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systems**

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*Second annual report on AIP participation (AIP6)***

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Abstract

This deliverable summarizes the GeoViQua contributions to the AIP6. Participation in previous editions of AIP (4 and 5) can be found in D8.3

In AIP6 two main activities took place. In the Agriculture group we experimented with GMU the integration of the user feedback system and the geolabel into the GMU drought portal. In the GCI research we participated in the incorporation of several GeoViQua quality improvements into the DAB. In collaboration with GMU, GeoViQua also contributed with the elaboration of the edition of a tutorial video promotion.

GeoViQua is also providing the GeoViQua Twiki to support AIP6 activities.

This document will be realised as an OGC AIP Engineering report and will be maintained in the OGC repository.



GROUP ON
EARTH OBSERVATIONS

GeoViQua Integration

Engineering Report

GEOSS Architecture Implementation Pilot

Version 1

	Version: 1.0
GeoViQua integration Engineering Report	Date: 31/Jan/14

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0.2	14/February/14	Lorenzo Bigagli	DAB contribution

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	Version: 1.0
GeoViQa integration Engineering Report	Date: 31/Jan/14

Table of Contents

Abstract	4
GeoViQa Integration	5
Engineering Report	5
GEOSS Architecture Implementation Pilot	5
Version 1	5
Table of Contents	7
Table of Figure	8
GeoViQa Integration	9
1. Introduction	9
1.1 Scope of this document	9
1.2 GEOSS AIP	9
2. GeoViQa Objectives	9
3. Scenario 1: User Feedback and GEO label integration	10
3.1 Actors	10
3.2 Context and pre-conditions	10
3.3 Scenario Events	10
3.4 Post-Conditions	11
3.5 Special Requirements	11
4. System Model of the Scenario	11
4.1 Context Diagram	11
4.2 Enterprise View	12
4.3 Information View	12
4.4 Computational View	12
4.4.1 Detailed description of the interaction.	13
5. Implementation	15
5.1 Deployed Components	15
5.2 Interoperability Arrangements	15
5.3 Quality-enabled Discovery and Access Broker	15
5.4 Use of the GCI	18
5.5 Demonstrations	18
5.6 Future plans for deployment	18
6. References	18
ANNEX I GeoViQa response to the AIP 6 CFP	19

	Version: 1.0
GeoViQua integration Engineering Report	Date: 31/Jan/14

1. Overview	21
2. Proposed Contributions	21
2.1.1 Societal Benefit Area Alignment and Support	21
2.1.2 Component and Service Contributions	24
2.1.3 Architecture and Interoperability Arrangement Development	24
3. Description of GeoViQua	27

Table of Figure

Figure 1. George Mason University Global Agricultural Drought Monitoring and Forecasting System Wiring Diagram of the whole information system	11
Figure 2. Enterprise viewpoint diagram.....	12
Figure 3. Dynamic icons integrated in the GMU portal	14
Figure 4. User feedback interface to report new feedback	14
Figure 5. Expert review additional information emerging from de expert reviews GEO label faced.....	15
Figure 6 Producer Quality Model queryables.	16
Figure 7 User Quality Model queryables.	17
Figure 8 DAB-Q context.	17

	Version: 1.0
GeoViQua integration Engineering Report	Date: 31/Jan/14

GeoViQua Integration

1. Introduction

1.1 Scope of this document

This document summarizes two main activities took place in AIP6. In the Agriculture group a methodology to integrate both GEO label API and the User feedback system API was tested in the GMU drought portal. In the GCI research, several GeoViQua quality improvements were incorporated into the DAB. The system is related to GEO SBA Task AG-01 Global Agricultural Monitoring and Early Warning. The system to be integrated into is its Component C1 - A Global Operational Monitoring System of Systems for Agricultural Production, Famine Early-warning, Food Security and Land-use Change.

1.2 GEOSS AIP

The GEOSS Architecture Implementation Pilot (AIP) task develops process and infrastructure components for the GCI and the broader GEOSS architecture as a means of coordinating cross-disciplinary interoperability deployment. The AIP Task provides phased delivery of components to GEOSS operations, with each phase consisting of: architecture refinement based on user interactions; component deployment and interoperability testing; and SBA-focused demonstrations.

This Engineering Report (ER) is a key result of the second phase of AIP. AIP-6 was conducted from May 2013 to January 2014. A separate ER describes the overall process and results of AIP-6 and thereby provides a context for this Community SBA ER.

2. GeoViQua Objectives

GeoViQua has 3 major scientific and technical objectives:

- a) Provision of innovative tools to enhance the current infrastructure capability. GeoViQua's major technical innovation will be searching and visualising tools for the community which communicate and exploit data quality information from GEOSS catalogues. The activities required to deliver this major objective are as follows:
 1. Derive, extract and collect information about data quality from data, metadata, CAL/VAL processes including *in-situ* observations, provenance and end-users' feedback
 2. Encode and embed information on data quality and link it to data themselves. This process will include interfacing with standards and protocols, quality metrics and storage catalogues
 3. Develop context-driven smart visualisation of information on data quality (e.g., reveal information and detail progressively) in 2D and 3D. A prototype has to be developed
 4. Enable search and discovery over GEO Portal using information on data quality.
 5. Enable the developed functionality over low bandwidth transmission and small screen devices (smart phones and PDA components).
- b) Contribution to the GEO Label development. With its technical and scientific achievements, GeoViQua will significantly contribute to the definition design, prototype development, and evaluation of a strong GEO Label, which will allow users to query, explore and contribute to data quality information within a flexible and interoperable framework. GEO Label requirements will be defined (Work

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	Version: 1.0
GeoViQua integration Engineering Report	Date: 31/Jan/14

Package WP2), the label will be integrated with the components (WP6) and validated and applied in pilot cases (WP7) and disseminated to the community will be done (WP8). It will be completed in collaboration with the GEO task ST-09-02. The GEO Label deliverable will mature during the project and will crystallize on a final report about this.

- c) Harmonization, exploitation and dissemination of project outputs. GeoViQua will secure lasting impact for its deliverables through continuous and direct interaction with a number of relevant GEO tasks and user communities. A careful validation process will be conducted in collaboration with a number of communities of practice and standards committees to ensure that the project contributes effectively to the GEOSS GCI architecture. Collaboration with AIP will be on going. The solution will be transferred to the GCI.

3. Scenario 1: User Feedback and GEO label integration

3.1 Actors

The Actors for the User Feedback and GEO label integration in the George Mason University Global Agricultural Drought Monitoring and Forecasting System are the following

- Drought Monitoring and Forecasting System Expert Users (that are able to provide user feedback into a web portal)
- Drought Monitoring and Forecasting System Users (that approaches the portal and queries it)
- The User Feedback System
- GEO Label creation API

3.2 Context and pre-conditions

The George Mason University Global Agricultural Drought Monitoring and Forecasting System was already working but it lacked a User Feedback system and a GEO Label. The GeoViQua project had already developed a User Feedback system and a GEO Label. They are both based on a easy to use RESTful AIP.

