

**7th Framework Programme
ENV.2010.4.1.2-2
Integrating new data visualisation approaches of
earth Systems into GEOSS development**



Project Nr: 265178

**QUAlity aware VISualisation for the Global Earth Observation system of
systems**

**Deliverable D2.2
Technical Requirements and Architecture for GeoViQua**

Version 1.0

Due date of deliverable: 31/02/2012
Actual submission date: 03/09/2012

Document control page

Title	D2.2 Technical Requirements and Architecture for GeoViQua		
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Description	This document summarizes the technical requirements for GeoViQua components gathered in the first year of the project, describes the project's technical architecture and details the GeoLabel implementation strategy. It serves as a common reference for the project partners for driving the design and development of the software components as well as for upcoming discussions and decisions.		
Publisher	GeoViQua Consortium		
Contributors	GeoViQua Partners		
Type	Text		
Format	MS-Word		
Language	EN-GB		
Creation date	17/01/2012		
Version number	1.0		
Version date	03/09/2012		
Last modified by			
Rights	Copyright © 2012, GeoViQua Consortium		
Dissemination level		CO (confidential, only for members of the consortium)	
	X	PU (public)	
		PP (restricted to other programme participants)	
		RE (restricted to a group specified by the consortium)	
		When restricted, access granted to:	
Nature	x	R (report)	
		P (prototype)	
		D (demonstrator)	
		O (other)	
Review status		Draft	Where applicable:
	X	WP leader accepted	Accepted by the PTB
		PMB quality controlled	Accepted by the PTB as public document
	X	Coordinator accepted	
Action requested		to be revised by all GeoViQua partners	
		for approval of the WP leader	
		for approval of the PMB	
	X	for approval of the Project Coordinator	
		for approval of the PTB	
Requested deadline	31/03/2012		

Revision history			
Version	Date	Modified by	Comments
0.1	17/01/2012	FRAUN_ST	Initial Draft
0.5	28/06/2012	FRAUN_ST, AST, S&T, CNR, 52N, UREAD, CREAM	Second draft
0.7	16/07/2012	FRAUN_ST, AST, S&T, CNR, 52N, UREAD, CREAM	Third draft
0.8	31/07/2012	FRAUN_ST	Pre-Final version
1.0	03/09/2012	FRAUN_ST	Final version

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Abstract

With increasingly diverse uses and users for geographical information, together with growing accessibility to EO data and applications, the provision of meaningful data quality information with geographic data products is ever more important. To enable effective communication on data quality, it is equally important to thoroughly analyse the users, purposes and perspectives and to derive a set of requirements. In the GeoViQua project (7th Framework Programme; ENV.2010.4.1.2-2), two deliverables deal with the user and technical requirements that have been gathered, structured and documented during the first year of the project. Deliverable 2.1 documents the user requirements, while Deliverable 2.2 documents the technical requirements. The requirements have been collected by different means, in particular user interviews and state of the art analysis, and subsequently integrated, reviewed and validated collaboratively. They represent the essential initial step to the development of the systems in GeoViQua.

This deliverable focuses on the technical requirements, i.e. requirements that shape technical aspects of the systems that will be implemented in GeoViQua. They address questions such as the type and content of metadata, quality indicators considered useful, or associations to be visible. Further, it outlines strategies for extraction and representation of quality information and the enhancement of the GEO Label.

This document provides a common ground for driving the design and the development of the software components and serves as reference for upcoming discussions and decisions in the GeoViQua project.

Acronyms and Abbreviations

AIP	Architecture Implementation Pilot, an OGC activity
DoW	Description of Work
ICT	Information and Communication Technology
GCI	GEOSS Common Infrastructure
GEOSS	Global Earth Observations System of Systems
OGC	Open Geospatial Consortium
UncertML	Uncertainty Mark-up Language
WP2	Work package 2 (<i>or others</i>)

Purpose of this document

This document describes the technical requirements identified within GeoViQua WP2, and explains the architecture derived to enable fulfilment of the requirements. That is, it presents the result of the engineering of technical requirements from user requirements as defined in deliverable D2.1, and it describes technical boundary conditions, architectural decisions, implementation strategies and other details of how GeoViQua tackles implementation of the requirements.

1. Introduction

The GeoViQua project focuses to a large extent on the human dimension of data quality, i.e. how actual users perceive and judge quality. Requirements on this aspect were elicited in structured interviews from geospatial data users who are concerned with data quality as a part of their daily job. Besides interviews, requirements have been elicited from other public sources.

The method and the results of this activity are presented in deliverable D2.1 "User Requirements for GeoViQua". As the technical architecture for GeoViQua emerges, the understanding of the technical side of user requirements sharpens as well. This is a natural occurrence within a requirements process as explained in (Pohl, p. 25). This document summarizes the technical requirements and the resulting architecture in chapter 2.

In chapter 3, additional aspects of the GeoViQua project which have been influenced by the requirements are presented. In section 3.1, the quality measures, indicators and models used in GeoViQua are described. Section 3.2 presents the project's approach towards the GEO Label, which is to become an important vehicle to foster adoption of quality information in the workflows of those dealing with earth observation data. The GEO Label intends to substantially reduce the amount of work required by the user to do a first assessment of data quality.

2. Technical Requirements

2.1 Method for technical requirements

The technical requirements are based on the same corpus of information as the user requirements that have been reported in D2.1, and the processes applied to them share one methodology. To recap, the requirements elicited from user interviews were entered into a requirements management database which allowed the project partners to review the requirements and decide about their relevance in the context of GeoViQua. The interviewees did not get detailed instructions about what GeoViQua intends to build, so this corpus also contains requirements which are not directly related to GeoViQua. Such requirements were classified "rejected" or "abandoned", but they could still be useful for other earth observation endeavours. From a base of 160 requirements, 50 unique requirements were deemed to be valid and relevant to GeoViQua.

This accepted part of the requirements has been analysed further. As outlined in the methodology (see 2.1.2), we identified functional components, their interactions and possible or mandated standard interfaces.

2.1.1 User vs. technical requirements

The distinction of user vs. technical requirements that underlies this deliverable is best explained in terms of the well-documented requirements methodology described in (Pohl, 2010). It is used here only for reference; it is not the methodology the GeoVi-

Qua process is based on. It distinguishes, among other things, three kinds of requirement artefacts and three core activities. The requirements artefacts are:

- Goals (unspecific intents)
- Scenarios (concrete examples of achieving the goals)
- Solution-oriented requirements (functional and other types of requirements)

The majority of user requirements fall into the goals or scenarios bins. Technical requirements, however, are firmly solution-oriented requirements. They may be supported and given context by related requirements of other types.

The other references useful to explain the differentiation are the methodology's core activities:

- Elicitation
- Specification
- Negotiation

User requirements more or less correspond to what was elicited, i.e. they can be found in source documents such as interview transcripts. Technical requirements, on the other hand, typically have been significantly shaped by specification and negotiation activities.

This document summarises the technical requirements in the areas of overall system design, GEO label strategy and quality indicators. Its aim is to sum up the common understanding within the project with regard to the mentioned areas, and to describe how this common understanding was achieved.

2.1.2 Methodology

The methodology used in GeoViQua has been negotiated and tailored in the beginning of the project. Textbook and field knowledge about requirements engineering as well as past experiences in other geographically distributed projects are the foundations of our methodology. At the same time, the resources planned for the project and the nature of the work packages and tasks involved had to be reflected. It is described in more detail in D2.1, but that explanation focuses on the methodology, elicitation and analysis phases of our process, which led to the user requirements. This chapter shortly recaps the specification and validation activities, which formed the technical requirements and architecture.

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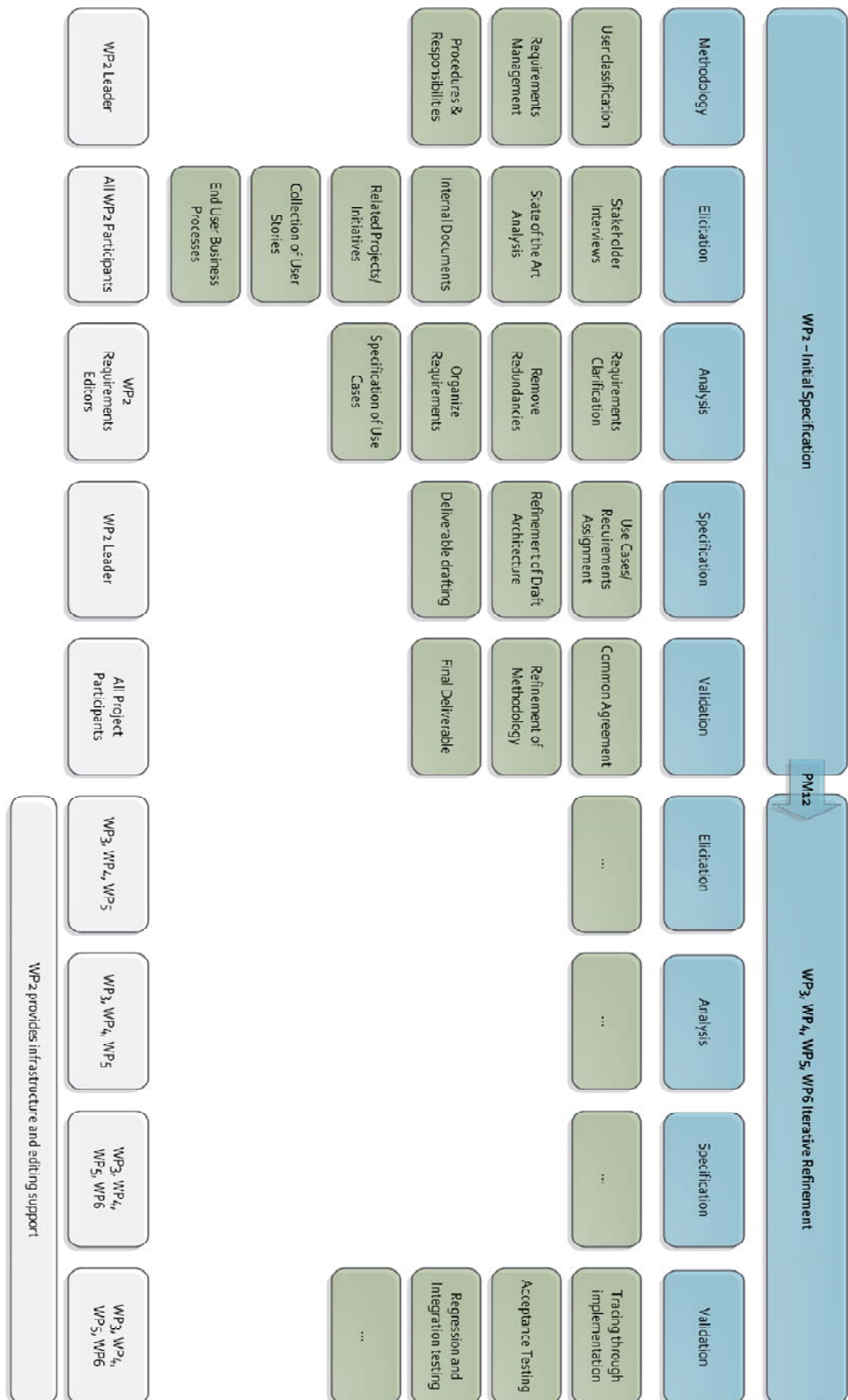


Figure 1 Requirements specification and management process for GeoViQua

2.1.3 Specification and Validation

Specification and validation have been handled as an iterative process, which is consistent with our goal to do iterative refinement from project month 12 onwards.

In the specification phase, we refined the draft architecture displayed in D2.1 by first identifying collaborations between the components required by our use cases. We refined these by detailing the protocols to support the collaboration and checking whether the ensuing data flows supported our requirements and use cases. Another criterion was whether our component's purpose was reasonably easy to define, to understand and to agree on.

At the same time we identified use cases and began to build models (in particular the producer and user quality models described in D6.2) which enable us to fulfil project goals and user requirements. This was supported by the user requirements (see D2.1), the GeoViQua scenarios (WP7), quality measures (see 3.1), use cases (see e.g. D6.2) and feedback from the GEO label activities (see 3.2).

During model building, the requirements were checked to be implementable using the proposed model, and accordingly some model changes were caused or influenced by requirements. This is particularly true for the user quality model which is more centred on users than the producer quality model which is based on existing standards and aligned to on-going standardization efforts.

In the validation phase, we agreed on a subset of requirements to be used for specification of the GeoViQua system, the "accepted" requirements. Also, the scenarios have been formalised as UML and been reconciled with the requirements, helping to ensure that the requirements body is internally and externally consistent.

Finally, our methodology will be revised based on the findings documented in D2.1, and adapted to cater for management of the requirements during the project's life-time. As indicated in the process, the iterative refinement encompasses its own validation steps. In this stage WP2 is merely in a provisioning role, thus the actual validation of the emerging system against the acceptance criteria is up to the work packages WP3, 4 and 5, but will be supported actively by WP7.

2.2 Technical requirements

The following table lists the identified technical. They were drawn from the list of requirements which the GeoViQua Consortium classified as valid and relevant to the project, i.e. the "Accepted" requirements (see D2.1 for details). There are 67 accepted requirements and 42 are technical requirements.

Key	Summary	Components
GEOVIQUA-172	An application for a mobile device shall react to a display rotation	Augmented Reality Browser
GEOVIQUA-155	Spatially display the distribution of the uncertainty of the data values	WMS-Q Viewer, KML-Q Viewer

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GEOVIQUA-76	Users want to visualise the quality information through desktop and Web-based GIS tools	WMS-Q Viewer, KML-Q Viewer
GEOVIQUA-72	Users want to visualize data uncertainties both at the map level (overall accuracy) and at the pixel level (spatially distributed accuracy)	WMS-Q Viewer, KML-Q Viewer
GEOVIQUA-70	Users want to retrieve quality information about a particular pixel on a map using the standard WMS 'getFeatureInfo' operation.	WMS-Q, WMS-Q Viewer
GEOVIQUA-68	Users want to see a list of associated data quality indicators and values attached to the dataset.	Quality-enabled Search
GEOVIQUA-67	Users want to find certain error distribution pattern via visualisation of error estimates	WMS-Q Viewer, KML-Q Viewer
GEOVIQUA-166	The data quality model and its encoding(s) needs a link mechanism to resources and parts of resources.	Consumer Quality Model, Feedback Creation
GEOVIQUA-161	A download data service shall provide data with associated uncertainty with each pixel in a standardized way	WMS-Q, Producer Quality Model
GEOVIQUA-141	A visualization service shall provide a list of data quality indicators/measures (at the dataset or pixel level)	WMS-Q Viewer, KML-Q Viewer, Metadata Viewer
GEOVIQUA-85	Metadata parameters shall be standardised such that their processing can be automated.	Producer quality model
GEOVIQUA-167	The system shall support querying of dataset provenance	Provenance Viewer, GeoViQua Broker
GEOVIQUA-164	Query language should support conjunct filters for (dis)similarity and (in)equality	GeoViQua Broker
GEOVIQUA-127	Enable search and discovery over GEO Web Portal using information on data quality	GeoViQua Broker, Quality-enabled Search
GEOVIQUA-40	Users could query and filter the GCI information content quality	GeoViQua Broker, Quality-enabled Search
GEOVIQUA-165	The quality model shall define a hierarchical multilevel approach to metadata, quality indicators and traceability information	Producer Quality Model

