OF OBS
   G16    963    963    963    963    963    963    963        PRN / # OF OBS
   G17   1023   1023   1023   1023   1023   1023   1023        PRN / # OF OBS
   G18    957    957    957    957    957    957    957        PRN / # OF OBS
   G19    771    771    771    771    771    771    771        PRN / # OF OBS
   G20    827    827    827    827    827    827    827        PRN / # OF OBS
   G21    771    771    771    771    771    771    771        PRN / # OF OBS
   G22    832    832    832    832    832    832    832        PRN / # OF OBS
   G23    797    797    797    797    797    797    797        PRN / # OF OBS
   G24    862    862    862    862    862    862    862        PRN / # OF OBS
   G25    768    768    768    768    768    768    768        PRN / # OF OBS
   G26    819    819    819    819    819    819    819        PRN / # OF OBS
   G27    756    756    756    756    756    756    756        PRN / # OF OBS
   G28    863    863    863    863    863    863    863        PRN / # OF OBS
   G29    854    854    854    854    854    854    854        PRN / # OF OBS
   G30    795    795    795    795    795    795    795        PRN / # OF OBS
   G31   1018   1018   1018   1018   1018   1018   1018        PRN / # OF OBS
   G32    857    857    857    857    857    857    857        PRN / # OF OBS
SE TPS 00000000                                               COMMENT
                                                              END OF HEADER
 08  6 18 23 59 59.9610000  0 10G 3G 6G15G16G18G21G22G24G26G29
   10922556.356 7  10922556.388 7  10922561.661 7 -19031745.274 1 -14807409.872 1
      4592.779        3578.790
   10254429.973 7  10254429.966 7  10254434.921 7 -33670043.896 1 -26217503.011 1
      3960.847        3086.377
   13143411.317 6  13143411.762 6  13143416.300 6  -2175628.821 1  -1679112.230 1
      2887.409        2249.927
    9546087.044 7   9546086.957 7   9546090.855 7 -36261245.943 1 -28237004.658 1
      1190.213         927.437
    9882112.545 7   9882112.207 7   9882116.209 7 -30679175.884 1 -23510700.456 1
      3071.588        2393.441
    9305068.411 7   9305068.119 7   9305071.861 7 -48864423.462 1 -38049068.779 1
       706.581         550.584
   11268914.833 7  11268915.009 7  11268917.506 7 -18731259.526 1 -14558948.418 1
      5006.700        3901.323
   12190550.312 6  12190550.161 6  12190556.045 6 -34685537.925 1 -26962325.507 1
     -1338.703       -1043.152
   12693972.696 6  12693972.956 6  12693978.520 6  -1034096.861 1   -784706.214 1
      2614.042        2036.919
   12179568.412 6  12179568.753 6  12179573.440 6 -47534463.011 1 -37017304.624 1
     -1181.229        -920.431
```

5.7 Technical requirements

The prototype does have some technical requirements. The architecture will be based on a Service Oriented Architecture. Basically we can recognise three tiers, a data layer, an application or services layer and a presentation layer. The following shows the typical layout (see figure 11).
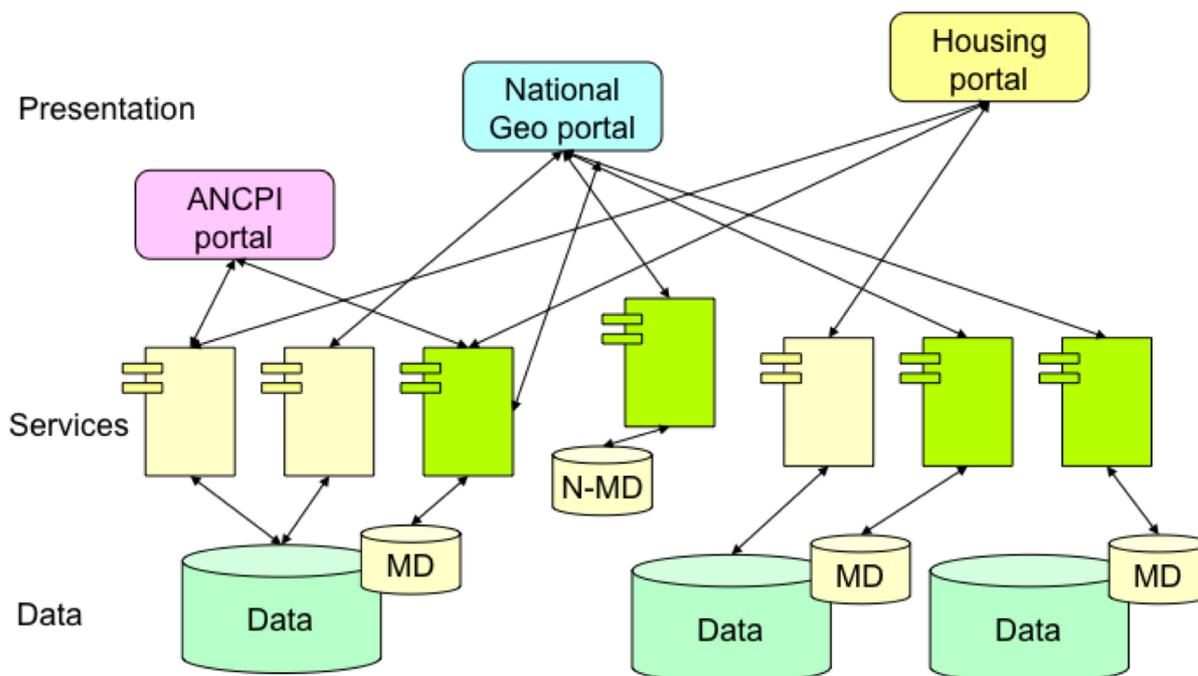

Figure 11 typical lay out for a three-tier architecture

The data can be stored in spatial databases or file systems. We distinguish data and metadata to be stored in separate databases. The National Metadata database can be the result of harvesting the distributed metadata databases through a harvesting protocol.