3.3 Scenario Events

Once the integration is done by the GMU responsible, the following scenario is possible:

1. An Expert User approaches the GMU Drought monitoring portal requests a product and downloads it. This user evaluates the product and sees a potential usage for its purposes.
2. The Expert User return to the portal and uses the “feedback” button to provide a rating and an expert review on the portal products based on his experience.
3. The User Feedback System is opened and the information introduced is stored by the system.
4. Another users approaches the GMU Drought monitoring portal and wonders about the documentation that accompanies the data.

	Version: 1.0
GeoViQua integration Engineering Report	Date: 31/Jan/14

5. GEO Label creation API is invoked by the web browser automatically and an small GEO label is show in the GMU Drought monitoring portal
6. The user sees the GEO label and gets an immediate idea on the key metadata elements that are present on the documentation. He focuses his attention on the “expert reviews” faced (that is now full of color).
7. The user moves the mouse over the GEO label facet and he gets an indication on how many expert reviews are there. By clicking on the facet, a window is opened and the expert review is shown.
8. The user read the expert review and realizes that his use case is very similar so he decides to use the GMU portal to get his data.

3.4 Post-Conditions

N/A

3.5 Special Requirements

N/A

4. System Model of the Scenario

4.1 Context Diagram

Drought information is crucial to many sectors. The users include decision makers across different sectors, analysts, and statisticians. Figure 1 shows the context diagram of the information system in this use case.

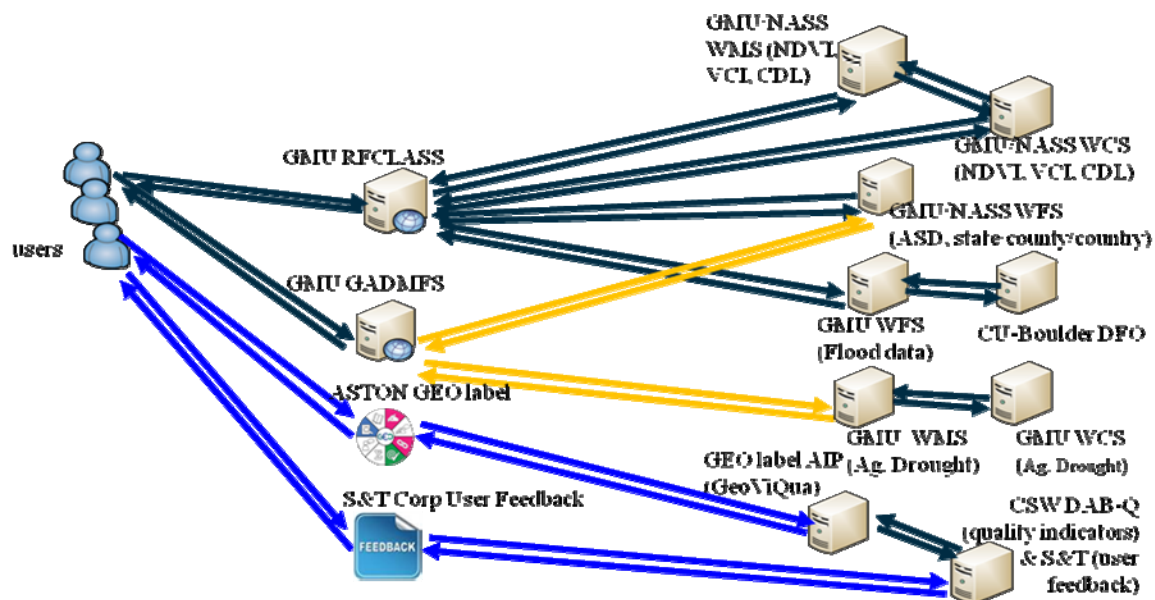


Figure 1. George Mason University Global Agricultural Drought Monitoring and Forecasting System Wiring Diagram of the whole information system

	Version: 1.0
GeoViQua integration Engineering Report	Date: 31/Jan/14

4.2 Enterprise View

The main objective of this activity is demonstrate how the user feedback server and the GEO label can be connected to any community portal and how users can improve the information available in the portal that describes the products that can be generated by the portal and improve the description of the quality of this products

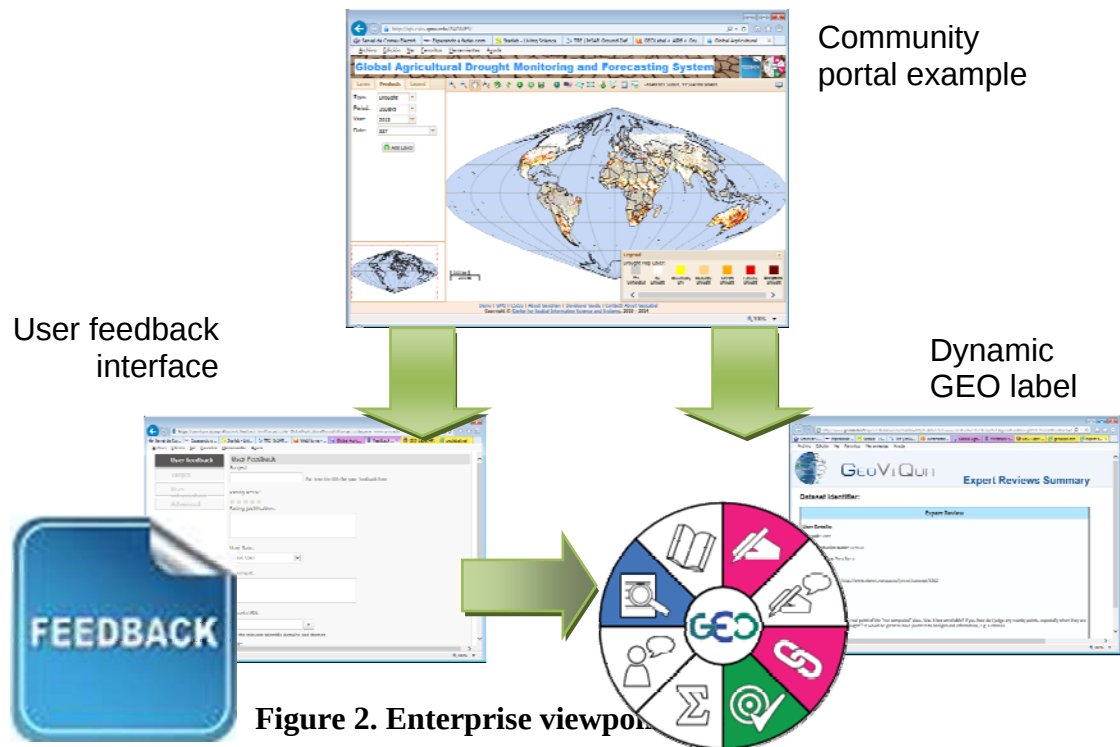


Figure 2. Enterprise viewpon

4.3 Information View

The objective of this activity is to generate and see metadata about the data present or produced in a web portal. This means that the information in the portal needs to have a dataset id. The producer metadata about this datasets is linked to it using the same dataset id and it is assumed to be more static. The user feedback is provided by the users in the portal and is considered another kind of more dynamic metadata but it is also linked to the dataset by its dataset id. Both producer metadata and user feedback metadata are used in the creation of the GEO label that is another representation of the same information but more easy to understand and compare

