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**Coordinating an Observation Network of Networks EnCompassing saTellite and IN-situ
to fill the Gaps in European Observations**

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1 Introduction

In addition to metadata provided by the original data provider describing resources, many users report that they come to trust data based on information about studies performed by their peers. An important element of that trust constitutes not only linking resources with relevant citations in the scholarly literature, but also a desire for less formal feedback mechanisms such as user comments. As user feedback is a key driver for providers to improve their data products, some data providers have also expressed their desire for user feedback.

The purpose of providing user feedback is to inform other users and resource providers about use cases and experiences using a given resource. The goal is to collect requirements for resources that providers can incorporate into objective quality measures for their products, allowing providers to meet the real needs of users and potentially to find new markets for their resources. Especially for a system like GEOSS, with a large user community that has much knowledge in different GEO areas it is beneficial to support the communication and spreading of knowledge via an easy and informal instrument. As part of the ConnectinGEO project, previous initiatives involving (expert) user feedback mechanisms are extended and tested for different cases.

This document describes the existing user feedback systems available within the GEO community. It is investigated where a user feedback system will be of added value to the user community, and how it should be integrated into the GCI. For these examples, the GEOSS user feedback system developed for GeoViQua is used for testing because this system is a foreground element of the GeoViQua project that has been transferred as background to the ConnectinGEO project. The system is suitable for the purpose and some members of the ConnectinGEO consortium have comprehensive experience with this system.

This document focuses on the improvements, readiness and possible usage of user feedback. The results and user experience of the resulting software is part of other tasks within the project.

2 Existing user feedback systems

2.1 GeoViQua GEO user feedback system

The GeoViQua project aimed to improve the ways in which geospatial experts can communicate user feedback about geospatial data registered in the GEOSS portal as part of a broader strategy for visualizing and improving data quality in GEOSS. In a federated environment, such as GEOSS, implementing feedback is challenging because existing approaches do not apply to federated resources. During the GeoViQua project, a geospatial user feedback model was developed addressing these deficiencies and a GEO user feedback system was developed to allow testing of the model. The system is composed by the following components:

- A user feedback server
- A feedback submission client
- A feedback search client

All these elements can be substituted for alternative elements, because the three components share a clear and open API and the clients have been developed as stand-alone HTML/JavaScript applications communicating with the server only via HTTP methods. In addition, the components are able to exchange data because the feedback is expressed in a common data model. Because of this the submission and search client can be simply redeveloped to address the needs of a user for specific websites.

The system was initially developed to support feedback about geospatial data and metadata (called “resources” in the data model). The feedback is loosely connected to the “resources” through a unique identifier. This way the use of the system can be extended to any kind of digital resource that can be uniquely identified. ConnectinGEO has taken advantage of this characteristic to allow applications that were not initially foreseen in GeoViQua.

2.1.1 Geospatial user feedback model

The GUF model makes an effort to remain as simple as possible but comprehensive enough, in order to allow for simple user interfaces that can cover different levels of expertise on geospatial data usage. The following are examples of what the GUF model allows: commenting, asking questions, providing answers, rating data, citing publications, providing a quality measure, documenting additional lineage information or emphasizing a significant event that conditions the interpretation of a resource. Each one of the previous examples is considered an “item” of feedback. Feedback items can be arranged in collections and a summary description of the collection is also modelled.

The following two UML class diagrams describe the geospatial user feedback item and the way it is related to the user description and to the target resources.

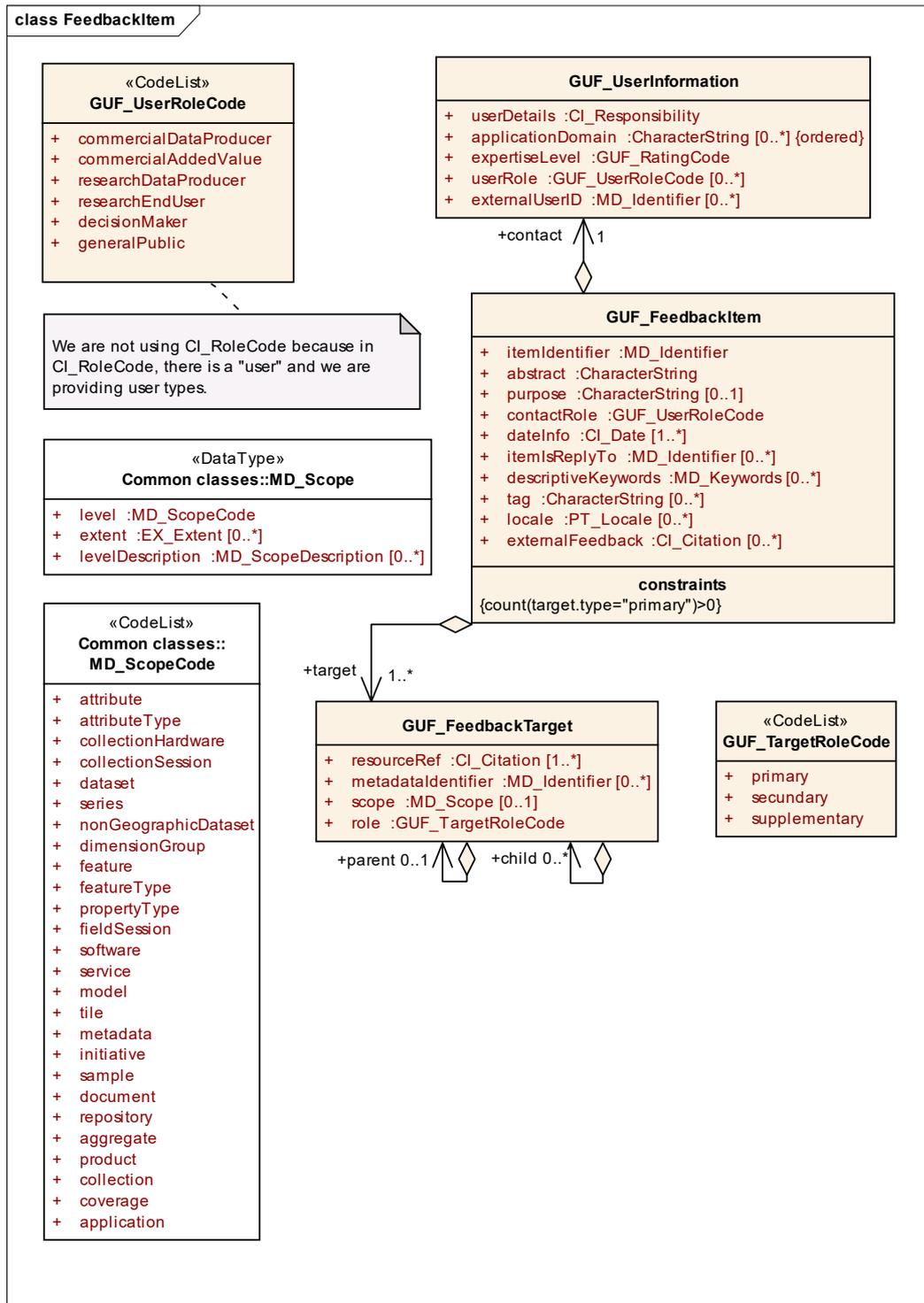


Figure 1: UML class model of the User Feedback item where the relation with the target resource and the user are shown.

