GEOSS Clearinghouse

Request for Information for Proof of Concept Phase

1 Introduction

The Global Earth Observing System of Systems (GEOSS) is to be a global, coordinated, comprehensive and sustained system of earth observing systems. The GEOSS architecture requires that the functions of observing, processing, dissemination be achieved through interoperability specifications agreed to amongst all contributing systems. GEOSS will include a publicly accessible, network-distributed clearinghouse, subject to GEOSS interoperability specifications, including an inventory of existing data, metadata, services and pre defined common products.

This Request for Information (RFI) for the GEOSS Clearinghouse seeks comments on a draft architecture for the GEOSS Clearinghouse. The RFI also seeks GEO Members and Participating Organizations willing to contribute components for a Proof of Concept (POC) phase. It is anticipated that the results of the POC phase testing along with comments received on the Architecture will be used in a Request for Proposals (RFP) for an Operational Phase of the GEOSS Clearinghouse.

This RFI contains the following sections:

2 Responding to this RFI

This RFI seeks two types of responses from GEO Members and Participating Organizations:

1. Comments on the GEO Clearinghouse Requirements and Architecture in this RFI
2. Contributed components offered for testing in the POC Phase.

Comments as in Item 1 above will be used to revise and refine the GEOSS Clearinghouse Requirements and Architecture. Contributed components, Item 2 above, must participate in a testing and evaluation during the POC Phase. Responses that are contributing components must provide a written summary of how the components relate to the Requirements and Architecture in this document. Such Contributed Component Summaries may propose updates to the GEOSS Clearinghouse Requirements and Architecture

Responses to this RFI should be sent to the GEOSS Clearinghouse Task Team through the Task Point of Contact (George Percivall, percivall@opengeospatial.org).

This RFI will remain open indefinitely until the Clearinghouse Task Team decides to close the request. Responses may be sent immediately upon receipt of this RFI. Responses received before 31 December 2006 will be included in the POC Testing phase to begin January 2007.

To demonstrate interim progress, the GEOSS Clearinghouse Task Team is organizing a demonstration at the GEO-III Plenary, Bonn, 28-29 November 2006. GEO Principals with components relevant to the GEOSS Clearinghouse are invited to participate in the GEOSS Clearinghouse Demo at GEO-III. In order to participate, GEO Principals must respond with a description of the components to be demonstrated and how they relate to the GEOSS Clearinghouse Requirements and Architecture prior to 27 October 2006. Responses must be sent to the Clearinghouse Task Point of Contact (George Percivall, percivall@opengeospatial.org). Participation in the GEO-III Demo is not a requirement for participating in the POC Phase. GEO Principals may respond to the RFI as defined above without participating in the GEO-III Demo. The RFP for the Operational Phase of the Clearinghouse will be based upon the POC events beginning in January.

3 Proof of Concept Plan

The Proof of Concept Phase of the GEOSS Clearinghouse Task will demonstrate a search capability against existing catalogues from GEO members and participating organizations, to highlight the range of functionality possible, and create a basis for a more persistent operational capability within GEOSS in support of the 2007-2009 workplan activities. The RFI seeks catalogue and consolidated search implementations to be part of integration, testing and evaluation activities in early 2007. The components should be relevant to the GEOSS Requirements and Architecture defined in the latter sections of this RFI.

This RFI requests GEO Members and Participating Organizations to contribute Clearinghouse Components to a Proof of Concept Phase. During the Proof of Concept, a set of Technology Integration Experiments (TIEs) with be conducted to assess the interoperability between the contributed components for the GEOSS Clearinghouse.

Table 1 GEOSS Clearinghouse Schedule – Proof of Concept Phase

Release of this RFI for POC Phase	13 October 2006
Last day for Responses proposing to be part of GEO-III Plenary Clearinghouse Demo	27 October 2006.
GEO-III Plenary	28-29 November 2006
Last day for Responses to RFI to be part of POC Testing and Evaluation	31 December 2007
POC Testing and Evaluation	1st Quarter 2007
Begin Operational Phase of Clearinghouse Task	2nd Quarter 2007

4 GEOSS Clearinghouse Requirements

In the frame of the implementation of the GEO Systems of Systems, the availability of the description of the contributions from the members and partners from a single access point is an essential element for its successful development. This single access point, or clearinghouse, is part of the wider set of GEOSS components and as such will follow the applicable rules and constraints such as the need for interoperability, the need to be based on existing systems and resources, and the need to follow as much as possible standards and best practice recommendations.

The clearinghouse will provide access to the descriptions of a wide variety of resources relevant to the GEO Community and beyond. The end user will see the set of descriptions as one homogeneous set of distributed repositories independently of their location and hosting

organization. The type of resources that will be made available and the way it will made available is dependent on:

- Outcome of this RFI; what kind of contributions are seen as being relevant and what is available out there.
- Outcome of the user committee activity, especially on access to basic information.