4.4 Computational View

The overall system design is based service oriented architecture constructed on standard geospatial Web services and RESTful APIs that allows for calling web services using simple URLs with some additional parameter following the KVP convention (<http://tools.ietf.org/html/rfc3986>). In particular the User Feedback API has been formalized and documentation can be found here: <http://geoviqua.stcorp.nl/home.html>. The GEO label API has been formalized and documentation can be found here: <http://www.geolabel.net>.

This API's can be called by the GMU portal during the of the portal load or is invoked by users interacting on the two icons that connects with the user feedback interface and the GEO label.

	Version: 1.0
GeoViQua integration Engineering Report	Date: 31/Jan/14

4.4.1 Detailed description of the interaction.

To start the activity, we have generated a metadata file that describes a generic dataset that can be obtained in their Global Drought monitoring system. Currently the file resides here: <http://www.creaf.uab.es/temp/AgriculturalDrought19139.xml>

It is important to note that this metadata document declares a code *GlobalAgriculturalDrought* and a codespace *www.gmu.edu* for the dataset series of data that can be generated by the portal.

It is easy to generate a dynamic GEO label associated with this metadata record using Aston services (hosted by CREAM):

<http://www.geolabel.net/api/v1/geolabel?metadata=http://www.creaf.uab.es/temp/AgriculturalDrought19139.xml>

but this will ignore any possible user feedback. To connect to the user feedback,

The URL to invoke the user feedback interface to generate feedback already contains the code and codespace of the dataset series so that users does not need to take care of this and any feedback item produced will be linked to the right dataset series:

https://geoviqua.stcorp.nl/submit_feedback.html?target_code=GlobalAgriculturalDrought&target_codespace=www.gmu.edu

Each feedback item receives a numeric identifier and the following URL allows for recovering it <https://geoviqua.stcorp.nl/api/v1/feedback/items/#/> (were # represents a numeric id, e.g. "4")

To generate a GEO label associate with both the producer metadata and the user feedback requires to use a more elaborated URL like this one:

http://www.geolabel.net/api/v1/geolabel?metadata=http://www.creaf.uab.es/temp/AgriculturalDrought19139.xml&feedback=http://geoviqua.stcorp.nl/api/v1/feedback/collections%3Ftarget_code%3DGlobalAgriculturalDrought%26target_codespace%3Dwww.gmu.edu%26format%3Dxml?size=50

In this case a more "colorful" label is shown that considers both producer metadata and user feedback.

This URLS can be linked as the icons for connecting to both API's are placed in the GMU portal using this code and are completely hidden to the user.

	This static icon has to be linked to: https://geoviqua.stcorp.nl/submit_feedback.html?target_code=GlobalAgriculturalDrought&target_codespace=www.gmu.edu
	This icon is generated automatically using a link in the GEO label API. Since this is an SVG document, and ensure maximum compatibility, you should use this html code: <pre><object data="http://www.geolabel.net/api/v1/geolabel?metadata=http://www.creaf.uab.es/temp/AgriculturalDrought19139.xml&feedback=http://geoviqua.stcorp.nl/api/v1/feedback/collections%3Ftarget_code%3DGlobalAgriculturalDrought%26target_codespace%3Dwww.gmu.edu%26format%3Dxml?size=50" type="image/svg+xml"></pre>

	Version: 1.0
GeoViQua integration Engineering Report	Date: 31/Jan/14
	ua.stcorp.nl/api/v1/feedback/collections%3Ftarget_code%3DGlobalAgr iculturalDrought%26target_codespace%3Dwww.gmu.edu%26format% 3Dxml?size=50" type="image/svg+xml" align="right" width="50" height="50"></object>

The final aspect in the portal is (see figure 3):

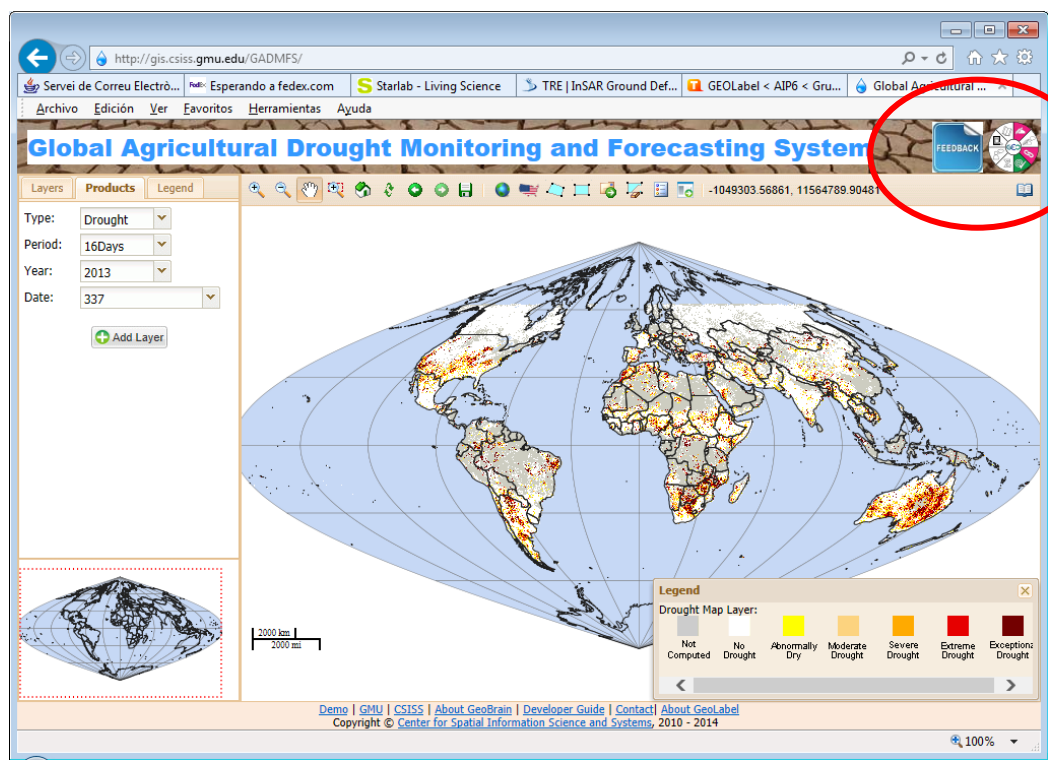


Figure 3. Dynamic icons integrated in the GMU portal

A click in the feedback icon will result in the user feedback interface in a new window (see figure 4).