In the services layer typically the map and feature services (WMS/WFS) are present in combination with catalogue services (CS-W). In reality there can be a number of other services as well, but these are less relevant for the prototype. The presentation layer contains the web based client application showing the information to the user. It provides the user with interactivity to perform specific tasks carried out by the underlying services.

If we look closer we need more components for the generic tasks. To summarise the different components (figure 12):
- Server with proper Operating system
- Java Virtual Machine
- Internet server (Apache)
- Application server (Apache TomCat)
- Mapserver (Geoserver)
- Spatial data base (Oracle spatial, ArcSDE, PostGIS) or File based data storage (Shape files)
- Services
    - WMS/WFS (geoserver)
    - CS-W (eXcat)
- Internet GIS Client (ArcGIS, uDig, OpenLayers, Luigi, etc
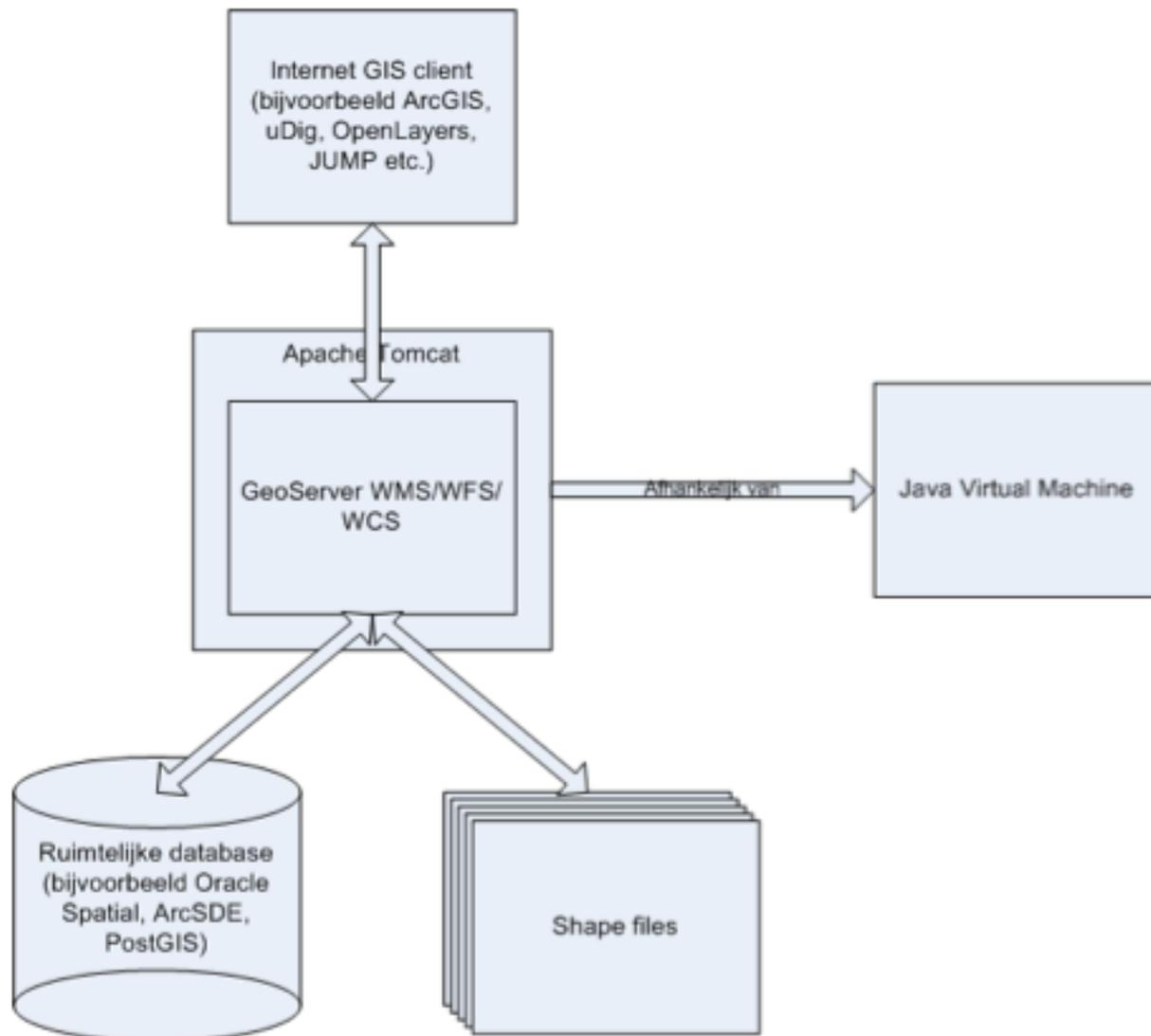
Figure 12 Internet GIS set up

6   Recommendations

The prototype is meant for demonstration purposes. The content was prepared and described by the Romanian counterparts and the Dutch developers of the team did the development of the web client. During the courses held in January of 2008 within the scope of the twinning project it already appeared that there is little experience in setting up SDI's in a service oriented architecture (SOA). In using the prototype as a demonstrator more experience can be gained and it will provide more insight in how to set up services within a SDI. In this chaper recommendations are made at the end of most of he paragraphs.

- Use the prototype as a demonstrator to have more experience and define the road ahead for the development of SDI's in Romania. Also use this report and the main SDI report on NSDI development for more background information.

6.1   For Geoportal development

For the development of the prototype Geoportal we used available products. Also it was decided to use open source and freeware products. Except for de web client all components are used as they are well documented on the web. The webclient component, Luigi, is the only component that had to be modified by programming in order to get the proper layout and the necessary functionality. This component is built in Flex and Ruby on Rails programming language and can be modified by Flex programmers. But any other development environment can be used.

For future development it is recommended to define how to realise a National or ANCPI Geoportal. This can be based on the knowledge experience form creating and using the prototype. The selection of the components doesn't have to be the same. It is very well possible to use propriety commercial software like the ESRI product to set up the services. Whatever choice is made, it is important to stick to the standards used and defined according to the INSPIRE directive.

- Reuse SDI-components, any component will do, as lng as the comply to the appropriate standards.
- The webclient is usually tailor made to the user needs, select a programming environment for which skills are available.