GEOVIQUA-148	The quality model and quality-aware search shall support sensors with quality description	Quality-aware Search, GeoViQua Broker
GEOVIQUA-140	The quality model shall use ISO standards for metadata (19115) and quality (19157) with extensions for UncertML and O&M	Producer Quality Model
GEOVIQUA-135	The quality model shall support statistical quantitative estimates of data quality (probabilistic, variance...)	Producer Quality Model
GEOVIQUA-121	The system shall extract quality information from data, metadata and user feedback	GeoViQua Broker, Feedback Catalogue, Intercomparison Client
GEOVIQUA-113	The quality model shall support links to journal articles in which dataset quality checks are reported.	Consumer Quality Model, Feedback Creation
GEOVIQUA-71	The system should provide a standard means to allow the structured data quality information (e.g. error estimates, provenance) embedded or linked to WMS /WMTS and KML.	KML-Q, WMS-Q
GEOVIQUA-66	Data providers want the system to guide them to provide required quality information for the dataset.	Metadata import tool
GEOVIQUA-55	Users want to know whether the dataset has gone through certain 'validation campaign'	Quality-enabled Search, Metadata viewer
GEOVIQUA-162	The quality model and the system shall support recording, editing, and querying/searching some important metadata elements (complete list in the description)	Producer/Consumer Quality Model, Metadata import tool, Metadata viewer, Quality-enabled search
GEOVIQUA-158	The quality model and the system shall support recording, editing, reviewing and subsequent querying of who has used the dataset	Feedback catalogue, Quality-enabled Search
GEOVIQUA-120	The quality model and the system should support the recording, editing, reviewing, and querying of information about the purpose for which a dataset was originally collected.	Producer Quality model, Metadata import tool, Quality-enabled search

GEOVIQUA-119	The quality model and the system shall support the recording, editing, reviewing, querying and peer review of the methodology adopted for dataset data collection.	Producer Quality model, Metadata import tool, Quality-enabled search
GEOVIQUA-107	The quality model and the system shall be able to record, edit, review and query dataset limitations and boundaries of use provided by the creator of the dataset.	Producer Quality model, Metadata import tool, Quality-enabled search
GEOVIQUA-105	The quality model and the system shall support recording, editing, reviewing and subsequent querying of dataset provenance.	Producer Quality model, Metadata import tool, Quality-enabled search, Provenance viewer
GEOVIQUA-93	The system should support the recording and subsequent querying information about the origin of a given metadata record (e.g. the harvesting metadata pathways)	Metadata import tool, Quality-enabled search, Provenance viewer
GEOVIQUA-91	The system should support the recording and subsequent review of methodology information associated with a dataset.	Metadata import tool, Producer Quality model, Provenance viewer
GEOVIQUA-77	Users want to visualise or access the data provenance information from each data source as a workflow	Provenance Viewer
GEOVIQUA-61	Users want to know the build-up history of the dataset	Provenance viewer
GEOVIQUA-111	The system should support visual side-by-side comparison of metadata attributes.	Metadata intercomparison
GEOVIQUA-163	Consumer metadata (feedback) shall include a list of metadata records	Consumer Quality model
GEOVIQUA-136	The quality model shall support qualitative statements of belief about the data quality	Consumer Quality model, Feedback Creation, Feedback catalogue
GEOVIQUA-134	Combine provider-generated metadata with user-generated metadata	Consumer Quality model, Feedback catalogue, GeoViQua Broker
GEOVIQUA-118	Rating of dataset	Consumer Quality model, Feedback catalogue, GeoViQua Broker, Feedback Creation
GEOVIQUA-88	Expert reviews with value judgements about datasets	Consumer Quality model, Feedback Creation

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GEOVIQUA-34	Users want to know the problems identified and highlighted about this dataset	Consumer Quality model, Producer quality model, Quality-enabled search, Metadata viewer
GEOVIQUA-33	Users want to know the citations of dataset	Consumer Quality model, Producer quality model, Quality-enabled search, Metadata viewer

These requirements were modified during project-internal negotiations and often include ambient knowledge such as constraints from GEOSS architecture or GCI recommendations. They are fully documented in the project-internal requirements management system but are also included for reference in Annex I of this document.

2.3 GeoViQua system architecture

A preliminary architecture showing the layout and interaction of the identified functional components can be seen in Figure 2 Architecture for GeoViQua. The architecture will be used for prototype development and will be reviewed when prototype development is ending. It encompasses components from WP 3,4,5,6, the GEOSS GCI, and assumed GEOSS producer services.

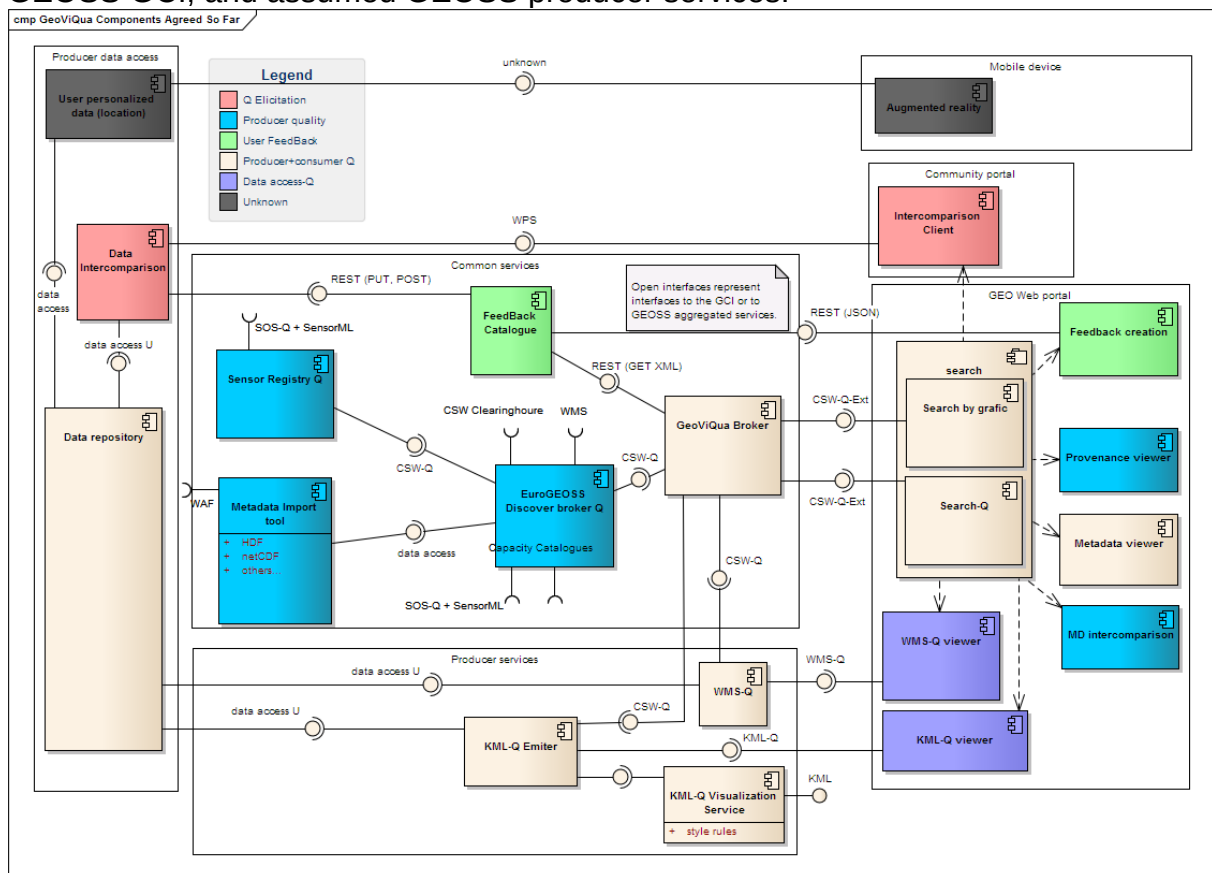


Figure 2 Architecture for GeoViQua

2.3.1 Functional components

GeoViQua is working with the following definition of a functional component:

A functional component is a part of an ICT system and is specified during the analysis phase. It is used to structure the analysis model. Its definition makes no assertions about whether it represents exactly one logical or physical (deployed) component, or of what type (service, RCP, Application ...) this component is.

Part of the functional components model existing GEOSS or GEO Portal components to make reasoning about the components easier. These will not be described in detail here, merely the interaction with them. Naturally, much more preconditions have to be accepted for those components than for GeoViQua's own components.

GeoViQua components, when operational, must be integrated in the current GEOSS Common Infrastructure. This is an *a-priori* requirement of the project that must be honoured. ESA as project partner will facilitate this. As you can see in the following figure (Figure 3), the current GCI already incorporates the EuroGEOSS broker, which will be directly assimilated and extended in GeoViQua.

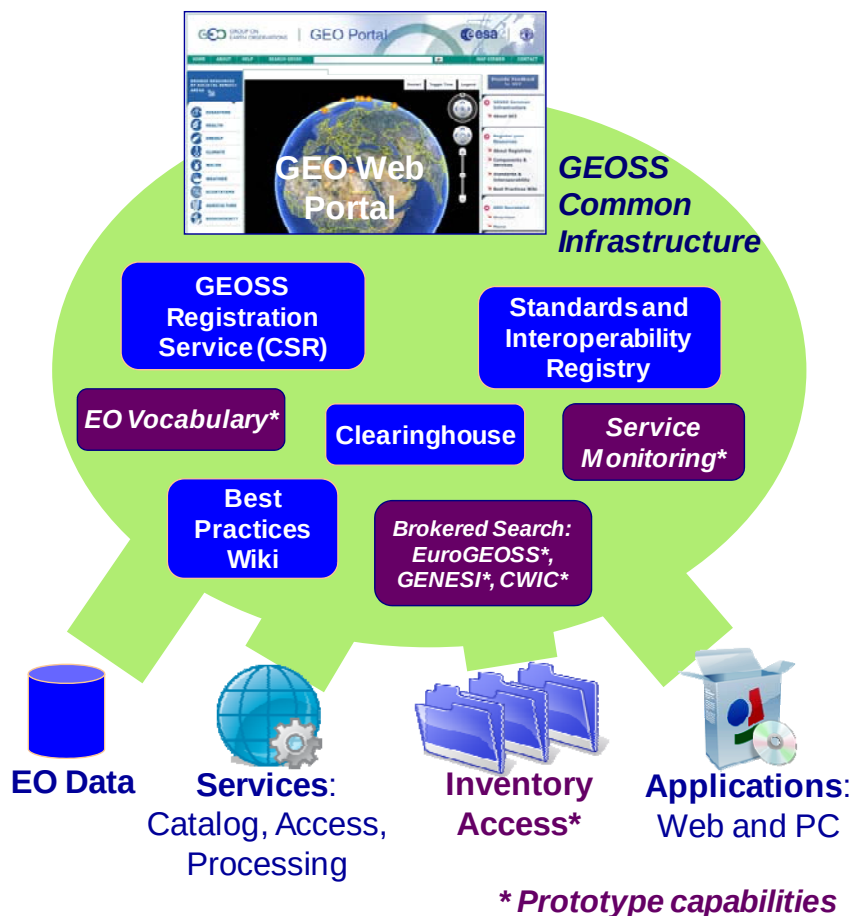


Figure 3 GEOSS Common Infrastructure current architecture.

(1) GEOSS components

Here we list the components that will be developed or extended during the project. Even though they have their own reasons for existence independent from project

objectives, their operational characteristics will need to be adapted to meet project objectives.

(a) EuroGEOSS Discovery Broker

The EuroGEOSS Discovery Broker harvests the producer metadata from various GEOSS catalogues, including that of the GEOSS clearinghouse. It is the central component making dataset metadata discoverable for GEOSS users. This component will be enhanced with quality search capabilities.

(b) Sensor Registry

The Sensor Registry is a catalogue that facilitates the discovery of Sensor Observation Service Collections from independent services; this is done in the same way that a CSW catalogue is facilitating the discovery of data and data access services.

(2) GeoViQua components

These components are being developed by GeoViQua and serve to meet GeoViQua's goals. They are quality-focused or –enhanced in comparison to existing components. They will be entirely developed in the project and tested with real GCI data to ensure proper operation. Once the development is completed, they will be presented in the GEO boards and, if accepted, they could be adopted by the GCI as operation components.

(a) Augmented Reality Browser

A component which will use GPS and compass of the mobile device to augment the reality sensed by the mobile camera system with the requested EO data, and allow visual access to quality information. An open source mobile platform will be targeted.

(b) Data Intercomparison Service

A component that provides data intercomparison functionality as a Web Processing Service (WPS). Intercomparison enables users to compare data from different datasets, which provides insight in similarities and differences between datasets, and leads to an improved understanding of data quality. The component functions include:

1. Co-location of data from 2 different datasets to obtain pairs of records (one for each dataset) that are measured at roughly the same location at roughly the same time (where the meaning of “roughly” can be configured as a parameter).
2. (Optional) Spatial interpolation of data for one of the datasets such that it matches the spatial extent of the other dataset.
3. Intercomparison of co-located data and reporting of results.

The intercomparison service reuses interpolation methods from the EC funded INTAMAP project, as well as co-location and intercomparison functions from other open source tool developments (GECA). The service requires access to relevant data inside both datasets, in particular measurement geolocation and time information for co-location, and associated measurement values for intercomparison.

(c) Intercomparison Client

See also previous item. The Data Intercomparison client allows users to configure and run a request to the Data Intercomparison Service, including:

- Configuration of the datasets to intercompare, including the data source files (or references for downloading data source files). The configuration of the datasets may be facilitated by using the Metadata-Comparison component in order to find candidate datasets that match to some extent in the phenomenon being measured, and/or in geolocation and measurement time.
- Configuration of thresholds for maximum distance between measurements, and maximum time difference between measurements
- Configuration of processing parameters, such as enabling the spatial interpolation and/or intercomparison step.
- Configuration of output reporting
- Submitting the request, monitoring progress, and viewing results

(d) Metadata Import tool

The metadata import tool is a component that is able to read NetCDF files (an eventually other scientific data as well as data specific to remote sensing formats) and to facilitate metadata extraction and conversion to standardized quality descriptions following the producer quality model. During the execution of the project, NetCDF has been identified as a key format, mainly because many scientific data is now being distributed on this standard, but also because some partners have previous experience on the use and on tools that work with this format. Particularly important is the relation and exploitation that this project can do of the UncertML developments and results (such as NetCDF-U OGC discussion paper).

(e) Feedback Catalogue

The feedback catalogue provides separate storage for user feedback and thereby helps to delineate consumer from producer metadata. It is intended to run within the GCI to provide feedback capabilities to GEOSS infrastructure, especially the GEO Portal. The feedback catalogue is designed to be easy to integrate into the GEO Portal by combining web and OGC service technologies, but will likely also be able to cater for other community portals.

(f) Feedback Creation

A user-facing component in the GEO Portal in which user feedback can be entered and prepared for submission to the feedback catalogue. Some types of feedback require attention to get right, for example the metadata override (see the GeoViQua deliverable D6.1). The feedback creation component will assist the user in issuing unambiguous, relevant and discoverable feedback.

(g) GeoViQua Broker

The GeoViQua Broker joins consumer and producer metadata to provide the ability to query both types of metadata over a single access point. This component ensures maximum compatibility with existing workflows, because the logic to join producer and consumer “metadata” need not be re-implemented by every user interested in feedback. See also GEOVIQUA-134.

(h) Provenance Viewer

A component to explore the provenance of a data set as defined in the appropriate ISO and GeoViQua provenance metadata elements. Previous GEOSS clearinghouse analysis revealed that many GEOSS datasets have a very detailed description of the lineage of the data. This information has not yet been exploited in the GEOPortal. Furthermore, the dataset lineage has been identified by users as one of the relevant components of the quality information that help them to trust the data.

(i) Metadata Intercomparison

The Metadata Intercomparison compares two or more metadata records in a way that makes it easy to see the differences between them and to integrate the metadata in a single clear view. Under some circumstances, the comparison may automatically emphasize elements that fit the purpose of the user.

(j) WMS-Q Viewer

A tool capable of displaying quality information made accessible via WMS-Q server component. The WMS-Q Viewer includes web-based WMS-Q Viewer and desktop-based WMS-Q viewer. The web-based WMS-Q viewer is a WMS-Q service client tool that will allow users to visualise data and associated uncertainty information from WMS-Q servers interactively at the pixel level. The Web-based WMS-Q Viewer encompasses at least the "Godiva2" web-based client that is packaged with ncWMS¹. The desktop WMS-Q Viewer will allow users to visualise data and uncertainty information from users' local disks or remote OPeNDAP servers.