Figure 4. User feedback interface to report new feedback

	Version: 1.0
GeoViQua integration Engineering Report	Date: 31/Jan/14

A click in a GEO label facet will result in more information about the topic represented by the icon (see figure 5).



Figure 5. Expert review additional information emerging from de expert reviews GEO label faced.

5. Implementation

5.1 Deployed Components

The following are deployed and registered components:

- (1) The user feedback system is deployed in the S&T corp. facilities in Delft, The Netherlands
- (2) The GEO label service were developed by Aston University but are deployed in a cluster of services in CREAM facilities in Barcelona, Spain.

5.2 Interoperability Arrangements

The following specifications were followed in implementing and deploying data and Web processing services:

- (1) The user feedback system use its API and the GeoViQua project is working on getting support for the creation of an Standards Working Group in OGC to standardize both the model and the protocol
- (2) The GEO label API is in discussion in the Standards Interoperability Forum to be declared as a GEOSS interoperability arrangement.

5.3 Quality-enabled Discovery and Access Broker

The Quality-enabled Discovery and Access Broker (DAB-Q) enables smart search and discovery functionalities using parameters relevant to GEO products extended to include

	Version: 1.0
GeoViQa integration Engineering Report	Date: 31/Jan/14

quality information. Quality information can be stated both by data producers and by data users, resulting in two conceptually distinct data models, the Producer Quality Model (PQM) and the User Quality Model (UQM) (also known as User Feedback Model). These models together form the GeoViQa Quality Model, now in its final version 4.0 (<http://schemas.geoviqua.org>).

In the GeoViQa project, the following activities and goals were achieved:

- (1) Identify relevant properties (queryables) for quality-constrained queries
- (2) Define and implement the quality extension to CSW-ISO (CSW-Q interface)
- (3) Define and implement brokering logic, mapping and access to GeoViQa services (Feedback Catalog, GEO label service, WMS-Q).

The DAB-Q has implemented the following capabilities:

- (1) Feedback Catalog integration: discovery and upload of user feedback items to the Feedback Catalog; merging of discovered metadata records with related user feedback items
- (2) Support to quality-related constraints: PQM constraints (Figure 6) and UQM constraints (Figure 7)
- (3) WMS-Q integration: encoding quality information in a Web Map Service (WMS)
- (4) GEO label integration: insertion of GEO label link to all discovered records (in the *graphicOverview* element).

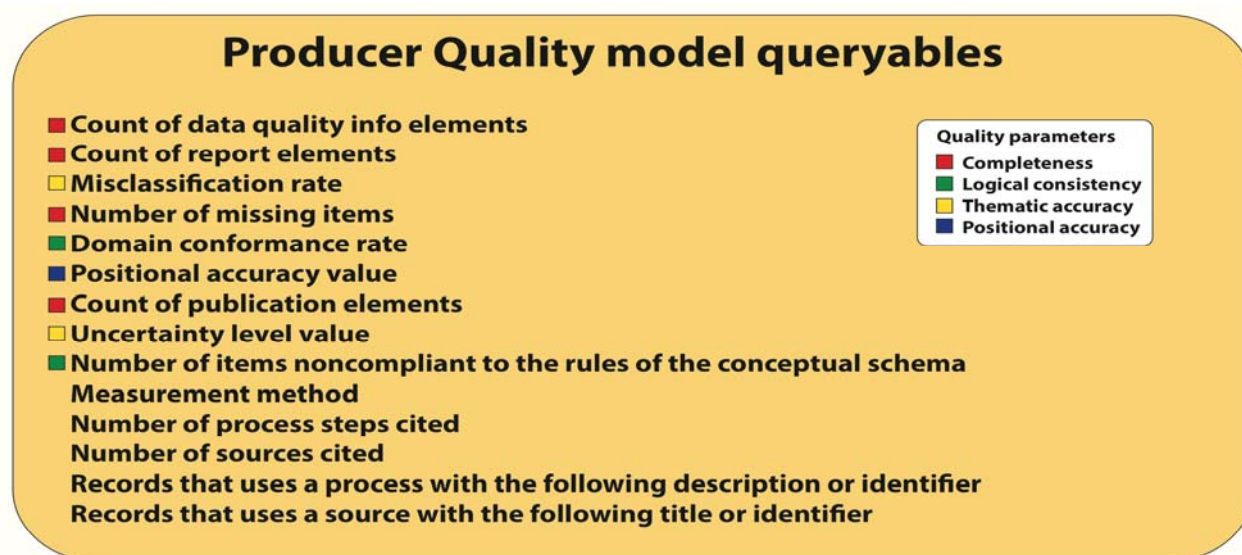


Figure 6 Producer Quality Model queryables.

	Version: 1.0
GeoViQa integration Engineering Report	Date: 31/Jan/14

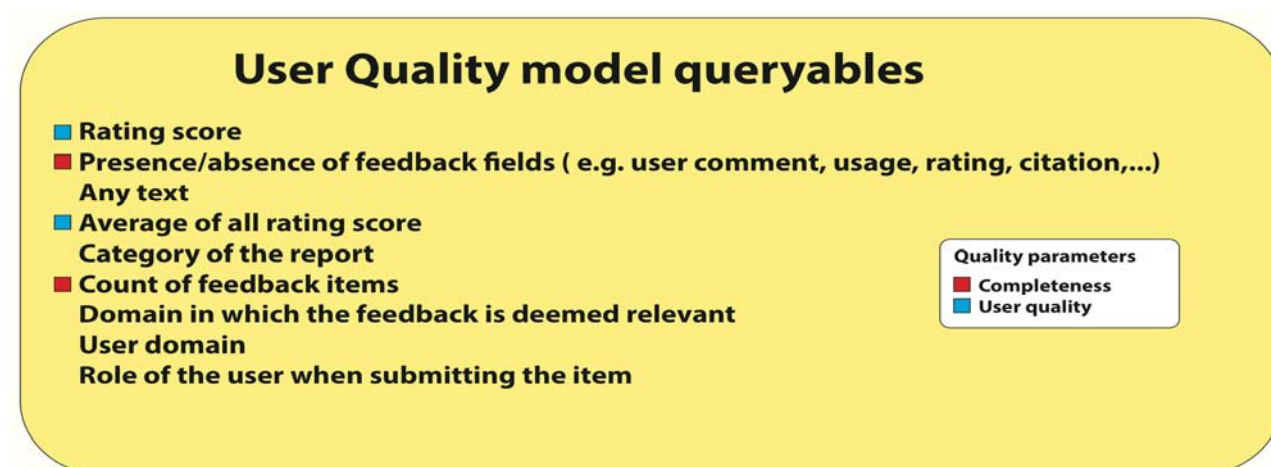


Figure 7 User Quality Model queryables.