6.1.1   Theory

Research showed us that the success of Geoportals so far could vary enormously. There are factors known why some are successful and others are not. So to identify what Geoportal should be realized one should consider these aspects. [5].

It is important that the potential user is clearly determined and that the content offered is tailored to this user group. This can be done the best by describing real world use cases of known users of spatial data for the national Geoportal, or the client of the ANCPI for ANCPI portal. For the latter, being webshop portals a clear marketing strategy may help in designing the portal (seewww.urisa.org/vanoort or www.Geoportalmarketing.wur.nl).

- Identify clearly the need of the user and define specifications accordingly
- Develop a clear marketing strategy

6.1.2   Generic functionality

The prototype shows the most essential functionality needed. It is clear that this should be extended to the need of the users, but it should also be based on the nature of the data and

or information provided. Depending on the type of Geoportal (discovery, data delivery, and so on) functionality should be available. A search engine for querying the metadata service and a map viewer with map navigation tools is almost always necessary.

- Always provide search (discovery) and mapviewing functionality

6.1.3 Selection of software tools and components

There are software components available as open source and freeware software. The experience is that Open Source Software usually comply better to the OGC standards then proprietary software. The reason for this is that open source software is maintained by communities for who interoperability is a necessity in the developing the components.

For the prototype we selected the following components:
  o Internet server → Apache
  o Web application server → Tomcat
  o Catalogue server → eXcat (CS-W, Harvester and metadata data base)
  o Mapserver → Geoserver for WMS (and WFS)
  o Webclient → Luigi (Flex mapviewer)

To edit the metadata we used CatMDEdit.

- Select available components to built the Geoportal (Open source and freeware do comply well to the OGC standards but any other market product also complying OGC will be fine)

6.2 For geo product development

6.2.1 Geodata

In realising the Geoportal we found that a lot of data is already available. Part of it is available in a digital format, but not all of it is vectorised and up to date. Digitisation and updating will require a major effort, but since the need for spatial data is growing this process has to be started. In this process ANCPI should start with the datasets needed most.

- Start the process of making datasets digital available, starting with the datasets most needed (1:5,000 topographic map).

6.2.2 Geo metadata

Metadata is crucial for discovery. This will imply two things: (1)the metadata should be created, and (2) they should be published. This is necessary in order to be able to find the data. An important aspect is that the metadata contains information to obtain the data, this can be a reference to the data provider, the web service to connect or the location to download. The INSPIRE profile on the ISO-standard does contain all the necessary elements for efficient discovery.

- Supply metadata with each dataset using the INSPIRE profile. If for Romania special requirements are needed, consider to define a Romanian profile on top of INSPIRE.

6.2.3 Geo services

The use of Geoportals based on a service oriented architecture requires map and data services. So if data do exist in the proper digital way, services should be created to make the data accessible. Depending on the funding model used, provision should be made to grant access to the data. OGC services are required to guarantee interoperability. Be aware of the versions of the standard used. Also the selected software components are compliant the certain versions of the standards.

- Make digital data accessible through web services.
- Grant proper access to data services based on the restriction for use.
- Use OGC compliant web services for interoperability.

6.3   Additional recommendations

Geoportals are needed to access the data based on the services. The services are the most crucial part in the set-up and the form the spatial data infrastructure. Geoportals will make it easy to make data accessible, but are in its nature dispensable. Nevertheless the provide the gateway to spatial information and the user need them. But consider they may (or even should) change in time while the services remain usually the same. The specify the functionality of the Geoportal try to involve the users or user groups. The collaboration with the Ministry of Development, Public Works and Housing is a start.

- Focus on web services.
- Use Geoportals to facilitate users adequate, and keep them up to date to suit the users demands by specifying real world use cases.

In the organisation, more specific the SDI department of ANCPI, skills and expertise must be available. The NSDI report mentions how to set up proper means for capacity building.

- Provide training and support for SDI personnel.

References

[1] Prototype Geoportal Romania DRAFT Functionality 0.1 – Supply of Digital Cartographic Information and Photogrammetric Data. Author: Christiaan Lemmen. Date: May 10, 2008. File: Prototype_Geoportal1.ppt.

[2] Actionplan SDI prototype. Author: Jandirk Bulens. Date: June, 2008. File: Action plan SDI prototype-v2-1.ppt.

[3] Minutes of meeting Tuesday June 10, 2008. Jandirk Bulens.

[4] ANCPI Orthophoto Portal: www.ancpi.ro > Server imagini. Date of visit: July 28, 2008.

[5] The Added Value of Geoportals: An Internet Marketing Perspective. Authors: P.A.J. van Oort, M.C. Kuyper, A.K. Bregt, J. Crompvoets. In: Urban and Regional Information Systems Association (URISA). In prep., submitted July 22, 2008. Download: www.urisa.org/vanoort.

[6] ESRI GIS Portal Toolkit: http://www.esri.com/software/arcgis/gisportal-toolkit/index.html.

[7] FAO GeoNetwork: http://www.fao.org/geonetwork.

[8] ANCPI Maps and Plans ordering system: www.ancpi.ro > Harti si planuri. Date of visit: July 30, 2008.

Annex 1 directions for maintenance and short manuals

ANCPI data services

GeoServer configuration

Coordinate Reference System

SRC70→ Stereographic 1970 Reference and Coordinates System (EPSG 19926). The EPSG code is not accepted yet in he list, but is used in the prototype. Lookup SRS will not result in a usable hit from the list. The specifics are shom in the next figure.

