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# AIP-2 Use Cases GEOSS Architecture Implementation Pilot, Phase 2 Engineering Report

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# AIP-2 Use Cases

## 1. Introduction

### 1.1 Scope of this document

This AIP-2 Engineering Report (ER) describes a set of transverse technology Use Cases developed and applied in the GEOSS Architecture Implementation Pilot Phase 2 (AIP-2). Such Use Cases define reusable activities within a service-oriented architecture, tailored for the GEOSS environment. This report contains the general Use Cases that were specialized by community Working Groups to implement several specific Societal Benefit Area (SBA) Scenarios in AIP-2. The SBA Scenarios and specialized use cases are defined in separate AIP-2 ERs. This AIP-2 ER will be offered for consideration by the GEOSS Best Practice Registry editors and to OGC Technical Committee for consideration as a Best Practice.

### 1.2 GEOSS AIP

The GEOSS Architecture Implementation Pilot (AIP) leads the incorporation of contributed components consistent with the GEOSS Architecture using a GEO Web Portal and a Clearinghouse search facility to access services through GEOSS Interoperability Arrangements in support of the GEOSS Societal Benefit Areas. AIP is a GEO task for elaborating the GEOSS Architecture under the purview of the GEO Architecture and Data Committee.

This Engineering Report (ER) is a key result of the second phase of AIP. AIP-2 was conducted from July 2008 to June 2009. A separate AIP-2 ER describes the overall process and results of AIP-2 and thereby provides a context for this ER.<sup>1</sup>

### 1.3 Organization of this document

The following section introduces the role of the transverse technology use cases in GEOSS and how they support the reusable process described in the AIP-2 Summary Report ER. Section 3 describes the five categories of use cases developed and exercised in AIP-2, in addition to the system actors and the use case template. Section 4 highlights successful examples of using and specializing the use cases in AIP-2 and lists a mapping of the use cases to the GEOSS Common Infrastructure and Community Components as used in the AIP-2 scenarios. Sections 5, 6, 7, 8 and 9 describe the individual registration and harvesting, clients and portals, deployment and access, service testing and workflow use cases respectively.

## 2. Role of the Transverse Technology Use Cases in GEOSS

As with the Internet, GEOSS is envisioned as a global and flexible network of content and service providers enabling decision makers to discover, access and integrate an extraordinary range of earth observing related information within their applications. To achieve this vision, the GEOSS architecture must provide an easy and reusable process to leverage the GEOSS Common Infrastructure (GCI) and components in support of many SBA communities. The AIP defined and piloted such a process for using and augmenting the GEOSS Common Infrastructure to meet SBA community needs. The process applies a system modeling methodology based on international standards tailored specifically to the GEOSS environment.

The reusable process is based on implementing community-defined scenarios using transverse technology use cases. The community scenarios are narrative descriptions of SBA community needs with minimal discussion of the implementation architecture. Community scenarios serve to provide an end user view of the value of GEOSS to specific community needs. The transverse technology use cases, on the other hand, describe reusable functionality of the GEOSS service oriented architecture implemented through Interoperability Arrangements.

This document describes in detail the ten generalized use cases identified in AIP-2. Each generalized use case encompasses a unit of useful functionality and describes a set of actions performed by various system actors in

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<sup>1</sup> A listing of all AIP-2 Engineering Reports: <http://www.ogcnetwork.net/AIP2ERs>

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support of one or more actors or other stakeholders interacting with the system. Within AIP-2, several generalized use cases were refined and/or specialized as needed to meet specific SBA scenario requirements. The individual SBA ERs describe how the generalized use cases were used, refined and/or specialized.

The next section presents the categories and general descriptions of the generalized use cases as well as identifies the system actors participating in the use cases. Representative instances on how the use cases were refined/specialized in the AIP-2 community scenarios are presented in Section 4.

### 3. Use Cases Overview

#### 3.1 Categories and General Descriptions

In AIP-2, the transverse technology use cases supporting the community scenarios were grouped in five categories, as shown in Figure 1. The grouping of the use cases was based on supporting the end-to-end GEOSS process from resource deployment (02), registration (01) and harvesting (03) to discovery (04), access (05, 06) and exploitation (07) of resources enabled by infrastructure-support functionality such as workflow construction/processing (08), service testing (09) and interoperability arrangements management (10).

The development of each category of use cases was lead by an AIP-2 transverse technology working group in a collaborative and iterative process. The development of each category was coordinated across technology working groups to maintain the integrity of the end-to-end process with participation from AIP-2 community working groups to ensure alignment with GEOSS SBA community needs.

