

Report of the GCI/IOC Task Force

In July 2008, the Group on Earth Observation (GEO) Executive Committee established the Global Earth Observation System of Systems (GEOSS) Common Infrastructure Initial Operating Capability Task Force, (hereafter referenced as the “IOC-TF”), with the purpose of supporting the GEO in the coordination, implementation and sustainability of the GEOSS Common Infrastructure (GCI).

Under its Terms of Reference, the IOC-TF is required to report to the Executive Committee:

- to define and recommend a Concept of Operations plan for the GCI components, including aspects of operational requirements, responsibilities, and interaction,
- to evaluate the existing GCI components and their sustained operation in light of known and emerging provider and user requirements, reliability, suitability, sustainability, and quality of service, and
- to provide administrative recommendations regarding models of GCI operational solutions addressing sustainability, maintenance, enhancements, access control and security, and software licensing and ownership (intellectual property rights).

To address these requirements, the Work Plan of the IOC-TF foresees the following deliverables:

- Concept of Operations Document;
- Evaluation of GCI Components;
 - Consolidated User Requirements (new document);
 - GCI Verification Test Plan;
 - Report on the Evaluation of the GCI Components.
- Recommendations for Long-term GCI Operations.

Status as of 31 August 2009

1 CONCEPT OF OPERATIONS DOCUMENT

Version 1 of the Concepts of Operation document was prepared by the IOC-TF in 2008 and presented to the Executive Committee at its 14th meeting in November 2008.

The Concept of Operations is a “high level” system document that is used to build consensus among both user groups, and developers so that there is a common technical understanding of the requirements and functionality of the GEOSS. The document thus includes a system description, a description of different types of users, the ways in which these users will employ GEOSS and an examination of operational scenarios.

This document can be found at:

http://www.earthobservations.org/documents/excom/ec14/09_Concept%20of%20Operations%20Document%20GEOSS%20Common%20Infrastructure.pdf.)

2 EVALUATION OF GCI COMPONENTS

2.1 Consolidated User Requirements (new document)

During the preparation of the Concept of Operations Document, the GCI Component Providers identified the need for a document that could enhance the process for the implementation and operation of the GCI, whilst also clarifying the rules, identifying additional improvements and user requirements.

This document represents an additional document to those foreseen in the original IOC-TF Work Plan noted by the Executive Committee at its 13th meeting. However, the IOC-TF took the view that having listened to the input from the GCI Component Providers, there was a need for such a document. The IOC-TF therefore developed such a set of consolidated requirements and the first version of this document was released to the GEO Community on 12 March 2009 and presented to the Executive Committee during its 15th meeting.

The consolidated requirements document sets out the various system requirements applicable to the components of the GCI, outlining the source of this requirement, how critical this requirement is to the functioning of the GCI and outlines the verification method that is used to assess the operation of the GCI in accordance with that requirement.

The Consolidated User Requirements document is now publically available via the GEO web site at: http://www.earthobservations.org/documents/gci/gci_requirements_20090312.doc.

2.2 GCI Verification Test Plan

The IOC-TF is currently developing and finalising the Verification Test Plan. This Verification Test Plan should then be used during the testing of the GCI itself and the various GCI components. It is the intention to merge the GCI Verification Test Plan document together with the document that contains the Consolidated Requirements for the GCI, (document a1 above).

The GEOSS GCI Verification Test Plan will define the tests to be executed to verify that the elements that compose the GCI satisfy the GCI Consolidated Requirements. (This provided a further motivation for the preparation of the GCI consolidated requirements.)

The purpose of the GCI Verification activities will be to verify the compliance of the GCI Components with the Consolidated requirements in terms of GCI internal interfaces (between the GCI components e.g. between the GEO Web Portals and the GEOSS Clearinghouses), external interfaces (GCI elements with other non-GCI GEOSS elements e.g. between the GEOSS Best practice registry and the GEO Users Community), output data, timeliness and reliability. This verification phase is used to evaluate the behaviour of the various GCI components and to make the appropriate recommendations for improvements whenever necessary.