SRS: EPSG:19926   [Lookup SRS] SRS Help - SRS List

SRS WKT: Could not find a definition for: EPSG:0

Native SRS WKT: PROJCS["Romania_double_stereo", GEOGCS["GCS_Pulkovo_1942", DATUM["D_Pulkovo_1942", SPHEROID["Krasovsky_1940", 6378245.0, 298.3]], PRIMEM["Greenwich", 0.0], UNIT["degree", 0.017453292519943295], AXIS["Longitude", EAST], AXIS["Latitude", NORTH]], PROJECTION["Oblique_Stereographic"], PARAMETER["central_meridian", 25.0], PARAMETER["latitude_of_origin", 46.0], PARAMETER["scale_factor", 0.99975], PARAMETER["false_easting", 500000.0], PARAMETER["false_northing", 500000.0], UNIT["m", 1.0], AXIS["x", EAST], AXIS["y", NORTH]]

Service metadata

WFS

WMS

WCS

Vector data

Shape file
Serving a shape file using GeoServer entails two steps:

1. Creation of a DataStore

2. Creation of a FeatureType

To create a DataStore, click "DataStores" in the "GeoServer Data Configuration" screen (Figure 13).
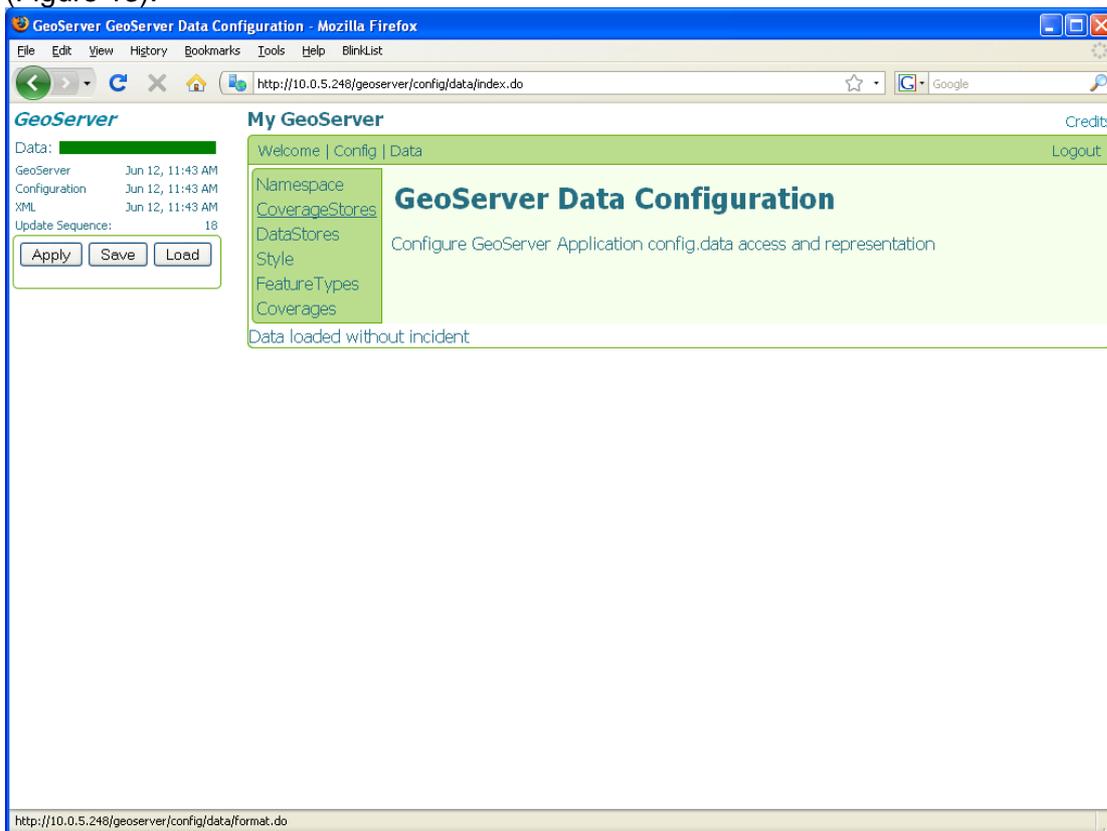
Figure 13 GeoServer Data Configuration

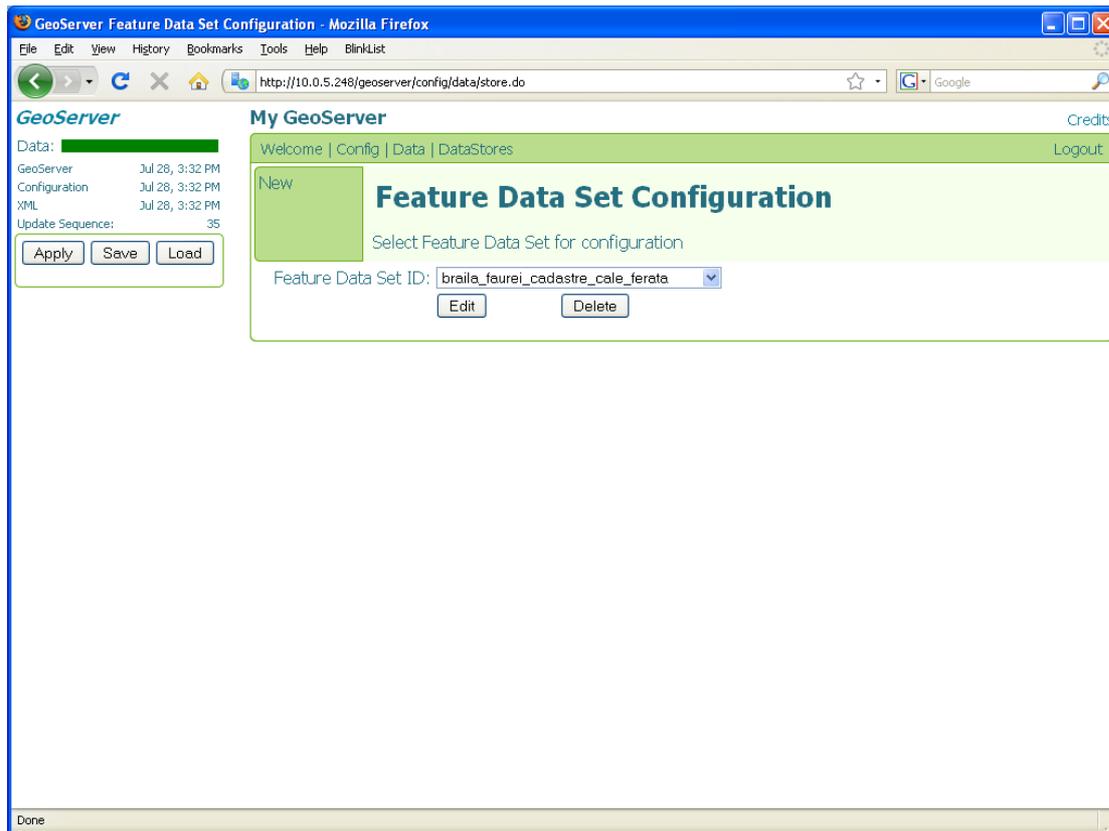In the "Feature Data Set Configuration" screen (Figure 14), click "New".