It is expected that a set of validated uncertainty visualisation methods will be implemented in the WMS-Q Viewer. The implementations will be based on uncertainty visualisation methods such as single raster map approach, two adjacent maps approach, or contouring map approach. Details of the uncertainty visualisation approaches can be found in the document D5.2 "Best practice document of uncertainty visualisation"

(k) KML-Q Viewer

The KML-Q viewer will provide means of portraying quality information encoded in KML-Q in COTS 3D web globes. Because quality information does not, by itself, imply a specific visualisation the service will make use of styling rules that govern the visualisation of quality information. KML-Q is interoperable in that it is only tied to the data and quality information to be displayed, but does not make predictions about how the quality information is to be displayed. The KML-Q Viewer architecture is therefore interoperable at the data format level and open to new ways of visualising quality information. It will serve as a test bed for applying or extending KML towards quality visualisation.

(l) Quality-enabled Search

The quality-enabled search will enable to search for EO data using producer or user quality information as filtering criteria. The component will leverage the CSW-Q extension which will expose appropriate quality indicators.

¹ <http://www.resc.rdg.ac.uk/trac/ncWMS>

(m) Graphical Search

Sometimes it is difficult to formulate the right question to a metadata search engine if you do not have *a priori* information on the distribution of the data and on what can be requested. A graphical search tool is a portal interface to the data that shows some overview of what is available in a graphical form. By clicking on the graphics, users can automatically make or refine queries and thus, adapt their constraints to what is really available.

2.3.2 Interactions of Functional components

2.3.2.1 Search-Q and WMS-Q Service

Provide means to access and display pixel-level quality information about datasets from the search component. This is intended to increase the use of quality information during data set selection. See also requirement GEOVIQUA-141.

The WMS-Q service provides three OGC WSC standard-based operations for a WMS-Q viewer to visualise pixel-level uncertainty information interactively: GetCapabilities, GetMap and GetFeatureInfo. As shown in the Figure 2, the WMS-Q service is deployed at the data provider side. It is expected that the CSW-Q extensions help identify datasets with pixel-level quality information as well as facilitate access to pixel-level quality information. The viewer then implements to necessary protocol to access and visualize the pixel-level quality information.

2.3.2.2 Search-Q and KML-Q Viewer

Provide means to access and display quality information in 3D using commercially available KML-compliant “virtual globes”. The viewer’s task is to make use of KML-Q to display the quality information (ideally the one subject to the search) using plain KML compatible with a virtual globe.

In this setup, the quality-aware search will only need to know where associated KML-Q may be obtained (or produce the KML-Q itself) and how to invoke an associated view service. Thus a prototype need not be installed at a data provider – the KML-Q View Service is independent of the actual source as long as access is granted.

2.3.2.3 Search-Q and Metadata Comparison

The metadata comparison enables users to compare metadata between two data sets visually. Because the comparison respects the structure of metadata an intercomparison based on metadata is easier to perform for the user and thus helps adopt the use of quality information during selection.

The basic intercomparison can be performed by an XSLT transformation from a catalogue result. Modifications are required in the GEOPortal query interface to select the intercomparison metadata records that have to be compared. Moreover, it has to be possible to link the intercomparison XSLT document to the results of a catalogue.

2.3.2.4 Search-Q and Provenance Viewer

This integration will enable provenance records to be inspected directly from the search results on the GEO Portal. Similar to metadata comparison, it is aimed at promoting trust via declared provenance, i.e. transparency.

Provenance viewer must be part of the GEOPortal results interface; it must be able to show processes as well as sources in a tree structure that can be partially folded and unfolded to facilitate the user a clear interpretation of the data form an overview to a detailed view.

2.3.2.5 Search-Q and Metadata Viewer

Alternative metadata viewers must be part of the GEOPortal results interface. This way, users can switch from short summaries to comprehensive descriptions. An important aspect is to be able to switch between discovery, evaluation, access and exploitation of the data. A metadata completeness assessment based on the rubric approach can also be available.

2.3.2.6 Search-Q, Metadata Intercomparison and Intercomparison Client

The configuration of datasets to be used for data intercomparison is facilitated by the Search-Q and Metadata-intercomparison components, as these provide insight into datasets that measure the same phenomenon and have some overlap in measurement location and time. The interaction will however be indirect: the user discovers interesting dataset matches using the Search-Q and Metadata Intercomparison components, and configures the Intercomparison Client manually using the matches that he/she found.

2.3.2.7 Intercomparison Client and Data Intercomparison

The Intercomparison Client provides an interface to the user for full configuration and submission of requests to the Data Intercomparison service, as well as handling results.

2.3.2.8 Search-Q and GeoViQua Broker

The GeoViQua broker is the primary means for performing search requests using producer or user quality criteria. Over a CSW-Q interface, both types of quality parameters can be queried and the result is expected to join producer and user quality information for the resulting datasets. Thus, there is no change in the way querying and searching is integrated in the GEO Portal or other clients of GEOSS infrastructure.

2.3.2.9 Graphical Search and GeoViQua Broker

The GeoViQua broker must be able to pre-compute statistical summaries of some metadata elements and store them in a database ready to be queried. Graphical representations of these statistical overviews will be queried to the broker and then presented to the user in the GEOPortal. The query language and the response encoding of this interaction has to be defined since we have not been able to identify

any relevant standard that covers this need. Probably this will be an extension of CSW ISO profile.

2.3.2.10 Search-Q and Feedback Creation

The quality-enabled search will make user feedback available and also enable users to submit feedback for datasets. User feedback is expected to emerge sometime after a user started using a data set, so a link to the Feedback Creation component will be made available within the search facility to prompt the user to provide feedback to datasets he may already have evaluated. This may be seen as introducing a bias as someone content with dataset will not be searching for alternatives. However absence of bias is a dangerous assumption for user-generated content in the first place, so the increased outreach will likely outweigh slight imbalances introduced by individual access points.

2.3.2.11 Feedback Creation and Feedback Catalogue

The Feedback Creation component will be directly submitting the user's feedback to the feedback catalogue. The protocol will probably be based on REST principles and be resilient enough to allow for the submission of technically incomplete feedback which the server is clever enough to complete. Useable feedback, as is explained in 3.1.3.2, has to exploit interrelations of datasets which the submitter or the component he is using cannot be expected to know.

2.3.2.12 Data Intercomparison and Feedback Catalogue

The user quality model foresees the submission of reports, in particular reports based on an intercomparison. To allow for intercomparison reports to be submitted as feedback easily, the GeoViQua Feedback Creation component will support the user in doing so, i.e. by allowing the user to attach such reports to the feedback and potentially parsing part of the report to fill fields in the User Feedback record.

2.3.2.13 Feedback Catalogue and GeoViQua Broker

The feedback Catalogue supports queries involving criteria based on the user quality model, such as searching for the best-rated datasets. The Broker processes such a query creating two co-dependent requests, respectively to the EuroGEOSS Broker and to the Feedback Catalogue, and merging their results appropriately. The exact process definition is being investigated. In a common use case the GeoViQua Broker forwards a query to the EuroGEOSS Broker with few changes and then complements the result with user quality information retrieved from the Feedback Catalogue, such as a star-rating distribution or the number of free-text comments.

2.3.3 Interfaces and Interface Standards

This section introduces the interface standards GCI and GeoViQua are using, and explains how GeoViQua intends to use or enhance the respective standard to foster interoperable access to quality information.

2.3.3.1 WMS-Q

The OGC Web Map Service is a portrayal standard intended for maps, but can also be used to access EO data. At the moment of this writing a candidate for an EO profile of WMS details how this might be done in an interoperable manner.

WMS-Q refers to the extensions GeoViQua will develop to associate quality information at the WMS protocol level. This will enable a WMS-Q-aware client to portray spatially distributed quality information.

The purpose of WMS-Q is to develop and apply conventions for conveying information about data quality through the OGC Web Map Service specification. The WMS Specification 1.3.0 currently does not support the integration of quality information into WMS. Whether the dataset-level quality information is present in an un-structured format (e.g. PDF), encoded using the proposed producer model, or encoded using ISO19157, the current WMS 1.3.0 provides no means to integrate it into the WMS. If pixel-level uncertainty information is represented using NetCDF-U (which defines NetCDF uncertainty conventions), the current WMS does not support specifying how a data layer can be semantically associated with the corresponding uncertainty layers. WMS-Q, accordingly, proposes to address these limitations. The WMS-Q proposes to slightly expand the options of “Type” attribute of the “MetadataURL” element, and suggests an application profile to associate the layers (i.e. using the established “layer nesting” mechanism). Details of WMS-Q can be found in D5.1 “Integration of Quality Information with OGC Web Map Service”.

In order to enable a closer interaction with the OGC community and wider discussion and dissemination of our research, WMS-Q will also contribute to the OWS Innovations Thread, specifically 7.2.3 “Coverage Access Requirements”.

2.3.3.2 CSW-Q

CSW, the Catalogue Service for the Web (Catalogue Service 2.0.2 - OGC 07-006r1), is the standard Web interface for discovery services defined by the OGC. The generic core data model defined by CSW can be specialized by Application Profiles, such as the ISO AP, which extends CSW to the ISO 19115-19119 data model and introduces several related queriable properties, for client convenience. CSW-Q is an extensions to the CSW ISO AP that GeoViQua is developing, based on GeoViQua producer and user quality models and related queriable properties.

2.3.3.3 SOS-Q

The Sensor Observation Service (Sensor Observation Service 2.0 - OGC 12-006) can be combined with the UncertML model to encode sensor quality information in a more interoperable way. SOS-Q refers to this combination. WP4 will create a quality-aware sensor registry which handles SOS-Q.

2.3.3.4 KML-Q

The Keyhole Mark-up Language (KML) has been donated by Google Inc. for standardization at OGC with the primary goal “That there be one international standard

language for expressing geographic annotation and visualization on existing or future web-based online maps (2d) and earth browsers (3d).” (KML 2.2 - OGC 07-147r2)

KML-Q will allow to associate 3D data with corresponding quality and uncertainty information. This approach and the component in which it will be tested are being developed in WP5. As KML specifically targets mass-market demand, the concrete form KML-Q will take is likely a convention using KML, not an extension thereof so adoption would not require extension of the standard against its stated intent.

2.3.3.5 WPS

The OGC Web Processing Service (WPS²) Interface Standard provides a standard for defining and interacting with web processing services, including requesting, processing and handling responses.

The WPS standard will be used to implement the data intercomparison service. It is largely agnostic on the type of data being processed, so there is no particular need for a quality-enabled version or convention.

3. Transversal aspects

This chapter addresses topics which are important to the project and, though being of technical nature, have been shaped by user and technical requirements alike.

3.1 Quality measures and models

3.1.1 Method for identifying quality indicators and measures

Quality indicators adopted will be those specified in the ISO19115 and the upcoming ISO19157. The list of indicators is limited to 15 as in following table:

Generic Quality Indicator	Specific Quality Indicator
Positional accuracy	Absolute external positional accuracy
	Gridded data positional accuracy
	Relative internal positional accuracy
Completeness	Completeness commission
	Completeness omission
Logical consistency	Conceptual consistency
	Domain consistency
	Topological consistency
	Format consistency
Temporal accuracy	Accuracy of a time measurement
	Temporal consistency
	Temporal validity
Thematic accuracy	Non quantitative attribute accuracy
	Quantitative attribute accuracy
	Thematic classification correctness.
Total quality indicators	

² see <http://www.opengeospatial.org/standards/wps>

To define a quality indicator three things are involved: a measure, a value and units. An initial list of quality measures in ISO is described in ISO19138 and in the new ISO19157, but producers are free to incorporate more quality measures. Then, one has to specify the value of this parameter and the units of measure. In a requirements gathering process several user requirements were translated into technical requirements affecting the list of quality measures.

3.1.2 Identified Quality Measures

The project has identified the need for two different kinds of measures that come from two different origins. There is a clear need to harmonize both approaches in the project. There is a requirement that states that:

REQUIREMENTS	TITLE	DESCRIPTION
GEOVIQUA-140	The quality model shall use ISO standards for metadata (19115) and quality (19157) with extensions for UncertML and O&M	Where necessary (and possible) we will extend existing standards by augmenting them rather than revising them. We will also consider developing profiles of standards that are conceptual, for example Observations & Measurements (O&M), to produce usable encoding standards specific to the EO context. Rationale: UncertML can be used with ISO19115/19157, although UncertML goes further in representing intrinsically uncertain (probabilistic) quantities and providing a mechanism to express data quality through metadata.

The following sections review both approaches. As you will see, the second subsection already proposes solutions for embedding UncertML in ISO descriptors.

3.1.2.1 ISO Quality Measures

The following list of user requirements applies directly to the need of quality indicators and quality measures.

REQUIREMENTS	TITLE
GEOVIQUA-22	The quality model shall support quality indicators (QA4EO Principle)
GEOVIQUA-14	The GCI shall allow inclusion, edition and retrieval of quality assurance information in an easy to compare in an interoperable form, and following the QA4EO guidelines.
GEOVIQUA-68	Users want to see a list of associated data quality indicators and values attached to the dataset.
GEOVIQUA-125	The quality model shall document calibration and validation campaigns their statistically derived quality indicators
GEOVIQUA-135	The quality model shall support statistical quantitative estimates of data quality (probabilistic, variance...)

GEOVIQUA-148	The quality model and quality-aware search shall support sensors with quality description
GEOVIQUA-165	The quality model shall define a hierarchical multilevel approach to metadata, quality indicators and traceability information

The result of these different requirements is the realization of a technical requirement that sets the need for creating a vocabulary of quality measures that can be found here:

REQUIREMENTS	TITLE
GEOVIQUA-89	The quality model shall support recording and searching of 3 types of quality/usability statements: syntactic; schematic; and semantic.
GEOVIQUA-141	A visualization service shall provide a list of data quality indicators/measures (at the dataset or pixel level)

This vocabulary has been collected as a collection of references in a document but other future technical requirements could ask for a more formal encoding such OWL or equivalent. UncertWeb has initiated the migration of UncertML to the semantic web and GeoViQua project is considering this possibility but no decision has been taken so on technical requirement has been formalized so far.

3.1.2.2 UncertML Measures

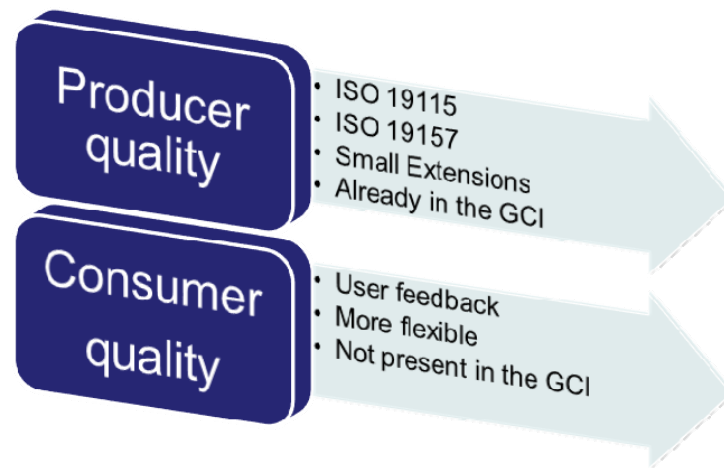
With no changes or extensions to existing ISO schemas such as 19115/19138 and the proposed 19157, the UncertML encoding for statistically quantified uncertainty information can be used to supply rich information about the nature of a quantitative result in a metadata quality report. Because the value type (for example 'quantile', 'mean' or 'confusion matrix' can be specified using the UncertML dictionary and namespace³, consistent parsing and use of potentially complex statistical information may be achieved, facilitating interoperability and reliable exchange of quality information. The details of how this may be achieved are described in section 4.5 of GeoViQua Deliverable 6.1

3.1.3 Identified Quality Model

During the requirements gathering, a need for data models was detected. Two main quality models were identified: the producers' model and the consumers' quality. Requirement GEOVIQUA-134 was instrumental in finding the alignment between the models, as it calls for a combined view but not handling of the different quality information. In the producer side, there was a clear reference: the ISO metadata model that is already present in the metadata records of the clearinghouse. For the consumer model, there has been much speculation on the possibility for users to record their degree of satisfaction with GEOSS data in the same way that e-bookings allows ratings and comments about hotels, but no practical implementations exist so far. The project had to generate a model from scratch.

