
# Renewable Energy Scenario Engineering Report
# GEO Architecture Implementation Pilot, Phase 2
# GEOSS Architecture Implementation Pilot, Phase 2

**Version <Final>**

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## Revision History

| Version | Date | Editor and Content providers | Comments |
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| 01. | <15/06/09> | Lionel Menard, Lucien Wald | Draft Version |
| 02 | <20/07/09> | Lionel menard | Add contents and graphs |
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| Final | <26/08/09> | Lionel Menard | Correct activity and component diagrams |

## Document Contact Information

If you have questions or comments regarding this document, you can contact:


| Name | Organization | Contact Information |
|---|---|---|
| Lionel Menard | Mines ParisTech | lionel.menard@mines-paristech.fr |

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# Renewable Energy Scenario

## 1. Introduction

### 1.1 Scope of this document

This AIP-2 ER illustrates an end-to-end scenario between a data provider on the one hand and a consulting company looking for the best place to sit a solar power plant on the other hand. Both benefit from GEOSS as a centralized point of access. The needs of the data providers looking for an efficient dissemination of his databases are expressed. The necessary concepts, steps, tools and actions needed on the data providers side to ensure that resources copes with the various GEOSS use cases allowing a full search, discovery and bind mechanisms are described. From W3C Web Service deployment, building INSPIRE ISO 19119 Metadata for WAF (Web Accessible Folder) catalogue, registering components and services in the GEOSS Service Registry, all the necessary steps towards data and catalogue interoperability are detailed. A dedicated Community Portal for Renewable Energy (www.webservice-energy.org) is currently hosting numerous Web Services for the goods of the community. A dedicated client specially build for the scenario as a JSR-168 Portlet is presented. This client allows Web Services chaining from remote interoperable map resources of GEOSS data providers. Based on a real business use case, the needs of the consulting company are also expressed within the scenario and illustrate the usefulness of GEOSS.

### 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 Community SBA ER.[1]

[1] A listing of all AIP-2 Engineering Reports: http://www.ogcnetwork.net/AIP2ERs

## 2. Community SBA Objectives

Renewable Energy Sources (RES) such as solar and wind energy offer a large untapped potential for electricity production. The exploitation of these energies requires accurate knowledge of the resources and of their availability (in space and time) in the different phases of an energy system life cycle. For instance, the site selection process for development of large solar systems, such as photovoltaic (PV) on open land, require data on time-averaged values of solar irradiance from which basic economic assessments of a plant concept can be made.

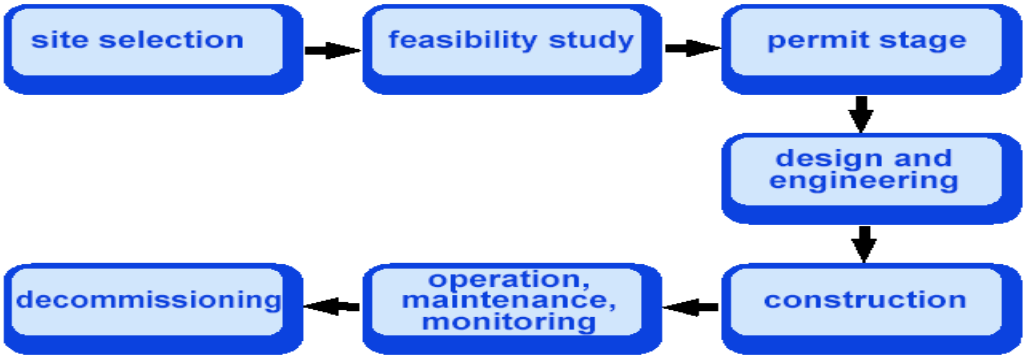


**Figure 1 – Life-cycle of an energy system**

Several studies funded by ESA and the Energy Community of Practices of the GEOSS initiative, stress out that meteorological data are mandatory for each step of energy system life-cycle, and that satellite-derived information is instrumental. Other types of data are also needed depending on the step that could be derived from EO.

To better harness renewable energy sources, consultants need an easy and unified access to data sets. Such data sets include meteorological, geographical and environmental parameters. The scenario intends to demonstrate how Earth observation data can be exploited in this context, to set-up a series of Web Services that implement key features in Earth observation data exploitation and to illustrate their use through a complex application in the sitting of a solar power plant. In general, the scenario builds on GEOSS facilities to achieve connections to facilitate movement of data, applications and information between actors and development of interoperable tools towards persistent exploitation. The end goals of the scenario is to demonstrate the potentials of the interoperability of EO sources and to implement in the collaborative service SoDa, services exploiting the demonstrated components in a sustainable form.