Figure 14 Feature Data Set Configuration

In the "Create New Feature Data Set" screen, select "Shapefile", enter a Feature Data Set ID and click the "New" button.
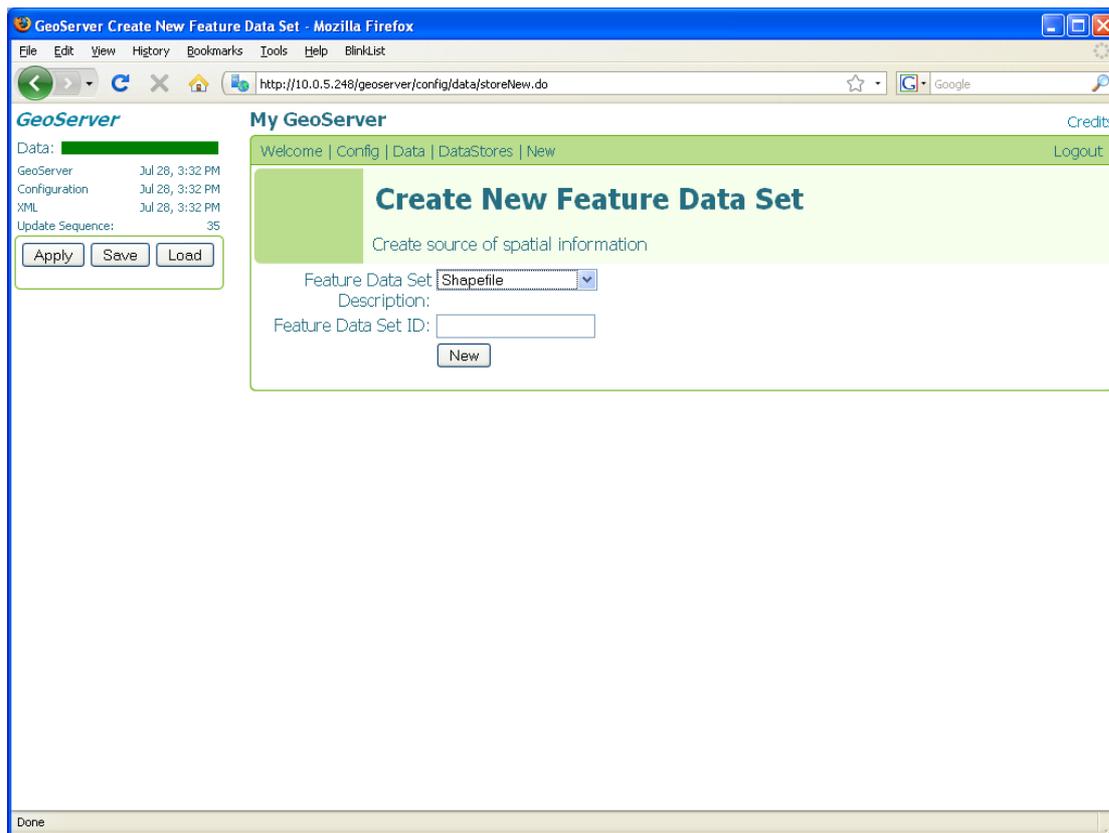
Figure 15 Create New Feature Data Set

In the "Feature Data Set Editor" screen, enter the location of the shape file en click the "Submit" button.
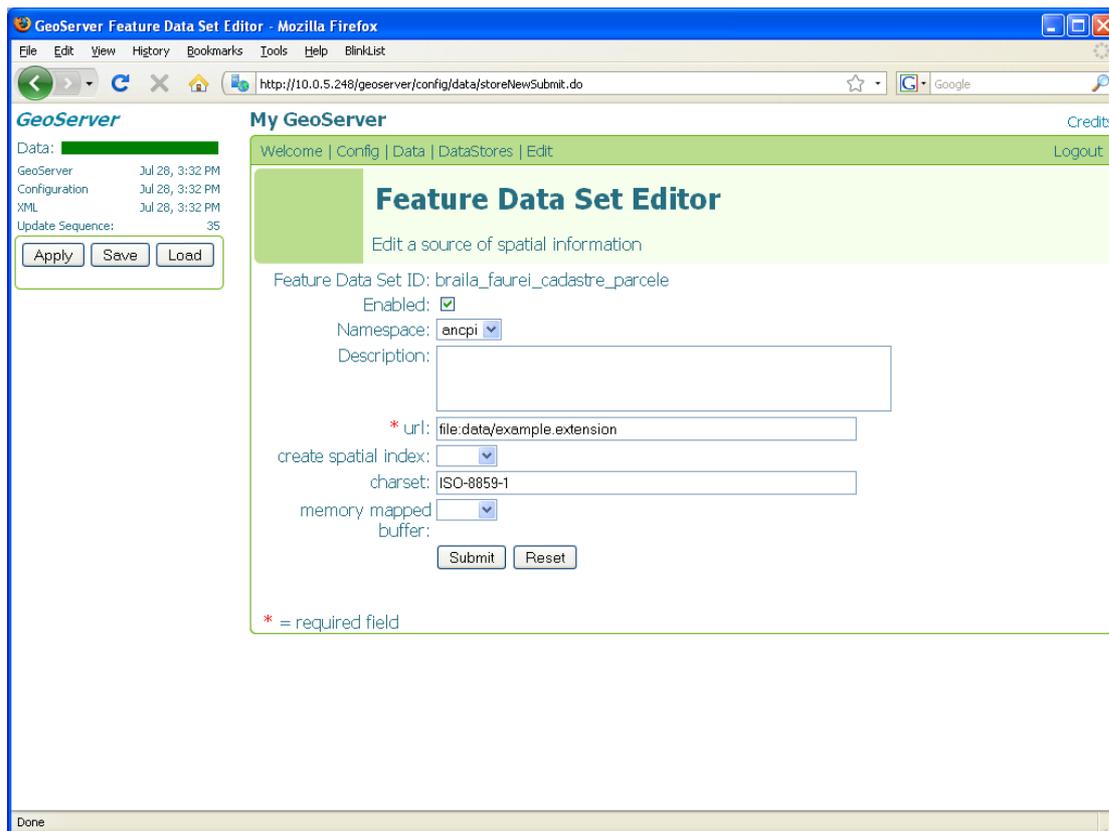
Figure 16 Feature Data Set Editor

The following information has to be entered in the "FeatureType Editor" screen (Figure 17).