³ <http://www.uncertml.org/>

The following figure represents the main characteristics of both models that will be detailed in the following two subsections. The models themselves are the subject of deliverable D6.1, where they are described in detail with examples.



3.1.3.1 Producer Quality Model

The producer quality model enables data providers to encode additional quality-related information. It builds on ISO19115 and ISO19157, extending them with capabilities to describe qualitative and quantitative quality information. It aims to increase a user's ability to assess dataset quality by adding discovered issues, reference datasets, traceability information, and statistical quality summaries.

3.1.3.2 Consumer Quality Model

The consumer quality model, also called the user feedback model (the name was coined in a later decision to align both models along the lifetime of the facts they represent), is a model for representing feedback about geospatial data that emerges after publication of the data. Its aims come from the user requirements and include:

Discoverability

The model allows description of the focus of user feedback. It is possible to narrow the feedback so that another user dealing with the same issue is likely to see the feedback more prominently than unrelated feedback.

Interoperability

Where applicable, feedback is made interoperable with standards used in GEOSS, chiefly the ISO 19000 family.

Extensibility

The model's anticipated use cases have been modelled in a relatively generic way. Thus, addition of new capabilities should be possible without replacing the model as such.

Though it incorporates ISO 19000 elements, the model itself has been created from scratch. Existing implementations such as the discontinued W3C "web annotations" which involve related problems were considered but not found adequate. The SIOC ontology also has been evaluated with the same result.

One of the core issues with user feedback in a complex system such as GEOSS is that multiple hierarchies co-exist. People themselves have non-trivial relations, their scientific domains are often intertwined, datasets can be seen as hierarchical (but that hierarchy will often be difficult to establish), and finally user feedback itself can get complex. For example, properly modelling an answer to some comment that references a paper (perhaps a report detailing quality issues) and other users comments can be challenging.

Why would it be useful to thoroughly model this case? The example just given can be solved using web URLs embedded in text. A conscious reader will be able to follow links. Part of the problem is the pre-defined granularity of links, which allow for documents and anchors to be referenced, but not freely defined parts of a resource; parts of a resource which might be essential to understand a (quality) problem the resource as a whole does not really have. Another aspect is discoverability – the linked resource will not “know” of the reference even if that might be desirable. Thus, a solution needs not only to provide references to defined parts of resources, but also discover feedback about a matching part, e.g. when that part of the resource is being examined.

Another related problem is exploitation of the focus of feedback. For example, a comment about a dataset in general may, at times, be of interest when inspecting a detail and vice versa. However most of the time comments of similar focus are more interesting. Anticipating the amounts of feedback that may accumulate on a frequently-used data set, the ability to decide the similarity or dissimilarity of different foci becomes essential to identify a relevant subset of feedback.

These issues were not at all addressed by SIOC or web annotations, which are modelled so items belong to a strictly hierarchical information space.

3.2 Geo Label strategy

3.2.1 Method for determining the geo label strategy

At present the Science and Technology Committee (S&T) is actively discussing the topic of establishing a GEO Label to assist the user in assessing the quality of geospatial data. As envisioned by the S&T, the GEO Label is proposed as a value indicator for geospatial data and datasets accessible through the GEOSS. It is suggested that the development of such a label could (1) encourage scientists, researchers, and others to contribute their data and systems to GEOSS by offering an accepted voluntary label that provides recognition that their contribution is valued by the GEO community, and also (2) differentiate components, data and products delivered through GEOSS and provide a “trusted brand” to GEOSS users; member governments may base their decisions on data/products of such contributions. Thus far, however, this initiative has scarce research on which to base its agenda: hence, it remains open to proposals for establishing the GEO Label.

GeoViQua will contribute to the concept of the GEO Label in order to allow for an increasing trustworthiness over GEOSS data and services delivery. GeoViQua will

conduct online surveys, focus groups and controlled structured studies to define the role that a GEO Label should serve. We will apply the defined GEO Label protocol to the pilot case studies and identify major issues and possibility for improvements.

The development of a GEO label will be carried out in three phases. In phase I we have conducted an online survey (GEO label questionnaire) to identify the initial user and producer views on a GEO label or its potential role. In phase II we will conduct a further study presenting some GEO label examples that will be based on Phase I. We will elicit feedback on these examples under controlled conditions. In phase III we will create physical prototypes which will be used in a human subject study. The most successful prototypes will then be put forward as potential GEO label options.

GEO Label aims to encourage scientists, researchers, and others to contribute their data and systems to GEOSS by offering an accepted voluntary label that provides recognition that their contribution is valued by the GEO community. It also will be used to differentiate components, data and products delivered through GEOSS and provide a “trusted brand” to GEOSS users; member governments may base their decisions on data/products of such contributions. (ST-09-02 Draft GEO Label Concept document)

The process of defining the most useful GEOLabel will be structured in three phases. Phase I

- We will conduct an online survey (GEO Label Questionnaire) that will be looking at: background information about the survey participants, the data sources they use or produce in their work and their awareness of any certificates or seals that apply to geospatial data;
- Initial user and producer view on the role that a GEO Label should serve;
- some examples of common review and rating systems to identify the participants' opinion on such systems so that we can draw on the strengths of these when developing the GEO Label;
- some examples of commonly used seals that use click-to-verify functionality and the relevance of such functionality to the GEO Label;
- further comments and suggestions on a GEO Label or its potential role.

Phase II:

When Phase I results are analysed, we will conduct a further study presenting some GEO Label examples that will be based on our first study results. We will elicit feedback on these examples under controlled conditions and in a well-managed and structured way.

Phase III:

We will create physical prototypes which will be used in a human subject study. The most successful prototypes will then be used to define the GEO Label concept and the role that a GEO Label will serve.

3.2.2 Initial User and Producer Views on a GEO Label

As part of phase I of GEO label development process, we conducted an online questionnaire-based survey. This online survey served as an initial investigation into

geospatial data producers' and users' views on the concept of a GEO label. Our questionnaire comprised five parts, A to E. We designed two appropriately tailored versions of Section A to separately target users and producers of geospatial data, with the remaining sections of the questionnaire being common to all respondents. The user-oriented version of Section A focused on dataset information available to users and informational aspects that influence their dataset choice. The producer-oriented version of Section A focused on data that producers provide. Section B asked respondents for their initial views on the potential role of a GEO label. Section C explored the idea of a GEO label being some sort of assurance seal. Section D investigated respondents' views on a GEO label concept that provides an all-in-one drill-down interrogation facility that would combine several geospatial data informational aspects. Finally, Section E focused on respondents' overall preferences for the GEO label's role.

We constructed and administered the questionnaire using the QuestionPro online-survey software. To inform potential respondents about the GEO label questionnaire, we produced a small leaflet that was distributed at the GEO Plenary session in Istanbul, Turkey on 16th of November 2011. We also emailed a number of professionals from key organisations such as NASA, ESA and EPA, academics and researchers that work in the GIS field, and other GIS professionals, asking them to complete the questionnaire. We received a total of 87 valid questionnaire responses: 57 from dataset users and 30 from dataset producers. The questionnaire was accessed and completed from a number of countries including Austria, Spain, Germany, Slovenia, Greece, United States, Netherlands, France, Italy, United Kingdom, Belgium, Switzerland, China, Bolivia, and Estonia.

Overall, the results show that users and producers of geospatial data have positive attitudes towards a concept of a GEO label. Respondents generally agreed that a GEO label would influence their dataset selection decisions: 48% of respondents stated that its presence would influence their decision, 22% stated that it would depend on whether they had previously used the data, and 11% stated that a GEO label would not influence their selection. When asked their initial views as to whether a GEO label should serve a certification role, the opinions of users and producers were reasonably concordant: 52% of respondents viewed certification positively, with only 13% disagreeing with the benefit of certification programmes. Many respondents agreed that data certification would improve data quality, "ensure that a minimum amount of information is captured" and ensure that international data standards are appropriately used. After presenting respondents with examples of everyday e-Commerce type review/rating systems (eBay and TripAdvisor), we asked them to state whether they believe a GEO label should support a similar role. Nearly half of the respondents (49%) agreed that a GEO label should fulfil an assurance and review/rating function; 34% recorded no opinion and 16% disagreed. Then we asked respondents about their awareness of e-Commerce seals and associated click-to-verify functionality and presented them with some relevant seals as the examples (BBBOnline, TRUSTe, VERIFIED by VISA, etc.). Three quarters (75%) of respondents stated that they had come across e-Commerce seals before; of these, 46% had clicked on an approval seal to verify if it was genuine and over half (54%) agreed that a GEO label should fulfil a drill-down function and support click-to-verify

functionality. Finally, we asked respondents to identify their preference(s) for the role of a GEO label. The majority (50 respondents) indicated preference for a drill-down interrogation facility, with a large number of respondents additionally and/or alternatively stating preference a certification seal. Where respondents suggested alternative functionality, it was generally related to seeing predominant representation of individual elements of metadata.

Overall, the results of our study show that users and producers of geospatial data appear to have generally very positive attitudes towards the development and introduction of a GEO label. Interestingly, there was no distinct difference between user and producer views on the role that a GEO label should serve. Respondents demonstrated positive attitudes towards a GEO label providing some sort of rating and review facilities, seeing this as appropriate support for more subjective metadata recording and assessment for datasets. The majority of users and producers also seem to support the notion of a GEO label providing an all-in-one drill-down interrogation facility that would combine expert value judgements, community advice, links to citation information, side-by-side visualisation of metadata records, etc. This suggests that, in order to make an informed dataset selection decision, respondents require as much information as possible presented in one place in a format that allows for easy comparison.

3.3 Requirements not relevant for GeoViQua

The User Requirements Registry (URR; (GEOURR, 2011)) is a new component of the GCI that collects user inputs on their needs. Some of the GeoViQua requirements are imposed or recommended by GEO documentation on recommendations, which cannot be transferred to the URR. Some others are new requirements that come from user interviews and the GEOLabel questionnaire. Some of the latter can be of general interest for GEOSS community. In this case we have made the effort of transferring them to the URR. We are currently joining efforts with the URR responsible (initiative led by Hans-Peter Plag) to find the best way to merge GeoViQua requirements into the URR. It is a meritorious effort; this is going to be the first time that an FP7 project is working towards the transferring of some of the identified requirements found along the execution of the project into the URR. The database was initially conceived to upload GEO user requirements about data gaps, data sustainability production and data applicability. Nevertheless, we strongly believe that some of the requirements elaborated by GeoViQua are on the same lines of those described as the URR original aim. Results on this discussion will be reported on a later WP8 deliverable.

4. Summary

The requirements, the derived architecture and models laid out in this document provide the foundation for the GeoViQua project to start working on prototypes and their evaluation. As is foreseen by the DoW, continued requirements management as

part of WP2 will provide continued support for refining and implementing this baseline to form testable prototypes.

While WP2 is in an attenuated role in this starting phase of the project, the requirements will probably be refined further as the implementation proceeds. In our experience, technical requirements sometimes remain latent for long time, so the need to refine and derive will be there if only for this reason. Also, end-user testing and validation are sure sources of change in requirements. We are, however, confident that the project's requirements management infrastructure and the technical architecture described in this deliverable provides a sound framework to accommodate for and help solve the problems occurring in such situations.

5. References

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6. Annex I Technical requirements

6.1.1 [GEOVIQUA-33] Users want to know the citations of dataset Created: 10/Jun/11 Updated: 19/Aug/12

Status:	Accepted
Project:	GeoViQua

Type:	User Story		
Reporter:	Kevin Yang	Assignee:	Daniel Nüst
Resolution:	Unresolved	Votes:	0
Labels:	interview, technical_req		

Issue Links:	Derivation		
	has been derived into	GEOVIQUA-163	Consumer metadata Accepted (feedback) shall in...
	Relates		
	relates to	GEOVIQUA-39	Users want to know any Reviewed inter-comparis...
	relates to	GEOVIQUA-116	Peer review of datasets to Accepted establish ...
Impact:	Many users		
User Story:	As a scientist or a generic user, if the data has been published, I want to know how many citations in scientific literature, so that it can help me to make judgement about how much I trust the dataset (i.e. as a trust trigger).		
Cluster:	Feedback		

Description

Extracted from user interview. See http://twiki.geoviqua.org/twiki/bin/view/GeoViQuaIntranet/WP2_Initial_User_Interviews_Results

Having this as user feedback allows researchers themselves to add their citation to the dataset - and thereby the people who have the highest interest of making a research endeavor public.

6.1.2 [GEOVIQUA-34] Users want to know the problems identified and highlighted about this dataset

Created: 10/Jun/11 Updated: 19/Aug/12

Status:	Accepted
Project:	GeoViQua

Type:	User Story		
Reporter:	Kevin Yang	Assignee:	Daniel Nüst
Resolution:	Unresolved	Votes:	0
Labels:	interview, technical_req		

Issue Links:	Derivation		
	has been derived into	GEOVIQUA-45	Peer review of datasets Accepted
	has been derived into	GEOVIQUA-163	Consumer metadata (feedback) shall in... Accepted
	Relates		
	relates to	GEOVIQUA-19	The system shall be based on a qualit... Rejected
	relates to	GEOVIQUA-42	Users want to know the methodology th... Rejected
	relates to	GEOVIQUA-39	Users want to know any inter-comparis... Reviewed
Impact:	Many users		
User Story:	"Any dataset has its problem(s)". As a scientist or generic user, I want to know the problems identified and highlighted about the dataset, so that it can help me to make a judgement about how much I can trust the dataset.		
Cluster:	Feedback		

Description

Extracted from user interviews. The interview results can be found at http://twiki.geoviqua.org/twiki/bin/view/GeoViQuaIntranet/WP2_Initial_User_Interviews_Results

6.1.3 [GEOVIQUA-40] Users could query and filter the GCI information content quality

Created: 10/Jun/11 Updated: 19/Aug/12

Status:	Accepted
Project:	GeoViQua

Type:	Functional Requirement		
Reporter:	Joan Maso	Assignee:	Lorenzo Bigagli
Resolution:	Unresolved	Votes:	0
Labels:	epic, fast-track, technical_req		

Issue Links:	Relates		
	relates to	GEOVIQUA-14	The GCI shall allow inclusion, Accepted editio...
Impact:	Entire CoP or Pilot Case		
Related Initiatives:	GCI, GEOSS		
Requirement:	The GCI should enable users to discover the declared quality of resources registered in the GEOSS, enabling them to query and filter the GCI information content quality, based on the metadata provided		
Rationale:	The GCI should be ready to accommodate and support recommendations on data quality management in accordance with the GEOSS Quality Assurance Strategy		
Acceptance Criteria:	Users can access an interface tool in which a GCI data search can be filtered by quality indicators. Quality indicators can also be shown in the results.		
Cluster:	Quality-aware Search		
Component:	Quality Search - Web user interface (classic)		

Description

Users could query and filter the GCI information content quality

Source: Recommendations for Long-term GCI Operations. 16th Executive Committee - Document 9. 21-22 September 2009.