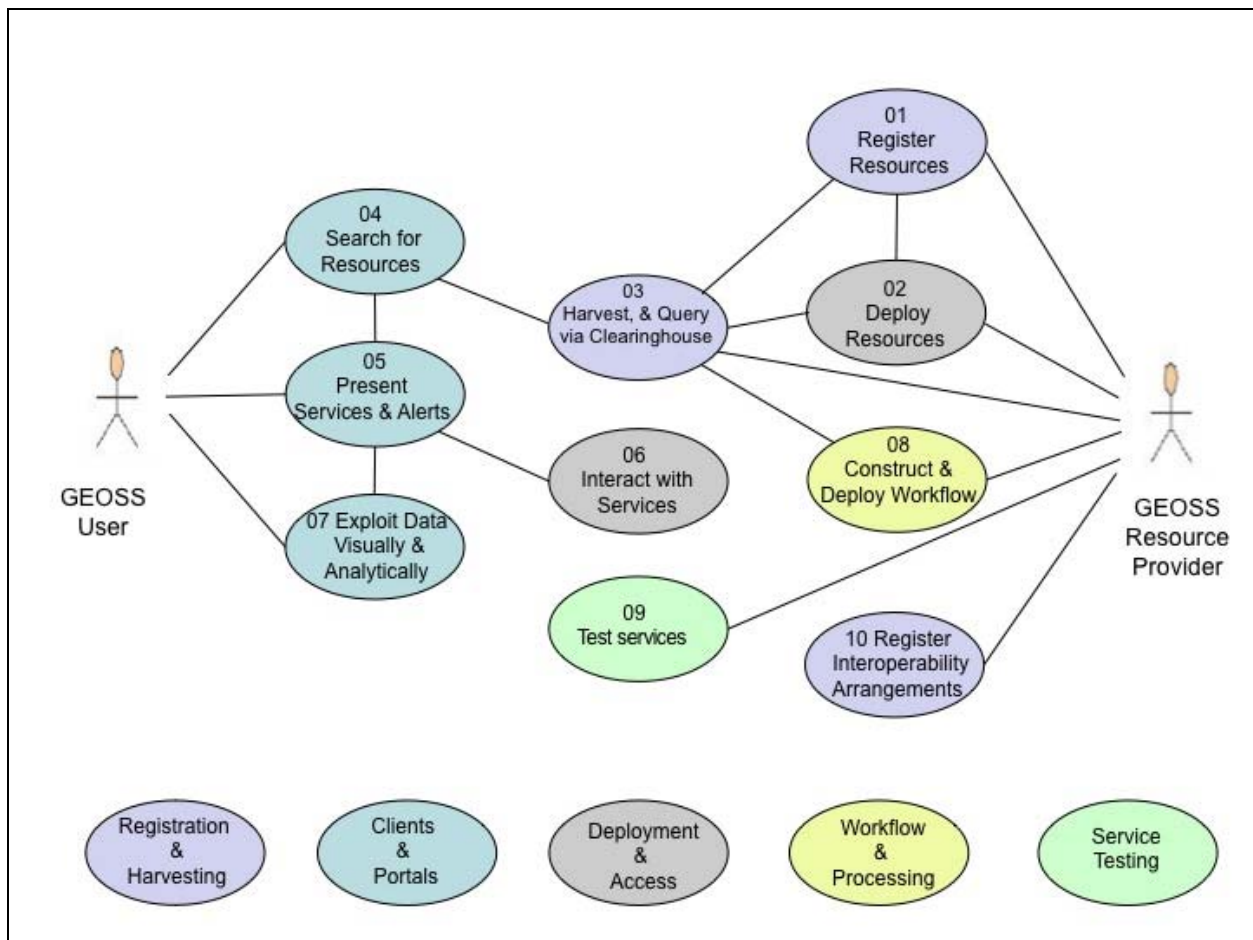


Figure 1 GEOSS Transverse Technology Use Cases

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### 3.2 Use Case Actors

Table 1 lists the major actors used in the transverse technology use cases. Each actor is matched with the use case(s) they initiated (indicated by a bold **I**) or participated/interacted in (indicated by an **X**). Depending on the use case, an actor represents a human user, software component or other subjects that interact with the use case.

	Register resources	Deploy resources	Harvest & Query	Search for resources	Present results	Interact with services	Exploit data	Construct & Deploy workflow	Test services	Register interop arrangement
<b>Service Provider</b>	<b>I</b>	<b>I</b>	X		X	X	X	X	<b>I</b>	<b>I</b>
<b>GEOSS CSR</b>	X	X	X				X		X	X
<b>Community Catalog</b>	X			X						
<b>GEOSS SIR</b>										X
<b>GEOSS SIF</b>									X	X
<b>GEOSS Clearinghouse</b>			<b>I</b>	X						
<b>Client Application</b>			X	<b>I</b>	<b>I</b>	<b>I</b>	<b>I</b>	X		
<b>GEOSS User</b>				<b>I</b>	X		X			
<b>Test Facility/Tool</b>									X	
<b>GEOSS Integrator</b>				X	X	X		<b>I</b>		

**Table 1 Actors in GEOSS Transverse Technology Use Cases**

Some actors were further defined in community scenarios to better represent those actors within the specific communities. For instance, the GEOSS user was represented by

- Air quality managers/analysts/forecasters/modelers in the Air Quality AIP-2 community scenario
- Investors/electricity producers/consulting companies/academic/research organizations in the Renewable Energy AIP-2 community scenario
- Scientists in the Climate Change & Biodiversity AIP-2 community scenarios

Similarly, the specific Client Application actor varied in the different scenarios as follows:

<b>AIP-2 Community Scenario</b>	<b>Client Application</b>
Air Quality	ESRI GeoPortal
Renewable Energy	Renewable Energy Community Portal
Pika Distribution (CC & Biodiversity)	IP2 Client Application
Polar Ecosystems (CC & Biodiversity)	Arctic community portal
Disaster Management and Response	GeoPortals, SIREN Disaster Response Portal, ERDAS Titan

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### 3.3 Use Case Template

The following use case template was used to describe the Transverse Technology Use Cases in this document.