- Optional: enter an alias

- Select default style

- Enter CRS (EPSG:19226)

- Click the "Generate" button to generate the bounding box in lat lon coordinates
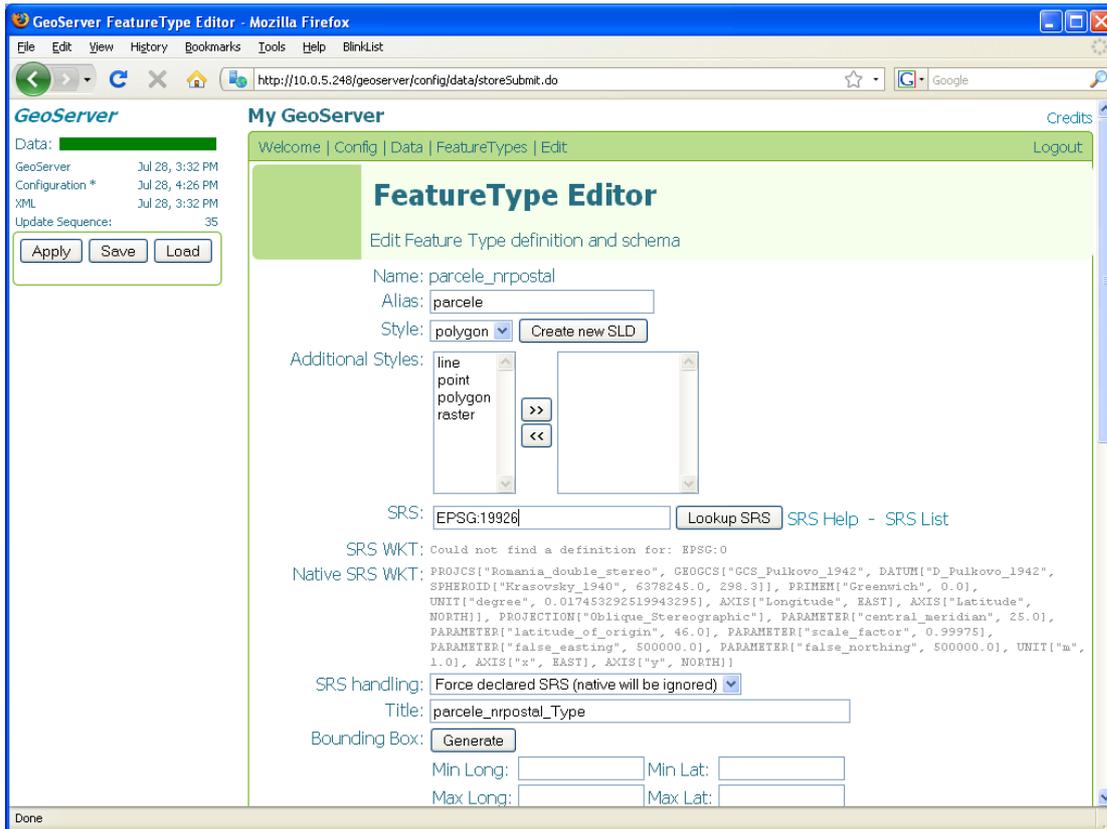
Figure 17 FeatureType Editor

Once all this information has been entered, click the "Submit" button at the bottom of the screen and click the "Apply" and "Save" button in the top left of the screen. The shape file should now be available via the WMS and WFS services.

Raster data

GeoServer cannot serve ECW raster data because of license restrictions. Therefore, ECW files have to be converted to a file format GeoServer can serve, a JPEG with a world file for instance.
Serving a raster in GeoServer entails two steps:

1. Creation of a CoverageStore

2. Creation of a Coverage

To create a CoverageStore, select "CoverageStores" in the "GeoServer Data Configuration" screen (Figure 13). Subsequently, click "New" in the "Coverage Data Set Configuration" screen (Figure 18).