6.1.4 [GEOVIQUA-55] Users want to know whether the dataset has gone through certain 'validation campaign' Created: 13/Jun/11 Updated: 19/Aug/12

Status:	Accepted
Project:	GeoViQua

Type:	User Story		
Reporter:	Kevin Yang	Assignee:	Joan Maso
Resolution:	Unresolved	Votes:	0
Labels:	fast-track, interview, quality_model, technical_req		

Issue Links:	Derivation	
	has been GEOVIQUA-125 derived into	The quality model shall Accepted document cali...
	Relates	
	relates to GEOVIQUA-21	Elaborate procedures, Accepted guides and exam...
Impact:	Many users	
User Story:	As a scientist or generic user, I want to know whether the dataset has gone through certain 'validation campaign', what the 'validation campaign' is, and what the validation results are, etc. so that I make a judgement about much I can trust the dataset.	
Cluster:	Quality and Uncertainty	

Description

Extracted from a set of user interview we carried out. Interview results can be found: http://twiki.geoviqua.org/twiki/bin/view/GeoViQuaIntranet/WP2_Initial_User_Interviews_Results

6.1.5 [GEOVIQUA-61] Users want to know the build-up history of the dataset

Created: 13/Jun/11 Updated: 19/Aug/12

Status:	Accepted
Project:	GeoViQua

Type:	User Story		
Reporter:	Kevin Yang	Assignee:	Joan Maso
Resolution:	Unresolved	Votes:	0
Labels:	fast-track, interview, quality_model, technical_req		

Issue Links:	Derivation		
	has been derived into	GEOVIQUA-91	The system should support the recordi...
	Relates		
	relates to	GEOVIQUA-42	Users want to know the methodology th...
Impact:	relates to	GEOVIQUA-23	The quality model shall support trace...
	Many users		
User Story:	As a generic user or scientist, I want to know the up-to-date version / beta version of this dataset, build-up history of the dataset (derived or measured dataset (e.g. reanalysis product, in-situ observation)), methodology consistency, retrieval algorithm (if used), whether known issues fixed, etc. so that I can latter derive more quality information on this dataset.		
Cluster:	Provenance and Purpose		

Description

Extracted from user interview we carried out. See

http://twiki.geoviqua.org/twiki/bin/view/GeoViQuaIntranet/WP2_Initial_User_Interviews_Results

This is related to 'data provenance'.

6.1.6 [GEOVIQUA-66] Data providers want the system to guide them to provide required quality information for the dataset.

Created: 13/Jun/11 Updated: 19/Aug/12

Status:	Accepted
Project:	GeoViQua

Type:	User Story		
Reporter:	Kevin Yang	Assignee:	Joan Maso
Resolution:	Unresolved	Votes:	0
Labels:	fast-track, interview, quality elicitation, technical req		

Issue Links:	Relates
	relates GEOVIQUA-47 To establish a web-based Abandoned Quality Cont...
Impact:	Many users
User Story:	As a data provider, I want the system to provide me a kind of mechanism (e.g. template) that can guide me to provide required quality information for the dataset.
Cluster:	Quality and Uncertainty

Description

Extracted from user interview.

6.1.7 [GEOVIQUA-67] Users want to find certain error distribution pattern via visualisation of error estimates

Created: 13/Jun/11 Updated: 19/Aug/12

Status:	Accepted
Project:	GeoViQua

Type:	User Story		
Reporter:	Kevin Yang	Assignee:	Joan Maso
Resolution:	Unresolved	Votes:	0
Labels:	fast-track, technical req		

Issue Links:	Relates
	relates GEOVIQUA-50 To apply uncertainty as a Accepted parameter i...
Impact:	Many users
Related Initiatives:	AIP-3
User Story:	As a scientist or generic user, I want the system to provide a visualisation of error estimates, so that I can find an error distribution pattern which can help to better understand the dataset.
Cluster:	Visualisation

Description

Extracted from AIP-3 'Air Quality Engineering Report'

6.1.8 [GEOVIQUA-68] Users want to see a list of associated data quality indicators and values attached to the dataset. Created: 13/Jun/11 Updated: 19/Aug/12

Status:	Accepted
Project:	GeoViQua

Type:	User Story		
Reporter:	Kevin Yang	Assignee:	Joan Maso
Resolution:	Unresolved	Votes:	0
Labels:	fast-track, technical_req		

Issue Links:	Cloners		
	is cloned by	GEOVIQUA-65	Users hope their trust on Reviewed the dataset...
	Dependency		
	is a dependency of	GEOVIQUA-141	A visualization service Accepted shall provide...
	Relates		
	relates to	GEOVIQUA-14	The GCI shall allow Accepted inclusion, editio...
	relates to	GEOVIQUA-31	The GEO Label shall Accepted reflect scientifi...
	relates to	GEOVIQUA-19	The system shall be Rejected based on a qualit...
Impact:	Many users		
Related Initiatives:	QA4EO		
User Story:	As a scientist or generic user, I want to see a list of associated data quality indicators and values attached to the dataset.		
Cluster:	Visualisation		

Description

Extracted from specification QA4EO

6.1.9 [GEOVIQUA-70] [Retrieve quality information about a particular pixel on a map using the standard WMS 'getFeatureInfo' operation.](#) Created: 17/Jun/11 Updated: 28/Jun/12

Status:	Accepted
Project:	GeoViQua

Type:	Functional Requirement		
Reporter:	Kevin Yang	Assignee:	Joan Maso
Resolution:	Unresolved	Votes:	0
Labels:	DoW, fast-track, technical_req		

Impact:	Many users
User Story:	As a scientist or generic user, I want to retrieve quality information about a particular pixel on a map using the standard WMS 'getFeatureInfo' operation.
Cluster:	Visualisation

Description

This requirement was extracted from DoW task 5.1.

6.1.10 [GEOVIQUA-71] The system should provide a standard means to allow the structured data quality information (e.g. error estimates, provenance) embedded or linked to WMS /WMTS and KML.

Created: 17/Jun/11 Updated: 28/Jun/12

Status:	Accepted
Project:	GeoViQua

Type:	Functional Requirement		
Reporter:	Kevin Yang	Assignee:	Joan Maso
Resolution:	Unresolved	Votes:	0
Labels:	DoW, fast-track, linking, technical_req		

Issue Links:	Derivation	
	is derived from GEOVIQUA-69	Users want the system to link the qua... Rejected
	Relates	
	relates to GEOVIQUA-126	Develop context-driven smart visualis... Accepted
Impact:	Entire CoP or Pilot Case	
Requirement:	The system should provide a standard means to allow the structured data quality information (e.g. error estimates, provenance) embedded or linked to WMS /WMTS and KML. The structured information should be in a standard format (e.g. UncertML). The embedding or linking should also be in a standard format(e.g. W3C XLink, XPointer)	
Rationale:	Users should be able to obtain the the assocaited data quality inforamtion from data visulisation (e.g. WMS/WMTS and KML).	
	The quality information represented in structured format and embedding / linking into the data in a standard format make it easy for machine processing and interoperability.	
Acceptance Criteria:	The quality information can be obtained or visualised from data visualisation (e.g. WMS/WMTS, KML). The quality information is represented in certain structured format (e.g. UncertML) The embedding or linking done in a standard format (e.g. W3C XLink, XPointer)	
Cluster:	Quality and Uncertainty, Visualisation	

Description

This requirement was extracted from DoW task 5.1.



development

FP7 Project Nr: 265178

Project start date: 01 Feb 2011

Acronym: **GeoViQua**

Project title: **QUALity aware Visualisation for the Global Earth Observation system of**

Theme: ENV.2010.4.1.2-2

Theme title: Integrating new data visualisation approaches of earth Systems into GEOSS

6.1.11 [GEOVIQUA-72] Users want to visualize data uncertainties both at the map level (overall accuracy) and at the pixel level (spatially distributed accuracy) Created: 17/Jun/11 Updated: 19/Aug/12

Status: Accepted

Project: [GeoViQua](#)

Type: Non-functional Requirement

Reporter: [Kevin Yang](#)

Assignee: [Thum, Simon](#)

Resolution: Unresolved

Votes: 0

Labels: DoW, fast-track, technical_req

Issue Links:	Dependency	
	is a GEOVIQUA-155	Spatially display the Accepted distribution of...
	Duplicate	
	duplicates GEOVIQUA-96	The quality model shall Rejected support point...
	Relates	
	relates to GEOVIQUA-161	A download data service Accepted shall provide...
Impact:	Entire CoP or Pilot Case	
Cluster:	Visualisation	

Description

This user story was extracted from DoW task 5.2 and requirement was derived from a user interview (see http://twiki.geoviqua.org/twiki/bin/view/GeoViQuaIntranet/WP2_Initial_User_Interviews_Results?sortcol=table;up=#Interview_with_Michael_Kollmar_J).

6.1.12 [GEOVIQUA-76] [Users want to visualise the quality information through desktop and Web-based GIS tools](#) Created: 17/Jun/11 Updated: 19/Aug/12

Status:	Accepted
Project:	GeoViQua

Type:	User Story		
Reporter:	Kevin Yang	Assignee:	Thum, Simon
Resolution:	Unresolved	Votes:	0
Labels:	DoW, fast-track, technical_req		

Impact:	Entire CoP or Pilot Case
Related Initiatives:	OGC
User Story:	As a generic user or a scientist, I want to visualise the quality information through desktop and Web-based GIS tools(e.g. WMS / WMTS client tools)
Cluster:	Visualisation

Description

This user story was extracted from DoW Task 5.2.

6.1.13 [GEOVIQUA-77] [Users want to visualise or access the data provenance information from each data source as a workflow](#) Created: 17/Jun/11 Updated: 19/Aug/12

Status:	Accepted
Project:	GeoViQua

Type:	User Story		
Reporter:	Kevin Yang	Assignee:	Thum, Simon
Resolution:	Unresolved	Votes:	0
Labels:	DoW, fast-track, technical_req		

Impact:	Entire CoP or Pilot Case
User Story:	As a generic user or a scientist, I want the system to provide a mechanism for me to visualise the data provenance as a workflow that provides access to quality information for each source dataset, so that I can have data provenance information from source dataset in an automatic and systematic manner.
Cluster:	Provenance and Purpose, Visualisation

Description

Extracted from DoW task 5.3

6.1.14 [GEOVIQUA-85] Metadata parameters shall be standardised such that their processing can be automated. Created: 18/Jun/11 Updated: 19/Aug/12

Status:	Accepted
Project:	GeoViQua

Type:	Functional Requirement		
Reporter:	Joanna Lumsden	Assignee:	Thum, Simon
Resolution:	Unresolved	Votes:	0
Labels:	fast-track, frascati-session, interview, technical_req		

Issue Links:	Derivation	
	is derived from GEOVIQUA-81	Archivers of datasets Rejected should be suppo...
	Duplicate	
	is duplicated by GEOVIQUA-117	Dataset metadata shall conform to int...
	Relates	
	relates to GEOVIQUA-162	The quality model and the Accepted system shal...
Impact:	Many users	
Rationale:	Datasets are becoming more and more plentiful - especially with the introduction of what is known as the "long tail" of datasets (that is, datasets which are developed by single researchers and which are increasingly being including in archiving initiatives). For these datasets to be more easily archived and then referenced, the ideal situation would be standardised metadata parameters.	
Acceptance Criteria:	Standardised metadata schema which can supercede any previous used schema.	
Cluster:	Standards and Communication	

Description

It is becoming a fairly comprehensive and wide ranging initiative to find, describe, and reference data sources whether or not they are locally archived. There is an obvious need to be able to find and use data that may be anywhere in the world. If those data sources were described in a standardised manner it would be possible to automate their processing, making it possible to do more with them.

This scientific objective was elicited from user interview (see http://twiki.geoviqua.org/twiki/bin/view/GeoViQuaIntranet/WP2_Initial_User_Interviews_Results?sortcol=table;up=#Interview_with_Wim_Hugo_SAEON_31).



development

FP7 Project Nr: 265178

Project start date: 01 Feb 2011

Acronym: **GeoViQua**

Project title: **QUALity aware Visualisation for the Global Earth Observation system of**

Theme: ENV.2010.4.1.2-2

Theme title: Integrating new data visualisation approaches of earth Systems into GEOSS

6.1.15 [GEOVIQUA-88] [Expert reviews with value judgements about datasets](#)

Created: 18/Jun/11 Updated: 19/Aug/12

Status:	Accepted
Project:	GeoViQua

Type:	Functional Requirement		
Reporter:	Joanna Lumsden	Assignee:	Daniel Nüst
Resolution:	Unresolved	Votes:	0
Labels:	fast-track, interview, technical_req		

Issue Links:	Dependency		
	depends on	GEOVIQUA-87	System should support Abandoned peer review or ...
	is a dependency of	GEOVIQUA-143	Ensure direct and Abandoned regular interaction...
	Derivation		
	is derived from	GEOVIQUA-81	Archivers of datasets Rejected should be suppo...
	Relates		
	relates to	GEOVIQUA-86	Archiving of datasets Reviewed should make no ...
	relates to	GEOVIQUA-116	Peer review of datasets Accepted to establish ...
	relates to	GEOVIQUA-136	The quality model shall Accepted support quali...
	relates to	GEOVIQUA-163	Consumer metadata Accepted (feedback) shall in...
Impact:	Many users		
Requirement:	Domain experts should be able to associate their value judgement of a dataset with the dataset, limited to the scope of their own domain, thereby enabling a peer review.		
Rationale:	To assist novice users in making informed selection decisions about datasets, it would be valuable to have recognised domain experts identify the value of a given dataset for use in a given domain. This would support users in the given domain in selecting their dataset but allow users outside of the domain to ignore the comments/judgements that are irrelevant to their domain of practice.		
Acceptance Criteria:	System permits registered and recognised domain experts to add value judgements qualified by domain identification to a given dataset.		
Cluster:	Feedback		
Component:	Quality Search		

Description

Whilst dataset archivers should not make face-value judgements about datasets, there should be scope for domain experts (for example: GEO tasks members, EO data providers and the Earth science and technology community) to record value judgements with datasets to reflect on the appropriateness of the dataset for use in their specific domain.

This has been derived from user interview (see http://twiki.geoviqua.org/twiki/bin/view/GeoViQuaIntranet/WP2_Initial_User_Interviews_Results?sortcol=table;up=#Interview_with_Wim_Hugo_SAEON_31).

6.1.16 [GEOVIQUA-91] The system should support the recording and subsequent review of methodology information associated with a dataset. Created: 18/Jun/11 Updated: 19/Aug/12

Status: Accepted

Project: [GeoViQua](#)

Type: Functional Requirement

Reporter: [Joanna Lumsden](#)

Assignee: [Thum, Simon](#)

Resolution: Unresolved

Votes: 0

Labels: fast-track, interview, quality_model, technical_req

Issue Links:	Cloners	
	clones GEOVIQUA-141	A visualization service shall provide...
	Dependency	
	depends on GEOVIQUA-82	System should support the recording a...
	Derivation	
	is derived from GEOVIQUA-61	Users want to know the build-up histo...
	is derived from GEOVIQUA-60	Users want to know the methodology th...
	is derived from GEOVIQUA-81	Archivers of datasets should be suppo...
	Relates	
	relates to GEOVIQUA-119	The quality model and the system shal...
	relates to GEOVIQUA-110	System should support the recording, ...
Impact :	Few users	
Requirement:	System should support the recording and subsequent review of methodological aspects associated with the dataset collection/creation.	
Rationale:	See description. This requirement was derived from a user interview (see http://twiki.geoviqua.org/twiki/bin/view/GeoViQuaIntranet/WP2_Initial_User_Interviews_Results?sortcol=table;up=#Interview_with_Wim_Hugo_SAEON_31).	
Acceptance Criteria:	System supports the recording of methodological information as well as its subsequent reference and review.	
Cluster:	Provenance and Purpose	

r:

Description

If data is going to be preserved for a long time, it is important to have a clear and detailed record of the methodology used to collect the data. Also, it is important to describe the processing that was employed to estimate the quality indicators and the standards followed if any. This is especially true when we consider the use of data 50 years down the line when the dataset creator is not necessarily still accessible.

The processing that was employed to estimate the quality indicators could be complemented with the standards being developed in the OGC Sensor Web Enablement activities, to which several participants contribute actively.

