SEN3APP Service Validation Report

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SEN3APP

Processing Lines And Operational Services Combining Sentinel And In-Situ Data For Terrestrial Cryosphere And Boreal Forest Zone

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Table of Contents

Introduction

The users of the satellite data based services are dependent on the regular and timely delivery of the data products, which is in general one of the key advantages of remote sensing as data source. There is need for regular monitoring on the data dissemination in order for the service provider to react to anomalies in the data production.

In SEN3APP the data dissemination is divided to two platforms to cover all regions and products under the SEN3APP umbrella. The Finnish National Satellite Data Centre (NSDC), which is also acting as ESA Collaborative Ground Segment, acts as one of the data dissemination centres, the other is the Cryoland Geoportal, established already in the FP7 Cryoland project.

The data dissemination in the two SEN3APP sites are hosted on platforms that provide operational monitoring capabilities, means for manual tests of the functionalities and features of the services and notifications to the operators to pick up anomalies in the data production.

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2. Title

Assessment of performance of the SEN3APP services

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4. Abstract

The methods for monitoring the two data production and dissemination facilities in SEN3APP are reviewed. The SEN3APP data dissemination at NSDC runs on commercial Hexagon Geospatial ERDAS Apollo system, which provides information on the service availability and to administrate the data in the portal.

The software used to provide Cryoland services have an automated testing procedure and manual tests can be carried out for testing individual features of the service. Cryoland Geoportal service was rigorously validation already in the Cryoland project, where comprehensive case study was made. The results of these tests are summarized here.

5. Keywords

#service, #validation, #performance,

6. Key terminology

CryoLand system	Total CryoLand system, including the backend part with the EOxServer software for controlling the product ingestion and interfaces, and the frontend part with the GeoPortal for dissemination snow and land ice products via an interactive webGUI and via non-interactive EO-WCS/EO-WMS options, respectively
CryoLand GeoPortal	Online data access point for snow and land ice services. This includes a graphical user interface (webGUI) as well as the option to download and/or integrate products automatically via EO-WCS/EO-WMS to an end-user's system
EOxServer	Software modules for controlling the CryoLand system
Erdas Apollo system	Online data access point for EO and in-situ data. This includes a graphical user interface (webGUI) as well as the option to download and/or integrate products automatically via EO-WCS/EO-WMS to an end-user's system
FMIARC GeoPortal	Acts as client to the FMI Erdas Apollo Server

7. Background, Context and Scope

The infrastructure for processing and distributing the satellite based data products in SEN3APP is established in FMI facilities in The Arctic Research Centre (ARC) at Sodankylä. The research centre also now hosts the Finnish National Satellite Data Center (NSDC). As the coverage of satellite data received at NSDC does not cover for all necessary data for services in the Alpine region, SEN3APP services for Alpine areas in Europe are hosted at ENVEO and distributed via the CryoLand GeoPortal, developed and established within the EU FP7 project CryoLand (2011 – 2015). The Sentinel data for the generation of Alpine wet snow and land ice products are retrieved from the Scientific Data Hub of ESA. The Pan-European and Alpine fractional snow cover services provided by ENVEO are still based on MODIS Terra data from NASA, as Sentinel-3 data were not yet available in near-real time during the SEN3APP demonstration phase.

Here the methodologies for monitoring the two infrastructures of FMI and ENVEO are presented.

Commercial software powers the FMI Erdas Apollo system, hosted by NSDC. The Hexagon Geospatial, the developer of the software, has tested the system (Hexagon, 2014). Erdas Apollo includes interfaces that enable easy remote system and data administration. To ensure that all services are running or working as they should, the administrator and data managers check whether the services are running correctly from the data manager. The administrator can also check the service capabilities and recently ingested SEN3APP products from the data manager.

The CryoLand system, hosted by ENVEO, was extensively evaluated during the EU FP7 project CryoLand (No. 262925, 2011 – 2015) with 991 tests. Since these evaluation activities,

the system has been running stable without any further changes of the functionalities. Thus, the evaluation results collected during the CryoLand project are considered to be still valid, and are summarized here.