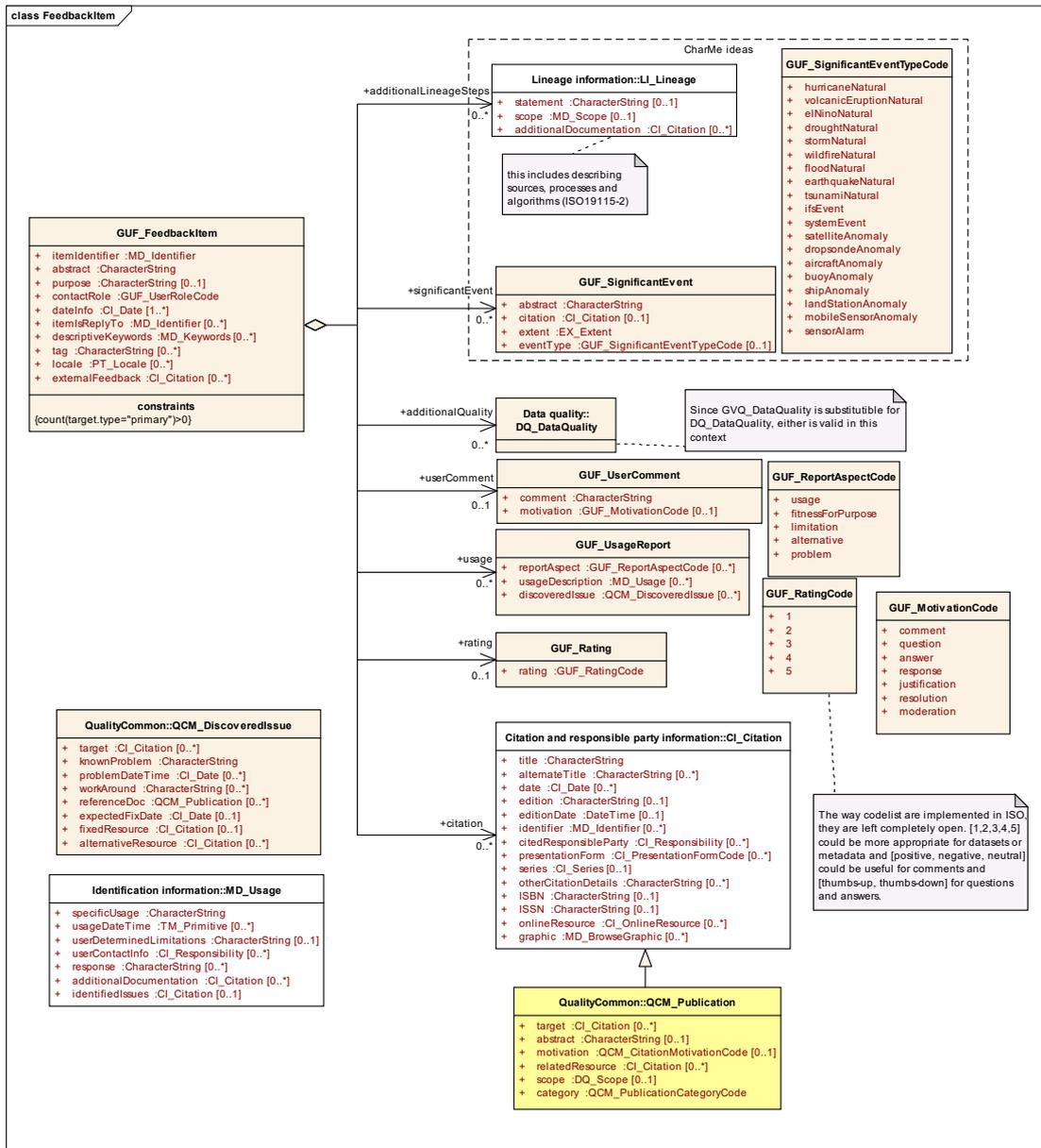


Figure 2: UML class model of the User Feedback item where the different possibilities for a feedback (including ratings, comments, citations, etc.) are shown.

In addition, the model provides a mechanism for grouping feedback items into feedback responses and feedback collections with summary statistics. A feedback collection is a collection of feedback items that share a common target and share the same rating code list. The attributes of each class and their relations are represented in the following UML class diagram.

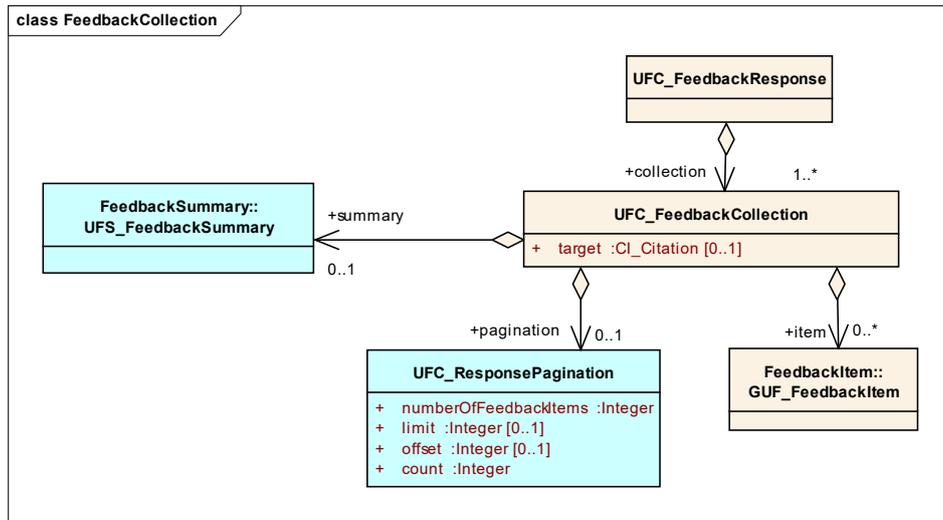


Figure 3: UML class model of the User Feedback collection is shown.