Overview	
<b>Title</b>	[Title of the basic flow use case]
<b>Description</b>	[Short description of the basic flow]
<b>Actors and Interfaces</b>	[Identifies the Actors and Interfaces to components and services that participate in the use case]
<b>Initial Status and Preconditions</b>	[A pre-condition (of a use case) is the state of the system that must be present prior to a use case being performed]
Basic Flow	
STEP 1: ...	
STEP 2: ...	
Post Condition	
[A post-condition (of a use case) is a list of possible states the system can be in immediately after a use case has finished]	
Alternative Flow(s)	
[Alternative flows are described here if needed]	

## 4. Application of the Use Cases in AIP-2

Although developed specifically for leveraging the GEOSS Common Infrastructure and Community Components, the Transverse Technology Use Cases as defined and used in AIP-2 have been designed to remain general enough to be applicable for the wide range of SBAs and community scenarios. With this level of generality, it is expected that various use cases would require further refinement and/or specialization when used in specific scenarios, as experienced in AIP-2.

The refinement and/or specialization can take many forms, such as:

- When a community refines or further defines the use case actors for their community (as discussed earlier)
- When a community specializes a use case based on the specific technology or architectural needs/constraints of their scenario (as when the community elaborates on the generic Access use case to describe the steps for accessing specific types of services used in the community, such as Sensor Services or Web Coverage Services. Another example is when a community elaborates on the use of Web Accessible Folders as their primary community catalog representation)
- When a community refines a use case to better define the types of resources used in a scenario (as in specifying the types of air quality data/services needed for a particular scenario)

The above list can easily be infinite given the breadth and reach of GEOSS combined with the varying needs and advancements of the different SBAs. To help with future applications of the use cases described in this document, this section highlights some of the specialization instances developed in AIP-2 and maps the use cases to the GEOSS Common Infrastructure and Community Components as used in the AIP-2 scenarios.

### 4.1 Use Case Specialization Instances in AIP-2

The following table represents successful examples of specializing some of the use cases described in this document. This table is not a comprehensive listing of all the specialization instances encountered in AIP-2. For more



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information about each instance, the reader is referred to the specific Community Working Group ERs.

General Use Case	Specialization Instance
<b>Register resources</b>	- Portlet was registered as reusable resource in Renewable Energy scenario
<b>Deploy resources</b>	- JSR 168 portlet was deployed as reusable resource that can be integrated in conformant portal framework/container in Renewable Energy scenario - A specialized use case for deploying a netCDF-CF WCS was developed to support the AIP-2 testing phases (managed by the Air Quality Community WG)
<b>Harvest &amp; Query</b>	- Air Quality scenario and Renewable Energy scenario both used a Web Accessible Folder that was successfully harvested by the GEOSS Clearinghouse(s)
<b>Search for resources</b>	- The Floods Disaster Response scenario involved searching for specific RSS feeds as well as searching for resources in the ESA EO Clearinghouse (in addition to the GEOSS Clearinghouse) - The Pika distribution scenario introduced a brokering and mediation component that performed the search for resources on behalf of the Client Application
<b>Present results</b>	- The Floods Disaster Response scenario experimented with presentation of alerts (e.g. potential floods CAP alerts) - The Pika distribution scenario used the brokering and mediation component to prepare the presentation of results to the client
<b>Interact with services</b>	- The Renewable Energy scenario required interaction with WMS serving offering GeoTIFF outputs - The Floods Disaster Response scenario required interaction with WCS/SOS services as well as advertising SAS from a sensor node event/alert and configuring SAS with thresholds

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## 4.2 Mapping of Use Cases to AIP-2 GEOSS & Community Components

The following table maps the Use Cases described in this Engineering Report to the GEOSS Common Infrastructure (GCI) and community components exercised in AIP-2.

Use Cases in columns;	1. <a href="#">Register Resources</a>	2. <a href="#">Deploy Resources</a>	3. <a href="#">Harvest &amp; Query</a>	4. <a href="#">Search for Resources</a>	5. <a href="#">Present Results</a>	6. <a href="#">Interact Services</a>	7. <a href="#">Exploit Data</a>	8. <a href="#">Workflow</a>	9. <a href="#">Test Services</a>	10. <a href="#">Register Interop</a>
<b>Components in rows</b>										
Main Geo Web Site										
<b>GEOSS Common Infrastructure</b>										
GEO Web Portals			S	P	P	S	P			
GEOSS Clearinghouse			P	S						
<b>Registries</b>										
Components & Services (CSR)	P		P				S			S
Standards & Interop (SIR)	S	S								P
Best Practices Wiki		S								
User Requirements										
<b>Community Components</b>										
<b>Clients</b>										
Community Portals	S	P	S	P	P	S	P			
Client Applications		P	S	P	P	S	P	P		
<b>Business Processes</b>										
Community Catalogues	P	P	P	S					S	
Alert Servers		P			S	P	S		S	
Workflow Management		P			S	P	S	P		
Processing Servers		P			S	P	S	P	S	
Mediating Services				P	P	P	P	P		
Test Facility		P							P	
<b>Access</b>										
Product Access Servers		P			S	P	S	S	S	
Sensor Web Servers		P			S	P	S	S	S	
Model Access Servers		P			S	P	S	S	S	
GEONETCast										

P = Component plays a prominent role in the Use Case  
S = Component plays a secondary role in the Use Case

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## 5. Registration and Harvesting Use Cases

### 5.1 Register Resources

This use case describes the conditions and steps to register resources in the GEOSS Components and Services Registry (CSR) or in (registered) Community Catalogs. This use case is a pre-condition to the discovery and harvesting of resources through GEOSS Clearinghouses.