In case of any problems with the basic server of the CryoLand system, the ENVEO team is automatically informed by mail and can thus solve such issues usually within a few hours. Further, users were contacting the ENVEO team in case they discovered any problem at the front end of the GeoPortal.

8. Outcomes

In total, 991 test cases were executed to assessing the performance of the CryoLand system, including the software and interfaces in the backend and the GeoPortal with the interactive webGUI and the non-interactive EO-WMS/EO-WCS options in the frontend of the system. Almost 100 % of these tests were successful. Only one minor browser specific error occurred during a manual test case of the GeoPortal, when the changing of the layer opacity did not fully work in the Google Chrome browser. Anyway, this error did not affect the usual behaviour of the GeoPortal.

CryoLand system part	*Test case*	*Number of executed tests*	*Number of successful tests*
Backend, Network service	Automated	919	919
Frontend, GeoPortal	Manual	72	71
TOTAL		991	990

Table 8.1: Summary of the CryoLand system evaluation.

9. Inputs

Input	Description	Link
Test case	Predefined purpose and description for testing the functionalities of the CryoLand GeoPortal	
CryoLand GeoPortal	The webGUI and the EO-WMS/EO-WCS services of the CryoLand GeoPortal	http://neso1.cryoland.enveo.at/cryoclient/
Test scripts	Automated scripts to test the performance of the EOxServer system to control the CryoLand backend (only for internal usage)	

10. Standards and Traceability

Standard/ Documentation	Description	Link

OGC standards	Open Geospatial Consortium standards for interfaces and encodings	http://www.opengeospatial.org/