The same data model allows for encoding summary statistics of feedback items that share the same target. The attributes of each class and their relations are represented in the following UML class diagram.

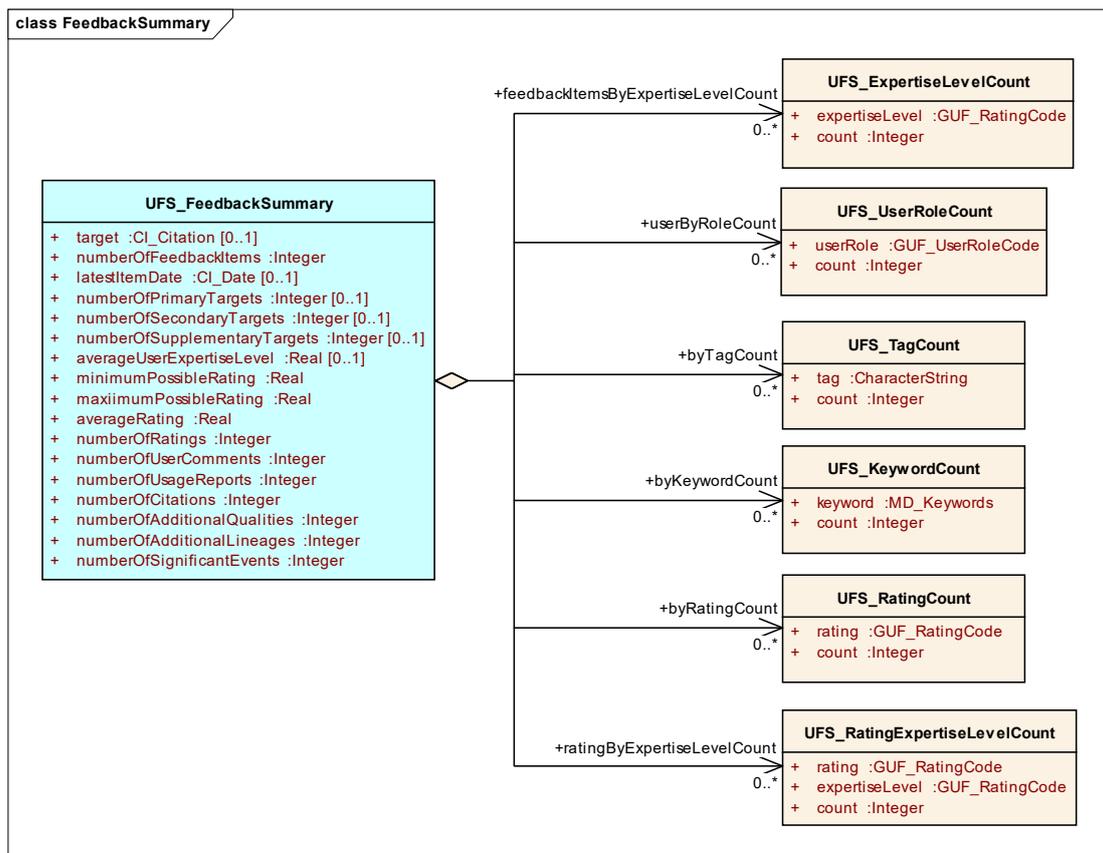


Figure 4: UML class model of the User Feedback summary is shown.

2.1.1.1 GUF data model evolution after the GeoViQua project

The work of the FP7 project GeoViQua on quality models for Producer and User feedback together with the work of the CHARMe FP7 project has led to the development of two new OGC standards for geospatial user feedback¹. The first one is a conceptual model and the second one is an XML encoding of the abstract model. This modularity allow for defining other encodings in the future. Both documents were approved by the OGC TC voting membership on the 9th of May 2016 and are available as open standards on the OGC website.

The aim is now to update the GEO feedback server by implementing the modifications introduced in the OGC process for these new standards. It is expected that this will be of added value to GEOSS because the system will be compliant with accepted and open standards. In essence, the original GeoViQua model and the OGC standard share the same fundamentals but differ in some details. Updating the implementation presented here will require extensive updates. This means that the database must be replaced with the new model and the data already in the database needs to be migrated. It is uncertain if this migration can be assumed in the period and resources of the ConnectinGEO project. In the opinion of the consortium, it is possible to continue using the GeoViQua model for the current applications and extrapolate the conclusions for an OGC compliant new implementation.

2.1.2 Geospatial user feedback system API

The first thing needed to setup a user feedback system is to deploy a server that without any content. After that, the user feedback system needs to be populated by adding feedback records. After, that there are three types of search actions possible, namely:

- Search for feedback items
- Search for a collection and summary of feedback items related to one target resource
- Search for target resources with certain feedback items about them

These search and post actions are explained further in the following subclauses.

2.1.2.1 Populate the system

An important aspect of providing a useful feedback system is a *good* user interface to populate the system. The geospatial feedback model (described before) supports creation of feedback in a flexible way. As a minimum, the 'target' needs to be defined as well as a feedback subject, which is a summary of the feedback in one line. The target consists of a unique id, a namespace

¹ <http://www.opengeospatial.org/standards/requests>

that represents usually the URI where the target is located and a 'nature_of_target' element, which describes what is commented. This nature of target can be e.g. a dataset, a metadata document, software, etc.

Because almost all other fields are optional, clients can be developed and adapted per use case. For an online shop, such as amazon.com, a user that has bought a book would provide, a rating of the book, a short story describing why he gave the rating and a summary. This would lead to posting the following user feedback information:

Name: "A. Reader"
 Subject: "lots of suspension"
 Rating: "4"
 UserComment: "I have read this book in one go, because it was so exciting. The theme is not very original, but if you want something nice for your holiday, buy this book!"

Other information such as the target (id: <book_id>, namespace: www.amazon.com, nature_of_target: book) and parts of the user information should be filled in automatically by the client and communicated to the server. Within the GeoViQua project an example client implementation is developed that is still available next to the server.

For a catalogue containing geospatial data, different types of information would be posted.