2.3 Report on the Evaluation of the GCI Components

The IOC-TF is currently developing and finalising this report, which will present the results of the evaluation of the actual solutions offered for the GCI against the logical design of the Concept of Operations Plan, documentation from the Architecture Implementation Pilot (AIP) Phase I, Interoperability Process Pilot Project (IP3) results, nominated component information systems and their services, and user requirements from Communities of Practice and Societal Benefit Areas (SBAs).

As an element of the GEOSS Architecture Elaboration process, the Architecture Implementation Pilot (AIP) has developed, deployed and evaluated components of the GCI. As GEO Task AR-09-01b, the AIP task contributes to the development of GEOSS through a process of deploying components, documenting the design of the deployed architecture and demonstrating the deployed components in scenarios relevant to the SBAs.

Two AIP phases have been completed: AIP-1 and AIP-2.

AIP-1 led the incorporation of GEOSS Web Portal and Clearinghouse components into a consistent GEOSS using GEOSS Interoperability Arrangements in support of the Societal Benefit Areas. The outcomes of AIP-1 in December 2007 were captured in a “GEOSS Core Architecture Implementation Report.” The report describes implementations achieved to date as well recommendations on how implementation should continue. The components deployed and the architecture developed in AIP-1 became a basis for the GCI IOC and the GCI Usability Testing. Specific results of AIP-1 are given in Annex 1a.

AIP-2 continued the development of the GEOSS architecture with a focus on augmentation of the GCI IOC. As GEO sub-task AR-09-01b, AIP-2 developed and piloted new process and infrastructure components for the GCI and the broader GEOSS architecture. AIP-2 is providing phased delivery of components to operations under sub-task AR-09-01a. AIP-2 activities included architecture refinement based on user interactions; component interoperability testing; and SBA-focused demonstrations. As of August 2009, specific results of AIP-2 are given in Annex 1b.

As a first step towards incorporating user requirements into the GCI, user testing took place from 4-8 May at the ISRSE-33 Symposium in Stresa, Italy. This was supported by the User Interface Committee (UIC) and the US EPA, who provided personnel and logistical support for this testing. The setup was designed to accommodate around 100 to 150 tests during the four days using one of the Portals in a test. 117 tests were performed during this period. Attendees at the Symposium and the GEO meetings came at random to do the test.

The results provided much needed feedback on the many problems existing in the GCI at that time. About two-thirds of the testers had not visited the Portals before, indicating that new users were engaged. A large majority said that they would visit the portals again and all of them had suggestions for improvements which they felt were needed to improve the Portals and the GCI. A one page summary of the results is provided in Annex 2.

A full "GCI User Assessment Report", prepared by the US EPA and based upon the results of these user tests, is available. This report and its annex are attached to this document. Based upon the feedback received from the users, this report included a number of recommendations on possible improvements to the functioning of the GCI. These are summarized in Annex 3.

The IOC-TF therefore agreed with the GCI component providers that a number of actions should be undertaken in the short-term, i.e. during the Summer of 2009, to enhance the capability of the GCI.

Upon completion of this work, by the end of August 2009, a second round of user testing is to be undertaken starting in early September.

The User testing exercise undertaken in Stresa has proven to be extremely valuable, highlighting the reliability and status of the GCI in a controlled manner. As such, it is now recognised that a mechanism needs to be implemented during the operational phase of the GCI to undertake such coordinated user testing exercises on a regular basis, in addition to the facilities that are in place to allow users to provide continuous feedback when using the GCI.

3 RECOMMENDATIONS FOR LONG-TERM GCI OPERATIONS

"Recommendations for Long-term GCI Operations" is a "high level" document that satisfies the requirements from the Executive Committee set out in the IOC-TF Terms of Reference and associated Work Plan to report discussions, alternatives and references to support the understanding of potential budgetary and operational commitments for the GEO with regard to the long-term operations of the GEOSS Common Infrastructure (GCI).

An initial draft of this document has been prepared for presentation to the Executive Committee at its 16th Meeting in September 2009.

This document sets out "administrative recommendations regarding models of GCI operational solutions ..", in accordance with the requirement set out in the IOC-TF Terms of Reference "*to provide administrative recommendations regarding models of GCI operational solutions addressing sustainability, maintenance, enhancements, access control and security, and software licensing and ownership (intellectual property rights)*".