Nevertheless, we can anticipate the user to be able to query and retrieve in an interoperable way a description of the contributions of the GEO members and participating organizations, while it is still to be defined what kind of other services or geoservices will be made available.

The way the requirements have been defined is illustrated in Figure 1 - requirements definition process. The reference requirements have been extracted exclusively from the GEOSS 10 year Implementation Plan and the GEOSS 10 Year Implementation Plan Reference Document, that have been reviewed for completeness, applicability and consistency by the GEOSS Clearinghouse Task Team (see Annex to this RFI). These reference requirements are now being submitted to the wider community of interested parties for input as the clearinghouse development proceeds and therefore its definition evolves and matures.

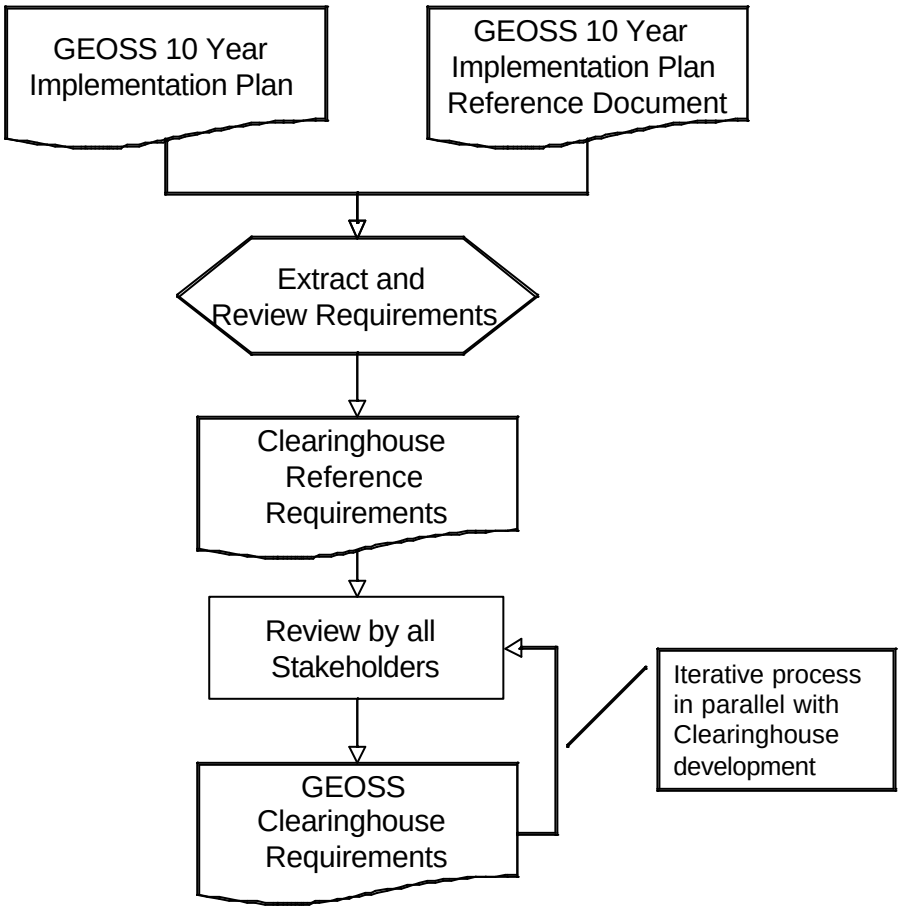

Figure 1 - requirements definition process

5 GEOSS Clearinghouse Architecture

The GEOSS Clearinghouse provides access to a distributed network of catalogue services that support the interoperability agreements of GEO. Member and participating organizations may nominate catalogues containing structured, standards-based metadata and other web services for access by the GEOSS Clearinghouse. The Clearinghouse provides search capability across the catalogues and their registered resources. The GEOSS Web Portal, the subject of another GEO Task, will search the GEOSS Clearinghouse but will also provide access to other GEOSS resources. Through the use of interoperability standards, additional portals may be established for national or professional communities to access the GEOSS Clearinghouse. The Global Spatial Data Infrastructure (GSDI), for example, offers a similar clearinghouse capacity.

The GEOSS Clearinghouse Architecture is defined by an Engineering Viewpoint Diagram showing the Components of the Architecture (Figure 2) followed by descriptions of key concepts that described the components and their relationships, i.e., registry, register, metadata schemas, distributed search protocols. The GEOSS Clearinghouse will access distributed catalogue services registered by GEO Principals.