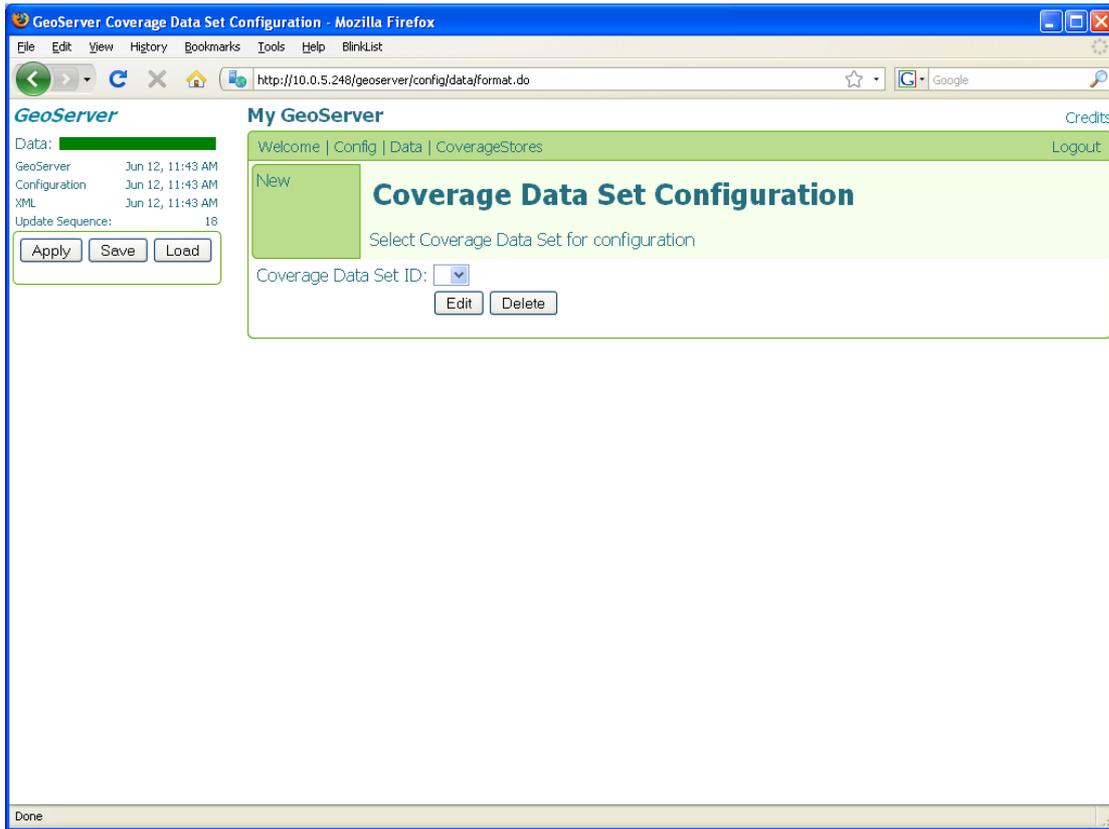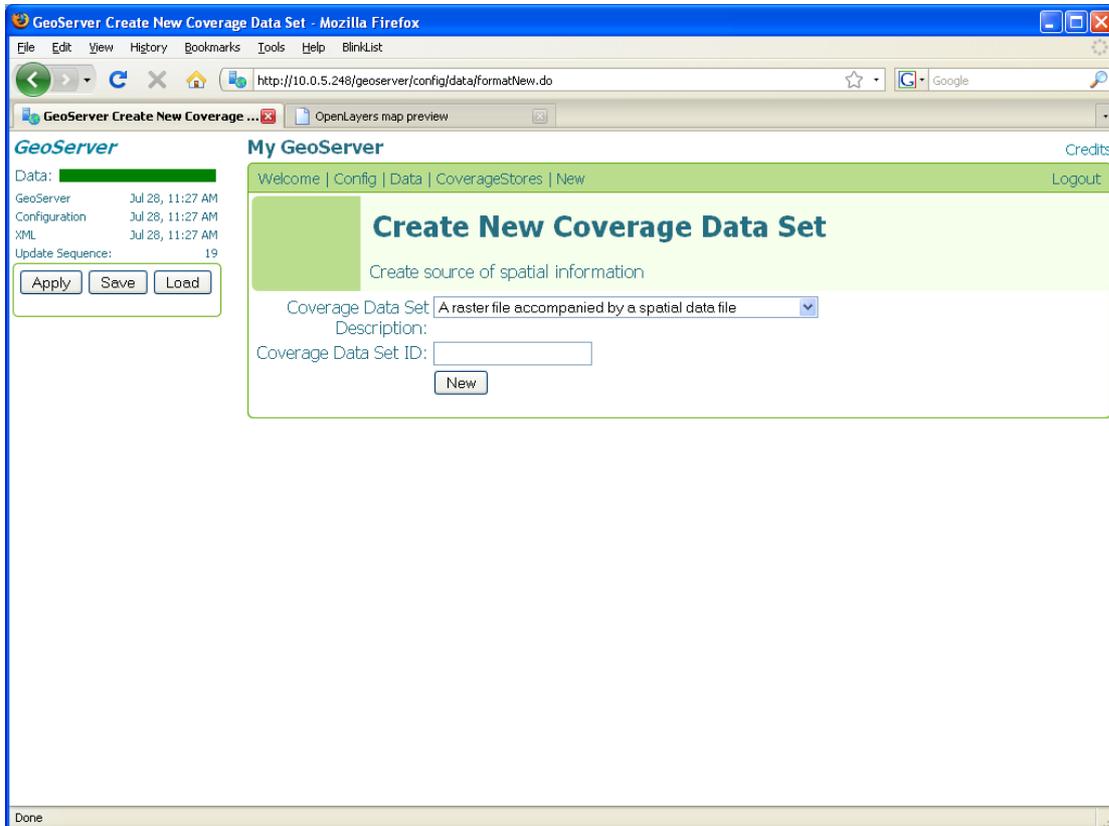
Figure 18 Coverage Data Set Configuration

Figure 19 Create New Coverage Data Set

In the "Create New Coverage Data Set" screen, select "A raster file accompanied by a spatial data file", enter an ID for the data set and click the "New" button.