4 REQUEST FROM THE IOC-TF TO EXCOM

The IOC-TF would welcome:

- feedback from the Executive Committee on the recommendations made with regard to long-term GCI operations;
- guidance on the steps the IOC-TF should take to complete its work and present the documents prepared at the GEO-VI Plenary session.

The IOC-TF would ask the Executive Committee to note that:

- Given the timing of the current round of GEO Committee meetings, the IOC-TF has not yet been able to undertake a detailed round of consultation with the GEO Committees.
- The second round of user testing will take place in September 2009. The IOC-TF would also welcome the opportunity to take account of the initial feedback from this round of user testing, in particular with regard to the recommendations on the issue of single versus multiple GCI Clearinghouse(s) and GEO Web Portal(s), where the IOC-TF has not yet reached a conclusion on the latter issue, i.e. single versus multiple GEO Web Portals.

The IOC-TF would therefore seek authorisation from the Executive Committee to update the document "Recommendations for Long-term GCI Operations" to take account of feedback received during the September co-located GEO Committee meetings, the second round of user testing and from the Executive Committee itself.

ANNEX 1A

SPECIFIC RESULTS OF THE ARCHITECTURE IMPLEMENTATION PILOT 1

Specific results of the Architecture Implementation Pilot 1 included:

- An architecture was established for GEOSS as a set of component types, functional requirements for interaction between the components, and standards for the interactions.
- Several organizations provided workable GEO Web Portal solutions. Initial evaluation of the portals was provide through development of demonstration scenarios.
- Continued dialogue with end users was identified as crucial to further improve the GEO Web Portals. An important issue raised by end users was customization of the portals.
- Demonstration were developed and recorded for: 1) registration and discovery, 2) eight SBA scenarios, and 3) the portal candidates.
- Videos of the demonstrations are available on-line: <http://www.ogcnetwork.net/AIPdemos>
- Standards for Interoperability Arrangements were communicated to the SIF. Adherence to standards is of utmost importance to ensure interoperability between the various GEOSS components, in particular GEO Web Portals, GEOSS Registries and GEOSS Clearinghouse.

ANNEX 1B

SPECIFIC RESULTS OF THE ARCHITECTURE IMPLEMENTATION PILOT 2

Specific results of the Architecture Implementation Pilot 2 included:

- Development and refinement of a reusable process for SBA groups to use the GEOSS Service-oriented Architecture (SoA). The SBA-to-SoA process is documented in the AIP-2 Summary Report. The process emphasizes the use of the GCI.
- The SBA-to-SoA process was employed for six SBAs scenarios. The SBAs were identified at the beginning of AIP-2 through collaboration of the UIC and ADC. GCI components employed in the scenarios were refined based upon the needs of the users.
- The GEOSS Architecture was extended beyond components of the GCI. A set of “engineering” component types were defined and deployed reducing the complexity of the contributed components without requiring changes to those components.
- Development of a set of use cases to support further coordinated development. The use cases rely upon GEOSS interoperability arrangements and the engineering components.
- Emphasis on "persistent exemplar" components that bring stability, consistency and high performance to the GEOSS network of contributed components.
- The results of AIP-2 were published in through twelve engineering reports and eleven videos of demonstrations. <http://www.ogcnetwork.net/AIppilot>

ANNEX 2**SUMMARY GEO PORTAL USABILITY TEST RESULTS****ISRSE-33, STRESA, ITALY, MAY 4-7, 2009****Sponsored by the User Interface Committee and USEPA**

- **117 users** tested the GEO Portals: 39 ESRI; 34 Compusult; and 44 ESA/FAO
- **100 (86%)** would visit the GEO Portals again
- **85 (73%)** of the users classified themselves as scientist/researcher; 4 (3%) policy analyst; 3 (2%) decision support; negligible other classifications
- **75 (64%)** had not visited the GEO Portals before
- **66 (56%)** previously used Portals or Web sources
- **73 (63%)** were familiar with GEOSS
- **58 (49%)** were experienced application users; 34 (29%) were casual users; 19 (16%) were software development oriented

Subjects searched:

- environmental data (e.g., air and water quality, soil erosion); agriculture/forestry data; disaster/flood data, health information; satellite imagery (e.g., data and maps); weather, wind energy.