6.1.17 [GEOVIQUA-93] The system should support the recording and subsequent querying information about the origin of a given metadata record (e.g. the harvesting metadata pathways) Created: 18/Jun/11
Updated: 19/Aug/12

Status: Accepted

Project: [GeoViQua](#)

Type: Functional Requirement

Reporter: [Joanna Lumsden](#)

Assignee: [Lorenzo Bigagli](#)

Resolution: Unresolved

Votes: 0

Labels: fast-track, interview, technical_req

Issue Links:	Conflict		
	conflicts with	GEOVIQUA-158	The quality model and the system Accepted
	Dependency		
	depends on	GEOVIQUA-82	System should support the Rejected recording a...
	Derivation		
	is derived from	GEOVIQUA-81	Archivers of datasets should be Rejected suppo...
	Relates		
	relates to	GEOVIQUA-105	The quality model and the system Accepted
Impact :	Few users		
Requirement:	The system should support the recording and subsequent querying of the pathway followed to harvest the metadata of given dataset and, in general, the origin of the metadata.		
Rationale:	See description. This requirement was derived from a user interview (see http://twiki.geoviqua.org/twiki/bin/view/GeoViQuaIntranet/WP2_Initial_User_Interviews_Results?sortcol=table;up=#Interview_with_Wim_Hugo_SAEON_31).		
Acceptance Criteria:	System provides the means to record, edit, review, and query information about the origin of the metadata records (e.g. the harvesting metadata pathways).		
Cluster:	Provenance and Purpose, Quality-aware Search, Quality and Uncertainty		

Description

Due to the growth in a number of portals that rely on metadata and on harvesting metadata

from one another, the path that metadata follows to arrive at your doorstep is lost. You only ever, usually, have a portal that you harvested it from, and where this is not the starting point you don't have the intermediaries. There is therefore a need to improve the way in which pathways are stored where each portal that touches a metadata record has an element to describe who they are and where they are located and who to contact at the end of the metadata record, so that one can trace the path. There is perhaps an opportunity to optimise the harvesting in future, because it's going to become an onerous path to keep these portals up-to-date and synchronised.

It is basically a requirement on metadata provenance (or meta-provenance).

6.1.18 [GEOVIQUA-105] The quality model and the system shall support recording, editing, reviewing and subsequent querying of dataset provenance. Created: 19/Jun/11 Updated: 19/Aug/12

Status: Accepted

Project: [GeoViQua](#)

Type: Functional Requirement

Reporter: [Joanna Lumsden](#)

Assignee: [Daniel Nüst](#)

Resolution: Unresolved

Votes: 0

Labels: fast-track, interview, quality_model, technical_req

Issue Links:	Cloners	
	is cloned by	GEOVIQUA-108 The system should support Abandoned recording, ...
	Derivation	
	is derived from	GEOVIQUA-103 Users of climate data should Reviewed be suppo...
	has been derived into	GEOVIQUA-111 The system should support Accepted visual side...
	has been derived into	GEOVIQUA-167 The system shall support Accepted querying of ...
	Relates	
	relates to	GEOVIQUA-92 The system should record the Accepted contact ...
	relates to	GEOVIQUA-107 The quality model and the Accepted system shal...
	relates to	GEOVIQUA-120 The quality model and the Accepted system shou...
Impact :	relates to	GEOVIQUA-158 The quality model and the Accepted system shal...
	relates to	GEOVIQUA-99 The system should support the Abandoned rating ...
Requirement:	relates to	GEOVIQUA-93 The system should support the Accepted recordi...
Rationale:	See description.	

	This requirement has been derived from a user interview (see http://twiki.geoviqua.org/twiki/bin/view/GeoViQuaIntranet/WP2_Initial_User_Interfaces_Results?sortcol=table;up=#Interview_with_Jon_Skoien_INTAMA).
Acceptance Criteria:	The system provides the facility for a dataset provenance to be recorded, edited, reviewed, and queried.
Cluster:	Provenance and Purpose, Quality and Uncertainty

Description

For a dataset's value and quality to be fully assessed, it is important that its provenance is recorded and can be reviewed. Provenance includes the source provider and who and how has subsequently processed the data.

6.1.19 [GEOVIQUA-107] The quality model and the system shall be able to record, edit, review and query dataset limitations and boundaries of use provided by the creator of the dataset. Created: 19/Jun/11 Updated: 19/Aug/12

Status: Accepted

Project: [GeoViQua](#)

Type: Functional Requirement

Reporter: [Joanna Lumsden](#)

Assignee: [Thum, Simon](#)

Resolution: Unresolved

Votes: 0

Labels: fast-track, frascati-session, interview, quality_model, technical_req

Issue Links:	Derivation	
	is derived from	GEOVIQUA-103 Users of climate data should be Reviewed suppo...
	Relates	
	relates to	GEOVIQUA-95 System should support the Rejected recording a...
	relates to	GEOVIQUA-105 The quality model and the system Accepted shal...
	relates to	GEOVIQUA-120 The quality model and the system Accepted shou...
	relates to	GEOVIQUA-108 The system should support Abandoned recording, ...
Impact :	Many users	
Requirement:	The system should support the recording, editing, reviewing, and querying of soft knowledge about a dataset as provided by the creator of the dataset and to include: anticipated limitations of the dataset; anticipated boundaries of use for the dataset; conditions under which the data should be trusted or not trusted, etc.	
Rationale:	See description. This requirement was derived from a user interview (see http://twiki.geoviqua.org/twiki/bin/view/GeoViQuaIntranet/WP2_Initial_User_Views_Results?sortcol=table;up=#Interview_with_Jon_Skoien_INTAMA).	
Acceptance Criteria:	The system facilitates the recording, editing, reviewing, and querying of soft knowledge about a dataset.	
Cluster:	Provenance and Purpose, Quality and Uncertainty	

Description

Uncertainty is considered the most important quality metric by some researchers. To help researchers make informed decisions about uncertainty of datasets, it would be helpful if the person who has derived a dataset could record "soft knowledge" about the dataset, to include: anticipated limitations of the dataset; anticipated boundaries of use for the dataset; conditions under which the data should be trusted or not trusted, etc.

6.1.20 [GEOVIQUA-111] The system should support visual side-by-side comparison of metadata attributes. Created: 20/Jun/11 Updated: 19/Aug/12

Status:	Accepted
Project:	GeoViQua

Type:	Functional Requirement		
Reporter:	Joanna Lumsden	Assignee:	Thum, Simon
Resolution:	Unresolved	Votes:	0
Labels:	fast-track, frascati-session, interview, technical_req		

Issue Links:	Derivation		
	is derived from	GEOVIQUA-105	The quality model and the system Accepted
	is derived from	GEOVIQUA-158	The quality model and the system Accepted
Impact :	Many users		
Requirement:	The system should support side-by-side visual comparison of metadata attributes across a range of datasets.		
Rationale:	See description. This requirement was derived from user interview (see http://twiki.geoviqua.org/twiki/bin/view/GeoViQuaIntranet/WP2_Initial_User_Interviews_Results?sortcol=table;up=#Interview_with_Sarah_Knight_DEFR).		
Acceptance Criteria:	The system facilitates visual side-by-side comparison of metadata attributes for a range of datasets.		
Cluster:	Intercomparison		

Description

In order to properly compare datasets when making a selection, it is valuable to be able to compare the metadata associated with candidate datasets side by side.

6.1.21 [GEOVIQUA-113] The quality model shall support links to journal articles in which dataset quality checks are reported.

Created: 20/Jun/11

Updated: 28/Jun/12

Status:	Accepted
Project:	GeoViQua

Type:	Functional Requirement		
Reporter:	Joanna Lumsden	Assignee:	Thum, Simon
Resolution :	Unresolved	Votes:	0
Labels:	fast-track, frascati-session, interview, linking, quality_model, technical_req		

Issue Links:	Cloners	
	clones	GEOVIQUA-102 The data model shall support links Rejected to...
	Derivation	
	is derived from	GEOVIQUA-109 Users of land use data should be Reviewed supp...
	is derived from	GEOVIQUA-94 Users of land set datasets should Rejected be ...
	Relates	
	relates to	GEOVIQUA-95 System should support the Rejected recording a...
	relates to	GEOVIQUA-110 System should support the Rejected recording, ...
Impact :	Many users	
Requirement:	The system should support the recording of links to journal articles (or other publications) in which dataset quality checks are reported.	
Rationale:	See description. This requirement has been derived from a user interview (see http://twiki.geoviqua.org/twiki/bin/view/GeoViQuaIntranet/WP2_Initial_User_Interviews_Results?sortcol=table;up=#Interview_with_Sarah_Knight_DEFR and http://twiki.geoviqua.org/twiki/bin/view/GeoViQuaIntranet/WP2_Initial_User_Interviews_Results?sortcol=table;up=#Interview_with_Michael_Kollmar_J).	
Acceptance Criteria:	The system provides the facility to link a dataset to publications associated with its quality standards.	
Cluster	Quality and Uncertainty	

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Description

When organisations document the quality standards they have applied to datasets, they often use the medium of journal papers or other publications. As such, the system should support recording links to such publications to allow users to validate the standards for themselves.

6.1.22	[GEOVIQUA-118] Rating of dataset	Created: 20/Jun/11 Updated: 28/Jun/12
Status:	Accepted	
Project:	GeoViQua	

Type:	Functional Requirement		
Reporter:	Joanna Lumsden	Assignee:	Daniel Nüst
Resolution:	Unresolved	Votes:	0
Labels:	epic, fast-track, interview, technical_req		

Issue Links:	Dependency		
	is a dependency of	GEOVIQUA-143	Ensure direct and regular interaction... Abandoned
	Derivation		
	is derived from	GEOVIQUA-109	Users of land use data should be supp... Reviewed
	Relates		
	relates to	GEOVIQUA-45	Peer review of datasets Accepted
	relates to	GEOVIQUA-110	System should support the recording, ... Rejected
	relates to	GEOVIQUA-99	The system should support the rating ... Abandoned
	relates to	GEOVIQUA-116	Peer review of datasets to establish ... Accepted
	relates to	GEOVIQUA-119	The quality model and the system shal... Accepted
Impact :	Project success		
Requirement:	The system should support the ability to rate a dataset and must allow this rating to be subsequently edited, queried, and searched. The system must allow the dataset provider to respond to the rating in a specific role.		
Rationale:	See description.		
	This requirement has been derived from a user interview (see http://twiki.geoviqua.org/twiki/bin/view/GeoViQuaIntranet/WP2_Initial_User_Views_Results?sortcol=table;up=#Interview_with_Sarah_Knight_DEFR).		

	Validation of datasets with user feedback from larger audience to allow that information to be shared and to get back to the data provider. More sources Source1: Data Way Forward.George Percivall, Open Geospatial Consortium, ADC-12 Melbourne Australia, 15 September 2009 Source2: The Science and Technology Roadmap (GEOSS)
Acceptance Criteria:	The system provides a facility to rate a dataset, and to subsequently edit, review, query and search the rating. Providers can respond to ratings.
Cluster:	Feedback

Description

The reputation of a dataset goes a long way to allowing a dataset user to make a decision to select a dataset. Akin to Trip Advisor, the system should support dataset users in being able to rate (e.g. award a star rating) a dataset which would, in turn, allow the dataset provider to receive and respond to feedback on his/her dataset and act on that feedback.

6.1.23 [GEOVIQUA-119] The quality model and the system shall support the recording, editing, reviewing, querying and peer review of the methodology adopted for dataset data collection. Created: 20/Jun/11 Updated: 19/Aug/12

Status:	Accepted
Project:	GeoViQua

Type:	Functional Requirement		
Reporter:	Joanna Lumsden	Assignee:	Thum, Simon
Resolution:	Unresolved	Votes:	0
Labels:	fast-track, frascati-session, interview, quality_model, technical_req		

Issue Links:	Derivation		
	is derived from	GEOVIQUA-109	Users of land use data should be Reviewed supp...
	Relates		
	relates to	GEOVIQUA-91	The system should support the Accepted recordi...
	relates to	GEOVIQUA-116	Peer review of datasets to Accepted establish ...
	relates to	GEOVIQUA-118	Rating of dataset Accepted
	relates to	GEOVIQUA-110	System should support the Rejected recording, ...
	relates to	GEOVIQUA-87	System should support peer Abandoned review or ...
Impact :	Many users		
Requirement:	The system shall support the recording, editing, reviewing, querying and peer review of the methodology adopted for dataset data collection.		
Rationale:	See description. This requirement has been derived from user interview (see http://twiki.geoviqua.org/twiki/bin/view/GeoViQuaIntranet/WP2_Initial_User_Views_Results?sortcol=table;up=#Interview_with_Sarah_Knight_DEFR).		
Acceptance Criteria:	The system facilitates the recording, editing, reviewing, querying, and peer review of methodological information.		
Cluster:	Provenance and Purpose, Quality and Uncertainty		

Description

The methodology applied for data collection - including captural effort and technologies used to record the data - should be provided to allow dataset users to make future value judgements about the quality or accuracy (including uncertainty) of a dataset.

6.1.24 [GEOVIQUA-120] The quality model and the system should support the recording, editing, reviewing, and querying of information about the purpose for which a dataset was originally collected.

Created:

20/Jun/11 Updated: 19/Aug/12

Status:	Accepted
Project:	GeoViQua

Type:	Functional Requirement		
Reporter:	Joanna Lumsden	Assignee:	Lorenzo Bigagli
Resolution:	Unresolved	Votes:	0
Labels:	fast-track, frascati-session, interview, quality_model, technical_req		

Issue Links:	Derivation		
	is derived from	GEOVIQUA-109	Users of land use data should be Reviewed supp...
	Reference		
	is referenced by	GEOVIQUA-108	The system should support Abandoned recording, ...
	Relates		
	relates to	GEOVIQUA-107	The quality model and the Accepted system shal...
Impact :	relates to	GEOVIQUA-110	System should support the Rejected recording, ...
	relates to	GEOVIQUA-105	The quality model and the Accepted system shal...
	Many users		
Requirement:	The system should support the recording, editing, review and subsequent query of information about the purpose for which a dataset was originally collected.		
Rationale:	See description. This requirement was derived from a user interview (see http://twiki.geoviqua.org/twiki/bin/view/GeoViQuaIntranet/WP2_Initial_User_Interviews_Results?sortcol=table;up=#Interview_with_Sarah_Knight_DEFR and also http://twiki.geoviqua.org/twiki/bin/view/GeoViQuaIntranet/WP2_Initial_User_Interviews_Results?sortcol=table;up=#Interview_with_Jon_Skoien_INTAMA).		
Acceptance Criteria:	The system facilitates the recording, editing, review, and query of dataset purpose information.		
Cluster:	Provenance and Purpose, Quality and Uncertainty		

Description

The same dataset may be ideal for one use but wholly inappropriate for another purpose. Knowing why a dataset was originally collated goes a long way to allowing dataset users to make a value judgement about a given dataset.

6.1.25 [GEOVIQUA-121] The system shall extract quality information from data, metadata and user feedback Created: 21/Jun/11 Updated: 28/Jun/12

Status:	Accepted
Project:	GeoViQua

Type:	Functional Requirement		
Reporter:	Joan Maso	Assignee:	Thum, Simon
Resolution:	Unresolved	Votes:	0
Labels:	DoW, epic, quality_extraction, technical_req		

Issue Links:	Relates		
	relates to	GEOVIQUA-134	Combine provider-generated metadata w... Accepted
Impact:	Many users		
Requirement:	Information about data quality will be extracted from metadata, from the data themselves, from validation processes towards in-situ sensor data, from provenance information and from user feedback.		
Rationale:	- Users have no means to quickly determine the quality of the data in a result set and to filter on the basis of this quality. Users still need to manually check the individual results. - A lot of EO data undergoes processing before it is used, but not all processing steps are documented in the metadata, particularly in the case of online processing. Such data thus do not have complete quality information. - Current search techniques ignore user's context in relation to data quality.		
Acceptance Criteria:	Users can use a quality compilation method that extracts quality information from from metadata, from the data themselves, from validation processes towards in-situ sensor data, from provenance information and from user feedback.		
Cluster:	Quality and Uncertainty		

Description

Source: Integrating new data visualisation approaches of earth Systems into GEOSS development. Annex I - "Description of Work". B.1 Concept and objectives, progress beyond state-of-the-art, S/T methodology and work plan

6.1.26 [GEOVIQUA-127] Enable search and discovery over GEO Web Portal using information on data quality Created: 22/Jun/11 Updated: 19/Aug/12

Status:	Accepted
Project:	GeoViQua

Type:	Functional Requirement		
Reporter:	Joan Maso	Assignee:	Lorenzo Bigagli
Resolution:	Unresolved	Votes:	0
Labels:	DoW, technical_req		

Issue Links:	Dependency		
	is a GEOVIQUA-142 dependency of	Data quality aware geo- search tools	Accepted
	Reference		
	references GEOVIQUA-130	Quality search visualisation to f...	Accepted
Impact:	Project success		
Requirement:	The GeoViQua system will include an enhanced quality-driven search methodology and data quality visualisation at the same time. In this approach, users' requests are enriched with context information to allow finer searches and the possibility to relate search results with end use.		
Rationale:	In order to compare the quality assessments from a Geo Portal, numerous detailed and complex metadata elements and their DQ elements must be manually cross-checked at moment, making it impossible to quickly choose a suitable data source from the presented results.		
Acceptance Criteria:	This approach will provide users with a way to determine which results that can best suit their needs by using the ranking and visualisation metrics.		
Cluster:	Quality-aware Search		

Description

Typically, a user must decide between multiple returned results from a Geo Portal search based on several available summaries: a metadata description, a thumbnail picture of the data and a syntactic description of the data quality.