Overview	
<b>Title</b>	Register resources in GEOSS Components and Services Registry (CSR) or Community Catalog
<b>Description</b>	This use cases covers making information about a GEOSS resource known to the GEOSS community, and “findable” through a GEOSS Clearinghouse, by either registering the resource directly with the GEOSS CSR or registering a community catalog/metadata service in which the resource has already been registered.
<b>Actors and Interfaces</b>	# Service Provider # GEOSS Components and Services Registry (CSR) # Community Catalog Provider
<b>Initial Status and Preconditions</b>	# Service Provider has deployed an online resource of interest to GEOSS. For example: a data access service, a catalog, a model, an observation service or process (grid transformation or workflow). # Service Provider has registered their organization in the GEOSS CSR. # (Recommended) Community Catalog (incl. Web Accessible Folder) Provider has made their service available for resource description registration.
Basic Flow	
<p><b>Step 1:</b> Service Provider chooses between three alternatives:</p> <ol style="list-style-type: none"> <li>1. Determine the appropriate component and service types to describe the resource and register those directly in the CSR.</li> <li>2. Determine the appropriate component and service type for a metadata service / resource they have deployed and register that service in the CSR in lieu of registering individual resources directly.</li> <li>3. Register their resource in a community catalog that has already been registered (possibly by another organization) in the CSR.</li> </ol> <p>For Alternatives 1&amp;2:</p> <p><b>Step 2:</b> Service Provider chooses a component type and registers the component corresponding to their resource in the CSR.</p> <p><b>Step 3:</b> Service provider determines that metadata about their resource appropriate to the service type(s) it represents is available through one or more Web links.</p> <p><b>Step 4:</b> Service provider chooses one or more service types to represent their resource and registers them with appropriate metadata links and update logistics.</p> <p><b>Step 5:</b> Service Provider, when registering a resource with the CSR, can associate the standards and interoperability arrangements used with the resource. See Register Interoperability Arrangement Use Case.</p>	
Post Condition	

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The provided resource description or metadata holdings can be queried by a Clearinghouse and found by GEOSS users searching for useful resources.

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## 5.2 Register New Interoperability Arrangements

This use case describes the steps for adding references to standards or special interoperability arrangements in the GEOSS Standards and Interoperability Registry (SIR). This use case is jointly developed with the GEOSS Standards and Interoperability Forum (SIF).

Overview	
<b>Title</b>	Register, in the GEOSS Standards and Interoperability Registry (SIR), new and recommended interoperability arrangements) as well as utilized standards.
<b>Description</b>	This use case covers the action of closing the loop on interoperability practices and arrangements (standard and otherwise) that have been implemented for GEOSS. The arrangements are registered and moderated in the SIR both to provide more information on what has been implemented, and to provide other GEOSS participants with an arrangement choice for registering their own resources.
<b>Actors and Interfaces</b>	# Service Provider # GEOSS Components and Services Registry (CSR) # GEOSS Standards and Interoperability Registry (SIR) # SIF (Standards and Interoperability Forum) Moderator
<b>Initial Status and Preconditions</b>	# Service Provider has deployed an online resource of interest to GEOSS. For example: a data access service, a catalog, a model, an observation service or process (grid transformation or workflow). # Service Provider may have registered their resource to the GEOSS Components and Services Registry or to a community catalog / metadata service which is itself registered with GEOSS. # Service Provider wishes to register, for wider recognition and re-use, a particular interoperability arrangement that is implemented by their resource.
Basic Flow	
<p><b>Step 1:</b> Service Provider develops or locates a description or specification of the chosen interoperability arrangement.</p> <p><b>Step 2:</b> Service Provider publishes the new document to a Web accessible location or obtains an online link to an existing document.</p> <p><b>Step 3:</b> If the Service Provider is registering the service with the CSR, continue with Step 5.</p> <p><b>Step 4:</b> If the Service Provider is registering the interoperability arrangement with the SIR, continue with Step 6.</p> <p><b>Step 5:</b> Service Provider logs in, registering if necessary, at the CSR. While registering the service, Service Provider will request to also register the <b>interoperability</b> arrangement, which will result in the SIR entry form being made available at the CSR. Continue with Step 7.</p> <p><b>Step 6:</b> Service Provider logs in, registering if necessary, at the SIR.</p> <p><b>Step 7:</b> Service Provider will choose to submit a new interoperability arrangement, providing:</p> <ol style="list-style-type: none"> <li>1. Name (concise version of official title)</li> <li>2. Version</li> <li>3. Title</li> </ol>	