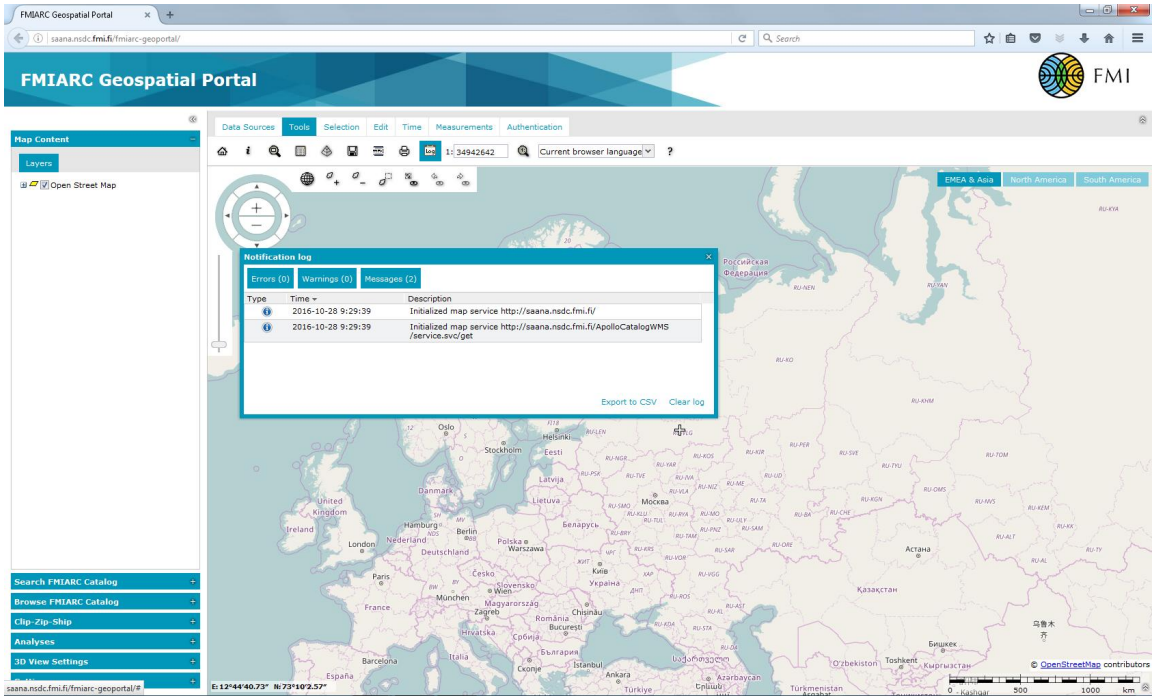
11. Methodology

NSDC, FMI

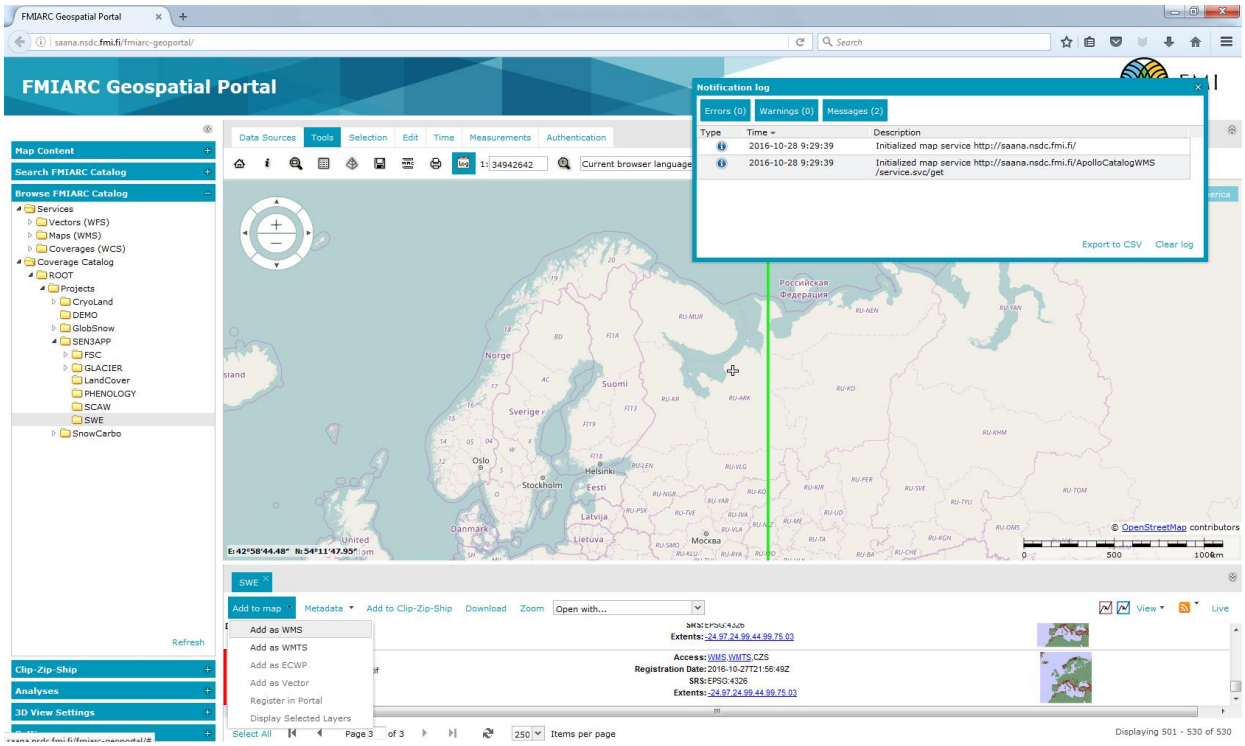
Regular monitoring of the processing lines and services is done daily. The Erdas Apollo administrator uses the data manager and GeoPortal to ensure that services are available and working correctly, as they should. Processing lines use fully automated emailing system to send quick-looks and logs of latest High Resolution (5km) Pan-European SWE and Fractional Snow Cover Extent for Northern Hemisphere from Optical Data, Extended Baltic Sea Drainage Basin Direct Broadcast FSC Based on NPP VIIRS, and Sentinel-3 SLSTR once available, products to the operators. The logs and quick-looks allow the operators to check that the processing lines are running without any discrepancies in the images.

The FMIARC GeoPortal acts as client to the FMI Erdas Apollo Server. To ensure that server OGC services are ok, an operator conducts regular tests using the GeoPortal. Below are some of the tests that were carried out;

1. Operator opens the GeoPortal, immediately the GeoPortal initializes access the server, if the server services are not available from the Tools tab, under the logs, it will then show error message. Figure xx shows the notification log.