The community that participates to the scenario is composed of research institutes and data providers (Mines ParisTech, DLR, NASA, U. Colombia), consulting companies (Meteotest, Lahmeyer), electricity producers (EdF) and policy makers (JRC of the European Commission).

# 3. Scenario

## 3.1 Actors

As we've written down this proposal as an end-to-end scenario, we address various types of actors. Let's start from the demand side. The Renewable Energy demand actors are investors and/or electricity producers, consulting companies as well as academic and research bodies looking for a reliable, thorough, up-to-date and quality check RE related information for their daily business and/or scientific and academic activities. On the provider side, the data and application provider is looking for the most efficient way to provide access to his/her data, to promote them and to monitor user access in order to build the most efficient dissemination strategy. In between the GEOSS portal integrator is identify as the point of contact for both data provider like for example for specific application deployment and at a lesser extent for Web portal information integration towards the GEOSS Web portal end users.

## 3.2 Context and pre-conditions

Specific information is needed before the scenario begins. Firstly we need the various layers that must be accessible in an interoperable manner. Layers have been divided in two sections. The first section called "core layers" address essentially solar radiation related datasets as they are the foundation of the consulting company business request. This core layers include the following resources:

- Meteorological data (derived from the Earth observation Meteosat satellite family) including:
  - Time-series of irradiance in W/m² (databases HelioClim)
- Geographical data (where additional parameters will be extracted) including:
  - SRTM (Shuttle Radar Topography Mission) for altitude and shadow
  - HYDRO 1K / GTOPO 30 for slopes

The second section of layers that we've called "optional layers" contribute to the completion of the scenario without being mandatory. This includes Environmental data such as:

- Various environmental layers coming from DEMIS including stream, rivers land use, build-up area, roads,….
- Maps of risks and hazards (CIESIN / World coverage)

Secondly a list of specific processing for enabling GEOSS search and discovery must be achieved before the scenario begins:

- Deploying Web Services (Use Case number 02)
  - Web Services using GEOSS standards recommendation must be deployed allowing interoperable access to the above mentioned data sets
- Metadata and Catalogue creation (Use Case 03)
  - Make use of the on-line INSPIRE Metadata Editor to create ISO 19119 Metadata for each WSDL Web Services and Specific Application Clients (JSR-168 Portlet)
  - Create a Web Accessible Folder (WAF) in the www.webservice-energy.org Community Portal to host Metadata files
- Registering to GEOSS (Use Case number 01)
  - The WAF containing Metadata must be register in the GEOSS Registry
  - Metadata files will be harvested by GEOSS compliant tool to be part of the GEOSS Catalogue for search and discovery facilities
- Specific application GUI development and GEOSS portal integration

- Build and deploy specific application client (JSR-168 Portlet) allowing end user to select the area of interest and to retrieve the layers that are needed
- Promote this standard client to a broader audience by allowing it to be display inside the GEOSS portal

### 3.3 Scenario Events

In order to provide any valuable results to the various GEOSS service consumers from the Renewable Energy domain (like Investors and consulting companies), some preliminary actions are mandatory regarding GEOSS service providers actors:

- Data Provider (operates a contributing Web Service)
- Application Provider (operates the RE Web Services)
- GEOSS Portal integrator

**Table 1 – Steps in the Renewable Energy Scenario**

<table>
<tr><th>Step</th><th>Description</th><th>Trans. Tech<br>Use Case</th></tr>
<tr><td>1</td><td>Components are deployed as W3C Web Services by the Application Provider at the Renewable Energy Communty Portal (www.webservice-energy.org). They allow access to various "core" layers such as maps for:<ul><li>DNI (Direct Normal Irradiance) from HelioClim 3 database</li><li>Shadows, Slopes, and Altitude from STRM database</li></ul>Other "optional" layers provided by Data Provider partners, implementing GEOSS interoperability arrangement (WMS), can be nested to fulfill a scenario. This includes:<ul><li>Hydro Network</li><li>Electric Network</li><li>Gazetteer</li><li>Land Use</li><li>Protected Area</li><li>Risks & Hazard</li></ul></td><td>
<table>
<tr><th>N°.</th><th>Name</th><th>Desc.</th></tr>
<tr><td>02</td><td>Deploy Components and Services</td><td>Configure and deploy a component with associated services</td></tr>
<tr><td>01</td><td>Register Resources</td><td>Register resources in the GEOSS OCS Registry</td></tr>
</table>
<table>
<tr><th>N°.</th><th>Name</th><th>Desc.</th></tr>
<tr><td>06</td><td>Interact with Services</td><td>Activity of consuming services for datasets, sensors, models, workflows, etc</td></tr>
</table>
</td></tr>
<tr><td>2</td><td>To implement the "search and discovery" process of such data in the GEOSS Portal, Metadata and catalog must have been defined by the Data Provider to describe candidate resources.<br>An approach using ISO 19119 Metadata describing W3C WSDL Web Service has been chosen for the core layers. For each Web Service a corresponding Metadata file is build using the INSPIRE on-line tool for building Metadata and Catalog (http://www.inspire-geoportal.eu/inspireEditor.htm) .<br>Each file is stored in a Web Accessible Folder (WAF) accessible by the GEOSS Crawlers at a Renewable Energy Community Portal (www.webservice-energy.org/metadata).</td><td>
<table>
<tr><th>N°.</th><th>Name</th><th>Desc.</th></tr>
<tr><td>03</td><td>Publish, Harvest, and Query Metadata via Clearinghouse</td><td>Develop and publish metadata at appropriate levels of detail. Harvest and/or query metadata from community catalogues</td></tr>
</table>
</td></tr>
</table>