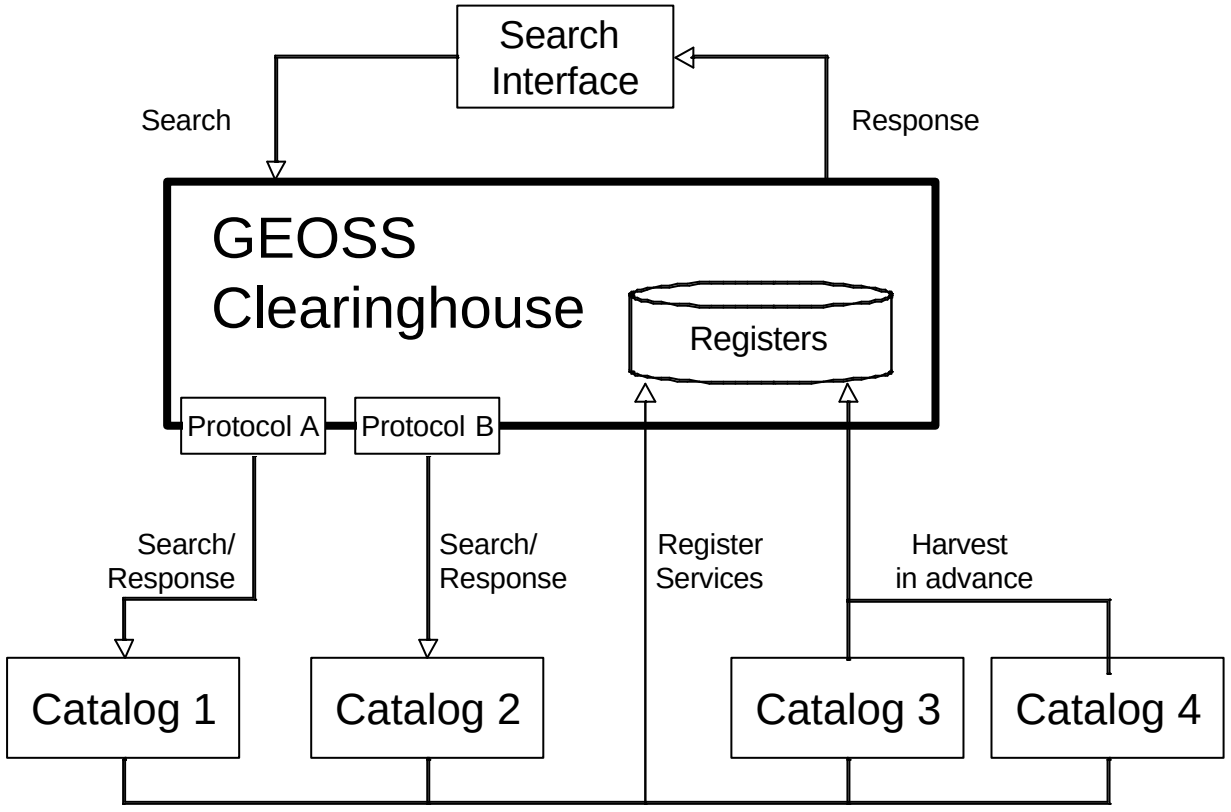

Figure 2 – GEOSS Clearinghouse Architecture - Engineering Viewpoint

The GEOSS Clearinghouse will provide a registry function for some of the registers currently under development in GEO. A registry is an information system on which a register is maintained; whereas, a register is a set of files containing identifiers assigned to items with descriptions of the associated items (definitions from ISO 19135). A registry provides access to the registers that it maintains. The GEOSS Clearinghouse will be a registry for a service register for the distributed catalogue services made accessible by GEO Principals. The GEOSS Clearinghouse may also

serve as a registry for other registers to be defined, e.g., documents, terminology, coordinate reference systems, codesets, models, etc.

Each distributed catalogue will hold metadata records that describe geospatial information and the means to access them. The metadata records shall be structured in accordance to standards agreed to by GEO. A given metadata record may represent a collection of imagery, an individual image, a vector data set or collection of features, a scanned map or other georeferenced information. Additional resource types that may be described in metadata include documents (e.g. spreadsheets, text files, HTML files), schemas, feature catalogues or data dictionaries, or other resource types of interest. Each metadata record should include a web-accessible link to the resource being described, though it may simply include instructions for other means of access. Where standards-based web access methods are available to visualize or access a data set, these should be expressed and included in the metadata record.

Specific interoperability arrangements are provided by the GEOSS Clearinghouse to maximize the ability to function in a distributed environment. For catalogue services, the ISO 23950 (ANSI Z39.50) standard using the Geospatial Profile (GEO) may be offered. The OGC Catalogue Services Specification 2.0.1 includes references to the Z39.50 protocol binding as well as the Catalogue Services for the Web (CS-W) protocol binding, which may also be offered for search through the GEOSS Clearinghouse. Both ISO 23950 and CS-W catalogues are anticipated offerings for search by the GEOSS Clearinghouse. The anticipated metadata standards in use include the ISO 19115 and 19139 (XML) standards and the Federal Geographic Data Committee (FGDC) Content Standard for Digital Geospatial Metadata (CSDGM, 1998). ISO 15836:2003 (Dublin Core) as applied to geospatial information is to be considered. Additional metadata standards may be anticipated although they will require specialized programming to process the results of the distributed search.