The DAB-Q context is illustrated in Figure 8.



Figure 8 DAB-Q context.

	Version: 1.0
GeoViQua integration Engineering Report	Date: 31/Jan/14

5.4 Use of the GCI

GEOSS Component and Service Registry (<http://geossregistries.info/>) was used to register all deployed components, services, and data. GEO

SS Portal mirror was used to integrate both systems during a GeoViQua workshop in the GEO-X Week. The GEOSS Portal can be used to discover the George Mason University Global Agricultural Drought Monitoring and Forecasting System that includes the scenario described here.

5.5 Demonstrations

The demonstration portal George Mason University Global Agricultural Drought Monitoring and Forecasting System is active and can be found at: <http://gis.csiss.gmu.edu/GADMFS/>

5.6 Future plans for deployment

GeoViQua project is working on an exploitation plan the will include strategies to make both components operational. This includes.

- (1) Look for support in different GEO Tasks and subcommittees such as the SIF and ID-03
- (2) Propose this subject for discussion in the IIB GEO board.

6. References

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- [3] Lush V., Lumsden J., and Bastin L. (2013) GEO Label – Quality Information Interrogation Tool for Geospatial Datasets: Towards Effective Visualization of Quality Metadata.

	Version: 1.0
GeoViQua integration Engineering Report	Date: 31/Jan/14

ANNEX I GeoViQua response to the AIP 6 CFP

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User Feedback System and
GeoViQua Agriculture and Carbon Scenarios
in the
GEOSS Architecture Implementation Pilot – Phase 6
(AIP-6)

Response Due Date: 15 March 2013

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	Version: 1.0
GeoViQa integration Engineering Report	Date: 31/Jan/14

GeoViQa Response to the GEOSS AIP-6 CFP

1. Overview

GeoViQa proposes to contribute with two scenarios around quality encoding and visualization. The Agriculture and Carbon Cycle scenarios demonstrate how GEOSS data can be used considering quality for the benefits of their respective Societal Benefit Areas. Additionally, GeoViQa plans to contribute with a user feedback database and user feedback service with the intention of having them integrated in the GCI Architecture. The objective is to complement the producer metadata about the quality of these resources that is already provided by the Discovery and Access Broker (DAB). Additionally, a client will be provided to query and to produce this information.

2. Proposed Contributions

Describe your proposed contribution to the Pilot based on your desired role.

Do not assume a single participant development or demonstration; rather anticipate that your contributions will interoperate through coordinated activity of multiple participants.

2.1.1 Societal Benefit Area Alignment and Support

GeoViQa has elaborated two scenarios around quality encoding and visualization. The Agriculture and Carbon Cycle scenarios demonstrate how GEOSS data can be used considering quality for the benefits of their respective Societal Benefit Areas.

2.1.1.1 *Agriculture Scenario*

The objective of this scenario is to illustrate a **decision support environment**. Some policies and legislation affecting a territory might come from upper levels although in the end legislation and rules will be adapted to the local management system. That happens with the international RAMSAR convention paper that derives in the habitat conservation legislation at European level. To promote the accomplishment of the legislation, the local administration subscribes to an established UE subvention. The subvention would define some requirements, including flooding practices. Farmers would fill in a form in which they would state which % of their fields will be flooded in a 4 months period.

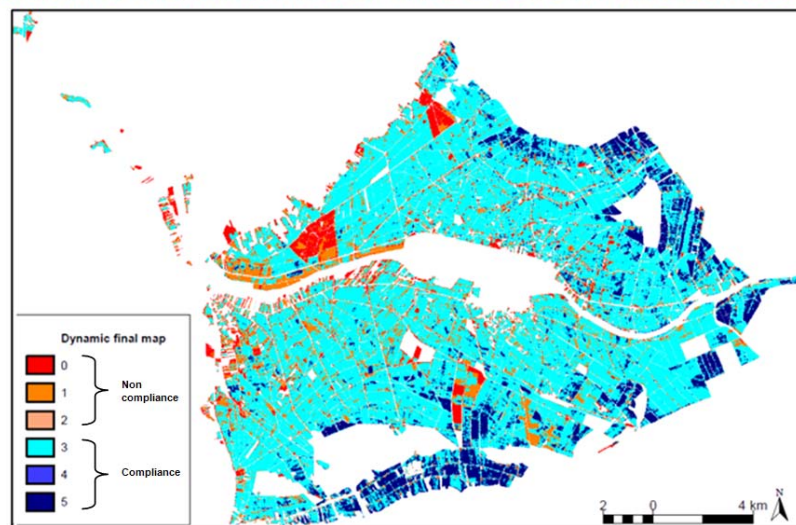
The local administration should then evaluate the farmers' declarations. In order to guarantee the farmer has kept his word, they need a control system as objective as possible. This task is entrusted to a research centre that will develop the corresponding Expert system.

From the GEOSS datastore a compilation of RS scenes (once a month during the subvention period) and aerial images are extracted in order to obtain a multitemporal dataset. Part of this flow is repeated monthly. The scenes undergo preprocessing corrections and then a classifier is applied in order to obtain a categorical map with the following classes: flooded/not flooded. In fact, a high/low distinction is included for each category, so in the end the categories constitute a case of ordinal categorical variables. The classification of the image is validated using the test areas, which are revised in another field survey that must take place at most two days after the corresponding RS scene date. This is a determinant step related to the validation of dynamic processes. The confusion matrix estimation, in turn is vital for the classification accuracy quantification. Methods of quantification, classification and **error modeling** are compared. Accordingly, **pixel level accuracy**, object level indicators and global estimates are estimated. Completeness and thematic accuracy issues are thoroughly revised in this study.

	Version: 1.0
GeoViQua integration Engineering Report	Date: 31/Jan/14

The categorical map obtained from the classification step is analyzed at the field scale, considering each farmer's parcels. This is the natural unit to be assessed: the real world is divided in parcels rather than pixels. Consequently, the cadastre is used as the vector layer delimiting the field contours in order to enable the disaggregation of the categorical surface into a categorical parcel surface. Some attributes related to the declaration form will be added to the attribute table in this layer. This might derive in consistency quality issues evaluation. In turn, the cadastre layer must be revised to avoid possible errors, which involves photointerpretation and ortophotographies revision. In the end, we have obtained a classification for each parcel. The uncertainty integration will define the uncertainty thresholds of the obtained product.