| | | |
|---|---|---|
| 3 | Providing an easy access to the above mentioned data is a key component of the RE Scenario.<br><br>Accordingly it is considered to develop a graphical client as a form of a Portlet (JSR-168). This Portlet is already deployed at the RE Community Portal (project.mesor.net), and can be deployed at other GEOSS Portal Candidate platforms, supporting such Portlet mechanism.<br><br>The Portlet will provide the user with a graphical Geolocalisation map mechanism (Google Map API) for AOI (Area Of Interest) selection and extra form for selecting the map size, and the list of desired optional layers.<br>As a result the Portlet will provide an archive (kmz file) of the core layers and the selected optional layers as a form of geo-referenced raster files (GeoTIFF).<br><br>The JSR-168 Portlet is not yet in the list of GEOSS Standard component though this topic is still active in the AIP Team. This does not yet prevent to register it as a GEOSS component to make it visible within the GEOSS Portal search.<br><br>Taking into account such new component in the framework of GEOSS standard must be discuss and further validated in the SIF (Standars & Interoperability Forum). | <table><tr><th>N°.</th><th>Name</th><th>Desc.</th></tr><tr><td>02</td><td>Deploy Components and Services</td><td>Configure and deploy a component with associated services</td></tr></table> |
| 4 | Deploying such Portlet to the GEOSS Portal currently need manual process from both Specific Application Provider and GEOSS Portal Integrator. In our example we wish to provide a AOI selection through a Google Map Mashup. The GEOSS Portal Integrator will either need to change the Google API Key to match the GEOSS portal domain name or he will need to provide it to the Specific Application Provider. In any case manual deployment of the Portlet will (at least for now) will be necessary. | <table><tr><th>N°.</th><th>Name</th><th>Desc.</th></tr><tr><td>02</td><td>Deploy Components and Services</td><td>Configure and deploy a component with associated services</td></tr></table> |
| 5 | The investor asks a consulting company for a study given geographical area. | |

| | | |
|---|---|---|
| 6 | The consulting company wants to obtain the necessary information and puts requests to the GEOSS portal | **N°.** / **Name** / **Desc.**<br>04 — Client Search of Metadata — Search for resources in Registry, Clearinghouse and Community Catalogs<br>05 — Presentation of Reachable Services & Alerts — User presentation of information about available services, workflows, and alerts |
| 7 | Among the result for his specific request, the consulting company select and invokes the specific application. | **N°.** / **Name** / **Desc.**<br>05 — Presentation of Reachable Services & Alerts — User presentation of information about available services, workflows, and alerts<br>06 — Interact with Services — Activity of client to consume services for datasets, sensors, models, workflows, etc |
| 8 | The specific application invokes various web services providing access to map based layers. The "core" services trigger W3C WSDL based Web Service. For "optional" layers at least two WMS Web Services resources is already identified (CIESIN, DEMIS) providing Hazards, Population Density, Natural Disaster, Human Footprint,... layers. | **N°.** / **Name** / **Desc.**<br>06 — Interact with Services — Activity of client to consume services for datasets, sensors, models, workflows, etc |
| 9 | The specific application packs the layers as an archive file (kmz) and deliver it to the consulting company. | **N°.** / **Name** / **Desc.**<br>06 — Interact with Services — Activity of client to consume services for datasets, sensors, models, workflows, etc |
| 10 | The consulting company retrieves the archive, performs the study by exploiting the retrieved information and its own models and reports to the investor. | **N°.** / **Name** / **Desc.**<br>07 — Exploit Data Visually and Analytically — Use portals and clients to present data in useful ways for interpretation and decision support |
| 11 | The investor takes a decision | |

Legend:
AIP-2 Services in green
AIP-2 Products in red
AIP-2 Actors in orange

### 3.4 Post-Conditions

As this scenario triggers various data sets from various data providers each of them holding parts of the final delivery archive, the system can either provide the full set of layers asked by the users or a subset according to Web services availability. The system will not be locked if a data set is missing. No feedback status of the availability of the selected layers for the end-user are provided yet.