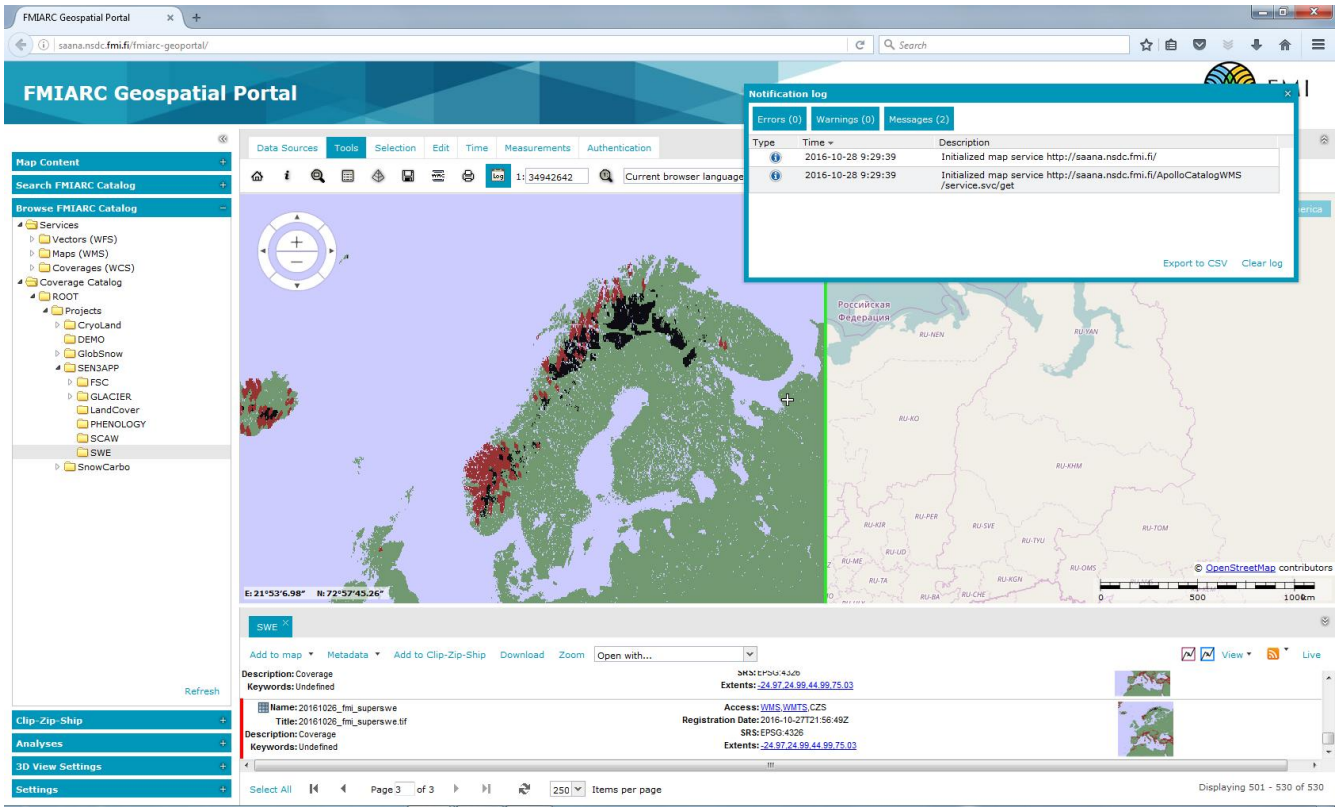


2. Are the catalog services running?
   Operator clicks on browse FMIARC Catalog and selects ROOT >Projects>SEN3APP, if the Catalog is showing all projects available, then the services working.



3. The next step is to check that the WMS service is running.

   The Operator then selects a product and adds it to the map, if the product does not appear on the map, the operator informs the administrator to resolve the issues. Figure xx below shows a 20161026 SWE product generated and registered at 2016-10-27T21:56:49Z.