FLOODING MONITORING OF RICE CROPS IN THE EBRE DELTA



This process is done for each of the scenes: hence, a multitemporal dataset covering four months is obtained. Next, we can evaluate the compliance of the subvention criteria by defining some decision tree rules in several steps for each image. The results will be either that it is certain that the % of flooded surface stated by the farmer is flooded (and maybe even more surface than stated), that it is certain that the % of flooded surfaces is inferior to the surface stated by the farmer or else that we can't be certain of neither because there are missing data and/or the uncertainty threshold estimated is too wide for us to take that choice. In some cases, results can be refined, for instance checking special circumstances from external sources (e.g., maintenance works in the channels). Other issues take place when the parcel has a strange shape that results in that the number of pixels of the scene makes it difficult to calculate the flooded surface % in relation to the farmer's declared surface or when the parcel falls in shared pixels in the limit between two different categories. Maybe other factors need to be revised: e.g., some maintenance works in the channels have made impossible for the farmer to flood the field during some days including the date of the RS data recording. The uncertainty threshold that must be considered in the uncertain results comes from the uncertainty assessment system, and collects the diverse error sources and estimations.

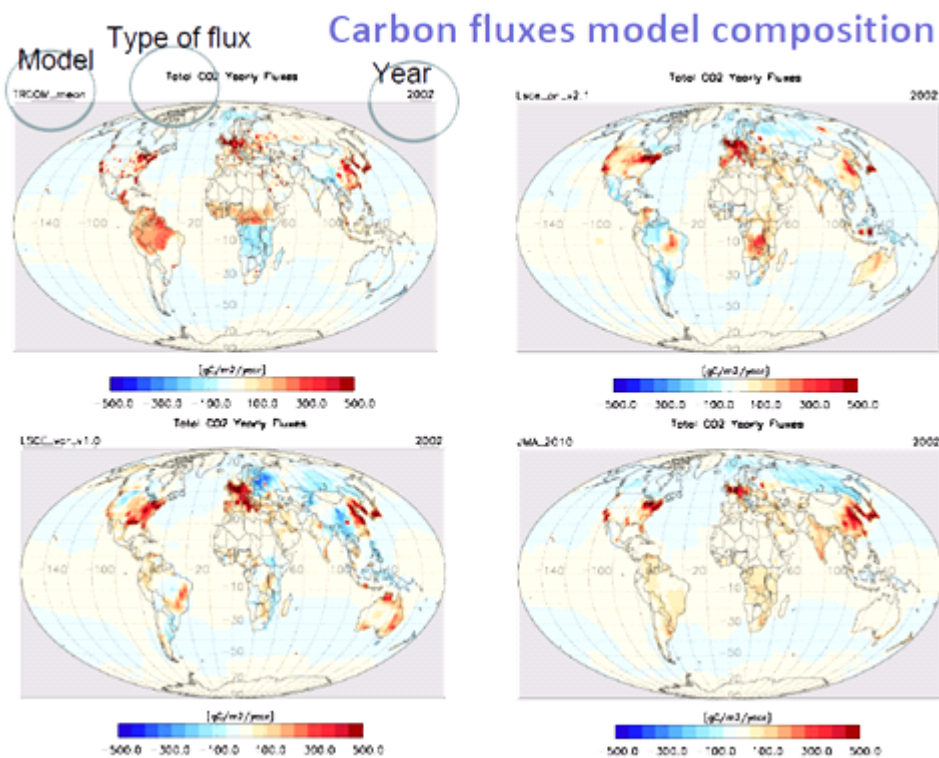
The results are given to the local administration that has to take the final decision. Most probably, a farmer that receives a notification of approval and gets the money finishes the story here. Alternatively, there can be farmers that although sure of having accomplished with the subvention criteria have been denied the subvention and decide to start a legal process against the local administration. This litigation gives us the opportunity of analyzing other issues related to quality both of processes and the general system in GEOSS: traceability and quality indicators , peer-review and even trustability, for instance.

	Version: 1.0
GeoViQua integration Engineering Report	Date: 31/Jan/14

Note that some of these issues can be considered a two ways road (e.g. the so called backlinks and the other way round) and lead to metadata updating issues, user feedback, and reliability of producer data models.

2.1.1.2 Carbon Cycle Scenario

The Carbon cycle scenario illustrates a **decision support environment** based on the following user story: in the process of updating the emission thresholds and mitigation strategies for the Kyoto protocol, the generation of carbon cycle products (in particular carbon flux products) provides scientific data for decision makers. We have imagined a period in which negotiations on emission thresholds and international agreements are discussed, searching the establishment of mitigation strategies and emission trading rules.



In the Carbon flux and budgets estimation there is a high diversity of data sources (space agencies, in situ laboratories, statistical agencies, meteorological institutes, green house gases metrology institutes). From sources compilation and collocation, direct **terrestrial and oceanic carbon models** are derived encapsulating natural and human induced processes through which land ecosystems absorb and emit CO₂. For producing global CO₂ flux maps, a terrestrial carbon model generally needs soils and vegetation maps, and climate drivers on a global grid, leading to prior fluxes estimation.

Next, statistical methods are used to combine available information (prior fluxes, observations of atmospheric trace gas concentrations, chemistry and transport model) to estimate fluxes by an inverse procedure, resulting in optimized carbon fluxes estimation. Using the information contained in observed concentration fields **from ground based networks** and from upcoming satellite observations in order to constrain the geographic distribution of surface fluxes is an inverse problem, which consists in finding a set of fluxes that optimally matches the available observations. The application of inverse methods enables the quantification of the distribution of the sources and sinks of CO₂ at the surface

	Version: 1.0
GeoViQua integration Engineering Report	Date: 31/Jan/14

of the Earth based upon global measurements of atmospheric concentration and three-dimensional models of the atmospheric transport. Top-down atmospheric inversion methods in terms of numerical transport modeling and atmospheric observation networks, and detail some of the currently important issues in prescribing errors are described in the Carbon cycle. Model discrepancy and uncertainties assessment and integration contribute to an iterative parameterization of the prior fluxes, resulting in optimized posterior fluxes estimation (i.e., improved correlation to observations).

Flux models can be compared and analyzed, detecting trends, anomalies and calculating statistics related to the quality and performance of the models. This process allows for model choice. When several models are selected, model assembling is attempted. In this manner, carbon products are generated, including models, estimation of fluxes and budgets, maps and **uncertainty assessment**, which can be exported in different levels of details and complexity.