### 3.5 Special Requirements

N/A

# 4. System Model of the Scenario

The enterprise viewpoint describes the business requirements for the Facility Management and decision support using GEOSS-2 without specifying the technology or other system considerations.
The Enterprise View defines use cases for Facility Management, using Object Management Group's Unified Modeling Language (UML). The sections that follow the Overview Use Case Diagram are organized by use case and describe the series of processes for each use cases. The processes are defined by activity diagrams, and are currently limited in scope to only the Wildfire scenario.

## 4.1 Overview Use Case Diagram

A use case diagram describes the behaviors and dynamics of the system being modeled, and is composed of a component boundary, use case name, external actors and their relationships. Within the use case diagram, actors are represented as person stick figures, and use cases are shown as bubbles.

The following diagram presents the overview use case diagram for Facility Management. It identifies the use cases that comprise Facility Management and decision support using GEOSS-2 and the high level relationships between them.

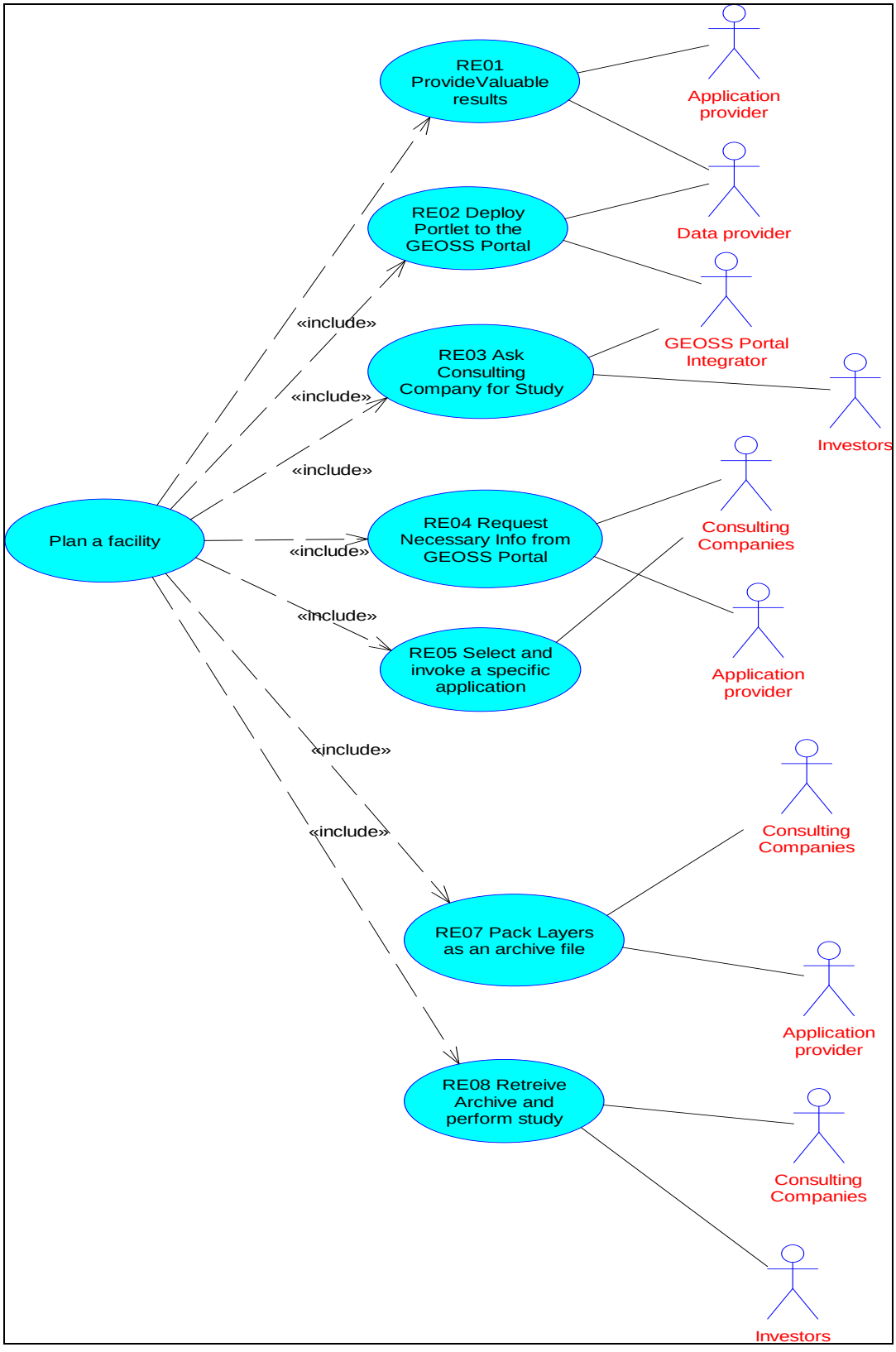


**Figure 2 Use Case Diagram for Facility Management**

Actors formalize the roles of systems, individuals, or external components which interact with this system. The following table describes the actors in the use case diagram.

**Table 2 – Actors in the System**

| Actor Name | Description |
| --- | --- |
| Application Provider | Application Provider (operates the RE Web Services) |
| Data Provider | Data Provider (operates a contributing Web Service). Other "optional" layers provided by Data Provider partners, implementing GEOSS interoperability arrangement (WMS), can be nested to fulfill a scenario. This includes:<br>• Hydro Network<br>• Electric Network<br>• Gazetteer<br>• Land Use<br>• Protected Area<br>• Risks & Hazard<br>to implement the "search and discovery" process of such data in the GEOSS Portal, Metadata and catalog must have been defined by the Data Provider to describe candidate resources. An approach using ISO 19119 Metadata describing W3C WSDL Web Service has been chosen for the core layers. For each Web Service a corresponding Metadata file is build using the INSPIRE on-line tool for building Metadata and Catalog. |
| GEOSS Portal integrator | In our example we wish to provide an AOI selection through a Google Map Mashup. The GEOSS Portal Integrator will either need to change the Google API Key to match the GEOSS portal domain name or he will need to provide it to the Specific Application Provider. In any case manual deployment of the Portlet will (at least for now) will be necessary. |