Table 2 - Components in the Engineering Viewpoint Architecture

Component in Architecture	Functionality Overview
Clearinghouse	Acts as a coordination facility to search distributed and local (cached/harvested) metadata regarding distributed geospatial data and services. Processes search against common metadata fields, receives and forwards metadata in XML format to User Interface for presentation and interaction. Exposes search API for peer and User Interface interactions.
Search Interface	Provides user interaction to browse and search registered services based on full-text and field-based query, including spatial, temporal, and text. May include ability to determine the number of results matching a query and sort the query results based on user selected search requirements. User may select a specific metadata entry to view partial or full detail, and if a web-accessible resource is associated with it, may connect to or visualize that remote resource through map services, ordering services, or data access services.
Catalogue	Standards-based metadata registries provided by GEO members and participating organizations. Catalogues support ISO 23950 or OGC CS-W search interfaces that permit return of “Brief” and “Full” metadata records in XML format. Catalogues support search on full-text and fields, including spatial, temporal, and text. A Catalogue interface may also exist on a “peer clearinghouse” instance allowing for remote search or harvesting.

The GEOSS Clearinghouse should anticipate the ability to perform distributed search of remote disparate catalogues and the ability to harvest and cache metadata from certain distributed collections. Some metadata collections may be highly static or are not available through web search services (only ftp or http web directories) are amenable to caching and search within the Clearinghouse. Other metadata collections are searchable through catalogue interfaces and may be searched in parallel through the GEOSS Clearinghouse interface. Both methodologies are sought for demonstration in the GEOSS Clearinghouse proof-of-concept.

The metadata to be held by the Clearinghouse is dependent upon the approach used for searching. Two anticipated capabilities for access to remote catalogues may include:

- Distributed search approach: search requests are sent in parallel to registered distributed catalogues. For these catalogues the only 'local' Clearinghouse metadata is the registered address for the distributed catalogue stored in the Service Registry.
- Harvested approach: The clearinghouse periodically harvests all metadata from registered distributed catalogues. A user search request is executed against the metadata harvested from the remote catalogues and the results are managed and portrayed in the Clearinghouse.

6 RFI Preparation Team

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7 Annex – GEOSS Clearinghouse Reference Requirements

GEOSS 10 YEARS Implementation Plan

IDENTIFIER	REQUIREMENT	CONTEXT	CHAPTER	REQUIREMENT TYPE
REQ[1].PLAN	GEOSS builds on and adds value to existing Earth observation systems by sharing information	*It builds on and adds value to existing Earth observation systems by* coordinating their efforts, addressing critical gaps, supporting their interoperability, *sharing information*, reaching a common understanding of user requirements and improving delivery of information to users.	Preamble	Architecture constraint
REQ[2].PLAN	The contributing systems will range across the processing cycle, from primary observation to information production.	N/A	3.2 Scope of GEOSS	Defines Range of Contributions
REQ[3].PLAN	The benefits of GEOSS will be realized globally by a broad range of user communities, including managers and policy makers in the targeted societal benefit areas, scientific researchers and engineers, civil society, governmental and non-governmental organizations and international bodies, such as those assisting with the implementation of multilateral environmental agreements.	N/A	4.2 User Involvement	Defines Set or superset of clearinghouse users (TBC)
REQ[4].PLAN	GEOSS will be based on existing data exchange and dissemination systems	*GEOSS will be based on* existing observing, data processing, *data exchange and dissemination systems*, while fostering and accommodating new systems operated by GEO Members and Participating Organizations, as needs and capabilities develop.	5 Technical Approach, Capacity Building, and Outreach	Architecture constraint

IDENTIFIER	REQUIREMENT	CONTEXT	CHAPTER	REQUIREMENT TYPE
REQ[5].PLAN	The functionality of one component of GEOSS are to exchange, disseminate, and archive shared data, metadata, and products.	GEOSS, collectively, has several functional components: – *To exchange, disseminate, and archive shared data, metadata, and products*; and, – To monitor performance against the defined requirements and intended benefits.	5 Technical Approach, Capacity Building, and Outreach	Context Definition (Clearinghouse should be part of this component (at least for metadata))
REQ[6].PLAN	The functionality of one component of GEOSS are to monitor performance against the defined requirements and intended benefits.	GEOSS, collectively, has several functional components: – To exchange, disseminate, and archive shared data, metadata, and products; and, – *To monitor performance against the defined requirements and intended benefits.*	5 Technical Approach, Capacity Building, and Outreach	Context Definition (Clearinghouse should be part of this component)
REQ[7].PLAN	GEOSS will be fostering and accommodating new systems operated by GEO Members and Participating Organizations, as needs and capabilities develop.	*GEOSS will be* based on existing observing, data processing, data exchange and dissemination systems, while *fostering and accommodating new systems operated by GEO Members and Participating Organizations, as needs and capabilities develop.*	5 Technical Approach, Capacity Building, and Outreach	Architecture constraint
REQ[8].PLAN	GEOSS will be based on existing data exchange and dissemination systems	*GEOSS will be based on* existing observing, data processing, *data exchange and dissemination systems*, while fostering and accommodating new systems operated by GEO Members and Participating Organizations, as needs and capabilities develop.	5 Technical Approach, Capacity Building, and Outreach	Architecture constraint
REQ[9].PLAN	The functionality of one component of GEOSS are to exchange, disseminate, and archive shared data, metadata, and products	GEOSS, collectively, has several functional components: – To exchange, disseminate, and archive shared data, metadata, and products; and, – To monitor performance against the defined requirements and intended benefits.	5 Technical Approach, Capacity Building, and Outreach	Functionality definition (at least for metadata)

