Geo-Seas

Pan-European infrastructure for management of marine and ocean geological and geophysical data

D11.3-Documentation for final version of high – resolution seismic viewing service

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D11.3-Documentation for final version of high – resolution seismic viewing service	
Short Description	
This document describes the final version of the Geo-Seas seismic viewer, and provides an account of the development and evolution of the viewer from the prototype described in D11.1	
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0.3	G Sutton	Final	07 01 2013	Extensive re-writes and text revisions
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Executive Summary

This document forms the main documentation describing D11.3 which is the final release of the Geo-Seas high resolution seismic data viewer.

Because seismic data has a specific commercial value, access to the high resolution seismic viewing service must be regulated to ensure that the actual seismic datasets are only accessible to users based on the positive outcome of a negotiation with the data owners/providers. Hence the decision was made to develop a web based system that could be installed on servers at the data providing partners' sites to provide end-users with regulated access for viewing seismic data that are maintained at the partners' sites.

The seismic viewing system is based on a Java applet that enables the plotting of both the seismic section and associated track-line on a geographic map. These two objects are dynamically linked such that an indicator moves along the track line on the geographic map in accordance with the cursor positioned within the seismic section, and vice-versa. It is possible to zoom and pan both in the section and the map, and also to effect changes in viewing parameters as well as undertaking some simple processing of the seismic data.

A link between the viewer and the Geo-Seas metadata structure was defined in WP4 (D4.2), which uses the result element of the O&M document.

An initial prototype of the software was made available for testing and this version is described in Geo-Seas Deliverable 11.1. The outcomes of this testing phase were reported in Geo-Seas Deliverable 11.2.

This report describes the current version of the viewer, and incorporates the modifications that were made as a consequence of feedback received from the testing phase. It also includes the changes that were made in order to integrate the viewer within the broader Geo-Seas operational infrastructure. This required a fairly substantial redesign of the viewer in order to integrate with the core functionality of the Geo-Seas RSM/DM tool, and entailed significant additional effort as it was major departure from the original plan developed under Wp4 for the integration of the viewer and the infrastructure.

Content

1 Introduction to the viewer

The following is a typical use case scenario for the Geo-Seas seismic data viewer.

It is envisaged that a Geo-Seas partner will firstly enable end-users to browse the metadata of a given seismic survey and to preview the data by means of low resolution images. These processes are handled via the public CDI service. Once a user has selected a specific dataset of interest he/she is then able to request access for visualization. The viewer mechanism enables the direct downloading of data to be postponed until after an agreement has been made, in other words the viewer enables the user to ascertain whether the data correspond to his/her expectations without obtaining an actual copy of the dataset in question (Figure 1).

Figure 1 Sequence of data access

Once the agreement on the provision of the data has been reached, the end-user can then proceed to use the Geo-Seas download manager service to obtain a copy of the data for local use.

2 The original prototype and outcomes of the evaluation process

An initial prototype was released (see D11.1) which offered most of the features captured in the recommendations and feedback from end-users survey carried out under Geo-Seas WP10 (D10.1). This was installed at OGS site and was loaded with sample datasets as examples of different types of seismic data.

A small community of experienced end-users were asked to test the functionality of the viewer and the results of this process are contained in Deliverable 11.2.

The issues and recommendations were:

- *Reduce the time required to initially load the viewer into the end-users browser*.

  This issue was solved by compacting the java libraries used by the applet enabling it to load faster.

- *Increase the speed of image and map generation*.

  This was solved by developing a server side caching system that greatly increased efficiency by avoiding resource consuming activities

- *Improve the interactivity of the zooming functionalities*. The zoom function in the prototype was activated by means of the mouse wheel which was perceived as difficult to control.

  This problem was solved by introducing + and – icons that are activated by pressing the combination keys CTRL+Z. This method allows a smoother zoom.

- *Introduce pre-stack visualization tools*.

  Pre-stack data are very large raw data files which are very unlikely to be viewed in their original state. The visualisation image corresponding to a full seismic line would very large and for performance reasons due to bandwidth and other technical considerations would be difficult to handle e.g. for zooming etc. Whilst this mode of viewing is theoretically possible, it is considered more practical to envisage a visualization mode that selects and visualizes only common channel traces from the full file. This visualization could be loaded into a layer enabling comparison of different layers (different common channel traces) in order to highlight e.g. offset dependent amplitude variations that could be relevant for Amplitude Versus Offset (AVO) studies.

- *Introduce pop-up help messages*:

  These have been introduced for all the tool buttons.

3 Guide to viewer functionality (new edition)

3.1 Zoom

(current version beta 1)

 Click on the button to activate the zooming function (Figure 2).

Please note that the button must be pressed otherwise zooming does not work (Please note that zooming in the seismic section is different from zooming in the map)

Zooming is activated:

1) by the mouse wheel. Pointing with the cursor on the section

Wheel up zooms-out

Wheel down zooms-in (Please note that to zoom-in the mouse should be inside the area of the section)

2) by means of the + and – button that can be accessed by pressing CTRL + Z . The zooming box can be moved around simply grabbing it and moving to another area of the section.