| Investor | The investor asks a consulting company for a study for a given geographical area. he investor make a decision on geographical area to locate facility based on study from consultant |
| Consulting Company | The consulting company wants to obtain the necessary information and puts requests to the GEOSS portal. Among the result for his specific request, the consulting company selects and invokes the specific application. The consulting company retrieves the archive, performs the study by exploiting the retrieved information and its own models and reports to the investor. |

## 4.2 Use Case: “Locate a suitable location for a Renewable Energy Facility”

Purpose: Purpose: In order to locate a suitable location to build a renewable energy facility Components are deployed as W3C Web Services by the Application Provider at the Renewable Energy Community Portal (www.webservice-energy.org).
They allow access to various "core" layers such as maps for:

- DNI (Direct Normal Irradiance) from HelioClim 3 database
- Shadows, Slopes, and Altitude from STRM database

Other "optional" layers provided by Data Provider partners, implementing GEOSS interoperability arrangement (WMS), can be nested to fullfll a scenario type. These include:

- Hydro Network
- Electric Network
- Gazetteer
- Land Use
- Protected Area
- Risks & Hazard

Providing an easy access to the above mentioned data is a key component of the RE Scenario.

Accordingly it is considered to develop a graphical client as a form of a Portlet (JSR-168). This Portlet is already deployed at the RE Community Portal (project.mesor.net), and can be deployed at other GEOSS Portal Candidate platforms, supporting such Portlet mechanism.

The Portlet will provide the user with a graphical Geolocalisation map mechanism (Google Map API) for AOI (Area Of Interest) selection and extra form for selecting the period (Date min/max), the scale, and the list of desired optional layers.
As a result the Portlet will provide an archive (.zip/.tar....) of the core layers and the selected optional layers as a form of geo-referenced raster files (GeoTIFF).

The JSR-168 Portlet is not yet in the list of GEOSS Standard component though this topic is still active in the AIP Team. This does not yet prevent to register it as a GEOSS "Special Arrangement" to make it visible within the GEOSS Portal search.

Taking into account such new component in the framework of GEOSS standard must be discuss and further validated in the SIF (Standards & Interoperability Forum).

Pre-Conditions:
Not defined

Post-Conditions:
Not defined

Process(es):

The following activity diagram illustrates the process that is initiated by the Investor to request a study from a Consulting Company to provide a facility feasibility study. Since Societal Based scenario was made of several small use cases they were combined in one activity diagram rather than several very small activity diagrams.