Name: Prof. XX
 Subject: El Niño 2015-2016
 UserComment: "In this dataset, El Niño 2015-2016 information affecting the Asian coasts is clearly visible... "
 Domain: Oceanography
 Tags: El Niño, salinity
 Online reference: XX P., YY Z.N, Journal of Oceanography...dd-mm-yyyy

The bounding box and time interval can be provided to allow a second user of the data to find the subset used in the publication.

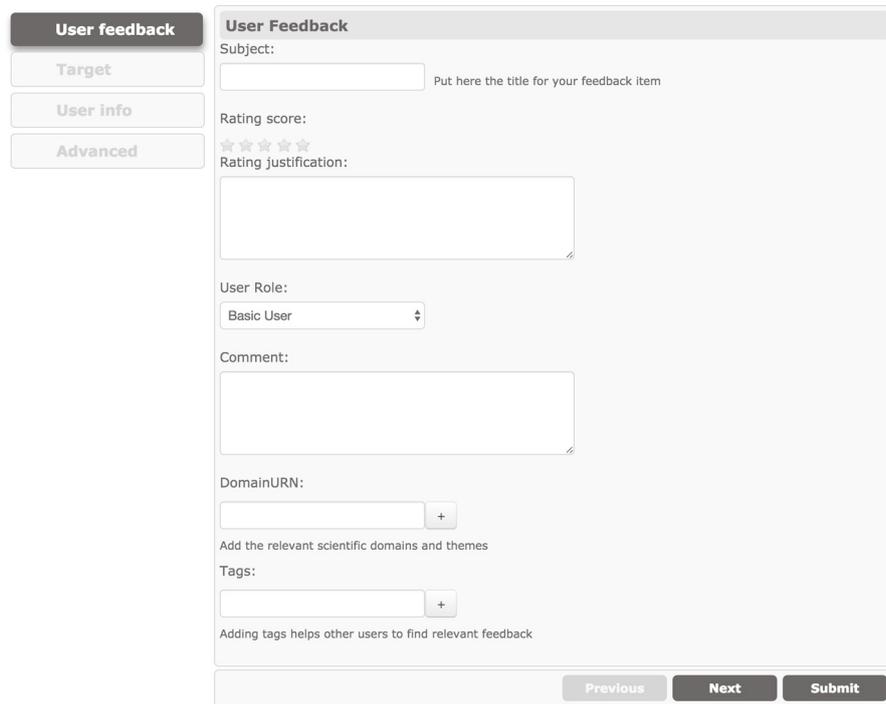


Figure 5: User Feedback submission page

To create the actual feedback item the information needs to be encoded according to the XML schemas or to a JSON format and posted to the feedback server using a HTTP POST request to:

```
[server_name]/api/v1/feedback/items/
```

2.1.2.2 Search for user feedback on a target

Often users are looking for a certain target and wishes to read reviews provided by other users. To this end, once the target is known, one can look for all feedback related to that target. This type of searching is called searching for a collection. In addition, summary information is provided (e.g. average rating).

The basic URI can be constructed in the following way:

```
[server_name]/api/v1/feedback/collections/search?target_code=x&target_codespace=y
```

This request returns the list of items related to one resource and a feedback summary, containing aggregated information of the resource. The two parameters `target_code` and `target_codespace` are required.

Table 1: Query parameters for searching user feedback related to a target

Query parameters	Values	Usage description
target_code	<target_code>	The unique ID of the dataset
target_codespace	<target_codespace>	Used to define the source of the found dataset
format	xml,json, html	The format of the response

2.1.2.3 Search for user feedback items

Sometimes it will be useful to look for the feedback itself. A GEOSS related example of this is to find user feedback where references have been made to papers and with a rating of 4 and higher. Based on the reviews resources can be found that are used for publications and are considered of good quality.

To search for items the URI must be constructed in the following way:

```
[server_name]/api/v1/feedback/items/search?
```

This will return all relevant feedback items (paginated).

After the question mark, search parameters and formatting parameters can be added to control the result.

Table 2: Query parameters when searching for feedback items

Query parameters	Values	Usage description
target_code	<target_code>	The unique ID of the dataset
target_codespace	<target_codespace>	Used to define the source of the found dataset
rating	1,2,3,4,5	Used to identify feedback with a certain rating, or range of rating.
report_aspect	usage, alternatives, fitnessforpurpose, problem	Look for a usage report of the specified type
feedback_domain	usage, alternatives, fitnessforpurpose, problem	Look for feedback in a certain domain.
user_domain	<search string>	Look for feedback provided by a user who is working in a certain domain.
user_role	CommercialDataProducer , ResearchEndUser , NonResearchEndUser , ScientificDataProducer	Search feedback items given by a user with a certain role.
expertise_level	1,2,3,4,5	The expertise level a user has given himself when providing feedback
fields	comment, rating, citation, quality_override, domain_urn, reply_to, external_feedback, tags, usage	Search for feedback of a certain type
q	<search string>	Looks for the specified text in the different items. Only relevant text fields are searched.

The different parameters can be combined in a URL via '&' (e.g. rating=3&q=good) If a user wants to specify multiple parameters of the same type, this can be achieved by adding a comma-separated list of values, up to

five values. When searching an 'OR' type filter expression is executed. An exception is the 'q' parameter. This one is separated by '+' sign and will be executed as an 'AND' type filter expression.

The following output control parameters can be added:

Table 3: Query parameters to control the output of the search query

Control parameters	Values	Usage description
offset	<number>	Defines the offset for pagination
limit	<number> (default=20)	The maximum amount of results that will be returned
format	xml,json, html	The format of the response
view	full, summary, brief (default = brief)	The size of the response

2.1.2.4 Search for targets that have been commented

The last search option provides the target identifiers directly when searching for targets with a specified average rating or minimum amount of comments. This way, popular targets can be identified.

```
[server_name]/api/v1/feedback/primary_target_ids/search?
```

This request returns the list of identifiers used as primary targets for feedback items. The set of key value parameters is almost the same as for the search for items. The specification of the target_code and target_codespace is not relevant and therefore not supported. Extra parameters especially designed for this URL are:

Table 4: Query parameters when searching for reviewed targets

Query parameters	Values	Usage description
minimum_average_rating	double	For the datasets found the average rating is calculated. Only datasets with an average rating, larger than the specified value are returned
minimum_total_count	integer	For the datasets found the amount of comments is calculated. Only datasets with the minimum amount of items as specified are returned.
format	xml, json, html	The format of the response

2.1.3 Server evolution after the GeoViQua project

The server that has been deployed for the GeoViQua project is still available and fully functional. As part of the ConnectinGEO project the following updates were developed:

The frameworks used in the GEO feedback system have been further developed in the last two years. It is useful to upgrade the feedback system, to support future development. The upgrading is partially done and will be an ongoing process during the ConnectinGEO project. When a new system is deployed this could lead to an updated URL or replacement of the original GeoViQua user feedback server. As a user, you will not notice the changes. In addition, no problems are expected for integration since the change of an URL is sufficient if even necessary. The new version will also be available as open source project on GitHub.