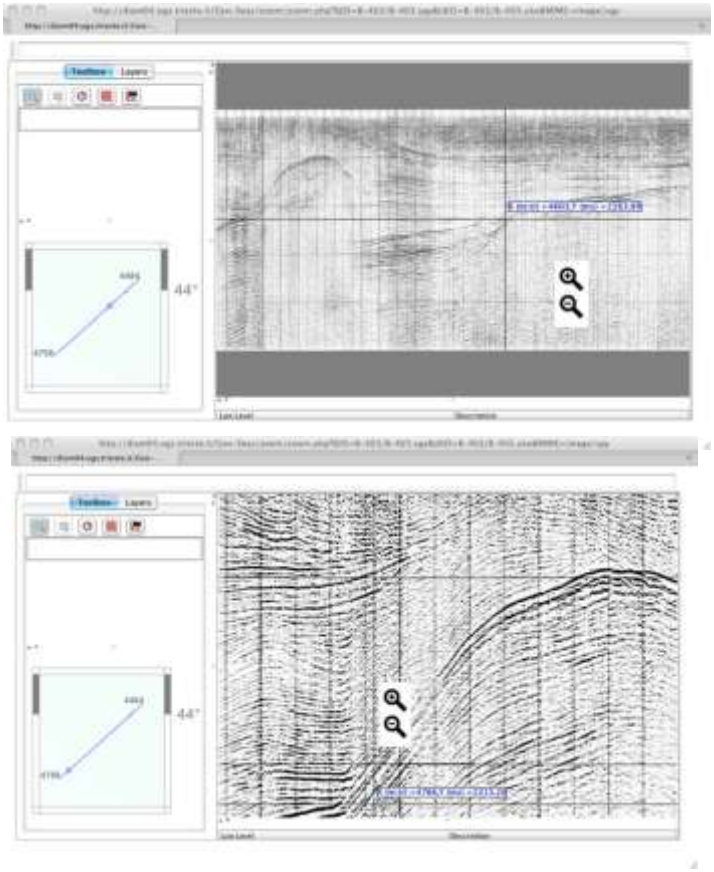


Figure 2 Viewer zooming functionality.

3.2 Processing: filters and/or Gain

(current version 0.9alpha)

Click on the button to activate the gain function

Please not that The enable filters check box should be activated, to ensure that you change the value of the gain, it will be applied immediately (Figure 3).

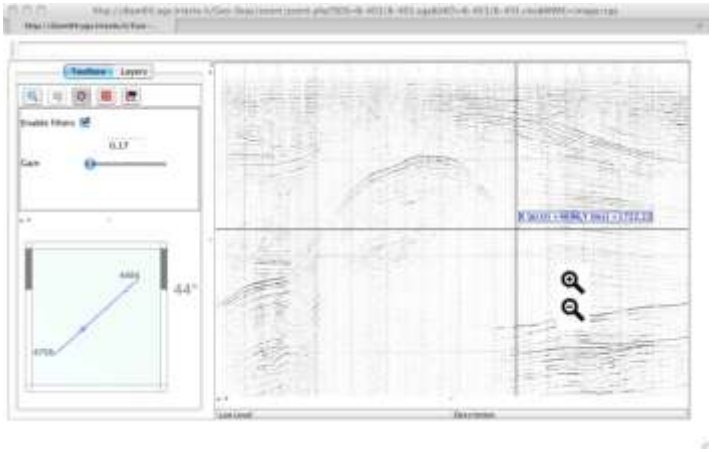


Figure 3 Changing the gain in the seismic viewer.

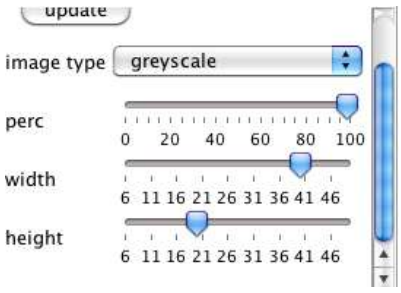
3.3 Change section presentation mode

There are two methods to change the presentation of a section:

All the sections at one time (must activate  button)

In this case the change in the presentation mode will be appied to all the section. The change is activated only when the Update Image button is pressed

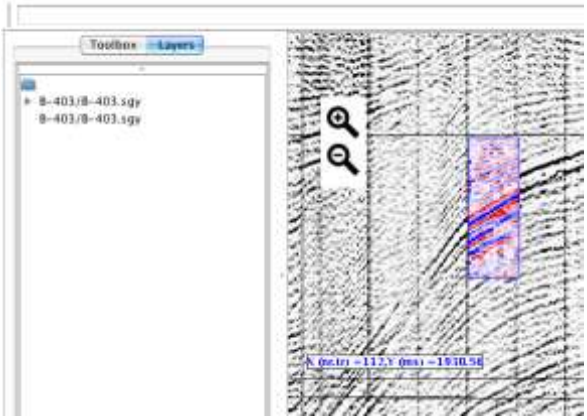
To change the presentation from greyscale to red white and blue simply change the combo box and press the Update Image button.



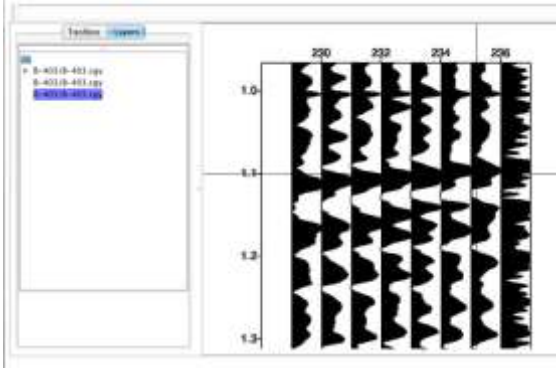
Additional editing effects can be achieved by adjusting the available parameters

In this area it is possible to vertically stretch or compress the section and to change the gain (according to Seismic Unix Perc plotting parameters)

A **portion of the section** can be superimposed onto the section itself (must activate button)



In this case the change in the presentation mode will be applied to a portion of the section. This portion is selected by clicking and dragging the mouse across the section itself. The selected area is sent to an application that will plot a new version of the selected area with the desired presentation. Please note that during zooming the selected super-imposed area is preserved but since the parameters could be different in the new layer, the signals may not be perfectly superimposed with the layer behind it.



It is to be noted that the resulting new section area becomes a layer that is listed in the layers tab. It is possible to show it in detail by clicking on it in the section or in the layers tab.(Figure 4). These new layers can be considered a result of processing (although the Seismic viewer is not to be considered a processing tool).