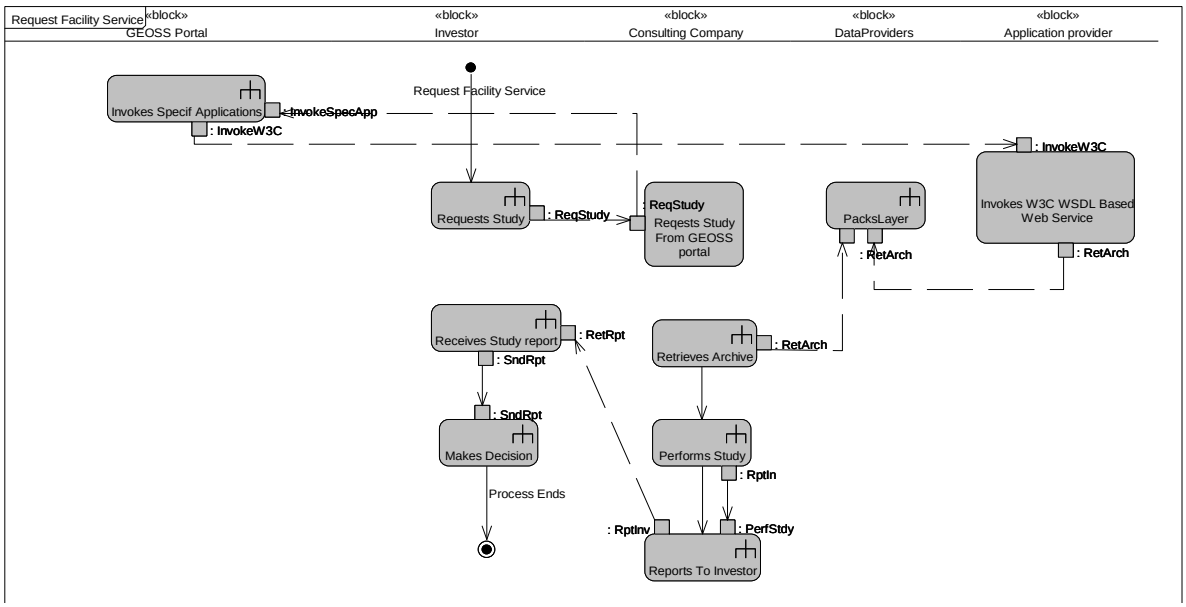


**Figure 3 Activity Diagram for the "Request Facility Service"**

### 4.3 Information View

The information specification viewpoint is concerned with information modeling. We have simplified the number of diagrams by offering all parts of view in an Entity Relation Diagram. It contains each information object its attributes and relationships with other information objects.

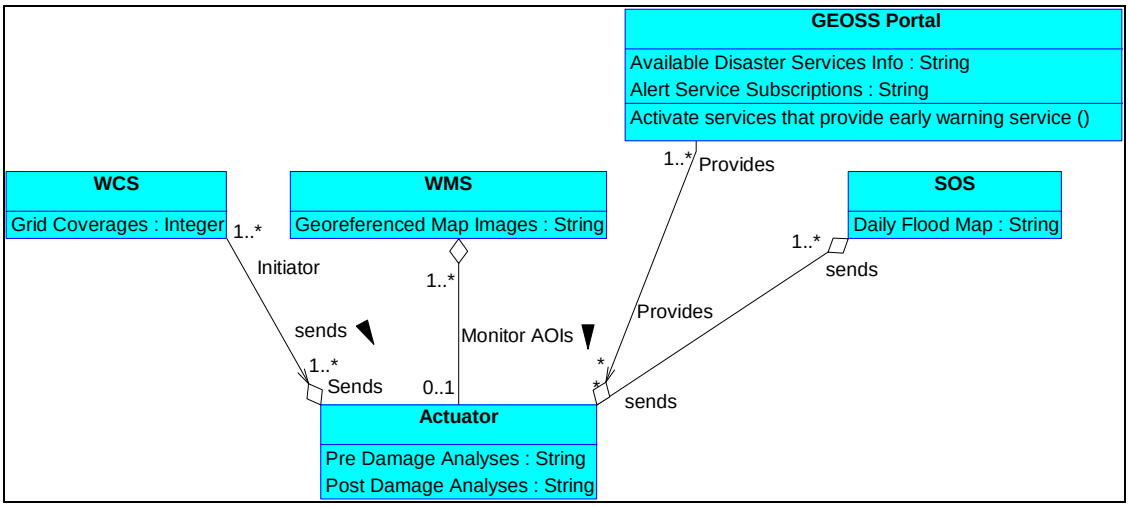


**Figure 4 Information View Facility Management**

### 4.4 Computational View

The computational view is described in accordance with ISO/IEC 19793 for the use of UML for Open Distributed Processing system specification.