IDENTIFIER	REQUIREMENT	CONTEXT	CHAPTER	REQUIREMENT TYPE
REQ[10].PLAN	GEOSS will encourage the adoption of existing and new standards to support broader data and information usability	N/A	5.2 Products, Data Management, and Radio Frequency Protection	Architecture constraint
REQ[11].PLAN	The success of GEOSS will depend on data and information providers accepting and implementing a set of interoperability arrangements, including technical specifications for collecting, processing, storing, and disseminating shared data, metadata, and products	N/A	5.3 Architecture and Interoperability	Development constraint (technical specifications stakeholders)
REQ[12].PLAN	GEOSS interoperability will be based on non-proprietary standards, with preference to formal international standards	N/A	5.3 Architecture and Interoperability	Architecture constraint
REQ[13].PLAN	Interoperability will be focused on interfaces	*Interoperability will be focused on interfaces*, defining only how system components interface with each other and thereby minimizing any impact on affected systems other than where such affected systems have interfaces to the shared architecture	5.3 Architecture and Interoperability	Architecture Constraint
REQ[14].PLAN	GEOSS implementation will facilitate observations and products recording and storage with metadata and quality	For those *observations and products* contributed and shared, *GEOSS implementation will facilitate* their *recording and storage* in clearly defined formats, *with metadata and quality* indications to enable search, retrieval, and archiving as accessible data sets.	5.3 Architecture and Interoperability	Architecture constraint (existence of metadata and quality information)
REQ[15].PLAN	The process for reaching, maintaining, and upgrading GEOSS interoperability arrangements is to be sensitive to technology disparities among GEO Members and Participating Organizations.	GEO will establish, within 2 years, a process *for reaching, maintaining, and upgrading GEOSS interoperability arrangements*, informed by ongoing dialogue with major international programs and consortia. That process *is to be sensitive to technology disparities among GEO Members and Participating* Organizations.	5.3 Architecture and Interoperability	Architecture constraint

IDENTIFIER	REQUIREMENT	CONTEXT	CHAPTER	REQUIREMENT TYPE
REQ[16].PLAN	Attention is drawn to the importance of using existing international standards organizations and institutes as a focal point for the GEOSS interoperability objectives as they relate to and use standards.	N/A	5.3 Architecture and Interoperability	Development constraint
REQ[17].PLAN	For the most commonly used open standard interfaces, the GEOSS process will advocate some implementations to have no restrictions on being modified freely, commonly known as "open source" software	N/A	5.3 Architecture and Interoperability	Development constraint
REQ[18].PLAN	GEOSS will draw on existing Spatial Data Infrastructure (SDI) components as institutional and technical precedents in areas such as standard protocols	To enable implementation of the GEOSS architecture, *GEOSS will draw on existing Spatial Data Infrastructure (SDI) components as institutional and technical precedents in areas such as* geodetic reference frames, common geographic data, and *standard protocols*	5.3 Architecture and Interoperability	Architecture Constraint
REQ[19].PLAN	GEO Members and Participating Organizations and their contributions will be catalogued in a publicly accessible clearinghouse	*GEO Members and Participating Organizations and their contributions will be catalogued in a publicly accessible*, network-distributed *clearinghouse* maintained collectively under GEOSS	5.3 Architecture and Interoperability	Catalogue content
REQ[20].PLAN	GEO Members and Participating Organizations and their contributions will be catalogued in a network-distributed clearinghouse	*GEO Members and Participating Organizations and their contributions will be catalogued in a* publicly accessible, *network-distributed clearinghouse* maintained collectively under GEOSS	5.3 Architecture and Interoperability	Architecture constraint
REQ[21].PLAN	GEO Members and Participating Organizations and their contributions will be catalogued in a clearinghouse maintained collectively under GEOSS	*GEO Members and Participating Organizations and their contributions will be catalogued in a* publicly accessible, network-distributed *clearinghouse maintained collectively under GEOSS*	5.3 Architecture and Interoperability	architecture and maintenance constraints
REQ[22].PLAN	The catalogue will be subject to GEOSS interoperability specifications.	*The catalogue will* itself *be subject to GEOSS interoperability specifications*, including the standard search service and geospatial services.	5.3 Architecture and Interoperability	development constraint
REQ[23].PLAN	The standard search service will be subject to GEOSS interoperability specifications.	The catalogue *will* itself *be subject to GEOSS interoperability specifications*, including *the standard search service* and geospatial services.	5.3 Architecture and Interoperability	Architecture constraint