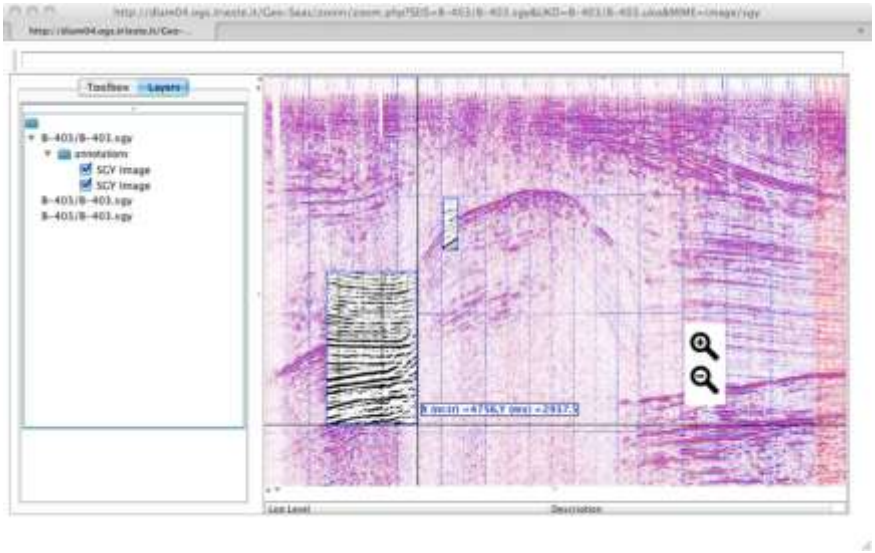


Figure 4 Multiple layers with different presentations on the same section.

Pre-stack data visualization

Pre-stack data correspond to large files that are not easy to visualize in a seismic viewer. Once a seismic dataset is loaded it is initially plotted showing all the traces in the file.

To ease visualization of such files a new tool is added into the toolbox corresponding to the following icon

This enables one trace (channel) per shot record to be selected so that the visualization of all the common channel sections resembles a stacked section (Figure 5). This improves the clarity of the view and makes it possible to highlight amplitude variations with offset.

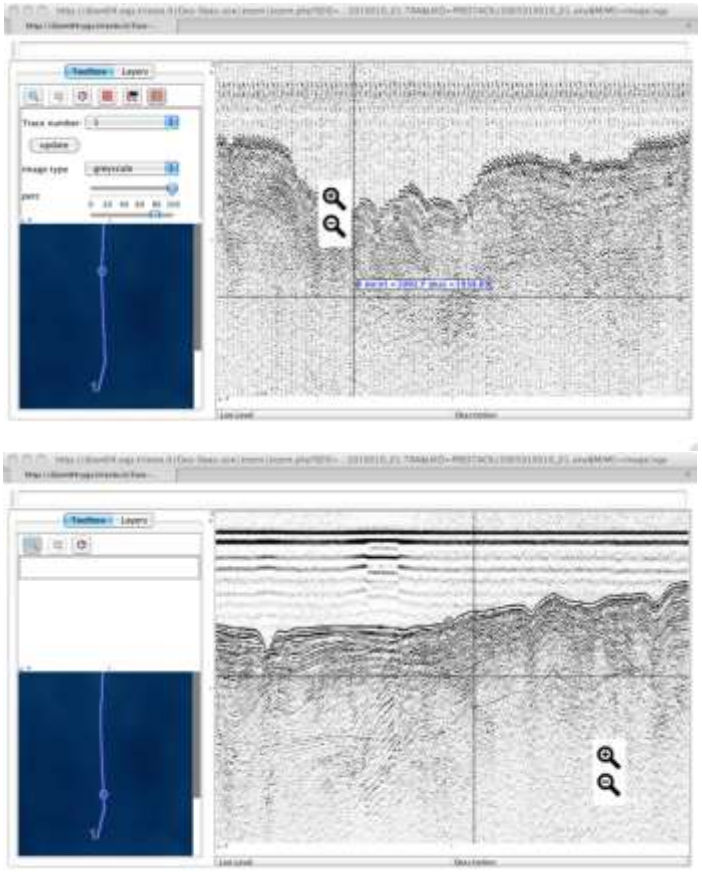


Figure 5 Prestack visualisation. Selects a single channel and plots a common channel section that resembles a stacked section

3.4 Annotation and collaborative tools.

These tools are at an early stage of development, and were implemented to establish the basic feasibility of further development in future editions of the viewer.

4 Integration of the viewer within the Geo-Seas distributed infrastructure

4.1 Original Viewer Configuration

It was originally envisaged that the initial prototype as described (D11.1) and tested (D11.2), would be integrated into the Geo-Seas infrastructure based on the outcomes of WP4 and in particular upon the requirements defined in D4.2.

As shown in Figure 6 (reproduced from D4.2) the original concept was to assign specific roles to each of the three layers that comprise the stack of XML documents that are used to describe metadata within Geo-Seas.

Of these three layers, the CDI was assigned the role of data discovery, the SensorML document controlled data browsing, and the O&M document provided the link between these and the means to access the visualization services.

In D4.2 it was envisaged that the viewer would have been linked from an O&M <result> element contained within (possibly) multiple <relatedObservation> elements. This approach had several advantages from the point of view of seismic data, including the potential to cater for instances where there can be multiple segments of seismic lines, e.g. as in the case of “vintage” data. This approach also enabled a direct link to the full navigation of the line in Ukooa/P1 format (as required in D4.2 and D4.5.)