The computational specification functionally decomposes Facility Management and decision support using the GEOSS-2, with "units of function as computational objects, and interactions among those computational objects, without considering their distribution over networks and nodes."

### 4.5 Basic structure of the computational viewpoint for Facility Management

The following diagram describes the elements or packages of the computational viewpoint for Facility Management. Interface templates are described as ports, where interface signatures define operations that can handle data and return values. Data types are defined for this data handled and return values. Computational objects are components and are also described by their templates.

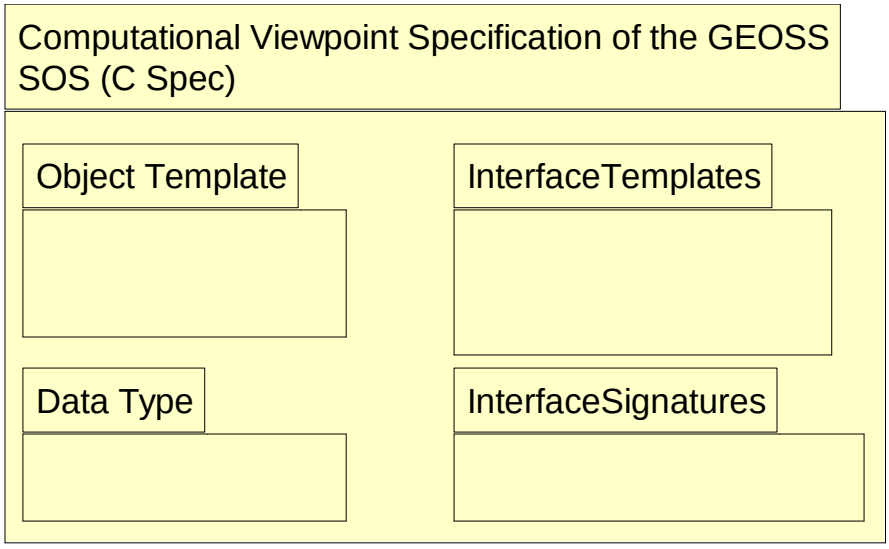


**Figure 5 Basic structure of the computational viewpoint for Facility Management**

### 4.6 Object and Interface Templates

#### *4.6.1 High-Level Architecture*

In the following component diagram, system functionality is decomposed into computational objects (or components) that interact at the interfaces (or port instances). The system consists of four main components – the Facility Management Main Functionality for Investor and Consulting Company. This defines the high-level architecture.

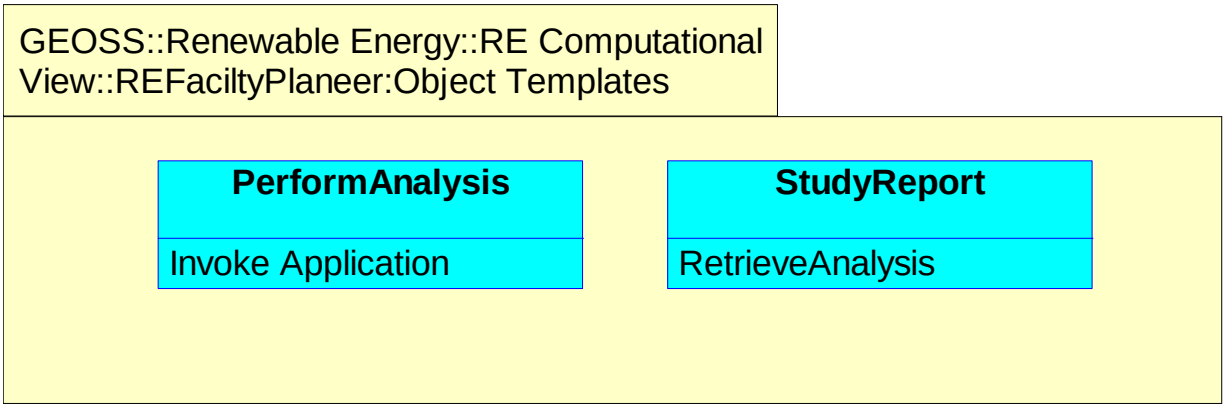


**Figure 6 Computational object templates**

### *4.6.2 Detailed Architecture*

The following component diagram decomposes the high-level architecture further to define the internal components, and interactions between those components.