IDENTIFIER	REQUIREMENT	CONTEXT	CHAPTER	REQUIREMENT TYPE
REQ[24].PLAN	geospatial services will be subject to GEOSS interoperability specifications.	The catalogue *will* itself *be subject to GEOSS interoperability specifications*, including the standard search service and geospatial services.	5.3 Architecture and Interoperability	Architecture constraint
REQ[25].PLAN	GEO will develop performance indicators for GEOSS.	N/A	7.2 Performance Indicators	Functionality Definition

10-Year Implementation Plan Reference Document

IDENTIFIER	REQUIREMENT	CONTEXT	CHAPTER	REQUIREMENT TYPE
REQ[26].REF	dissemination capabilities will interface through interoperability specifications	GEOSS is to include observing, processing, and *dissemination capabilities interfaced through interoperability specifications* established and adhered to by all contributing systems.	2 Scope of the GEOSS Implementation Plan	Architecture constraint
REQ[27].REF	Interoperability specifications will be established and adhered to by all contributing systems.	GEOSS is to include observing, processing, and dissemination capabilities interfaced through *interoperability specifications established and adhered to by all contributing systems.*	2 Scope of the GEOSS Implementation Plan	Development constraint
REQ[28].REF	Better interoperability standards for data and mechanisms to disseminate the data sets are needed	N/A	4.4.3 Existing Situation and Gaps	Architecture Constraint
REQ[29].REF	To support this, there is a need for international standards for registering geospatial data and information.	N/A	4.8.3 Existing Situation and Gaps	Architecture Constraint

IDENTIFIER	REQUIREMENT	CONTEXT	CHAPTER	REQUIREMENT TYPE
REQ[30].REF	GBIF is a global effort to provide interoperability between biodiversity databases. It has developed protocols and mechanisms for data standards and data sharing. It has started its work with specimen-level data, and intends to integrate species, geospatial, genetic, and ecological data also. GBIF and GEOSS must develop common interoperability protocols and tools, and extend them to other biodiversity-related observation system	N/A	4.9.3 Existing Situation and Gaps	Architecture constraint
REQ[31].REF	GEOSS is designed to be highly scalable	N/A	4.10.3 Common Approaches to Connecting Systems	Architecture constraint
REQ[32].REF	Facilitate the ability to overlay on epidemiology maps the variety of relevant inventoried and processed data, including meteorological, aerosol, ocean and land features, demographic, and infrastructure. This kind of overlay map will be created through interoperable databases and services provided by existing national and international Spatial Data Infrastructures (SDIs).	N/A	4.2.4 Targets	Functionality definition (geospatial services)
REQ[33].REF	Produce an inventory of available Earth remote sensing and ground-based databases that can be associated with known health problems	N/A	4.2.4 Targets	Architecture Constraint (external interface)
REQ[34].REF	Facilitate the establishment of operational linkage of Earth Observation data to geospatially referenced production and use statistics. This should cover crop agriculture, livestock, forestry and freshwater fisheries.	N/A	4.8.4 Targets	Architecture Constraint (External interface)

IDENTIFIER	REQUIREMENT	CONTEXT	CHAPTER	REQUIREMENT TYPE
REQ[35].REF	GEOSS is designed to be highly scalable; the same architectural principles that make GEOSS a “system of systems” can be applied independently to any element within GEOSS.	N/A	4.10.3 Common Approaches to Connecting Systems	Architecture and Development constraint
REQ[36].REF	Working with all GEOSS communities across societal benefit areas, GEOSS Will Facilitate the joint evaluation of prototypes that connect multiple systems, and support making operational any research demonstrations of such collaboration and interoperability.	N/A	4.10.4 Targets	Development partners and stakeholder definition
REQ[37].REF	A key consideration is that GEOSS catalogues data and services with sufficient metadata information so that users can find what they need and gain access as appropriate	N/A	5.1 Functional components	Architecture constraint
REQ[38].REF	The Internet is a primary medium for the mechanism to allow users to access the catalogue of available data and products	*The Internet is a primary medium for the mechanism to allow users to access the catalogue of available data and products,* with hardcopy media to also be available as appropriate	5.1 Functional components	Architecture constraint
REQ[39].REF	the catalogue of available data and products will also be available on hardcopy media as appropriate	The Internet is a primary medium for the mechanism to allow users to access *the catalogue of available data and products,* with *hardcopy media to also be available as appropriate*	5.1 Functional components	Functionality Definition
REQ[40].REF	Users searching GEOSS catalogues will find descriptions of GEO Members and Participating Organizations and the components they support,	N/A	5.1 Functional components	Catalogue content