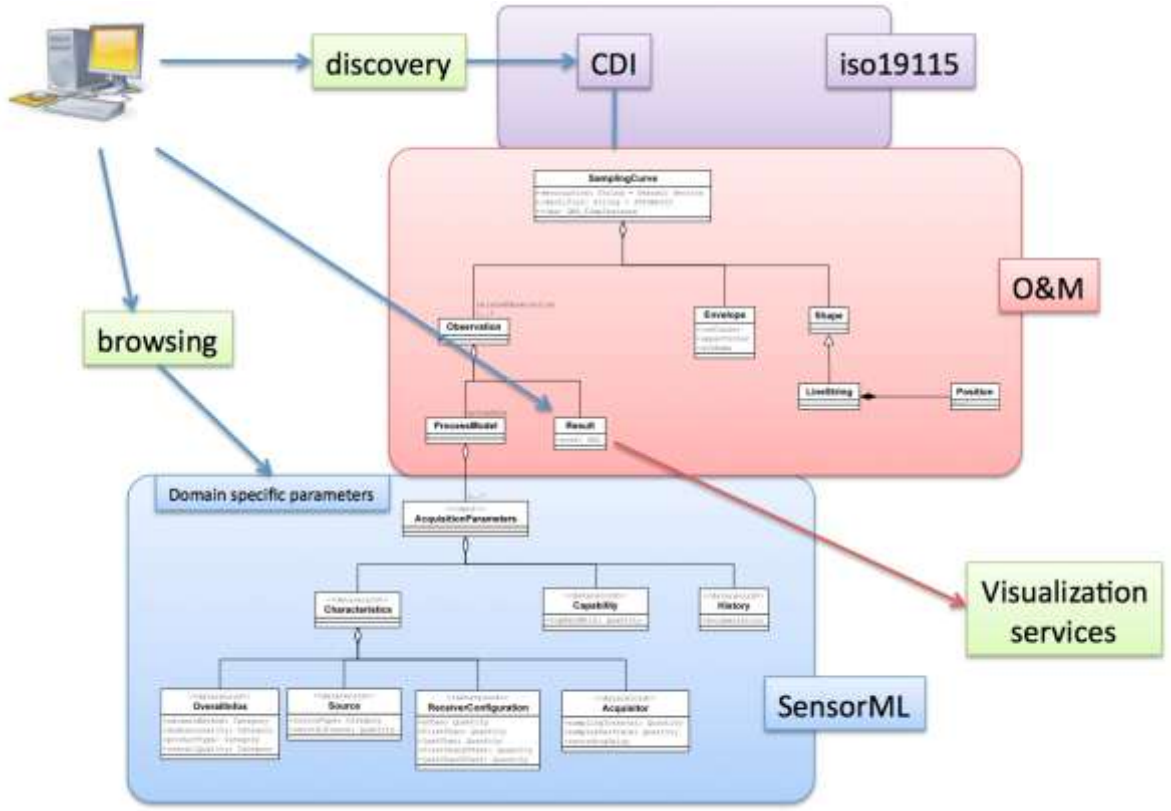


Figure 6 Initial metadata structure, and data access path

The original prototype viewer was conceived with this vision in mind, and hence did not make use of the RSM/DM software used within SeaDataNet. Rather, the concept was to embed the tools required to control user access within the viewer itself.

To this end the prototype was designed to enable switching between several optional data protection modes. These included watermarking, mid resolution and low resolution rendering of the seismic data, which would have enabled data owners to set their preferred data access policy control mechanism on a dataset by dataset basis.

This low-resolution visualisation mode capability would have meant that the viewer could satisfy the requirements for the Geo-Seas low resolution visualization, and was adopted as such under D8.3.

4.2 Revised viewer configuration

In the new revised version, in order to gain access to a dataset the end-user does not follow a link through the result element in the O&M document, but instead makes use of the RSM/DM facility available in the SeaDataNet/Geo-Seas infrastructure. This facility handles user authorisation and data request submissions and access.

Under this new approach the CDI is relocated at a central point and it's role is extended from discovery only, to include data access.

This arrangement is illustrated schematically in Figure 7, which also shows the evolution from the original arrangement illustrated in Figure 6.

The end user searches for the seismic line he/she is interested in at the CDI level (Figure 8). Once relevant data have been found, the end user is redirected to the RSM/DM, from where the user has the potential to enter into negotiation with the data supplier. A link to the viewer is then presented (Figure 9) in the case of a positive outcome to the negotiation