Source: Integrating new data visualisation approaches of earth Systems into GEOSS development. Annex I - "Description of Work". B.1 Concept and objectives, progress beyond state-of-the-art, S/T methodology and work plan

6.1.27 [GEOVIQUA-134] Combine provider-generated metadata with user-generated metadata Created: 22/Jun/11 Updated: 28/Jun/12

Status:	Accepted
Project:	GeoViQua

Type:	Functional Requirement		
Reporter:	Joan Maso	Assignee:	Kevin Yang
Resolution:	Unresolved	Votes:	0
Labels:	DoW, epic, technical_req		

Issue Links:	Relates		
	relates to	GEOVIQUA-121	The system shall extract quality info... Accepted
Impact:	Entire CoP or Pilot Case		
Related Initiatives:	GEOSS		
Requirement:	GeoViQua will combine provider-generated metadata with user-generated metadata, both formal and informal, in a single catalogue environment and will use the current catalogue standards to record the metadata so it may be searched and requested by standards clients.		
Rationale:	VGI (Volunteered Geographic Information) offers enormous opportunities to GEOSS as a bidirectional framework, but remains unexploited because of critical questions over VGI's data quality, sampling heterogeneity and bias, and lack of formal metadata. However, Web 2.0 and social networking can be leveraged to collectively create and exchange information on data quality and reliability.		
Acceptance Criteria:	To provide a single Volunteered Geographic Information catalogue environment.		
Cluster:	Quality-aware Search, Quality and Uncertainty, Feedback		

Description

The user will be able to comment about a particular dataset, a collection or a service (and, crucially, about the context in which they used the data, i.e., it's fitness-for-use) in a single environment that will also integrate search and visualisation.

6.1.28 [GEOVIQUA-135] The quality model shall support statistical quantitative estimates of data quality (probabilistic, variance...)

Created:

22/Jun/11 Updated: 19/Aug/12

Status:	Accepted
Project:	GeoViQua

Type:	Functional Requirement		
Reporter:	Joan Maso	Assignee:	Joanna Lumsden
Resolution:	Unresolved	Votes:	0
Labels:	DoW, quality_model, technical_req		

Impact:	Many users
Requirement:	This could take several forms: - a). a full characterisation of the probability density function; - b). a partial characterisation based on summary statistics of the full probability distribution, most commonly the first two moments, mean (bias) and variance (spread); - c). an interval based approach, which might provide quartiles which can be used in a probabilistic setting, or a non-probabilistic interval such as a credibility distribution or fuzzy set.
Rationale:	GEO has been developing a Quality Assurance strategy (i.e. QA4EO http://qa4eo.org/), which recognises that data quality indicators are essential to interoperability. The utility of such a quality indicator will be greatest if the indicator provides a quantitative, typically statistical, description of the relationship between the measurement and the measurement target (reality).
Acceptance Criteria:	"a means of providing 'a user' of a product (which is the result of a process) sufficient information to assess its suitability for a particular application." (QA4EO-QAEO-GEN-DQK-003).
Cluster:	Quality and Uncertainty

Description

To consider the quantitative estimates of data quality indicators based on a validated model describing the probabilistic relationship between the observation and reality.

6.1.29 [GEOVIQUA-136] The quality model shall support qualitative statements of belief about the data quality Created: 22/Jun/11 Updated: 19/Aug/12

Status:	Accepted
Project:	GeoViQua

Type:	Functional Requirement		
Reporter:	Joan Maso	Assignee:	Joanna Lumsden
Resolution:	Unresolved	Votes:	0
Labels:	DoW, bayesian, quality_model, technical_req		

Issue Links:	Dependency		
	depends on	GEOVIQUA-137	The system shall provide quantitative... Accepted
	Relates		
	relates to	GEOVIQUA-45	Peer review of datasets Accepted
	relates to	GEOVIQUA-88	Expert reviews with value judgements ... Accepted
Impact:	relates to	GEOVIQUA-163	Consumer metadata (feedback) shall in... Accepted
	Few users		
Requirement:	To use: a). subjective quantitative assessments of the quality of a given data set. In a subjective Bayesian framework these beliefs are consistent with, and can be integrated into, a rigorous quantitative framework; b). subjective beliefs about the fitness for purpose of a given data set. This mechanism allows scientists and users to rate the utility of a given data set for a given task, in a manner similar to rating systems on Amazon, eBay, etc.		
Rationale:	GEO has been developing a Quality Assurance strategy (i.e. QA4EO http://qa4eo.org/), which recognises that data quality indicators are essential to interoperability. However the concrete assessment of uncertainty is not always feasible. Where quantitative quality information is not available, quality indicators may consist of qualitative statements of belief about a specific product or its fitness for a specific purpose.		
Acceptance Criteria:	"a means of providing 'a user' of a product (which is the result of a process) sufficient information to assess its suitability for a particular application." (QA4EO-QAEO-GEN-DQK-003).		
Cluster:	Quality and Uncertainty, Feedback		

Description

To use Qualitative statements of belief about the data quality. Source: Integrating new data visualisation approaches of earth Systems into GEOSS development. Annex I - "Description of Work". B.1 Concept and objectives, progress beyond state-of-the-art, S/T methodology and work plan.

6.1.30 [GEOVIQUA-140] [The quality model shall use ISO standards for metadata \(19115\) and quality \(19157\) with extensions for UncertML and O&M](#) Created: 22/Jun/11 Updated: 19/Aug/12

Status: Accepted

Project: [GeoViQua](#)

Type: Non-functional Requirement

Reporter: [Joan Maso](#)

Assignee: [Joanna Lumsden](#)

Resolution: Unresolved

Votes: 0

Labels: DoW, quality_model, technical_req

Issue Links:	Cloners	
	is cloned by GEOVIQUA-13	The system shall use Accepted UncertML encodin...
	Dependency	
	depends on GEOVIQUA-12	Statistical framework to Rejected quantify and...
	Derivation	
	is derived from GEOVIQUA-22	The quality model shall Accepted support quali...
	is derived from GEOVIQUA-19	The system shall be based Rejected on a qualit...
	Relates	
	relates to GEOVIQUA-117	Dataset metadata shall Accepted conform to int...
Non-functional requirement type:	Standard Conformance (STR)	
Impact:	Few users	
Related Initiatives:	UncertML	
Requirement:	Where necessary (and possible) we will extend existing standards by augmenting them rather than revising them. We will also consider developing profiles of standards that are conceptual, for example Observations & Measurements (O&M), to produce usable encoding standards specific to the EO context.	
Rationale:	UncertML can be used with ISO19115/19157, although UncertML goes	

	further in representing intrinsically uncertain (probabilistic) quantities and providing a mechanism to express data quality through metadata.
Acceptance Criteria:	To provide an extended version of UncertML with descriptions of further types of uncertainty. To provide a single integrated standard ISO and OGC and W3C standards that consider data quality.
Cluster:	Quality and Uncertainty

Description

As described in the DOW this requirement will be archived by:

- GeoViQua will extend UncertML to allow descriptions of further types of uncertainty, including qualitative descriptions consistent with ISO19138 and the revisions being considered in ISO 19157, 19158 and 19159. In particular, we will promote the use of UncertML within the EO context taking UncertML to a best practice paper in OGC, and exploring standardisation within the ISO process.
- We will provide a single integrated standard that embodies the wide range of existing ISO and other OGC and W3C standards that consider data quality, which will greatly enhance interoperability.

Source: Integrating new data visualisation approaches of earth Systems into GEOSS development. Annex I - "Description of Work". B.1 Concept and objectives, progress beyond state-of-the-art, S/T methodology and work plan

6.1.31 [GEOVIQUA-141] A visualization service shall provide a list of data quality indicators/measures (at the dataset or pixel level)

Created: 22/Jun/11

Updated: 28/Jun/12

Status:	Accepted
Project:	GeoViQua

Type:	Non-functional Requirement		
Reporter:	Joan Maso	Assignee:	Joanna Lumsden
Resolution:	Unresolved	Votes:	0
Labels:	DoW, technical_req		

Issue Links:	Cloners	
	is cloned by GEOVIQUA-91	The system should support the recordi...
	Dependency	
	depends on GEOVIQUA-68	Users want to see a list of Accepted associate...
	is a GEOVIQUA-69 dependency of	Users want the system to Rejected link the qua...
	Relates	
Non-functional requirement type:	relates to GEOVIQUA-139	Elaborate best practices Accepted for using vi...
	relates to GEOVIQUA-19	The system shall be Rejected based on a qualit...
	Standard Conformance (STR)	
	Many users	
	OGC, UncertML	
Requirement:	The system shall provide means for embedding quality information/indicator/measures in visualization tools.	
Rationale:	Currently there is no standard means for conveying quality information through KML, WMS or WMTS interfaces, although a number of different approaches have been used informally. Although both KML and WMS are "lightweight" technologies and hence somewhat limited, they are very widely used and it is very important that users of such services can access quality information in a consistent manner.	
Cluster:	Standards and Communication	
Component:	Quality Visualization	

Description

GeoViQua will validate many alternatives and define a standard, practical means for embedding quality information, harmonizing where possible with parallel and related efforts in other projects. The alternatives will include (but will not be limited to):

- Simple hyperlinking from KML/WMS services to human-readable web pages giving more information about quality (supplied by the data provider or other sources).
- Embedding quality information in standard XML formats (e.g. UncertML) in standard locations in KML documents or WMS Capabilities documents.
- Establishing simple semantic relationships between KML features/WMS Layers, e.g. defining a way to encapsulate relationships such as "Layer Y gives the standard deviation of Layer X".

Solutions for visualising quality parameters and quality issues will be implemented as 'best practice' extensions of the WMS standard. One of the primary goals of the WMS standard (other than interoperability) was flexibility. It has been implemented by almost every data provider wishing to share information in an interoperable way and it will be a key service in GeoViQua.

Source: Integrating new data visualisation approaches of earth Systems into GEOSS development. Annex I - "Description of Work". B.1 Concept and objectives, progress beyond state-of-the-art, S/T methodology and work plan

6.1.32 [GEOVIQUA-148] The quality model and quality-aware search shall support sensors with quality description Created: 28/Jun/11 Updated: 19/Aug/12

Status:	Accepted
Project:	GeoViQua

Type:	Functional Requirement		
Reporter:	Daniel Nüst	Assignee:	Lorenzo Bigagli
Resolution:	Unresolved	Votes:	0
Labels:	fast-track, quality_model, technical_req		

Impact:	Many users
Related Initiatives:	GEOSS, SWE
Requirement:	Sensor systems can be described extensively in sensor description languages (SensorML, SFL). These descriptions must be extended with quality parameters, for example using a metadata profile which clearly defines a manageable set of mandatory elements. A sensor catalogue service must provide a search interface for users to discover available data by defining observable properties and quality parameters.
Rationale:	Sensor discovery and corresponding issues (like specific metadata description formats and service interfaces) are not sufficiently covered by high-level registries, such as the GEOSS registry, which operate more on a dataset-level, not at a (in-situ) sensor level.
Acceptance Criteria:	A user can find suitable sensors, which provide their data through web services, although both web service and sensor are previously unknown to the user.
Cluster:	Quality-aware Search, Quality and Uncertainty

Description

Sensors, whether remote or in-situ, provide observations for a specific part of space and time. Sensor descriptions must provide searchable quality parameters so that sensor catalogues can provide users with suitable sensors for quality-enabled search terms.

6.1.33 [GEOVIQUA-155] [Spatially display the distribution of the uncertainty of the data values](#) Created: 30/Jun/11 Updated: 31/Jul/12

Status:	Accepted
Project:	GeoViQua

Type:	Functional Requirement		
Reporter:	Alaitz Zabala	Assignee:	Daniel Nüst
Resolution:	Unresolved	Votes:	1
Labels:	technical_req		

Issue Links:	Dependency		
	depends on	GEOVIQUA-72	Users want to visualize data Accepted uncertai...
	Relates		
	relates to	GEOVIQUA-126	Develop context-driven smart Accepted visualis...
Impact:	Many users		
Requirement:	The user must be able to view both, data and uncertainty values for each location.		
Rationale:	To know the data quality at different areas of interest is important for decision-makers.		
Cluster:	Visualisation		

Description

The map browser must be able to combine the data and the associated spatial distribution of the uncertainty. Unfortunately many times just a global uncertainty value for the whole map is given. However, sometimes this is not accurate enough since the uncertainty could vary in function of geographical patterns and have a spatial structure.

6.1.34 [GEOVIQUA-158] The quality model and the system shall support recording, editing, reviewing and subsequent querying of who has used the dataset Created: 06/Sep/11 Updated: 19/Aug/12

Status:	Accepted
Project:	GeoViQua

Type:	Functional Requirement		
Reporter:	Joan Maso	Assignee:	Daniel Nüst
Resolution:	Unresolved	Votes:	0
Labels:	fast-track, interview, quality_model, technical_req		

Issue Links:	Conflict	
	conflicts with	GEOVIQUA-93 The system should support the Accepted recordi...
	Derivation	
	is derived from	GEOVIQUA-103 Users of climate data should Reviewed be suppo...
	is derived from	GEOVIQUA-35 The data model shall support Rejected recordin...
	has been derived into	GEOVIQUA-111 The system should support Accepted visual side...
	Relates	
	relates to	GEOVIQUA-92 The system should record the Accepted contact ...
	relates to	GEOVIQUA-99 The system should support the Abandoned rating ...
	relates to	GEOVIQUA-105 The quality model and the Accepted system shal...
Impact :	relates to	GEOVIQUA-163 Consumer metadata Accepted (feedback) shall in...
	relates to	GEOVIQUA-108 The system should support Abandoned recording, ...
Requirement:	The system should support recording, editing, reviewing and subsequent querying of who has used the dataset	
Rationale:	See description. This requirement has been derived from a user interview (see http://twiki.geoviqua.org/twiki/bin/view/GeoViQuaIntranet/WP2_Initial_User_Interviews_Results?sortcol=table;up=#Interview_with_Jon_Skoien_INTAMA).	

Acceptance Criteria:	The system provides the facility for a dataset provenance to be recorded, edited, reviewed, and queried.
Cluster:	Provenance and Purpose, Quality and Uncertainty

Description

For a dataset's value and quality to be fully assessed, it is important to record who has used the dataset.

Extracted from: As a scientist or a generic user, I want to know what communities or projects are using or have used this dataset; I also want to know the associated information about the communities, so that it can help me to make a judgement about how much I can trust the dataset.

6.1.35 [GEOVIQUA-161] A download data service shall provide data with associated uncertainty with each pixel in a standardized way

Created: 20/Sep/11 Updated: 31/Jul/12

Status:	Accepted
Project:	GeoViQua

Type:	Functional Requirement		
Reporter:	Joan Maso	Assignee:	Kevin Yang
Resolution:	Unresolved	Votes:	0
Labels:	technical_req		

Attachments:	 Figure 1 —WCS specification hierarchy graphical overview.png		
Issue Links:	Reference		
	references GEOVIQUA-130	Quality search and Accepted visualisation to f...	
	Relates		
	relates to GEOVIQUA-72	Users want to visualize data Accepted uncertai...	
	relates to GEOVIQUA-139	Elaborate best practices for Accepted using vi...	
Impact:	Few users		
Related Initiatives:	OGC		
Requirement:	A download data service shall provide data with associated quality/uncertainty with each pixel in a standardized way. Users want to benefit from the capacity that WCS represent in requesting and downloading the data with a trust quality associated.		
Rationale:	In the new "WCS 2.0 Overview: Core and Extensions" document it is described a uncertainty section, but it is not completely developed yet. The quality and lineage metadata elements are not included in the WCS Capabilities document.		
Cluster:	Standards and Communication		
Component:	Quality Search		

Description

the new "WCS 2.0 Overview: Core and Extensions" document describes the Uncertainty as: "Coverage range values can be annotated with a degree of uncertainty. This extension is under discussion, however, it is felt that an OGC-wide overarching concept should be resolved first rather, than establishing an ad-hoc solution."