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<p>4. Description</p> <p>5. Author</p> <p>6. Publisher</p> <p>7. Primary Taxonomy Category</p> <p>8. Secondary Taxonomy Categories</p> <p>9. URL for the published document</p> <p>10. URN for the published document</p> <p>11. Type (Standard or Special Interoperability Arrangement)</p> <p>12. Comments</p> <p>13. Contact Details</p> <p><b>Step 8:</b> SIF evaluates the submission by Service Provider.</p> <p><b>Step 9:</b> If SIF approves submission, it will be accepted into the SIR. Continue with Step 11.</p> <p><b>Step 10:</b> If SIF does not approve submission, Service Provider will be contacted.</p> <p><b>Step 11:</b> DONE.</p>
<b>Post Condition</b>
<p>A new interoperability arrangement is available in the GEOSS SIR for all GEOSS participants. If it was registered via service registration it will be referenced by the Service Provider's service registration record. If it was registered at the SIR, then Service Provider will need to update the service record at the CSR to reflect its association with the registered interoperability arrangement.</p>
<b>Alternative Flow(s)</b>
<p><b>Alternative Step 7:</b> Service Provider registers the interoperability arrangement at the SIR</p> <p>7a. CSR obtains an updated list of GEOSS SIR entries.</p> <p>7b. Service Provider registers or updates their service at the CSR.</p> <p>7c. Service Provider chooses the new interoperability arrangement from the SIR entries within the GEOSS CSR client in order to properly characterize their resource.</p> <p>7d. Continue with Step 11.</p> <p><b>Alternative Step 10:</b> Service Provider is contacted by SIF to discussion interoperability arrangement submitted.</p> <p>10a. SIF works with the Service Provider to refine the interoperability arrangement and its documentation or to choose a better alternative arrangement.</p> <p>10b. Service Provider submits updated interoperability arrangement.</p> <p>10c. Continue with Step 8.</p>

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### 5.3 Harvest & Query via Clearinghouse

This use case describes the steps for harvesting and/or querying service or content metadata from community catalogs or services via a Clearinghouse.

Overview	
<b>Title</b>	Harvest and Query Metadata via GEOSS Clearinghouse
<b>Description</b>	This use case describes the steps for harvesting and/or querying service or content metadata from community catalogs or services via a GEOSS Clearinghouse.
<b>Actors and Interfaces</b>	# Service Provider # GEOSS Common Infrastructure Registry # GEOSS Clearinghouse # Client Application
<b>Initial Status and Preconditions</b>	# Service Provider has deployed an online resource of interest to GEOSS. For example: a data access service, a catalog, a model, an observation service or a process (grid transformation or workflow) or information resource. The resource may also be a service client (online browser client generator or downloadable software component).  # Service Provider has published online resource description metadata by registering their service either with the GEOSS CSR "or" in a metadata service (e.g. Community Catalog, Web Accessible Folder) which in turn has been registered in the GEOSS CSR.
Basic Flow	
<p><b>Step 1:</b> GEOSS Clearinghouse queries GEOSS CSR for registered components and services.</p> <p><b>Step 2:</b> GEOSS Clearinghouse extracts from the CSR response the harvest policies and online metadata service links for CSR registered resources.</p> <p><b>Step 3:</b> For resources that are metadata services or provided metadata links, GEOSS Clearinghouse harvests all or part of the available metadata holdings (recommended).</p> <ol style="list-style-type: none"> <li>1. The community catalog permits harvesting and holds less than 10000 records. GEOSS Clearinghouse harvests all of the holdings and periodically updates them according to the registered frequency of change.</li> <li>2. The community catalog / metadata service does not permit bulk harvesting and/or holds more than 10000 records. GEOSS Clearinghouse harvests collection records (aggregate summary) as criteria for dynamically cascading queries to the Clearinghouse from users to the service</li> </ol> <p><b>Step 4:</b> For resources that are other than metadata services, GEOSS Clearinghouse harvests the service getCapabilities or equivalent resource description and any additional metadata references provided therein. The Clearinghouse assembles as complete as possible a set of discovery metadata records from this information according to its familiarity with that particular service type.</p> <p><b>Step 5 (Optional):</b> Service Provider issues a manual request to GEOSS Clearinghouse to re-harvest and update metadata sooner than indicated by its registered harvest policy.</p>	
Post Condition	
The GEOSS Clearinghouse is prepared to accept and process resource discovery queries from Client Applications.	

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## 6. Clients and Portals Use Cases

### 6.1 Search for Resources

This use case describes the conditions and steps for portals and application clients to support the GEOSS user in searching for resources of interest via the GEOSS Clearinghouses or Community Catalogs. This use case is a precondition to the Present Reachable Services and Alerts use case.