Input from the scientific side enables quality aware visualization, which is available in the **Carbon Atlas portal** (that could be an improved version of the actual Carboscope website). Besides, products are registered in GEOSS. Inside GEOSS, the development of quality aware tools is implied, suchlike a model comparison tool that enables the quality model compliance (extensively the GEO Label specifications) and enhanced geospatial capabilities (e.g. cataloguing services, broker, search filters). The Carbon Atlas web and sufficient material provides both technical reports and dissemination material for the media, general public and, most importantly, the national policy makers who in the end can contribute to the final version of the emission market rules agreement and can decide on an actionable scientific base on the best strategy for their country in particular, with a global understanding of the carbon fluxes, the associated uncertainties, and the regional budget knowledge in this country.

2.1.2 Component and Service Contributions

N/A

2.1.3 Architecture and Interoperability Arrangement Development

GeoViQua plans to contribute with a user feedback database and user feedback service with the intention of having them integrated in the GCI Architecture. The focus of this system is to provide a way to store user feedback about the resources listed in the Discovery and Access Broker (DAB) results. The objective is to complement the producer metadata about the quality of these resources that is already provided by the DAB. Additionally, a client will be provided to query and to produce this information. These efforts have to be harmonized with the User Requirements Registry (URR).

2.1.3.1 *User feedback model*

The user feedback model describes the structure and attributes of comments, citations, discovered issues, ratings and reports of usage. It re-uses some ISO quality and metadata elements, and elements of the producer model, but is far less strictly bound to existing ISO schemas.

The root element of the schema is the FeedbackCollection, which can hold zero or more FeedbackItems. An empty FeedbackCollection indicates, for example, a search for feedback where no relevant data was found.

A 'FeedbackItem' may 'own' or 'hold' for example any combination of:

- (optional) rating;

	Version: 1.0
GeoViQua integration Engineering Report	Date: 31/Jan/14

- one or more user comments;
- one or more reports of usage (including reports of any discovered issues);
- citation of one or more publications;
- a text description of the feedback subject;
- text tags which might assist with topic-based search and linking;
- one or more quality overrides.

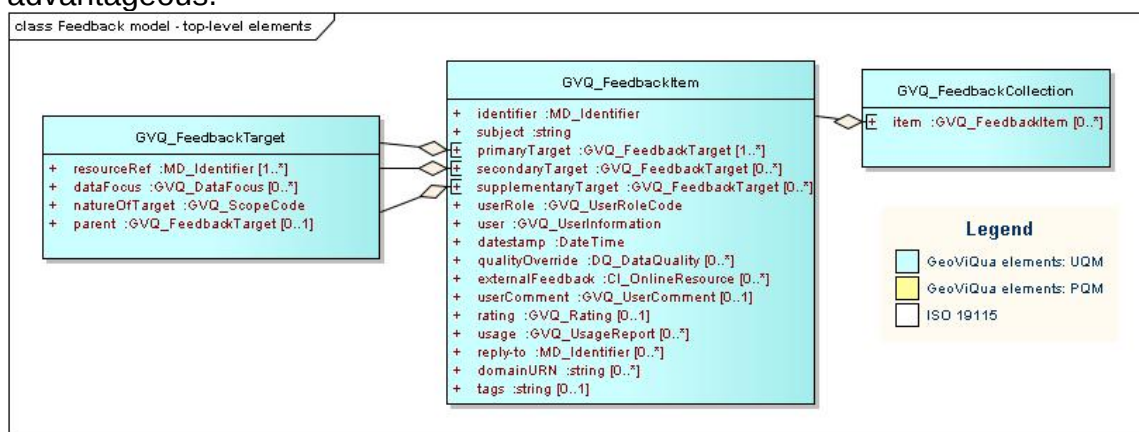
It must 'own':

- one or more sets of details on the focus of the feedback;
- a reference to at least one target of the feedback (a dataset, resource, etc.);
- one user information describing the submitter of the feedback.

The user model is generally intended for user feedback, but also for producer feedback that is changing more rapidly than official metadata for which more quality control applies, and that has other channels for dissemination (e.g. quality information in the data itself, or disclaimers accompanying the dataset).

The model is intended to connect GEOSS datasets and services (referred to as resources) to user generated data. System-centric information, i.e. information about users such as accounts and authentication or GEOSS resources are therefore not represented directly, but are linked in at pre-defined junction points in the model. These junction points are the user information and the target. A real implementation is expected to enrich these elements as appropriate, but not necessarily in a directly observable way.

While the model sometimes refers to ISO191xx schema elements, it is not intended to be seen as metadata or directly related to it. The ISO elements are included to ease interoperability in cases where a producer decides to include user-suggested data into the official metadata he or she maintains, or other cases where a common dataset is advantageous.



2.1.3.2 *User feedback database*

The user feedback database is hosted by S&T Corp. and contains all the necessary tables to store the user feedback in the user feedback model. The feedback catalogue uses the Django framework with a relational database, PostgreSQL, as backend.

2.1.3.3 *User feedback RESTful service.*

The API framework Tastypie is used to construct a RESTful interface. Via this interface, feedbackitems and collections can be requested and searched and feedbackitems can be

	Version: 1.0
GeoViQua integration Engineering Report	Date: 31/Jan/14

posted. The requests can be done via RESTful URL requests and to which response xml files (formatted according to the GeoViQua 3.1 xsd scheme) or json will be returned. The following needs are foreseen:

- request for single feedback items
- request for a collection of items

A "get resource" URI can be constructed in the following way:
server_name/api/v1/resource_name/{id}?format=xml

The id is optional. If left out all the resources will be returned. The parameters that can be used to specify the URI are: limit, offset and format. The format parameter is currently obligatory.

Search for a Feedback Item

The basic URI can be constructed in the following way:
/api/v1/feedback/items/?format=xml This will return all items in the database in a feedback collections. The formats supported are JSON and XML

Because it will usually be unnecessary to get all details of all items, the following parameters can be added to the URI:

- response: Limits the details of each item in the collection. When not specified only the URI's to the items are returned and aggregated information such as average rating and the number of items found. Options are brief, summary and full. The summary will return only the required elements of the feedback model and the rating.
- limit: The maximum amount of items returned.
- offset: The offset of the items returned. Is used in combination with the limit.

Besides these general parameters, some parameters can be added to create a search query.