IDENTIFIER	REQUIREMENT	CONTEXT	CHAPTER	REQUIREMENT TYPE
REQ[41].REF	Users searching GEOSS catalogues will find descriptions leading directly to whatever information is needed to access the specific data or service	*Users searching GEOSS catalogues will find descriptions* of GEO Members and Participating Organizations and the components they support, *leading directly to whatever information is needed to access the specific data or service* in a harmonized way, independent of the specific provider	5.1 Functional components	Catalogue content
REQ[42].REF	Users searching GEOSS catalogues will find descriptions leading directly to whatever information is needed in a harmonized way, independent of the specific provider	*Users searching GEOSS catalogues will find descriptions* of GEO Members and Participating Organizations and the components they support, *leading directly to whatever information is needed* to access the specific data or service in a harmonized way, *independent of the specific provider*	5.1 Functional components	Architecture Constraint
REQ[43].REF	The interoperable GEOSS catalogues form the foundation of a more general 'clearinghouse'	N/A	5.1 Functional components	Architecture constraint
REQ[44].REF	GEOSS data resources can be fully described in context, and data access can be facilitated through descriptions of other useful analysis tools, user guides, data policies, and services	N/A	5.1 Functional components	catalogue content
REQ[45].REF	Many Earth Observation catalogues that require interoperability at the search service have adopted the international standard used for catalogue search (ISO 23950 Protocol for Information Search and Retrieval)	N/A	5.5 Interoperability arrangements	Architecture Recommendation
REQ[46].REF	ISO 23950 also has demonstrated interoperability with services registries using either an ebXML metadata model or UDDI (Universal Description, Discovery, and Integration)	N/A	5.5 Interoperability arrangements	Architecture recommendation

IDENTIFIER	REQUIREMENT	CONTEXT	CHAPTER	REQUIREMENT TYPE
REQ[47].REF	Interoperability arrangements must be based on non-proprietary, open standards	N/A	5.5 Interoperability arrangements	Architecture Constraint
REQ[48].REF	Profiles [*of standards]* must be specified when standards are not sufficiently specific	Interoperability arrangements must be based on non-proprietary, open standards, and *profiles must be specified when standards are not sufficiently specific*	5.5 Interoperability arrangements	Architecture Constraint
REQ[49].REF	GEOSS should adopt standard specifications agreed upon voluntarily and by consensus	N/A	5.5 Interoperability arrangements	Development Constraint
REQ[50].REF	Preference [*will be*] given to formal international standards such as ISO	GEOSS should adopt standard specifications agreed upon voluntarily and by consensus, *with preference given to formal international standards such as ISO*	5.5 Interoperability arrangements	Architecture Constraint
REQ[51].REF	All interface implementations should be specified in a platform-independent manner	N/A	5.5 Interoperability arrangements	Architecture Recommendation
REQ[52].REF	All interface implementations should be verified through interoperability testing and public demonstrations	All interface implementations should be specified in a platform-independent manner, and verified through interoperability testing and public demonstrations	5.5 Interoperability arrangements	Architecture Recommendation
REQ[53].REF	GEOSS interoperability arrangements are to be based on the view of complex systems as assemblies of components that interoperate primarily by passing structured messages over network communication services	N/A	5.5 Interoperability arrangements	Architecture Constraint
REQ[54].REF	It should be understood that the GEOSS approach to interoperability does not require, for example, that all participating systems use the same data format	N/A	5.5 Interoperability arrangements	Architecture Constraint
REQ[55].REF	the interoperability specification states exactly how the service and the data must be described. (These descriptions are 'metadata'.)	N/A	5.5 Interoperability arrangements	Design constraint

IDENTIFIER	REQUIREMENT	CONTEXT	CHAPTER	REQUIREMENT TYPE
REQ[56].REF	GEOSS service definitions are to specify precisely the syntax and semantics of all data elements exchanged at the service interface	N/A	5.5 Interoperability arrangements	Design constraint
REQ[57].REF	GEOSS service definitions are to fully describe how systems interact at the interface	*GEOSS service definitions are to* specify precisely the syntax and semantics of all data elements exchanged at the service interface, and *fully describe how systems interact at the interface*	5.5 Interoperability arrangements	Design constraint
REQ[58].REF	At present, the systems interoperating in GEOSS should use any one of four open standard ways to describe service interfaces: CORBA, Common Object Request Broker Architecture; WSDL, Web Services Definition Language; ebXML, electronic business Extensible Markup Language, or UML, Unified Modelling Language.	N/A	5.5 Interoperability arrangements	Architecture Recommendation
REQ[59].REF	Systems interoperating in GEOSS agree to avoid non-standard data syntaxes in favour of well-known and precisely defined syntaxes for data traversing system interfaces. The international standard ASN.1 (Abstract Syntax Notation) and the industry standard XML (Extensible Markup Language) are examples of robust and generalized data syntaxes, and these are themselves interconvertible.	N/A	5.5 Interoperability arrangements	Architecture Recommendation
REQ[60].REF	It is also important to register the semantics of shared data elements so that any system designer can determine in a precise way the exact meaning of data occurring at service interfaces between components	N/A	5.5 Interoperability arrangements	Architecture Constraint