ENVEO

Automated tests: A fully automated testing procedure (autotest) for the CryoLand software modules was developed and run automatically after every change which is submitted into the system repository, as well as prior to any release version. These tests and associated scripts are only available internally.

Manual tests: manual tests of the CryoLand GeoPortal following predefined testing procedures for each particular functionality of the GeoPortal. Examples of predefined test cases are shown in Table 11.1 and Table 11.2. The webGUI and the EO-WCS/EO-WMS services of the GeoPortal were tested. Additionally, the integration of the CryoLand services into an user's application software was tested.

Test Case CRY-8: Daily Fractional Snow Cover from Optical Satellite Data		
Author:	admin	
Summary:	This test case intends to verify the ability to check the availability of the *Daily Fractional Snow Cover from Optical Satellite Data* product.	
#	*Step actions:*	*Expected Results:*
1	Open a web browser	
2	Insert the following URL: http://neso.cryoland.enveo.at/cryoland/cryoclient/	The GeoPortal graphical user interface is displayed (similar to the image below).

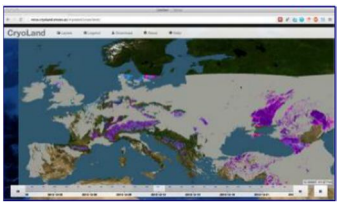
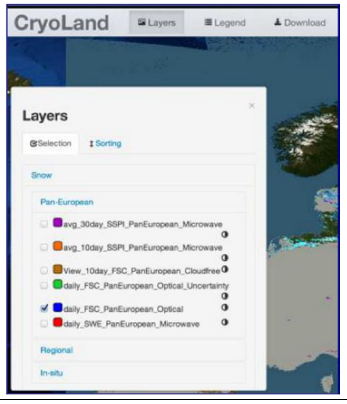
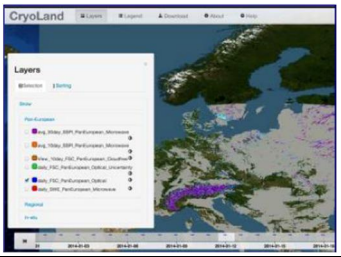
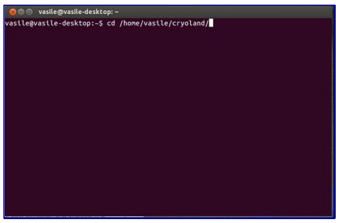
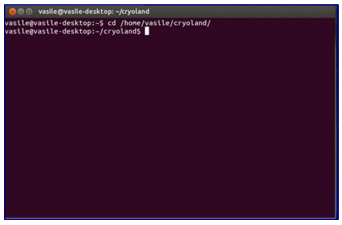
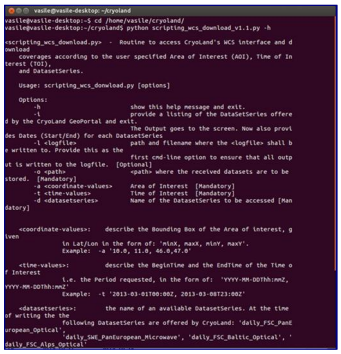
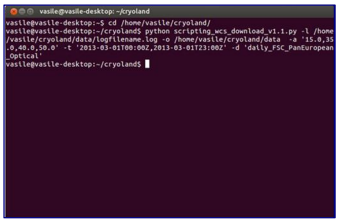
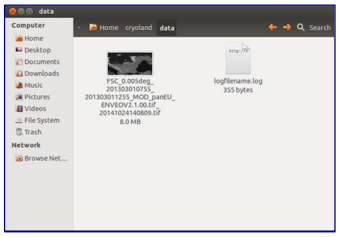
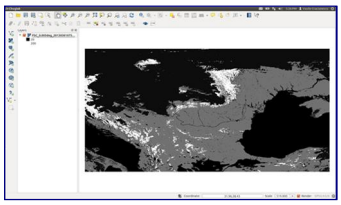
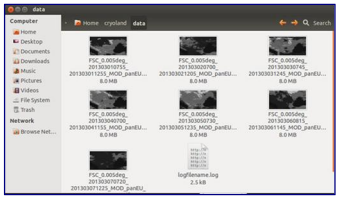
		