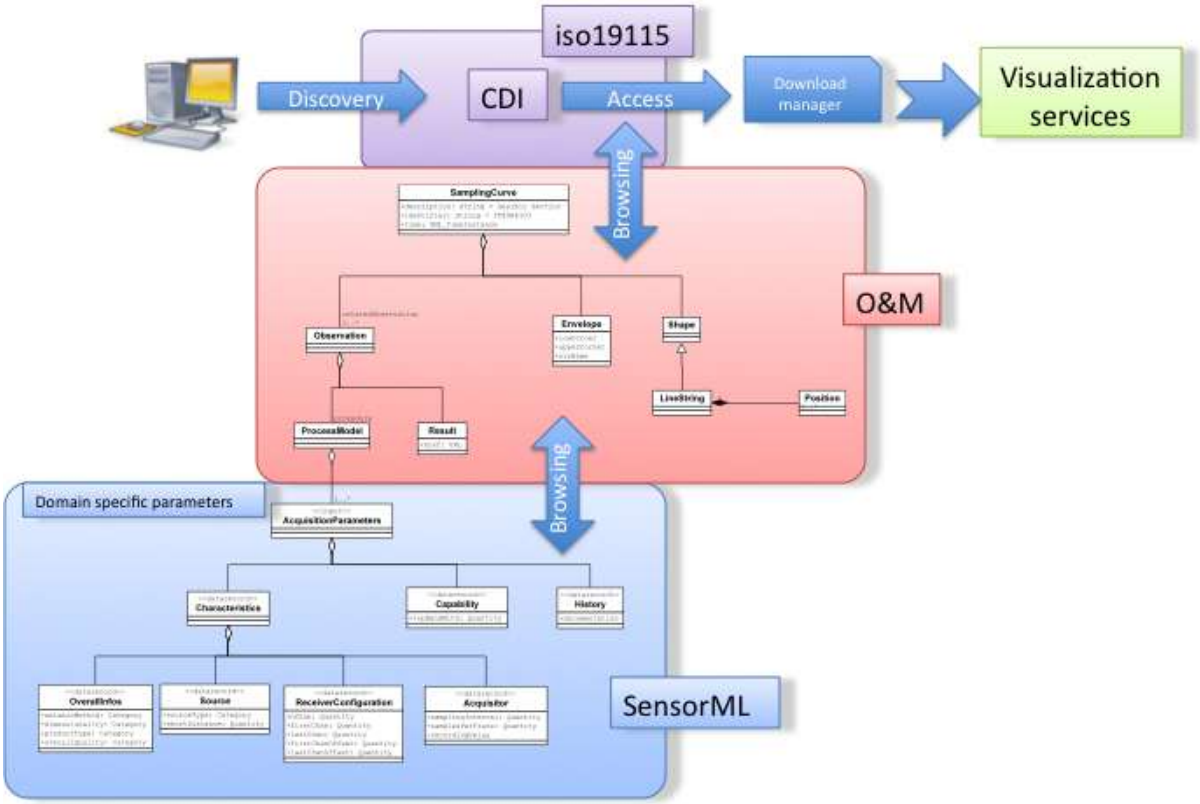


Figure 8 Current (redesigned) data access path

Figure 9 Data discovery through the central Geo-Seas search facility

It is important to note that in order to achieve what had originally been envisaged and described (D4.2) and subsequently developed (prototype described in 11.1) using the RSM/DM approach, would have required a considerable redesign of the RMS/DM tool itself. Since this was regarded as excessively complex and time consuming, the alternative option was chosen, i.e. to maintain the RSM/DM in its current configuration, and modify the process of data access and visualization.

This decision to step back from the original O&M centric approach, and adopt the RSM/DM centric method used in SeaDataNet, did, however, have serious consequences for the original prototype seismic viewer development plan, involving the expenditure of significant additional time in re-working and modification. Furthermore this change in perspective resulted in the exclusion of several functions that were present in the prototype.

From the data owners' perspective, the adoption of the revised method has several practical consequences in relation to metadata production and in setting up the viewer system. These are discussed in detail in the two annexes:

- Seismic data best practice:
- Seismic viewer installation tutorial:

Furthermore it should be noted that under the revised method, the seismic viewer can no longer be considered as the primary means to enable low resolution seismic image production. This is due to inherent limitations in the RSM/DM which confine it to a single visualization mode. Therefore to produce low resolution images as required by WP8.3 a separate procedure should be implemented by data owners. An open source based solution for this is outlined in D8.3

Annex A. **References**

[1] Geo-Seas deliverable 4.2: Geo-Seas geophysical CDI metadata XML standard, and possibly CDI modification list and international conversion protocols

[2] Geo-Seas deliverable 4.5: Geophysical data transport format

[3] Geo-Seas deliverable 8.3: Prototype software for low-resolution geophysical viewing services

[4] Geo-Seas deliverable 10.1: Report on user consultation for data products and viewing services

[5] Geo-Seas doc. : GS_WP11_[Seismic_data_best _practice]_[1].doc)

[6] Geo-Seas doc. : GS_WP11]_[Seismic_data_viewer_installation_tutorial]_[1].doc)

[7] Barry, K.M., Cavers, D.A., Kneale, C.W., 1975, Recommanded standards for digiral tape formats, Geophysics, 40, no 2, 2344-352, http://www.seg.org/documents/10161/77915/seg_y_rev0.pdf

[8] SEG Technical Standards Committee, 2002, SEG-Y rev 1 Data Exchange format http://www.seg.org/documents/10161/77915/seg_y_rev1.pdf

[9] Seismic Un*x : http://www.cwp.mines.edu/cwpcodes/

Annex B. **Figures and Tables**

B.1. List of Figures

Annex C. **Terminology**

Seismic viewer	Web based application able to access data on a remote server
Gain	Values of the single seismic data samples, increasing the gain means increasing the values of the samples of a seismic section
Presentation	The mode in which a seismic section is visualized: variable density means that the color/grey tone is determined after the value of the sample. Wiggle: is a common seismic display that shows trace amplitude versus time as an oscillating line about a null point.
Pixellation	In relation to images: pixellation is caused by displaying a bitmap or a section of a bitmap at such a large size that individual pixels, small single-colored square display elements that comprise the bitmap, are visible.
Pre-Stack data	Processing of seismic data comprises several phases. During one of these phases the original records are corrected in order that the delay in timing of events due to the velocity of the media is removed. After this phase traces in the same common mid point can be stacked to increase the signal and reduce noise. Pre-stack data refers to data before this phase while stack data refers to seismic sections that underwent this phase.

Annex D. GeoSeas seismic data viewer server-side installation instructions

History				
Version	**Author(s)**	**Status**	**Date**	**Comments**
001	P. Diviacco, A. Busato (OGS)	DRAFT	13/11/2012	Circulated for comment
002	Dick M.A. Schaap	FINAL	17/03/2013	Finalised

Content

5 Introduction

Geo-Seas implements an e-infrastructure of 26 marine geological and geophysical data centres, located in 17 European maritime countries. Users can identify, locate and access pan-European, harmonised and federated marine geological and geophysical datasets and derived data products held by these data centres through a single common data portal.

Seismic data sets are a new addition to the infrastructure, for which specific tools have been developed within the Project.