2.2 GEOSS Science and Technology Service Suite Feedback System

The GEOSS Science and Technology Service Suite (GSTSS) Feedback Systems (GST-FBS) is product oriented. For each product included, there is a set of standard questions and feedback option and a list of product specific questions. The GST-FBS is currently in the process of being integrated into the Socio-Economic and Environmental Information Needs Knowledge Base (SEEIN KB).

The present version of the GST-FBS covers products that are either data sets or web services, but any other product could be covered. After integration into the SEEIN KB, the FBS will cover a much wider range of product groups.

The current list of standard questions and feedback elements for web services includes several parts:

- Your use of the SERVICE NAME: In this part, a list of up to 12 specific options concerning the user's interest and use of the web service are made available to choose. An example of the first part is taken from the feedback page for the GEO web page, see Figure 2-6
- Usability, applicability, and relevance of the SERVICE NAME: Up to 12 service-specific questions provide the user with the opportunity for a rating on the scale from 1 to 5. Depending on the rating attribute, the rating translates into the meanings explained in **Error! No s'ha trobat l'origen de la referència..** An example for this part is shown in Figure 7.
- Web design and general functionality of the SERVICE NAME: In this part, a set of seven standard questions provide the opportunity to rate the performance, design, functionality, and quality of the pages. See Figure 8: The standard rating options concerning design and functionality available on all feedback pages for web services. For an example.
- A final part provides space for a free format review separated in a "like" and "did not like" part. See Figure 9.

Your Use of the GEO Web Page:

What did you use the GEO Web Page for? ?

- Get a general overview of GEO
- Access to GEO Document
- Read the GEO Newsletter
- Access the Work Plan tools
- Access the Meeting Calendar
- Access the Meeting Outputs
- Learn about Communities of Practice
- Never visited the GEO Home Page
- Other:

Are you planning to visit the GEO Home Page again? No Yes ?

Figure 6: Feedback part on the use of the web service. The example is for the GEO web page at <http://www.earthobservations.org>. The buttons with question marks provide help information.

Table 5: All ratings are on a scale from 1 to 5, with 1 being the lowest score and 5 the highest score

Score	Quality	Degree of Difficulty	Value	Importance	Support
1	Poor	Difficult	No value	No importance	Unhelpful
2	Somewhat poor	Somewhat difficult	Low value	Low importance	Somewhat unhelpful
3	Average	Average	Average	Neutral	Neutral
4	Good	Relatively easy	Above average	Important	Moderately helpful
5	Excellent	Easy	High value	Very important	Very helpful

Usability, contents, and relevance of the GEO Home Page:

Value of the GEO Web Page as an information source for you: 1 2 3 4 5 ?

Completeness, quality, and timeliness of information on GEO and its components: 1 2 3 4 5 ?

Completeness, quality and timeliness of information on Communities of Practice: 1 2 3 4 5 ?

Comprehensiveness of the GEO document library: 1 2 3 4 5 ?

Access to documentation of future and past meetings: 1 2 3 4 5 ?

Relevance, quality of contents, and timeliness of the GEO Newsletter: 1 2 3 4 5 ?

Importance of the GEO Web Page for the promotion of GEOSS: 1 2 3 4 5 ?

Importance of the GEO Web Page for user engagement: 1 2 3 4 5 ?

Usability of the Work Plan reporting tools:Your review of the GEO Web Page: 1 2 3 4 5 ?

Figure 7: Usability, contents, and relevance part of the feedback page for the GEO web page.

Web design and general functionality of the GEO Web Page web page:

Access to the GEO web page: 1 2 3 4 5 ?

Speed of page loading and refreshing: 1 2 3 4 5 ?

Ease of navigation through the pages: 1 2 3 4 5 ?

Readability and clarity of information: 1 2 3 4 5 ?

Ease of finding desired information: 1 2 3 4 5 ?

Completeness of provided information: 1 2 3 4 5 ?

Are all links valid and active? No Yes

Figure 8: The standard rating options concerning design and functionality available on all feedback pages for web services.



Figure 9: Free-format review part of the feedback page, which is available on all feedback pages.

Providers can generate feedback pages for their products and users can also register products they are interested in. As far as possible, the questions in the first part and the ratings in the second part should be standardized.

The search facility includes a search for a list of specific products, and the option to visualize a summary of the ratings and responses for each product individually. Searches for keywords and strings in the free-format reviews can also be used to generate lists of products for further scrutiny.

Currently, the feedback facility is integrated into the SEE-IN KB and in this process, some changes may be necessary. The advantage of the integration is that all products for which feedback is possible are documented in more detail in the SEE-IN KB and the feedback pages can be linked to this documentation.

3 Integration with the ConnectinGEO observation inventory

3.1 Interface design

Access to the observation inventory is managed via the GEO Discovery and Access Broker (DAB). Because the DAB wants to support multiple feedback servers, a design is chosen where an extra layer is put in between the feedback client and feedback server. This way one client can be designed to support all types of feedback servers, and there only needs to be a translation of the user feedback element to (in the case of the GEO user feedback server) a JSON or XML structure that is posted to the server. An advantage of this design is that all the user feedback will be traced because the DAB provides the UUIDs of all targets (datasets, metadata, observation inventory) and of the user feedback itself. The architecture is sketched in Figure 10.