Ease of use:[\[1\]](#)

- **45 (39%)** scored the Portal navigation capabilities as easy (i.e., 1 or 2);
- **31 (27%)** scored the Portal navigation capabilities as mid-range (i.e., 3)
- **39 (34%)** scored the Portal navigation capabilities as difficult (i.e., 4 or 5)

Most useful Portal feature:

- mapping interface (e.g., map search field, map viewer); drop down menus; globe; search system; web GIS features, browsing tool.

Difficult to use Portal feature

- area of interest tool; SBA search; legends/color interpretations; map; globe view; simple search.

Suggestions for improvement (in priority order)

- add Tips on how to conduct a search;
- add video tutorial of sample searches with printable instructions on how to duplicate the searches;
- add Frequently Asked Questions (FAQs);
- improve map layer visualizations;
- improve search tools to retrieve more relevant hits;

- add user guide; provide less text and more images with color contrast;
- improve speed for the global viewer;
- search geographically and thematically at the same time;
- combine with Google Earth maps.

[\[1\]](#) A review of individual user test results is needed to determine how many were “experienced” vs. “inexperienced” GEO Portal users.

ANNEX 3**SUMMARY OF GCI USER ASSESSMENT REPORT RECOMMENDATIONS****ISRSE-33, STRESA, ITALY, MAY 4-7, 2009****Sponsored by the User Interface Committee and USEPA****DATA ACCESS****Issue 1: How do you initiate a search on the three GEO Portals?**

- **Recommendation:** For each GEO Portal, provide clear and concise instructions or a printable tutorial on how to conduct a search using the Portal. These instructions should be printable and easy to find on the Portal Home Page. Each Portal also should provide search tips, FAQs, and a description of the types of information and resources available via the Portal.;
- **Recommendation:** Provide uniform and succinct descriptions of GEO and GEOSS GCI (i.e., Portals, Clearinghouses, and Registries) and descriptions of the nine SBAs as common references on each Portal.

Issue 2: Why are there separate GEOSS Clearinghouses and a GEOSS Registry? Can they be integrated? Is the clearinghouse a registry?

- **Recommendation:** Provide seamless access to the GEOSS Registries without reference to specific clearinghouses;
- **Recommendation:** Describe the difference between catalogues and clearinghouse and/or registries if links to these are included on the GEO Portal.

Issue 3: Why can't all of the Portals and Clearinghouses access Google Earth?

- **Recommendation:** Require Keyhole Markup Language (*kml*) access for all GEOSS Clearinghouses and Registries.

Issue 4: Why do some Portals and Clearinghouse “harvest” data differently (i.e., yield different results)?

- **Recommendation:** Provide a description on each Portal Home Page of the data harvest process, an agreed upon date and time when files are updated, and an explanation about how search results can vary depending on data file revisions.

DATA REGISTRY**Issue 5: How are components and services registered in GEOSS?**

- **Recommendation:** Provide a link on all GEO Portals for registering components and services in the GEOSS Registry.

5 DATA AVAILABILITY**Issue 6: Why are the number of GEOSS Registry Components and Services so low and what can be done to increase registration of components and services?**

- **Recommendation:** Advertise among GEO members and participating organizations the value in registering components and services;

- Recommendation: Set up a computer in the GEOSS booth at relevant conferences and symposia and encourage participants to register components and services onsite at the booth.

LESSONS LEARNED FROM GEO PORTAL USABILITY TESTING

Issue 7: Confirm that a Large Percentage of GEO Portals Users Would Re-Visit the Portals and Assess the Impact of Improvements Implemented on the Portals Since the ISRSE

- Recommendation: Conduct another round of GEO Portal Usability Testing using WebEx after the Portal developers have revised their Portals based on the ISRSE Usability Testing results and the completion of the planned AIP-2 activities.

Issue 8: Most testers at the ISRSE provided limited responses to subjective questions, making it difficult to glean useful information from these responses.

- Recommendation: Revise the ISRSE GEO Portal Usability Testing Questionnaire to include fewer open-ended questions.

Issue 9: Create near real-time records of GEO Portal use testing.

- Recommendation: Use Camtasia screen capture software to record use testing key strokes and online user responses to the Usability Testing Questionnaire in the presence of a testing official.

Issue 10: Clarify the value added of the GEO Portals.

- Recommendation: Prepare a marketing brochure on the GEO Portals and their advantages relative to other geoportals and Websites.