This document pertains to the enablement of data access which is provided via a web based viewer or High Resolution Seismic Viewer (HRSV) that should be installed on a server within each participating partner's existing infrastructure. Further details on the viewer can be found in Deliverable 11.1 and in the document specifying the general approach to WP8 and WP11 integration

6 Requirements

REFERENCE LINUX: ArchLinux distribution 64bit

a. Postgres 9.x

b. Postgis 2.x

c. Apache 2.22.x

d. PHP 5.3.x

e. PHP Modules

- php-apache 5.3.6-5
- php-curl 5.3.6-5
- php-gd 5.3.6-5
- php-mcrypt 5.3.6-5
- php-pear 5.3.6-5
- php-pgsql 5.3.10-4
- php-xsl 5.3.6-5
- jpgraph

f. Sun JDK 1.7.x

g. CWP (Seismic Unix) ogs patched version (distribuited in "extra" folder)

h. GMT 4.5.x

l. scripts (distribuited in "extra" folder)

m. ImageMagick 6.7.1-6

n. pstoedit with SVG plugin 3.50.x

7 Modules Description

a. Geoseas High Resolution Seismic Viewer (HRSV)

The HRSV is a PHP-web application which makes the applet available to clients. This application is developed to use CAS;

b. Broker (JMS Broker)

The JMS broker is based on the ActiveMQ (Apache project), and it is responsible for the delivery of application messages between components (JMS clients);

c. Internet Imaging Protocol Service (JMS Client)

Provides both image tiles against IIP protocol requests and static resources (SVG files)

d. Seismic Unix Utilities and Converter (JMS Client)

Converts legacy documents (sgy, uko, tif) to a convenient format as ptif or svg; effectively it is a proxy to GMT and CWP tools.

e. Sweeper

The sweeper is a help module which includes a configurator for HRSV modules and cache, and a cache manager in order to import new content into the cache database; in particular:

- the HRSV is based on a document caching system (developed by OGS) whose function is to maintain links to legacy and converted documents by adding information which depend on file type: e.g. shots number, vessel direction georeferenced path, and relationships between elements as provided by OEM

- legacy documents are preloaded in the cache using sweeper GUI tools, the sweeper is responsible for creating the first converted document

- another important feature of the sweeper is that it can configure the modules involved in the geoseas infrastructure

8 Installation

8.1 Database

execute the following command as a postgres user:

[postgres_home]/bin/psql -U postgres -f sql/db_octopus.sql

this command creates the db

. role "gsadmin" with default password "gsadmin"

. tables and funcitons for content cache system

8.2 GMT and CWP

GMT and CWP are deployed into installation package, please install them as indicated in their documentation files [GMT][SU]

8.3 Modules

WebApps

choose your favourite folder to uncompress the PHP-application *geoviewer_applet*

tar -xvfz geoviewer_applet.tgz

configure webserver apache:

- in **httpd.conf** add

  <FilesMatch "\.jnlp$">

  SetHandler application/x-httpd-php

  </FilesMatch>

- into Apache web application folder add a named “Geo-Seas” link to geoviewer_applet application

GeoViewer makes geoseas viewer applet available to clients and it checks user credentials against a CAS server; so the applet is reachable through two ways:

Applet

http[s]://<host>/Geo-Seas/zoom/zoom.php?local_cdi_id=<local_cdi_id>

Java Web Start

http[s]://<host>/GeoSeas/geoviewer.jnlp?local_cdi_id=<local_cdi_id>

JMS (Scalable Application Infrastructure)

choose your favourite folder to uncompress the following service

tar xvfz geoseas_broker.tgz

tar xvfz jms-iipservice.tgz

tar xvfz jms-seismic_service.tgz

these modules include into startup folder the linux service script; this file should be copied or linked into /etc/rc.d directory and included into rc.conf daemon section (archlinux reference) or linked into right service level directory for other types of linux distributions.

Utils

choose your favourite folder to uncompress the following package

tar xvfz sweeper.tgz

8.4 Configuration of the modules and import new file in cache using GUI

a. go to sweeper home

b. execute

sh configureGUI.sh

the panel is split into three tabs

1. Edit

   in this tabs you set all the parameters which will be used into hrsv modules

2. Configure

   The home locations of the modules must be selected in order to apply the parameters in the Edit tab

3. Sweep

   prerequisites Edit and Configure must be applied, you can import master files into the cache.

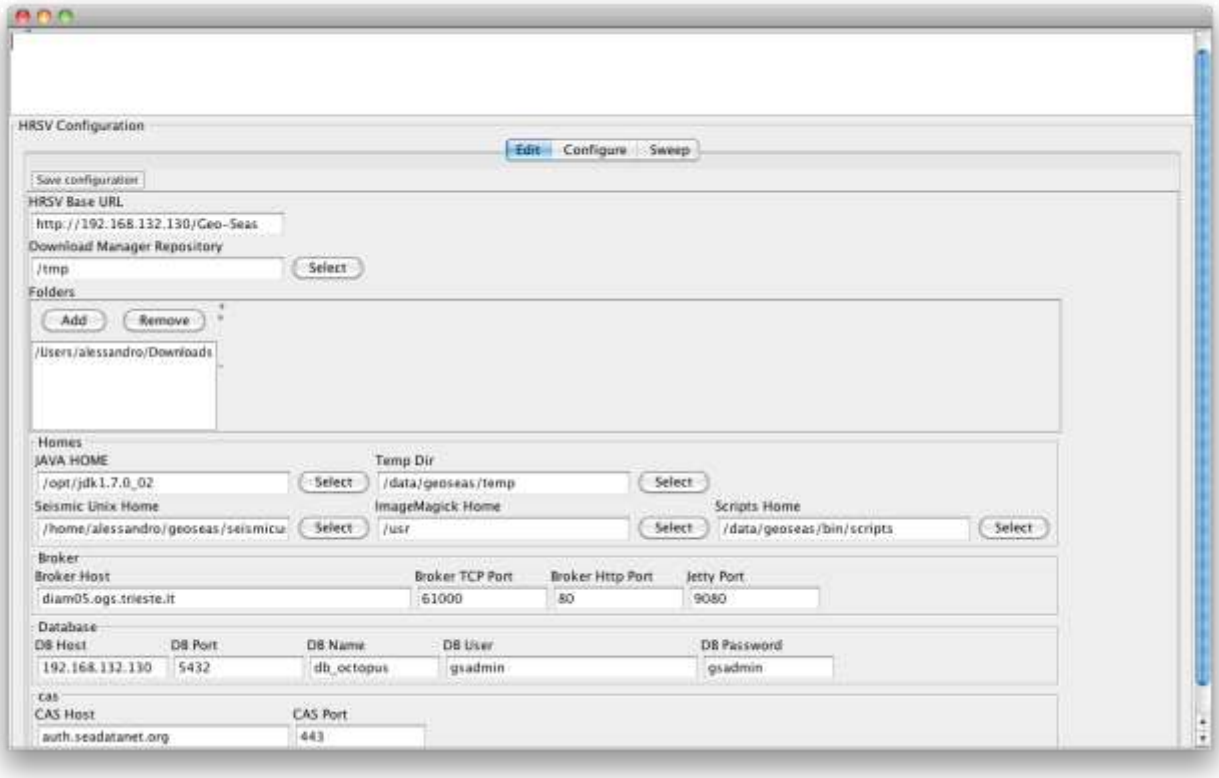
The master document path is structured using the schema:

<MASTER_HOME>/<local_cdi_id>/<the rest of path>

the loading process should be planned using this order (as defined in etc/application-context.xml)

1. uko, navigation files
2. oem, populates the content relationship table (because oem define relation)
3. sml
4. the rest of files as defined in etc/application-context.xml

8.4.1 EDIT



Meaning of the parameters:

1. HRSV Base URL, the url of the application in the form

   scheme://host[:port]/context-path , the default context path is “Geo-Seas”,

   example:

   http://diam04.ogs.trieste.it/Geo-Seas

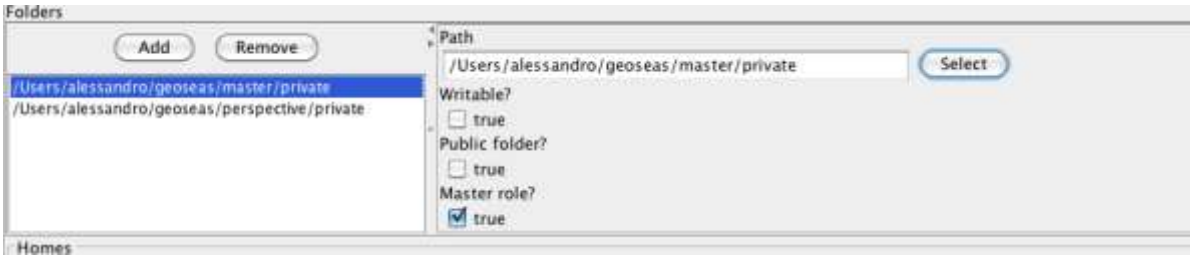
2. Download Manager Repository, sets the location where the download manager writes the user trigger directory, <dm_repository>/<user>/services/HRSVS/<localcdiID>, where <xy> are variables

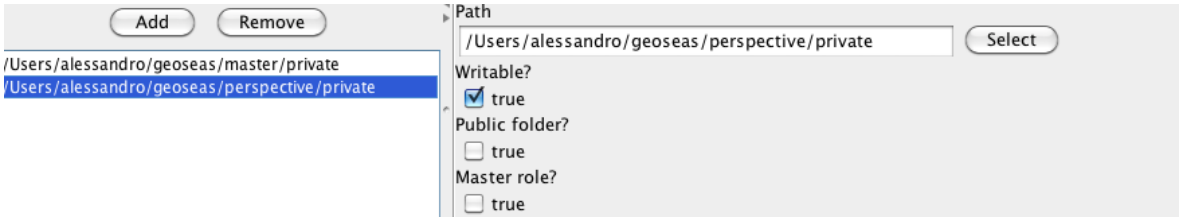
3. Folders, set the folder in which the sweeper scan for new files; folders are divided into classes:

   master, folder which keeps the original documents either private or public

   perspective, folder which are used to store documents created from the original ones

   If you set one or more masters you have to set one “non” master folder , if master is private then private perspective folder is required and if master is public then a public perspective folder is required





4. Homes section, parameters are self explained, just a tip:

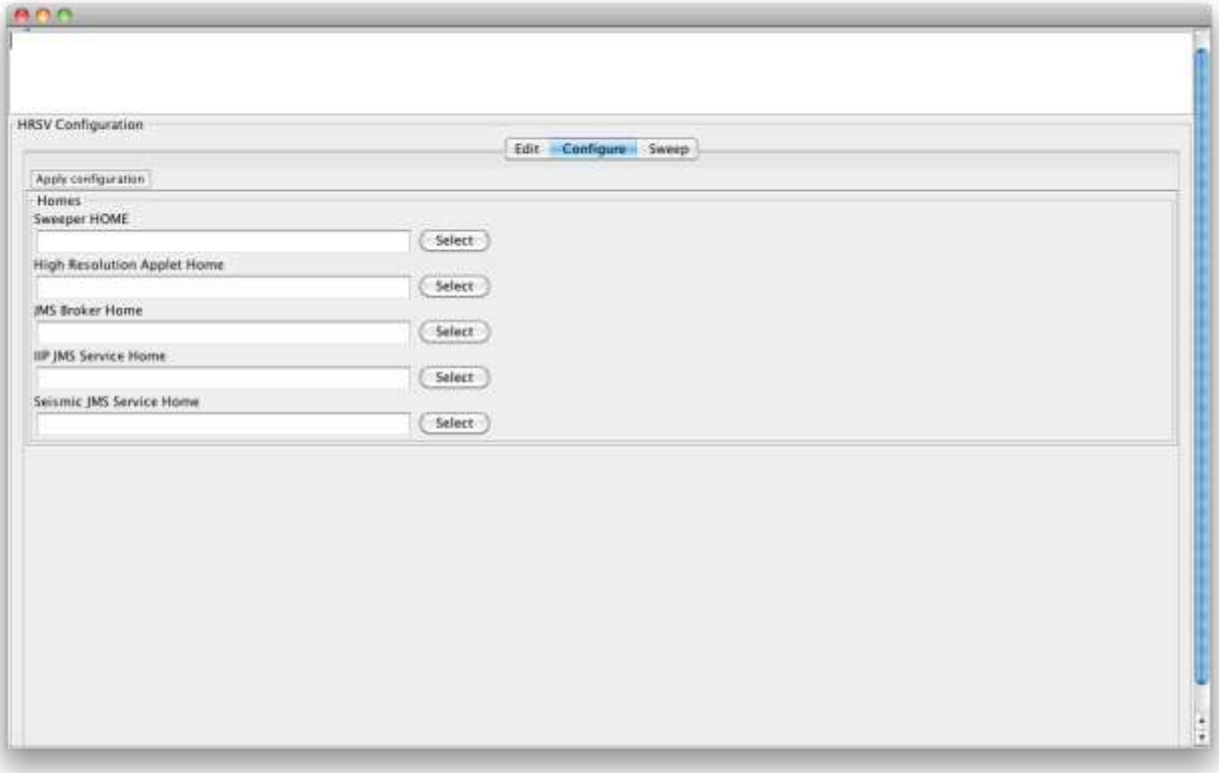
   Temp directory, it is a working directory for document conversion, this folder should have at least 10GB or above available