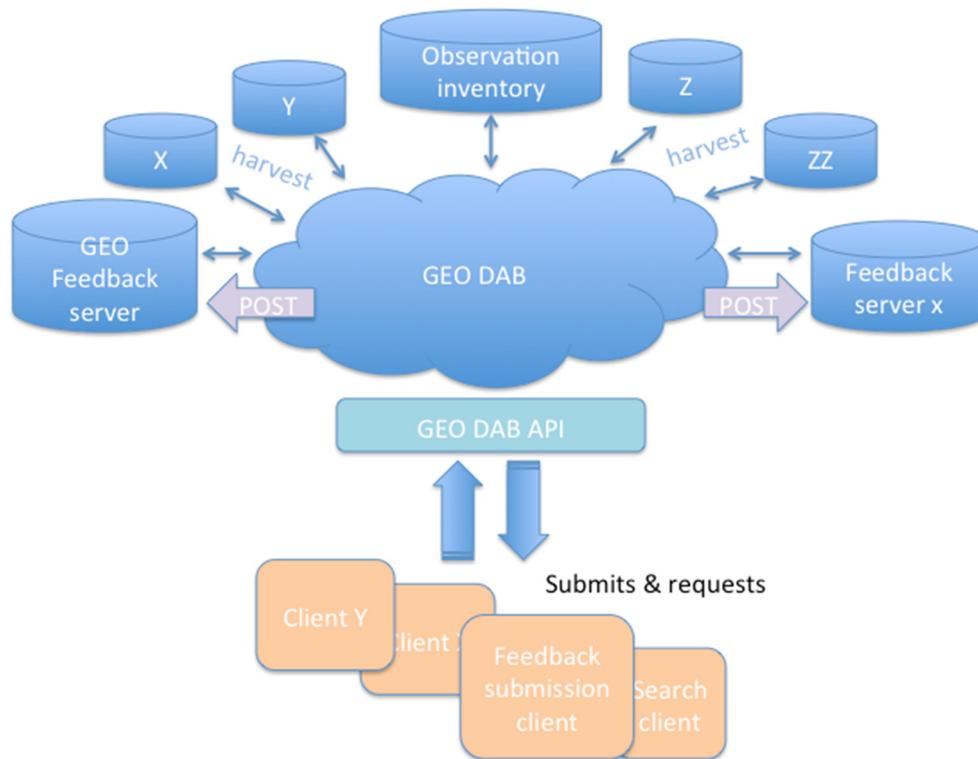


Figure 10: Architecture of GEO DAB connecting with clients, feedback server and the observation inventory.

The architecture shows how the GEO DAB is connecting to all the clouds/databases that can be harvested. This includes the connection with feedback servers. Furthermore, the GEO DAB can post information to the feedback servers via clients that are connected to the API layer of the GEO DAB.

3.2 Results

The integration and use of the GEO and other user feedback servers is an ongoing process. In the coming weeks the integration of the user feedback server with the observation inventory will be completed and tested as part of WP5 activities.

4 Integration with the gaps analysis table

One of the objectives within the ConnectinGEO project is to connect EO networks in Europe through ENEON and to provide the EC with a gap analysis among existing EO networks to monitor the Sustainable Development Goals using Essential Variables. The results of the gap analysis will lead to the identification of gaps that are being collected in a gaps analysis table. It is possible to add geospatial user feedback to the gaps. This way, it will be possible to provide geospatial information on a gap without the need to couple this to resources in the DAB. The information regarding the gap can be extended and it will be possible to search for gaps and common problems related to gaps. When the feedback is posted in the same database as the geospatial user feedback on datasets or if a query is done on both datasets at the same time, it will be possible to combine the results of gaps and datasets. This will provide more insight in where the gaps are and what could be done to mitigate them.

Gap ID	Gap type	Theme	EV	Gap description	Thread	Who	Traceability
001	1.1	Climate	ECV: Temperature (Atmosphere upper-air)	The scarce of microclimatic data (air temperature) from the beneath of trees.	2	Guillem	Pieter De Frenne and Kris Verheyen "Weather stations lack forest data"
002	2.3	Climate	ECV:Aerosols (aerosol mass, size distribution (or at least mass at 3 fraction sizes: 1, 2.5 and 10 micron), speciation and chemical composition, Aerosol Optical Depth (AOD) at multiple wavelengths, AAOD, water content, ratio of mass to AOD, vertical distribution of extinction).	Daily monitoring of inorganic compounds in precipitation	2	Guillem	EMET PROGRESS IN ACTIVITIES IN 2009-2019 AND FUTURE WORK. Level 1
003	2.3	Climate	ECV:Aerosols (aerosol mass, size distribution (or at least mass at 3 fraction sizes: 1, 2.5 and 10 micron), speciation and chemical composition, Aerosol Optical Depth (AOD) at multiple wavelengths, AAOD, water content, ratio of mass to AOD, vertical distribution of extinction).	Daily/weekly monitoring of heavy metals in precipitation	2	Guillem	EMET PROGRESS IN ACTIVITIES IN 2009-2019 AND FUTURE WORK. Level 1
004	2.3	Climate	ECV:Aerosols (aerosol mass, size distribution (or at least mass at 3 fraction sizes: 1, 2.5 and 10 micron), speciation and chemical composition).	Daily monitoring of Inorganic compuns in air	2	Guillem	EMET PROGRESS IN ACTIVITIES IN 2009-2019 AND FUTURE WORK. Level 1

Figure 11: Representation of the gap analysis results as a table. User feedback can be associated for each record of the gaps table.

4.1 Adding feedback on gaps

In this section, we will analyze how to facilitate the addition of geospatial user feedback on gaps. To this end, we take a closer look to the elements of a geospatial user feedback item and try to describe what elements would be useful in relation to gaps. Note that the table is not complete, but consists of the required and some important elements from the OGC standard for geospatial feedback that can be mapped to the GeoViQua quality model.

Table 6: User Feedback elements that can be used when reviewing gaps

Feedback element group	Feedback element	Description of how to use the element
Identification	datestamp	Timestamp of the feedback item
	unique identifier	UUID of the feedback item
Target	target identifier	ID of the gap and url of the table.
	target focus	Spatial extent of the gap
User feedback information	nature of the target/ scope	Gap or metadata
	abstract	Summary of the user feedback on the gap
	comment	More information related to the gap
	usage	E.g. relevance of the gap when doing research.
	citation	e.g. a link to where the gap is identified
User information	reply-to	Reply to another feedback item (on the same gap)
	general user information	Identification of the person providing user feedback
Context information	user role	Researcher, Data provider etc.
	descriptive keywords tags	e.g. SBA's, themes keyword-type additions to narrow down the context further

The gaps and the corresponding feedback items must be traceable. Therefore, every gap must have a unique ID. Currently the gaps have just a number. When integrating this gap table with e.g. the GeoPortal or the DAB this will be changed to a UUID (the DAB e.g. provides a UUID on harvesting). Since the gap analysis will only be integrated with the feedback server it is currently sufficient to derive an ID based on the gap number.