Overview	
<b>Title</b>	Search for Resources via GEOSS Clearinghouse(s) or Community Catalog(s)
<b>Description</b>	This use case describes the conditions and steps for portals and application clients to support the GEOSS user in searching for resources of interest via the GEOSS Clearinghouse(s) or Community Catalog(s).
<b>Actors and Interfaces</b>	<ul style="list-style-type: none"> <li># GEOSS User</li> <li># Client Application (GEO Portal, Community Portal, Desktop Application, Portlet, etc)</li> <li># GEOSS Clearinghouse</li> <li># Community Catalog</li> </ul>
<b>Initial Status and Preconditions</b>	<ul style="list-style-type: none"> <li># GEOSS User is looking for information of value to task at hand</li> <li># Client Application has been developed and is available for use</li> <li># Resources' metadata has been successfully harvested in GEOSS Clearinghouses (either directly or via registration in a Community Catalog)</li> </ul>
Basic Flow	
<p><b>Step 1:</b> Client Application requests capabilities of catalogs of interest (GEOSS Clearinghouse and/or Community Catalogs) to determine the protocol needed to search for resources (e.g CSW 2.0.2 or Z39.50) and the queryable elements of each as needed. Alternatively, the Client Application knows a-priori the protocol needed to interact with catalog(s)/clearinghouse(s) of interest</p> <p><b>Step 2:</b> Client Application presents GEOSS User with search criteria based on queryable properties of selected catalogs</p> <ul style="list-style-type: none"> <li>- Simple keyword search and area of interest/bbox search</li> <li>- Advanced search parameters such as organization, catalogs to be searched, societal benefit areas, resource type, etc</li> <li>- More specific earth-observation criteria such as sensor row/path, collection, subsetting/ordering and/or delivery mechanisms, etc</li> <li>- Value-added and/or domain/community specific search capabilities such as thesaurus matching, cluster matching, etc</li> </ul> <p><b>Step 3:</b> Based on user selections, Client Application constructs query to each selected catalog and the ResultSet is returned and presented to the user with application-specific options (such as total number of results, basic information about each result, grouping of results, etc)</p> <p><b>Step 4:</b> GEOSS User selects resources of interest for evaluation and/or use.</p>	
Post Condition	
The Client Application has retrieved the necessary metadata to present the GEOSS User with information	



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on discovered resources matching the search criteria for further evaluation and/or use.

## 6.2 Present Reachable Services and Alerts

This use case describes the conditions and the steps for portals and application clients to present the GEOSS User with the reachable services and alerts as returned by the GEOSS Clearinghouse(s) and/or Community Catalog(s) per the user's search criteria.

Overview	
<b>Title</b>	Present GEOSS User with Reachable Services and Alerts
<b>Description</b>	This use case describes the conditions and steps for portals and application clients to present the GEOSS User with the reachable services and alerts as returned by the GEOSS Clearinghouse(s) and/or Community Catalog(s) per the user's search criteria.
<b>Actors and Interfaces</b>	<ul style="list-style-type: none"> <li># GEOSS User</li> <li># Client Application designed to support the presentation of the selected services and/or alerts of interest (including GEO Portal, Community Portal, Desktop Application, Portlet, etc)- Note that a GEO Portal may act as a client only to a reduced set of services.</li> <li># GEOSS Service Providers</li> </ul>
<b>Initial Status and Preconditions</b>	<ul style="list-style-type: none"> <li># GEOSS User has discovered and/or selected services or alerts of interest</li> <li># Client has established reachability of discovered registered services or alerts (e.g. Client has established that the services of interest are running and responding to requests)</li> <li># Client can support the presentation of the selected services or alerts of interest</li> </ul>
Basic Flow	
<p><b>For OGC Services</b></p> <p><b>Step 1:</b> Client issues GetCapabilities request to receive further metadata about the service</p> <p><b>Step 2:</b> Depending on the type of service, the Client presents the GEOSS User with more information on the service offerings such as layers, features, coverages, sensor parameters, portrayal rules, etc served by the selected service</p> <p><b>Step 3:</b> The GEOSS User can choose to get additional information about each offering (if available via DescribeFeature, DescribeCoverage, DescribeSensor, etc)</p> <p><b>For Alert Services</b></p> <p><b>Step 1:</b> The GEOSS User is presented with subscription options (e.g. frequency of alerts, geographic extent, etc)</p> <p><b>Step 2:</b> The GEOSS User can choose subscription options</p> <p><b>Step 4:</b> After selection of resources, Client provides options for downloading/exploring resources (files, documents, websites), displaying alerts, viewing resources in the case of OGC Web Services, and/or parameterizing and executing workflows.</p>	
Post Condition	
The Client Application has an information representation for the GEOSS User to use for interacting with reachable services and alerts of interest.	

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### 6.3 Exploit Data Visually and Analytically

This use case describes the conditions and steps for exploitation of datasets served through Web Services and online protocols.

Overview	
<b>Title</b>	Exploit Data Visually and Analytically
<b>Description</b>	This use case describes the conditions and steps for exploitation in Client Applications of datasets served through Web Services and online protocols as used within GEOSS.
<b>Actors and Interfaces</b>	<ul style="list-style-type: none"> <li># GEOSS User</li> <li># GEOSS Components and Services Registry (CSR)</li> <li># GEOSS Service Providers</li> <li># Client Application (GEO Portal, Community Portal, Desktop Client, Portlet, etc)</li> </ul>
<b>Initial Status and Preconditions</b>	<ul style="list-style-type: none"> <li># GEOSS User has selected discovered Services or Alerts and is now ready to use the data accessible via the those services for further exploitation, visualization and/r analysis</li> <li># Client was able to successfully bind to selected Services or Alerts</li> <li># Client can support visual and/or analytical exploitation of data</li> </ul>
Basic Flow	
<p><b>Step 1:</b> Client follows Access Services Use Case to access data of interest from selected Services or Alerts of interest</p> <p><b>Step 2:</b> Client provides GEOSS User with exploitation options (processing, classification, comparison, advanced visualization, terrain modeling, etc) and their parameters (resolution, format, bands, etc). Specialized and community-specific exploitation options go here.</p> <p><b>Step 3:</b> Client presents GEOSS User with results of exploitation (e.g. via 3D visualization, graphs, coverages, media, etc)</p> <p><b>Step 4:</b> Client presents GEOSS User with options to save, share or register results</p> <p style="padding-left: 40px;">Registration of results as new resources in GEOSS is executed as described in the Register Resources Use Case. The results may be registered as model outputs, new coverage/layer in existing WCS/WMS, context document, KML, etc.</p>	
Post Condition	
<ul style="list-style-type: none"> <li># Client application provided GEOSS User with necessary tools to successfully exploit GEOSS resources in support for decision making task at hand</li> <li># GEOSS User has the option to register selected exploitation results as GEOSS resources in the CSR (assuming GEOSS User has sufficient metadata to meaningfully describe the new resources)</li> </ul>	