3	Click the Layers option from the WebGUI menu bar.	The layers management tab is displayed. 
4	If not already checked, click the left checkbox of the *daily_FSC_PanEuropean_Optical* layer.	On the timeline, the dates with available *daily_FSC_PanEuropean_Optical* product are marked with a blue line.  Being a daily product, each day from the demonstration period (winder 2013/2014), up to the current date should have such a blue line.
5	Use the timeline or the calendar to select a date from the demonstration period and check if the product is available.	Product is displayed on the map. 
6	Repeat the operation for two other dates.	Product is displayed on the map.
Execution type:	Manual	

Table 11.1: Example of a manual test case definition, used for manually testing the CryoLand GeoPortal. The test case describes the procedure for checking the availability of the Pan-European Fractional Snow Cover product (provided also during SEN3APP) using the webGUI of the CryoLand GeoPortal.

Test Case CRY-58: Download CryoLand products using the Python script		
Author:	admin	
Summary:	Test the setup of the Python script and data download using a Linux platform.	
#	*Step actions:*	*Expected Results:*
1	Download the Python script from http://neso.cryoland.enveo.at/scripting_wcs_download.py.zip	Script successfully downloaded to the local computer.

2	Unzip the Python script in the working folder.	The Python script is successfully unzipped in the working folder
3	Open the Terminal application and navigate to the working folder. 	The script is ready to be launched. 
4	Run the script with -h (help) fag to learn how to use the utility (python scripting_wcs_download_v1.1.py -h)	The script options are displayed. 
5	Download a single FSC product using the script with the following parameters *python scripting_wcs_download_v1.1.py -l /home/vasile/cryoland/data/logfilename.log -o /home/vasile/cryoland/data -a '15.0,35.0,40.0,50.0' -t '2013-03-01T00:00Z,2013-03-07T23:00Z' -d 'daily_FSC_PanEuropean_Optical'* 	The file is downloaded in the specified folder. 
6	Open the file with QGIS or other GIS client for inspection.	The file is successfully loaded in QGIS. 
7	Download a time series of FSC product using the script with the following parameters *python scripting_wcs_download_v1.1.py -l /home/vasile/cryoland/data/logfilename.log -o /home/vasile/cryoland/data -a '15.0,35.0,40.0,50.0' -t '2013-03-01T00:00Z,2013-03-01T23:00Z' -d 'daily_FSC_PanEuropean_Optical'*	The files are downloaded in the specified folder. 

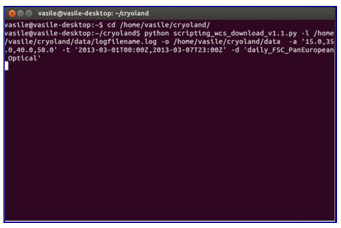
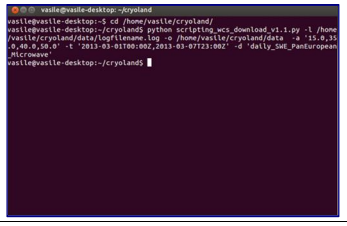
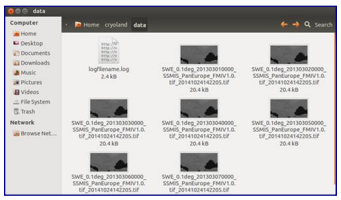
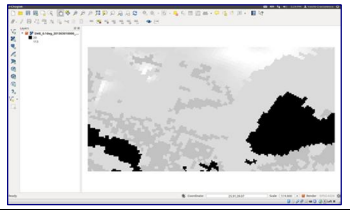
		
8	Download a time series of SWE product using the script with the following parameters *python scripting_wcs_download_v1.1.py -l /home/vasile/cryoland/data/logfilename.log -o /home/vasile/cryoland/data -a '15.0,35.0,40.0,50.0' -t '2013-03-01T00:00Z,2013-03-07T23:00Z' -d 'daily_SWE_PanEuropean_Microwave'* 	The files are downloaded in the specified folder. 
9	Open the file in QGIS or other GIS client for inspection.	The file is successfully loaded in QGIS. 
Execution type:	Manual	

Table 11.2: Example of a manual test case definition, used for manually testing the CryoLand GeoPortal. The test case describes the procedure for downloading CryoLand products using the python script provided in the Help menu of the webGUI of the CryoLand GeoPortal.