The current submission client for user feedback might be too flexible and too complex to reuse for feedback on gaps. A simpler user interface would consist of the elements as described above minus the elements that can be prefilled such as the user information, tags, identification of the feedback item and identification of the target. The way information regarding the gaps can be extracted from the gap analysis table is under debate. In Figure 12 a proposed alternative is provided for the submission of feedback on gaps. Currently the gap analysis table is coupled to the original feedback submission page (Figure 5).

Feedback submission on gap

User name: Maud van den Broek
Role: Research End User

Gap Information

Gap ID: xxxxyy005

Gap description: Daily/hourly monitoring of NO2 in air

Tags: gap, climate, ECV, aerosols, NO2

User Feedback

Summary:

Spatial resolution for daily monitoring

Put here the summarizing title for your feedback item

Comment:

It is not important to have global coverage daily monitoring of NO2. The daily monitoring will primarily be used for determining air quality in cities. The most important areas are indicated here.

Tags:

daily × health × pollution × air quality ×

Adding tags helps other users to find relevant feedback

+ Add spatial/temporal extent

+ Add Usage Report

+ Add Online Reference or Citation

Submit

Figure 12: Feedback submission client for feedback on gaps

4.2 Using user feedback on gaps

It is not only important to look at what additional information can be provided to extend the knowledge on gaps, but also to identify how this knowledge can be consumed and used. Therefore, there is a need for a mechanism to retrieve the user feedback that has been submitted. This subsection introduces examples, what a user would be looking for and how this is facilitated.

4.2.1 Q: “I’m looking for feedback on datasets related to NO2 information”

Since the user feedback on gaps is stored in the same database as the user feedback on datasets the feedback search client developed for GeoViQua can be used. If gaps are automatically annotated with the tag ‘gap’, it will be sufficient to add ‘gap’ and ‘NO2’ in the search window. As a result all feedback tagged this way will be returned. The example below is a mock-up result since no feedback on gaps is available yet.

Search for feedback

Enter search fields:

gap NO2

Specify a feedback domain:

Specify a user domain:

Specify a user role:

Specify the minimum rating:

rating comment

citation usage

Catalogue results

Results per page: Number of results: 5

- ▶ Feedback item: Test feedback
- ▶ Feedback item: Test Feedback
- ▶ Feedback item: Test feedback ustomType-Inversion_mode... num1
- ▶ Feedback item: Test Feedback
- ▶ Feedback item: Test feedback

Figure 13: Search client for finding feedback, an example on how to use it for gap reviews

4.2.2 “I’m looking for gaps related to NO2”

To support this, the DAB must harvest the gap analysis table. This is currently out of scope of the ConnectinGEO project and can be addressed as soon as the gap analysis table has matured. To this end it should be possible for the DAB to retrieve the information inside the table and provide an UUID to the gap. This way the gap can be treated as ‘dataset’ or ‘metadata information’. Once this is available, there is no difference anymore when searching for information between gaps and datasets as all search queries that can be performed for datasets can also be executed for gaps.

5 Integration with the ENEON network graph

To get a clear and understandable view on how all the networks in ENEON are connected, a network graph has been developed² (Figure 14). The model has been encoded in JSON-LD, which can be dynamically converted into RDF and connected to the linked data. The model is also validated using a JSON schema. This JSON-LD file is used by a web application developed in ConnectinGEO based in an open source code found in GitHub called d3-process-map that uses the d3.js graphical library. The code has been adapted by CREAM to our purposes.

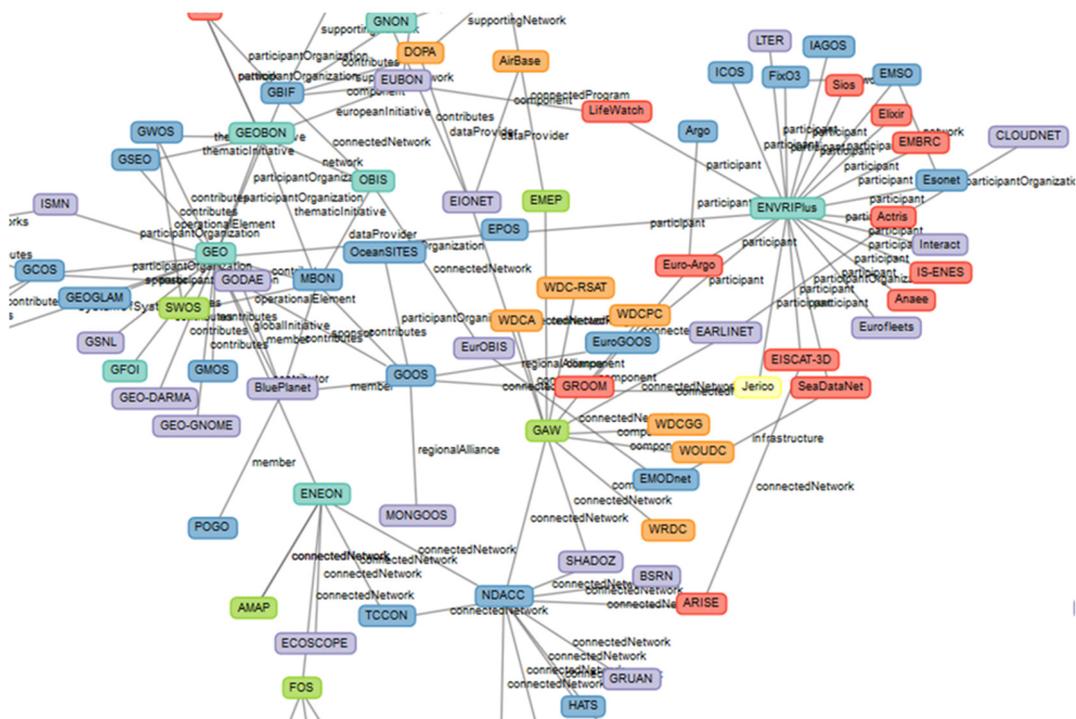


Figure 14. A portion of the European in-situ networks and their connectivity contained within <http://www.eneon.net/graph/index.htm>

The user feedback server is now been connected to this graph. This allows users to provide feedback on the networks themselves and on how the networks interact. For instance, a user provides comments on what links are missing and what links would be desirable.

5.1 Adding feedback on networks

Because of the lean API, it is fairly simple to connect the graph to the server. The only thing needed is to define the network as an identifiable object by giving it a unique ID. In this case, it is chosen to use the network name as ID. The

² ConnectinGEO deliverable 3.4 - Report on observations, measurements and gaps in observation systems reported by the communities.

codespace used is the ENEON graph website. To provide feedback the user must click on the “Add user feedback” link for a selected network, see Figure 15.