Request example:

<https://geoviqua.stcorp.nl/api/v1/feedback/items/?format=xml>

Response example:

```
<response xmlns:gmd19157="http://www.geoviqua.org/gmd19157"
xmlns:gvq="http://www.geoviqua.org/QualityInformationModel/3.1"
xmlns:updated19115="http://www.geoviqua.org/19115_updates"
xmlns:gco="http://www.isotc211.org/2005/gco"
xmlns:gmd="http://www.isotc211.org/2005/gmd">
  <GVQ_FeedbackCollection>
    <aggregatedInfo>
      <average_rating />
    </aggregatedInfo>
    <gvq:item>
      <resource_uri>/api/v1/feedback/1/</resource_uri>
    </gvq:item>
    <meta>
      <next />
      <total_count>1</total_count>
      <previous />
      <limit>20</limit>
      <offset>0</offset>
    </meta>
```

	Version: 1.0
GeoViQa integration Engineering Report	Date: 31/Jan/14

```
</GVQ_FeedbackCollection>
</response>
```

2.1.3.4 *User feedback input client.*

This client application is needed for users to introduce the user feedback data to the system.

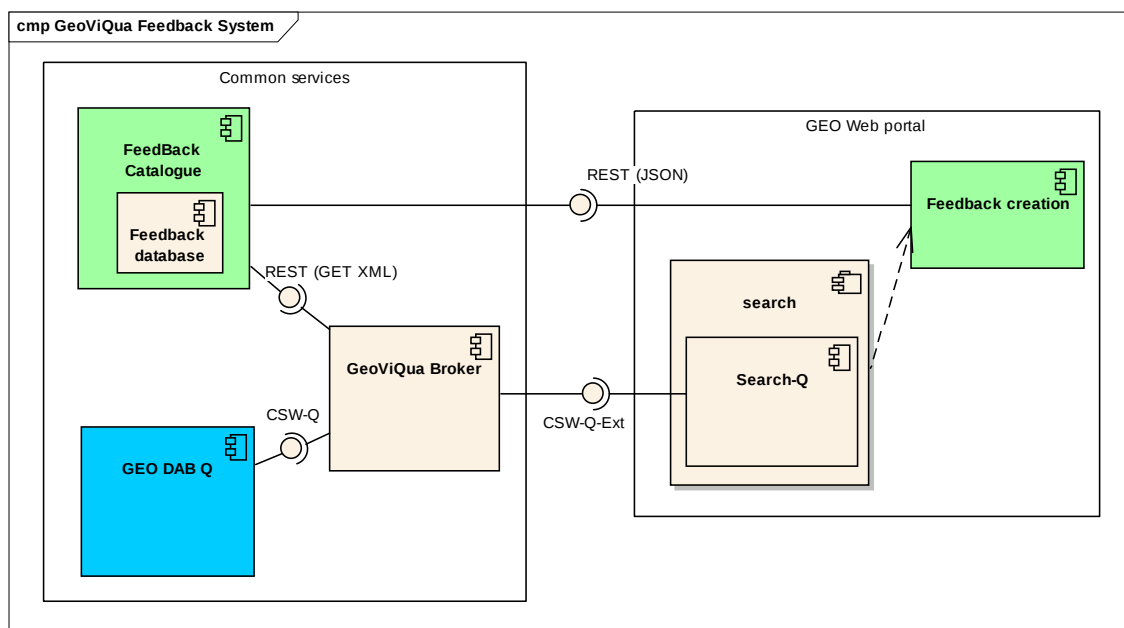
Authorization / Authentication

Currently username and password is required for both getting and posting data. The usernames and passwords can be set via the administration tool, which is supported by Django. In the future querying will be open but providing feedback will require user identification. This aspect can be discussed with the data sharing working group and a possible adoption of a “User Authentication and Single Sign-On” mechanism.

2.1.3.5 *User feedback query client.*

The user feedback query client allows the user to query the database with user feedback for relevant results, for example a query on all user feedback that was posted by users for a specific GEOSS dataset.

The basic interface for querying has been described before in the RESTful interface, which can be used as a low-level interface for testing. However, on top of this interface a GUI is necessary that enables the user to submit user feedback in a controlled and consistent way. This GUI is currently planned to be part of the GEO web portal.



3. Description of GeoViQa

This is a contribution of the GeoViQa project. GeoViQa project is a research activity financed by the European Commission in the 7th framework project in 2010 number 265178. GeoViQa's primary goal is to augment the GEOSS Common Infrastructure with innovative quality-aware visualization tools and geo-search capabilities, providing the user community with enhanced and advanced tools available through the GEO Web Portals and other end-user tools. In this context, GeoViQa will formalize and implement a methodology to extract, encode, embed and link information over data quality with the data themselves. GeoViQa will provide the technology and implementation background to the

	Version: 1.0
GeoViQua integration Engineering Report	Date: 31/Jan/14

quality assurance protocols proposed by QA4EO and will deliver interfaces to visualize quality related parameters in a range of data visualization tools. The context of this work falls under the Call area "Cross-cutting research activities relevant to GEO". Provide a brief description of responding organization including its relationship to the Pilot Initiative, e.g., through the European Commission Participation Organization of GEO.

GeoViQua will allocate some CREAM, UAB and S&T Corp. resources to participate in AIP6 and to lead the user feedback activities.

CREAM is a public research institution that was created in 1987 to promote basic and applied research in terrestrial ecology. CREAM has made important contributions in terrestrial ecology and towards a sustainable management of the environment and technology transfer. Some of these contributions are the publication of numerous scientific papers in international academic journals and the development of numerous scientific methodologies and technological tools such as the GIS&RS software MiraMon[®]. CREAM is the initiator and coordinator of the GeoViQua project and develops some of the quality elicitation and visualization tools and provenance graphical visualisation.

The Universitat Autònoma de Barcelona (UAB) was founded in 1968 and is 2nd in the national ranking of universities (2004-2005) and recently has been recognized as a campus of international excellence by the Ministries for Education (MEC) and for Science and Innovation (MICYT) of the Spanish Government. The Group of Methods and Applications in Remote Sensing and Geographical Information Systems (GRUMETS) in the Department of Geography aims to propose new algorithms, methodologies and tools for GIS, Remote Sensing, Cartography and land dynamics. The group has broad experience in image processing of remote sensors, having worked with images of low, medium and high spatial resolution from both satellite and airborne sensors. The members of the research group have published about 150 scientific papers and obtained a "Research, innovation and development" award from the Catalan Government. UAB coordinates the work on the pilot case studies and metadata standards in GeoViQua

S&T Corp, is an SME conducting high-tech projects and consultancy related to technical software engineering and analysis. S&T started in 2000 and has grown to a diverse group of 30 scientists and engineers. Typical customers and participants are the European Space Agency (ESA), TNO, EADS, ASTRIUM, VEGA, Siemens, SNECMA, Logica and others. S&T has a broad experience in building data quality monitoring, control and visualisation systems for various EO-missions, such as ENVISAT, GOCE, and Radar Altimetry. Typically these systems involve extraction of data from both instrument raw data and processed product flows, processing the data into quality data, conditional handling of EO data based on data quality analysis results, and visualization and reporting data quality to users. S&T is leading the efforts of implementing the user feedback database.

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