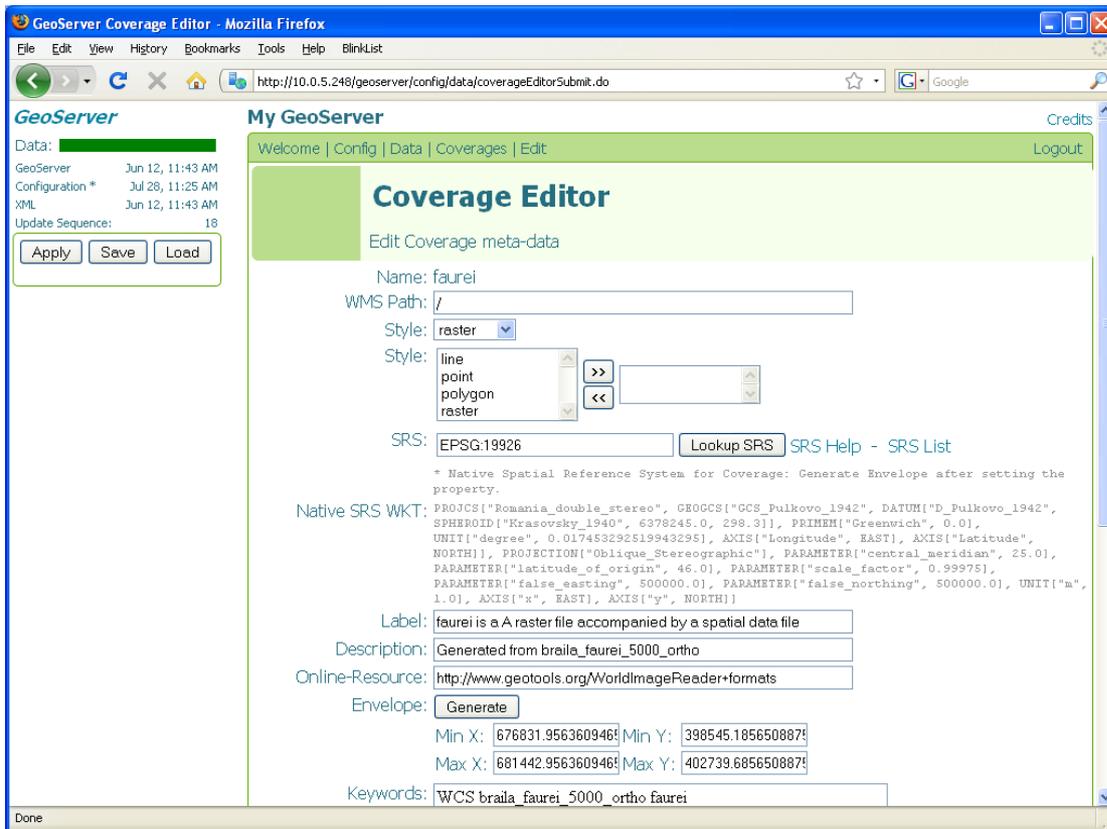

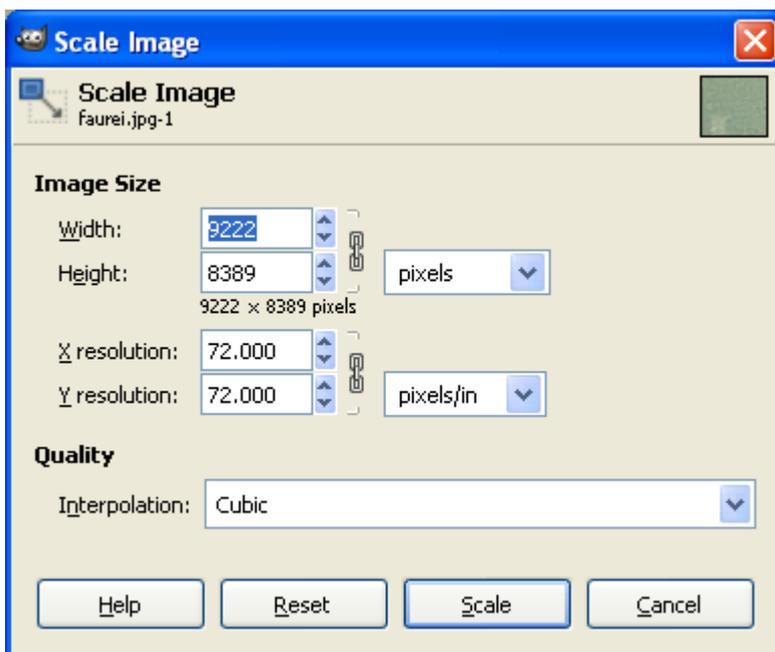Figure 20 Coverage editor

Memory usage
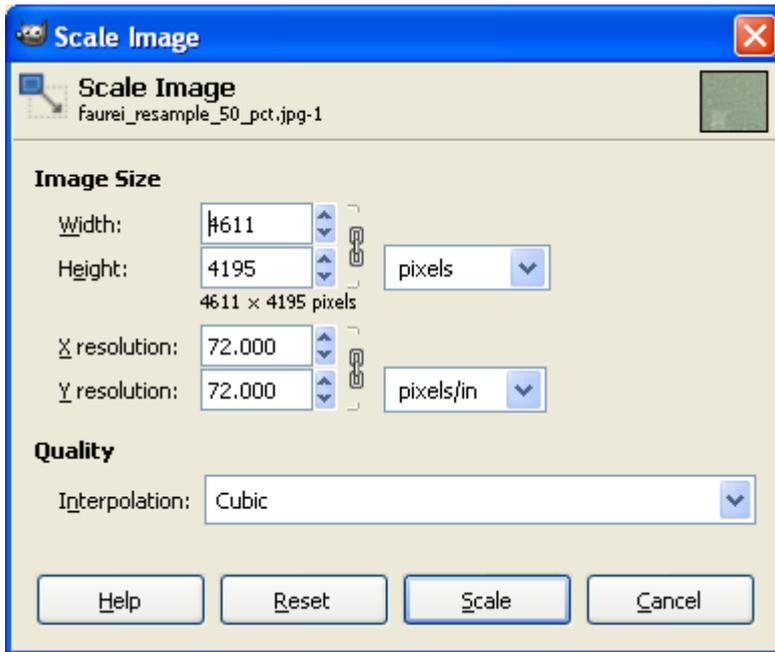

Figure 21 Original dimensions

Figure 22 New dimensions

The world file has to be updated accordingly.
Line 1: A, pixel size in the x-direction in map units/pixel
Line 2: D: rotation about y-axis
Line 3: B: rotation about x-axis
Line 4: E: pixel size in the y-direction in map units, almost always negative[3]
Line 5: C: x-coordinate of the center of the upper left pixel
Line 6: F: y-coordinate of the center of the upper left pixel
A, E, C and F parameters have to be adjusted.
References
GeoServer web site http://www.geoserver.org/
World file http://en.wikipedia.org/wiki/World_file