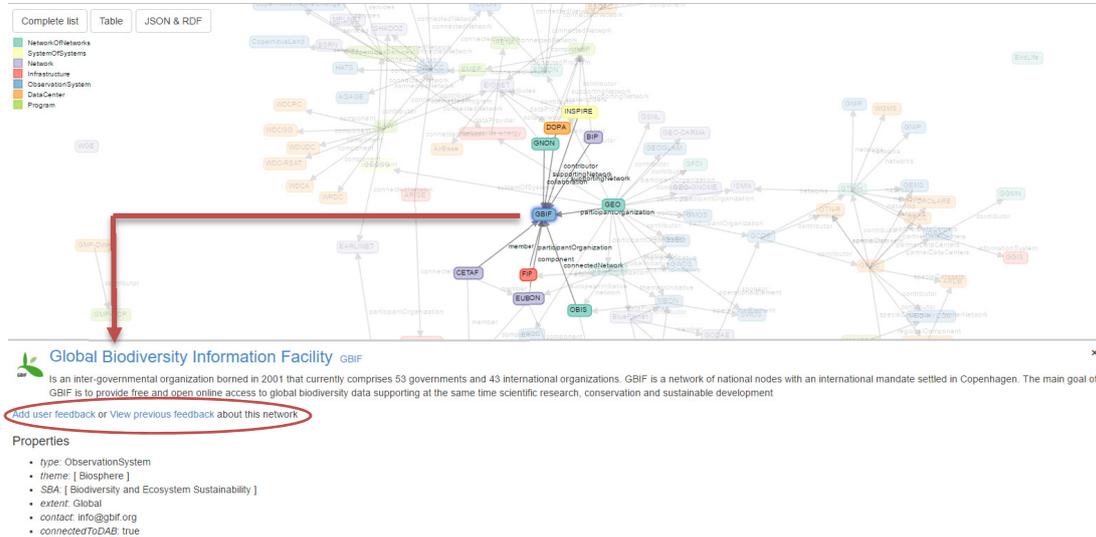


Figure 15. User feedback option for a specific network, for instance, Gbif

The feedback type a user will provide is probably only a comment or a reply to someone else’s comment. Based on the types of feedback submitted in the coming months a dedicated user feedback provision client can be designed and developed if needed.

5.2 Using feedback

A user will only be interested in searching for feedback on a specific network. There is no need to provide a separate search page with a lot of search functionality. It is sufficient to provide a link to previously posted feedback on the network. This has been implemented by providing the “view previous feedback” link next to the “Add user feedback” link (Figure 15). The presentation of the feedback results can be improved by developing a dedicated HTML page.

6 Integration with GEOSS

During the GeoViQua project, the feasibility of the integration of User Feedback in the GEOSS portal was demonstrated in a mirror of the version in production at that time. Nevertheless, the integration in the production copy has proved to be difficult. To make the situation more complicated, the portal was updated and renewed during the project. ESA is in charge of deciding which developments are going to be included in the GEOSS Portal and which are not. However, by providing open source packages and creating well-documented and easy-to-use APIs it should not be a problem to provide a user feedback service and to allow ESA to develop the integration in the GEOSS portal. To facilitate the integration of the feedback server, it has proven feasible

and easy to connect the user feedback system to the DAB. The DAB is already a part of the GEO Common Infrastructure, and this way the inclusion of user feedback in the system will not require the approval of another service component by GEO.

6.1 Security and single sign on

As discussed in GeoViQua D3.2³ on user feedback it is not convenient to implement user administration for a user feedback server if this needs to be integrated in a larger infrastructure that already has other user administration mechanisms. To solve this problem, the implementation of single sign on was proposed in GEOSS. It should be clear what mechanisms are desired for authentication and authorization, where user information is stored and credentials are provided and also the logon flow needs to be designed. These considerations have been discussed in the 7th phase and will continue during 8th phase of the Global Earth Observation System of Systems (GEOSS) Architecture Implementation Pilot (AIP-8), mainly thanks to the lead of COBWEB and the data sharing task force. Unfortunately, there is still no agreement on implementing a single sign on in GEOSS at the time of writing this document.

Even if a GEOSS common single sign on mechanism is not implemented, we need to prepare for it. E.g. to this end the Tastypie framework is updated to a version that supports OpenID (that is the technology tested in the AIP-8). In addition, the distribution with an open source license for the user feedback makes it possible to extend and change the software as needed in the near future.

6.2 Suggestions for deployment for GEOSS

6.2.1 Server deployment and maintenance

An instance of the GEO user feedback server is deployed and maintained by S[&]T corporation. Once the feedback system becomes operational and is not anymore in experimental state, it is necessary to have a separate server that is part of the GEOSS infrastructure to ensure backup of the information. In addition, a moderator will be needed at one point to ensure the feedback provided is relevant and the server is not misused.

6.2.2 User guidelines

Guidelines should be created on how to fill in feedback and what to add. This is needed especially for 'expert' feedback, which contains more than just a rating and/or a comment. The user feedback model on geospatial data is increasingly complex and there are many optional entries to fill it. Help based on experience in using the feedback system will be needed.

³ Deliverable D2_3 User Feedback Elicitation tool, see Appendix A

Appendix A Useful Links and references

ConnectinGEO D3.4. Report on observations, measurements and gaps in observation systems reported by the communities:
<http://www.connectingeo.net/Documents.htm>

CNR Data Access Broker: <http://api.eurogeoss-broker.eu/docs/index.html>

GEO feedback website: <http://geoviqua.stcorp.nl/home.html>

GeoViQua D2.3. User Feedback Elicitation tool:
http://www.geoviqua.org/Docs/SubmittedDeliverables/D3_2_GeoViQua.pdf

GeoViQua Github: <https://github.com/GeoViQua>

GeoViQua website: <http://www.geoviqua.org/>

Masó J., Bastin L., OGC 15-097r1 Geospatial User Feedback Standard. Conceptual Model. www.opengeospatial.org/standards/guf

Masó J., Bastin L., OGC 15-098r1 OGC Geospatial User Feedback Standard. XML Encoding Extension. www.opengeospatial.org/standards/guf

Masó, J., Broek M., Thum S., Nüst D., Zabala A., Geospatial User Feedback as a Form of Alternative Scientific Digital Reputation. ESA EO Open Science 2.0. October 2015