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## 7. Deployment and Access Use Cases

### 7.1 Deploy Resources

This use case describes the conditions and steps to configure and deploy a component with associated service interfaces, in order to make a resource accessible and usable within GEOSS. This use case is a precondition to the Interact with Services Use Case.

Overview	
<b>Title</b>	Deploy Resources for use in GEOSS
<b>Description</b>	<p>This use case identifies many of the aspects that are, or should be, common to all or multiple Web Services interface Implementation Specifications. It refers notably to the OGC Web Services Common document, OGC Web Map Service (WMS), Web Feature Service (WFS), and Web Coverage Service (WCS), but shall encompass as well OpenDAP and W3C W*S. Web Services common aspects include: service operation request and response encoding; and parameters included in operation requests and responses.</p> <p>This use case also deals with best practices for readying the service for registration in the GEOSS CSR, ensuring proper service discovery, retrieval, and testing by the GEOSS communities of practice.</p>
<b>Actors and Interfaces</b>	<p># GEOSS Service Provider</p> <p># GEOSS Components and Services Registry (CSR)</p>
<b>Initial Status and Preconditions</b>	# GEOSS Service Provider has a resource of interest for GEOSS. For example: a model, an observation or another process (grid transformation, workflow...)
Basic Flow	
<p><b>Step 1:</b> Service Provider identifies then implements the best available Web Service standard (OGC, W3C...) to make its resource available on GEOSS (based on best practices for that type of data, plus availability and familiarity of software tools)</p> <p><b>Step 2:</b> Service Provider configures or validates all the information about its Service interface as provided in the service Capabilities document:</p> <ul style="list-style-type: none"> <li>- Service Type, Version, Title and Abstract, Supported Languages</li> <li>- Contact information (service provider POC)</li> <li>- Supported service operations request and response encodings</li> <li>- Contents: layer names and titles</li> <li>- Domains of validity (dimensions, units, range, scales, reference systems)</li> </ul> <p><b>Step 3:</b> Service Provider is ready to register the Component and associated Service interfaces to the GEOSS CSR (as described in the Register Resources Use Case). Metadata about the service (ISO 19139) is generated automatically from the service. Often, additional information (e.g. metadata not found in the getCapabilities) also needs to be added</p>	
Post Condition	
<p># The following information about a Service is available for registration (ideally, each piece of information is associated with a Uniform Resource Identifier URI)</p> <ul style="list-style-type: none"> <li>- Service getCapabilities URL</li> </ul>	

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- Service type (WMS, WCS, SPS, etc)
- Type of procedure (model, sensor/platform, etc)
- Input (e.g. phenomena, configuration variables, etc)
- Output (e.g. phenomena, file, etc)

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## 7.2 Interact with Services

This use case describes the conditions and steps to interact with a Service Instance within GEOSS. This use case can be specialized to support a variety of GEOSS services and resources such as Sensor Planning Service, Ordering Service, Models, Sensor Observation Service, WCS over netCDF, WMS Cascading, WFS Simple, CAP Alerts atompub Service, etc.

Overview	
<b>Title</b>	Interact with Services
<b>Description</b>	This use case describes many of the aspects that are common to OGC Web Services (WFS, SOS, WCS, WMS). These common aspects are primarily some of the parameters and data structures used in operation requests and responses.
<b>Actors and Interfaces</b>	# GEOSS Service Provider # Client Application (GEO Portal, Community Portal, desktop application, etc)
<b>Initial Status and Preconditions</b>	# The server is deployed and configured for serving data according to some standardized dataset schemas and some data encodings. # A GetCapabilities operation has been performed by a client application to retrieve metadata about the service operations and the resources provided by the server (OWSContents).
Basic Flow	
<b>Step 1:</b> Service receives a Describe(resource) request	
<b>Step 2:</b> Services sends a response describing the content offerings of each queried resource	
<b>Step 3:</b> Service receives a Get(resource) request with parameters set by the client from the content offerings response	
<b>Step 4:</b> Service sends a response with the resource content matching the selected content offering	
Post Condition	
# The following information from a Service interaction must be available <ul style="list-style-type: none"> <li>- Service title, keywords, typeVersion, fees, accessConstraints, providerName &amp; contactInfo, requestMethods, exceptionHandlingMethods</li> <li>- Resources names, keywords, CRS &amp; boundingBox, metadata links, supported languages</li> </ul>	

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## 8. Service Testing Use Cases

The Service Testing Use Cases describe the conditions and steps to test services for conformance and quality of service. Such testing may occur before or after services are registered. The use case assumes that the future Service Provider has developed a service following the appropriate interoperability arrangements and has made the service accessible through a URL. More information on Service Testing is available in the GEOSS AIP-2 Testing Engineering Report.