12. Evaluation of Performance

For assessing the performance of the CryoLand system, the GeoPortal, the network services and the backend components of the CryoLand system were tested. About 93 % of these tests were run by automated scripts, testing the backend components, and about 7 % were predefined manual test cases for assessing the performance of the interfaces for the end-users, i.e. the GeoPortal and the network services. 65 particular cases were predefined for the manual tests to assess the performance of all functionalities of the GeoPortal. All these manual tests were performed and documented during the period of the CryoLand project (2011 – 2015) by a team of 15 external experts from 9 institutions under the lead of the National Meteorological Administration (NMA) of Romania. An example of the documentation of the results for a particular test case, executed by multiple members of the evaluation team, is shown in Figure 12.1.

Test Case CRY-8: Daily Fractional Snow Cover from Optical Satellite Data

- Author: admin
- Summary: This test case intends to verify the ability to check the availability of the *"Daily Fractional Snow Cover from Optical Satellite Data"* product.
- Execution type: Manual
- Last Result: Passed
- Build: b01

Date	Test Plan	Build	Platform	Tested by	Status	Test Case Version	Run mode
17/07/2014 11:55:46	t1	b01		ViorelChendes	Passed	1	
10/08/2014 22:38:05	t1	b01		Diana	Passed	1	
11/08/2014 10:41:17	t1	b01		marius	Passed	1	
30/07/2014 02:26:57	t1	b01		nelu	Passed	1	
23/07/2014 06:17:28	t1	b01		dragos	Passed	1	
27/07/2014 03:51:41	t1	b01		alina.ristea2	Passed	1	
19/07/2014 07:09:55	t1	b01		narcisa	Passed	1	
18/07/2014 11:33:44	t1	b01		codrina	Passed	1	
08/08/2014 22:59:20	t1	b01		ion	Passed	1	

Figure 12.1: Example of the evaluation results for the test case CRY-8, described in Table 11.1, executed by multiple members of the evaluation team.

Almost 100 % of all executed tests were successful. Only some very minor errors/warnings/slow system responses that do not affect the normal behaviour of the system were registered. The test cases used for assessing the performance of the CryoLand system are summarized in Table 12.1.

System part	*Test case*	*Number of executed tests*	*Number of successful tests*	*Comments*
Backend, Network service	Automated scripts for testing the software and the backend system	919	919	766 test cases fully OK; 153 test cases OK, but skipped, as functionalities were disabled on purpose.
Frontend, GeoPortal	Manual execution of predefined test cases	66	65	Minor errors on one test case regarding a browser specific error that does not affect the normal behaviour of the GeoPortal.
Frontend, GeoPortal	Integration of CryoLand service into a user's system	6	6	Some very minor errors/warnings/slow system responses that do not affect the normal behaviour of the system were registered.
TOTAL		991	990	

Table 12.1: Test cases used for assessing the performance of the CryoLand system.

The performances of the EOxServer software modules have been tested using a fully automated testing procedure. This automated check run after every change which has been submitted into the system repository, as well as prior to any release version.

The functionality of the EOxServer as well as all enhancements and bug fixes are well documented at the EOxServer project page (http://eoxserver.org).

13. References

Hexagon, 2014. ERDAS Apollo Performance Benchmark - ECW Delivery Performance of ERDAS Apollo Versus ESRI ArcGIS for Server. *White Paper, April 14, 2014.* http://www.hexagongeospatial.jp/document/2014/ecw/ERDAS_APOLLO_PERFORMANCE_BENCHMARK.pdf (7.1.2016).

Crăciunescu, V., Diamandi, A. and Schiller, C., 2014: CryoLand - Final system qualification of services and acceptance. CryoLand – GMES Service Snow and Land Ice (2011 – 2015), Deliverable D8.2 and Appendix, 250 pp. *Restricted dissemination*.