Currently the WCS standard represents a potential opportunity for the users to access the data

with the quality information associated by pixel.

6.1.36 [GEOVIQUA-162] The quality model and the system shall support recording, editing, and querying/searching some important metadata elements (complete list in the description) Created: 23/Sep/11 Updated: 19/Aug/12

Status:	Accepted
Project:	GeoViQua

Type:	Functional Requirement		
Reporter:	Joan Maso	Assignee:	Joan Maso
Resolution:	Unresolved	Votes:	0
Labels:	Metadata, md_element, quality_model, technical_req		

Attachments:	 ListMDElements.xls		
Issue Links:	Dependency		
	is a dependency of	GEOVIQUA-149	Easy access to Quartet- Insufficient Data
	Duplicate		
	duplicates	GEOVIQUA-58	Users want to know Rejected some key 'profile'...
	duplicates	GEOVIQUA-81	Archivers of datasets Rejected should be suppo...
	duplicates	GEOVIQUA-82	System should support Rejected the recording a...
	duplicates	GEOVIQUA-83	The system should Rejected support the recordi...
	duplicates	GEOVIQUA-84	The system should Rejected support the recordi...
	duplicates	GEOVIQUA-90	System should make Rejected dataset licensing ...
	duplicates	GEOVIQUA-94	Users of land set Rejected datasets should be ...
	duplicates	GEOVIQUA-95	System should support Rejected the recording a...
	duplicates	GEOVIQUA-97	System should make Rejected dataset licensing ...
	duplicates	GEOVIQUA-98	The system should Rejected support the recordi...
	duplicates	GEOVIQUA-101	The system should Rejected support the recordi...
duplicates	GEOVIQUA-115	The system should Rejected support the recordi...	

	duplicates	GEOVIQUA-2	Metadata shall include Abandoned process histor...
	duplicates	GEOVIQUA-57	Users want to know any Abandoned standard(s) a...
	Relates		
	relates to	GEOVIQUA-122	Remote Sensing from Draft Satellite, the co...
	relates to	GEOVIQUA-85	Metadata parameters Accepted shall be standard...
	relates to	GEOVIQUA-117	Dataset metadata shall Accepted conform to int...
	relates to	GEOVIQUA-166	The data quality model Accepted and its encodi...
	relates to	GEOVIQUA-16	Earth Observation data Rejected provider wants...
Impact:	Many users		
Related Initiatives:	GEOLabel, QA4EO, SCR, UncertML, data_citation		
Requirement:	The system should support the recording, editing, and querying/searching of relevant Metadata Elements.		
Rationale:	A well documented metadata record is an important part of the data quality. In order to process data for developing scientific studies, to be well informed about the data specifications, including quality indicators of the data, is of paramount importance.		
Acceptance Criteria:	Users have to be able to access to the well filled metadata records.		
Cluster:	Provenance and Purpose, Standards and Communication, Quality and Uncertainty		
Component:	Quality Search - Web user interface (metadata comparison)		

Description

This requirement was created as the union the different MD elements cited in other JIRA requirements. The previous requirements had been rejected

Users want to be able of recording, editing, and querying/searching of relevant Metadata elements.

Related important ideas are:

- Provide information across a standardised set of metadata attributes.
- To be able to find and use data that may be anywhere in the world. If those data sources were described in a standardised manner, it would be possible to automate their processing, making possible to do more with them.

- To compare dataset metadata across a range of datasets in order to make an informed dataset selection.
- Elements comparable to playing a specific version of quartet where one compares the properties of items on the card and the better value wins.

List of MD elements in other requirements:**Citation (what it is about and who created it or owns it)**

DataSet identification (ID)

Title

Subject

Date Stamp (edition)

Author/Responsible Party

Associated Party or Parties (co-authors, etc.)

Data Set Owner(s)

Contact

Topic Category

Keywords

Abstract

Language

Standard(s) are imposed on the archival of dataset

Usage, Restrictions, Caveats

Licensing

Use limitations (also access control and rules)

Official version (if multiple versions exist)

Legal validity

Cost of a dataset

Distribution conditions

Online Distribution Info

Technical Data Set Parameters

Format

Format Version

Character Set

Physical Structure Description

Attribute(s) Info

Spatial resolution (scale)

Temporal resolution

Radiometric resolution

Data Representation

Projections, complete projection information

Spatial Reference System

Data Tables, Images, and Other

Pre-processing steps

Methods - what sampling or methodologies applied

Processing levels

Absolute accuracy

Geometric accuracy (Horizontal and Vertical accuracy)

Radiometric accuracy
Cloud cover
Quality mask of the digital elevation model
Quality of information at specific points
Whether the data set has been validated
Quality indicators
Units
Calibration parameters (bias gain per band, sun elevation, etc)
Platforms and sensors

Coverage (main dimensions of the data)

Spatial Coverage/Bounding Coordinates
Creation Date
Publication Date
Revision Date
Taxonomic Coverage

Meta-Metadata

Online Resource
Custodian's Reference
Metadata Standard
Metadata Creation Date
Custodian

This is the list of interviews (and other sources) that were used to generate this list:

: INSPIRE directive
: Extracted from user interview.
: Extracted from user interviews we carried out.
: These minimum meta-data implementation standards were indicated during an interview with SAEON system architect (see http://twiki.geoviqua.org/twiki/bin/view/GeoViQuaIntranet/WP2_Initial_User_Interviews_Results?sortcol=table;up=#Interview_with_Wim_Hugo_SAEON_31) and refer to a set of guidelines SAEON have established in this regard (see http://data.saeon.ac.za/documentation/it-governance/policies-and-guidelines/G320..1.3.1.3%20Guidelines%20on%20Meta-Data%20Management%20in%20SAEON.docx/at_download/file)
: Form the ISO standard, these were identified as part of a user interview (see http://twiki.geoviqua.org/twiki/bin/view/GeoViQuaIntranet/WP2_Initial_User_Interviews_Results?sortcol=table;up=#Interview_with_Wim_Hugo_SAEON_31).
: Form the Dublin Core standard, These were identified as part of a user interview (see http://twiki.geoviqua.org/twiki/bin/view/GeoViQuaIntranet/WP2_Initial_User_Interviews_Results?sortcol=table;up=#Interview_with_Wim_Hugo_SAEON_31).
: These were identified as part of a user interview (see http://twiki.geoviqua.org/twiki/bin/view/GeoViQuaIntranet/WP2_Initial_User_Interviews_Results?sortcol=table;up=#Interview_with_Wim_Hugo_SAEON_31).
: These were identified as part of a user interview (http://twiki.geoviqua.org/twiki/bin/view/GeoViQuaIntranet/WP2_Initial_User_Interviews_Results?sortcol=table;up=#Interview_with_Michael_Kollmar_JJ).

: These were identified as part of a user interview (see http://twiki.geoviqua.org/twiki/bin/view/GeoViQuaIntranet/WP2_Initial_User_Interviews_Results?sortcol=table;up=#Interview_with_Michael_Kollmar_J).

: These were identified as part of a user interview (see http://twiki.geoviqua.org/twiki/bin/view/GeoViQuaIntranet/WP2_Initial_User_Interviews_Results?sortcol=table;up=#Interview_with_Michael_Kollmar_J).

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: These were identified as part of a user interview (see http://twiki.geoviqua.org/twiki/bin/view/GeoViQuaIntranet/WP2_Initial_User_Interviews_Results?sortcol=table;up=#Interview_with_Michael_Kollmar_J).

: These were identified as part of a user interview (see http://twiki.geoviqua.org/twiki/bin/view/GeoViQuaIntranet/WP2_Initial_User_Interviews_Results?sortcol=table;up=#Interview_with_Sarah_Knight_DEFR).

6.1.37 [GEOVIQUA-163] Consumer metadata (feedback) shall include a list of metadata records Created: 04/Nov/11 Updated: 28/Jun/12

Status:	Accepted
Project:	GeoViQua

Type:	Functional Requirement		
Reporter:	Daniel Nüst	Assignee:	Thum, Simon
Resolution:	Unresolved	Votes:	0
Labels:	epic, technical_req		

Issue Links:	Derivation	
	is derived from GEOVIQUA-39	Users want to know any Reviewed inter-comparis...
	is derived from GEOVIQUA-150	Data model shall include Reviewed information ...
	is derived from GEOVIQUA-160	Users should be able to find Reviewed datasets...
	is derived from GEOVIQUA-33	Users want to know the Accepted citations of d...
	is derived from GEOVIQUA-34	Users want to know the Accepted problems ident...
	Relates	
	relates to GEOVIQUA-88	Expert reviews with value Accepted judgements ...
	relates to GEOVIQUA-116	Peer review of datasets to Accepted establish ...
	relates to GEOVIQUA-118	Rating of dataset Accepted
	relates to GEOVIQUA-136	The quality model shall Accepted support quali...
	relates to GEOVIQUA-158	The quality model and the Accepted system shal...
Impact:	Many users	
Related Initiatives:	GEOLabel, QA4EO, data_citation	
Requirement:	The system provides specific fields for important peer review aspects, namely comparable datasets, publications/citations, problems, and fitness of purpose.	
Rationale:	Specific contents for user created comments are more useful if they are sorted by type and automatically resolvable. Therefore a feedback system should provide these aspects as specific fields.	

Acceptance Criteria:	Users can link datasets online to other datasets and publications.
Cluster:	Feedback

Description

User generated feedback, or "peer review", at any level, may it be with our without registration, by specialists in a public or blind peer review process, can be aided by providing specific fields of information that users are particularly interested in, such as

- inter-comparison, i.e. comparable datasets and respective studies/publications
- citations, i.e. publications based on/using a dataset
- fitness of purpose for a particular analysis (possibly as a free text)
- problems of a dataset

These fields must be resolvable links or unique identifiers where possible, for example in the case of other datasets or publications (e.g. with DOI). This also allows reverse linking from the referenced dataset.

6.1.38 [GEOVIQUA-164] [Query language should support conjunct filters for \(dis\)similarity and \(in\)equality](#) Created: 11/Nov/11 Updated: 28/Jun/12

Status:	Accepted
Project:	GeoViQua

Type:	Functional Requirement		
Reporter:	Lorenzo Bigagli	Assignee:	Lorenzo Bigagli
Resolution:	Unresolved	Votes:	0
Labels:	technical_req		

Issue Links:	Derivation		
	is derived from	GEOVIQUA-160	Users should be able to find Reviewed datasets...
Impact:	Many users		
Cluster:	Quality-aware Search		
Component:	Quality Search - Client request protocol for search		

Description

The query language should be able to express conjunct filtering criteria for similar/identical as well as dissimilar/unequal properties.

For example, a user might query for data from a certain area, but with origin or provenance different from a certain one.

6.1.39 [GEOVIQUA-165] The quality model shall define a hierarchical multilevel approach to metadata, quality indicators and traceability information Created: 20/Nov/11 Updated: 31/Jul/12

Status:	Accepted
Project:	GeoViQua

Type:	Functional Requirement		
Reporter:	Joan Maso	Assignee:	Alaitz Zabala
Resolution:	Unresolved	Votes:	0
Labels:	quality_model, technical_req		

Issue Links:	Dependency	
	depends on GEOVIQUA-96	The quality model shall Rejected support point...
	Relates	
	relates to GEOVIQUA-166	The data quality model and its Accepted encodi...
Impact:	Few users	
Pilot Cases:	RS_PC	
Requirement:	The quality model shall define a hierarchical multilevel approach to metadata, quality indicators and traceability information	
Cluster:	Quality and Uncertainty	
Component:	Quality extraction and Elicitation	

Description

In the last GEOPlenary there was a slide that worried me. They said that in 2010 there were only about 150 datasets in GEOSS, in July 2011 there was 90000 (as the clearinghouse harvest other catalogues) and now with the EuroGEOSS broker in place, they have access to 22000000 metadata records. A part for the surprising of these numbers, it reflects that document the quality of these datasets one by one is no feasible. A solution is to improve the model that we are proposing by adding the concept of quality "levels": product, sensor, series, dataset and pixel/feature. We need a metadata inheritance model to store all this information and document each aspect in its one right level. Some indications and statements can be applied to the product as a whole, to the sensor, to the series or to the dataset. The pixel/feature level could work a bit different but it has to be also taken into account.

The metadata returned by the discovery process can return metadata intergraded in a single document to simplify interaction to the users and software that do not support inheritance (many).

The multilevel metadata is discussed problem is discussed in the ISO19115 but the encoding

to XML 19139 is only based on datasets. In practice this can be achieved by inheritance rules or by links between metadata classes and elements.

The multilevel metadata was mentioned in the DoW and also on my first component model (that includes quality model is more a collection of ideas than a real model, but contains some details that are still not solved). I do not remember any mention to this problem in the quality model document 0.6 and OMHO we have to start thinking about it.

We (UAB+CREAF) developed a metadata inheritance model for topographic dataset series and have some experience on this field but there are many others trying to find a more general solution.

6.1.40 [GEOVIQUA-166] The data quality model and its encoding(s) needs a link mechanism to resources and parts of resources.

Created: 20/Nov/11

Updated: 28/Jun/12

Status:	Accepted
Project:	GeoViQua

Type:	Functional Requirement		
Reporter:	Joan Maso	Assignee:	Alaitz Zabala
Resolution:	Unresolved	Votes:	0
Labels:	encoding, quality_model, technical_req		

Issue Links:	Relates		
	relates to	GEOVIQUA-162	The quality model and the Accepted system shal...
	relates to	GEOVIQUA-165	The quality model shall define a Accepted hier...
Impact:	Few users		
Requirement:	The data quality model and its encoding(s) needs a link mechanism to resources and parts of resources.		
Rationale:	The idea is to support linking to metadata sections from the same document or other documents to reduce redundancy in the metadata documents. Also it will work with opendata and RDF, opensearch and the responses of opensearch (that are on RDF format). Many metadata elements suggested in the model are, in fact, links to publications, data sources etc.		
Cluster:	Standards and Communication		

Description

The requirement comes from an informal interview with TerraDue responsible.

6.1.41 [GEOVIQUA-167] The system shall support querying of dataset provenance

Created: 14/Dec/11 Updated: 28/Jun/12

Status:	Accepted
Project:	GeoViQua

Type:	Functional Requirement		
Reporter:	Lorenzo Bigagli	Assignee:	Lorenzo Bigagli
Resolution:	Unresolved	Votes:	0
Labels:	technical_req		

Issue Links:	Derivation is derived GEOVIQUA-105 The quality model and the Accepted system shal... from		
Impact:	Few users		
Acceptance Criteria:	The system allows searching by provenance criteria.		
Cluster:	Quality-aware Search		

Description

Probably not the main requirement for the average user, as provenance metadata should presumably be inspected after searching, for evaluation purposes. However, a few users may need this.

6.1.42 [GEOVIQUA-172] An application for a mobile device shall react to a display rotation Created: 05/Jan/12 Updated: 02/Aug/12

Status:	Draft
Project:	GeoViQua

Type:	Functional Requirement		
Reporter:	Daniel Nüst	Assignee:	Daniel Nüst
Resolution:	Unresolved	Votes:	0
Labels:	AR, mobile_devices, technical_req		

Impact:	Many users
Pilot Cases:	AirQuaPC
Requirement:	The mobile device has a sensor which provides information about the orientation of the device. An application can subscribe to be notified about changes of the orientation. The application detects whether a device is hold upright or in "landscape-mode" and adjusts the user interface accordingly.
Rationale:	The user interface of mobile devices is commonly adjusted to the way the device is held by the user.
Acceptance Criteria:	The application uses information about the device's orientation to adjust the user interface display.
Component:	Quality Visualization - Smart Phone Viewer Interface