Overview	
<b>Title</b>	Test Services
<b>Description</b>	Service Provider tests its service using a proper Test tool discovered in the GEOSS CSR.
<b>Actors and Interfaces</b>	# GEOSS Service Provider # GEOSS CSR # Test Facility/Tool # GEOSS Relevant Standards Authority
<b>Initial Status and Preconditions</b>	# The Test Facility shall be registered in GEOSS and shall be available # The Service Provider shall make available the Service to be tested through a URL
Basic Flow	
<p><b>Step 1:</b> Service Provider puts the Service to be tested on a reachable and available server</p> <p><b>Step 2:</b> Service Provider accesses the GEOSS CSR to search for a Test Facility/Tool matching the type of Service to be tested (e.g. WMS Service)</p> <p><b>Step 3:</b> Service Provider browses the search results and checks the details of registered Test Facilities/Tools. Optionally, the Service Provider can access the instructions on how to use Test Facilities/Tools of interest</p> <p><b>Step 4:</b> Service Provider selects and accesses a Test Facility/Tool and if necessary (and/or not previously done), the Service Provider registers in the Test Environment as a Service Provider</p> <p><b>Step 5:</b> Service Provider logs into the Test Environment</p> <p><b>Step 6:</b> For a WMS, the Service Provider fills the WMS form for the GetCapabilities request, providing the URL of the service to be tested and the other necessary parameters</p> <p><b>Step 7:</b> The Test Tool sends an XML GetCapabilities request to the service to be tested and receives back an XML response</p> <p><b>Step 8:</b> The Test Tool performs the testing and providers results to the Service Provider</p> <p><b>Step 9:</b> In case of problems (e.g. immature or emerging interoperability arrangement), the Service Provider has the option of providing feedback to the Test Facility Provider. The Test Facility Provider can provide feedback to the relevant GEOSS Standards Authorities after further analysis</p>	
Post Condition	
<p># The following information about a test must be available</p> <ul style="list-style-type: none"> <li>- Results of the test (received by the Service Provider)</li> <li>- Issues on the usage of the Test Facility/Tool</li> </ul>	

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- |  |
|--|
| - Reports of issues regarding immature or emerging interoperability arrangements |
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## 9. Workflow Use Cases

The workflow use cases describe the conditions and steps to configure and deploy workflows, consisting of one or more services. Detailed information on configuring, constructing, deploying and using workflows is available in the GEOSS AIP-2 Workflow and Processing Engineering Report. For the case of BEL, the Engineering Report includes information about two designing approaches: one for the concrete BPEL workflow that can be designed using standard BPEL designer such as the Oracle BPEL designer; and one for the abstract model which can be instantiated through an instantiation service to create the workflow on the fly.

Overview	
<b>Title</b>	Construct and Deploy Workflow
<b>Description</b>	This use case aims at capturing the alternative approaches to design, deploy and execute a workflow. The workflow can be described in Business Execution Language (BPEL), Sensor Markup Language (SensorML), or any other script language.
<b>Actors and Interfaces</b>	# GEOSS Integrator # Client Application # Service Provider
<b>Initial Status and Preconditions</b>	# Data: data or observations from sensors are available in rudimentary format and projection. Further processing is required to generate useful information for decision-makers  # Algorithms: Algorithms are available as geospatial Web Processing Processes that can be re-used in different workflows  # Web Services: Web Services to be used in the workflow are available and compliant with GEOSS interoperability arrangements
Basic Flow	
<p><b>Step 1:</b> GEOSS Integrator designs the Web Processing Service using a BPEL designer. The workflow can embed the steps to inject the results into standard, persistent storage services through their transaction capabilities (e.g. WCS-T or WFS-T)</p> <p><b>Step 2:</b> GEOSS Integrator deploys the workflow into a BPEL engine. The workflow can be registered as a GEOSS resource following the Use Case Register Resources</p> <p><b>Step 3:</b> Client Application executes the workflow via the Web Processing Service interface</p>	
Post Condition	
<p># Data is served through geospatial web services using GEOSS interoperability arrangements</p> <p># A composite service (or workflow) is available as a Web Processing Service and can be executed</p>	



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## 10. References

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- Usage of use cases in community scenarios <https://sites.google.com/site/geosspilot2/Home/scenario-use-case-matrix>
- AIP-2 Enterprise Modeling <https://sites.google.com/site/geosspilot2/Home/enterprisemodeling>
- AIP-2 Engineering Reports <http://www.ogcnetwork.net/AIP2ERs>

AIP-2 OGC Network Site <http://www.ogcnetwork.net/AIP2develop>

- AIP-2 Working Groups <http://www.ogcnetwork.net/AIP2develop#AIP2WGs>

GEO Web Portals [http://www.earthobservations.org/gci\\_gp.shtml](http://www.earthobservations.org/gci_gp.shtml)

GEOSS Architecture Implementation Pilot (Task AR-07-02) <http://www.ogcnetwork.net/node/244>

AIP-2 Call for Participation <http://www.ogcnetwork.net/AIPphase2CFP>

- Responses <http://www.ogcnetwork.net/node/395>
- Analysis of responses <http://www.ogcnetwork.net/node/402>