   Scripts Home, it used to store the script “Uko2gmt.sh” used to convert uko files into svg format

5. Broker section, you configure the backend of high resolution viewer
6. Database section, you configure a connection to postgresql instance
7. CAS parameters

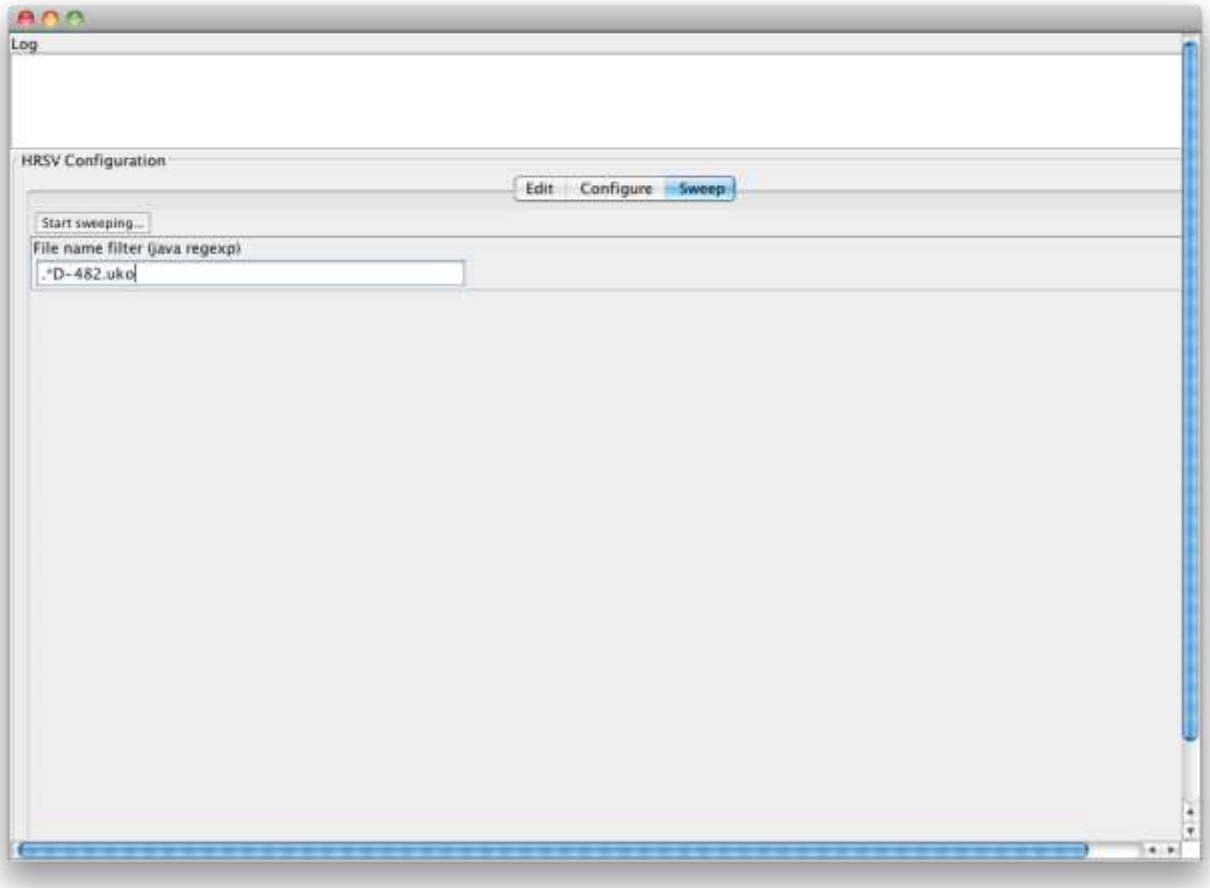
At the end click “Save configuration” in order to save these parameters

8.4.2 CONFIGURE



This is a very simple step; just select and set the module home and click on “Apply configuration”

8.4.3 SWEEP



Set the filter on file names and click on button in order to start the sweeping process; the default filter is ".*", you can change it if you want load just a subset of files (subset of files as defined in application-context.xml).

The process import into cache the files (in master folders) which match against the filter and create into perspective folder new converted document as defined in "etc/application_context.xml"; if master document is private the sweeper search for a private and writable perspective folder.

This GUI is a work in progress that means other features will be added as soon as possible for example:

1. database schema creation;
2. remove files from cache;
3. application-context.xml files filters and conversion plugins;
4. make the sweep tab user-friendly ;
5. any suggestions?

9 References

[GMT] http://gmt.soest.hawaii.edu/

[SU] http://www.cwp.mines.edu/cwpcodes/