IDENTIFIER	REQUIREMENT	CONTEXT	CHAPTER	REQUIREMENT TYPE
REQ[61].REF	The standard ISO/IEC 11179, Information Technology-Metadata Registries, provides guidance on representing data semantics in a common registry.	N/A	5.5 Interoperability arrangements	Architecture recommendation
REQ[62].REF	GEOSS will not require any commercial or otherwise proprietary standards (An 'open standard' is a standard specification that is not restricted in its use)	*GEOSS will not require any commercial or otherwise proprietary standards*, following the policy that software components must have open-standards-based interfaces. *An 'open standard' is a standard specification that is not restricted in its use*	5.5 Interoperability arrangements	Architecture and Development constraint
REQ[63].REF	A goal of GEOSS is that multiple software implementations compliant with the open standards should exist for the most commonly used components	N/A	5.5 Interoperability arrangements	Architecture and Development constraint
REQ[64].REF	a further goal of GEOSS is that at least one of the implementations for the most commonly used components should be available to all implementers 'royalty-free' (i.e. having no requirement for recurring payment).	N/A	5.5 Interoperability arrangements	Development constraint
REQ[65].REF	GEOSS also encourages the development and verification of software that has no restrictions on being copied, modified or redistributed	N/A	5.5 Interoperability arrangements	Development recommendation
REQ[66].REF	Data and information resources and services in GEOSS typically include references to specific places on the Earth.The standard for geospatial metadata is ISO 19115: Geographic Information – Metadata.	N/A	5.5 Interoperability arrangements	Design Constraint

IDENTIFIER	REQUIREMENT	CONTEXT	CHAPTER	REQUIREMENT TYPE
REQ[67].REF	Advocate use of existing Spatial Data Infrastructure (SDI) components as institutional and technical precedents in areas such standard protocols, and interoperable system interfaces.	*Advocate use of existing Spatial Data Infrastructure (SDI) components as institutional and technical precedents in areas such* as geodetic reference frames, common geographic data, s*tandard protocols, and interoperable system interfaces*, among other components.	5.8 Targets to enable the architecture for GEOSS	Architecture Constraint
REQ[68].REF	Thus, GEOSS will facilitate utilization of advanced database technology that enables multi-layered visualization of various types of data	N/A	6.2 Data management	Functionality definition
REQ[69].REF	Thus, GEOSS will facilitate: free availability of standardized metadata through a standard Internet-based catalogue search service, supporting multidisciplinary data and information search.	N/A	6.2 Data management	Functionality definition
REQ[70].REF	continuous and evolutionary system development is necessary to keep Earth Observation systems effective and efficient	N/A	6.4 Research facilitation	Development constraint
REQ[71].REF	These indicators quantify the auditable products delivered in the reporting period. They include number of users of GEOSS Internet-based resources, data and products.	N/A	9.2 Output indicators	Functionality definition
REQ[72].REF	Examples of outcomes include percentage interoperability achieved between collaborating systems	N/A	9.3 Outcome indicators	Functionality definition

ADDED REQUIREMENTS

Task "AR-06-05" Team Requirements

IDENTIFIER	REQUIREMENT	CONTEXT	CHAPTER	REQUIREMENT TYPE
REQ[73].INT	The resources or contributions from the participating agencies shall be of the following type: - Company/institution - document - data - models - Information Systems	Need to provide a first list of resource type to be supported by the clearngihouse	N/A	Clearinghouse content definition
REQ[74].INT	The GEO clearinghouse shall interface to the GEO documents library for query and retrieval	The GEO documents shall be visible from all GEO relevant components	N/A	Clearinghouse interface definition
	The end user will see the set of descriptions as one homogeneous set of distributed repositories independently of their location and hosting organization.	Potential requirement extracted from body of RFI		
	The GEOSS Clearinghouse will provide a registry function for some of the registers currently under development in GEO.	Potential requirement extracted from body of RFI		
	The GEOSS Clearinghouse should anticipate the ability to perform distributed search of remote catalogues and the ability to harvest and cache metadata from certain distributed collections	Potential requirement extracted from body of RFI		