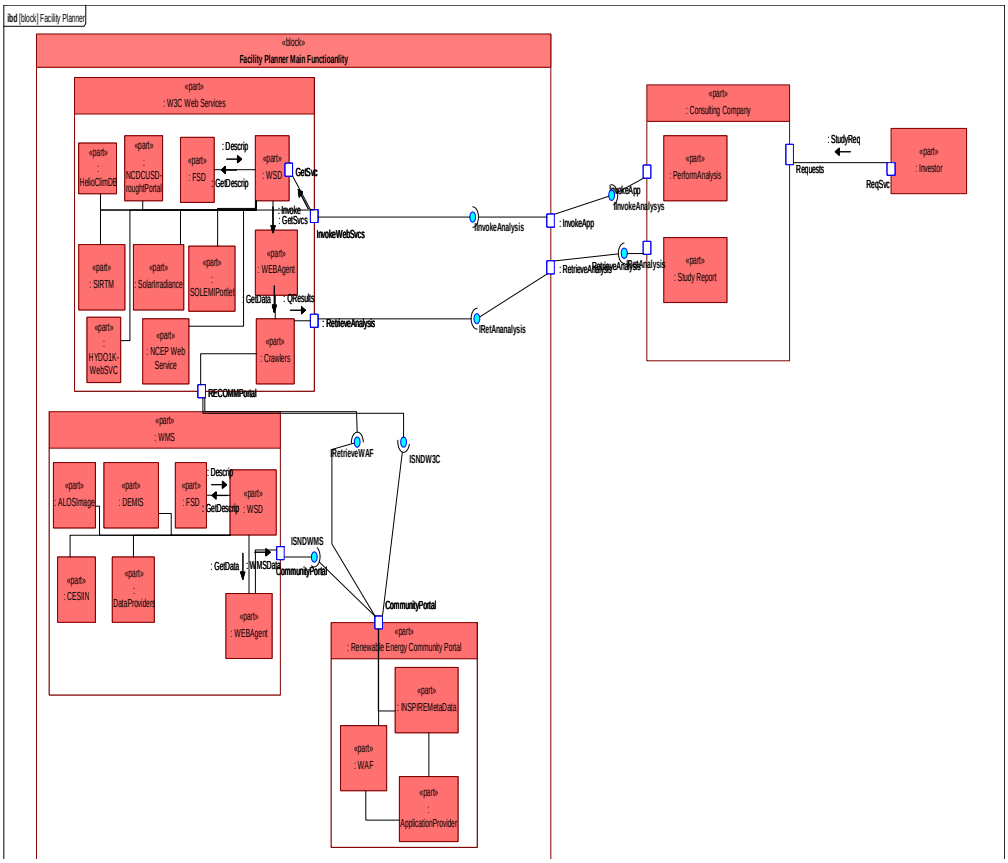


**Figure 7 Internal structure of the Facility Management System Functionality Computational Object**

## Interface Signatures

The following diagram defines the interface signatures that are instantiated by the ports defined in the prior two component diagrams.

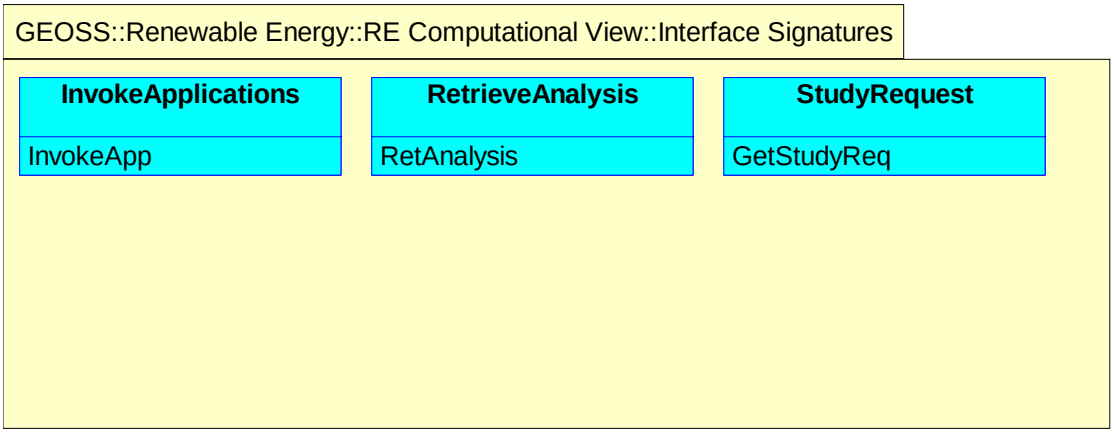


**Figure 8 Interaction signatures**

### 4.7 Data Types

Interface templates are described as ports, where interface signatures define operations that can handle data and return values. The following (incomplete) diagram describes the data types that are defined for the data handled and return values for interfaces.

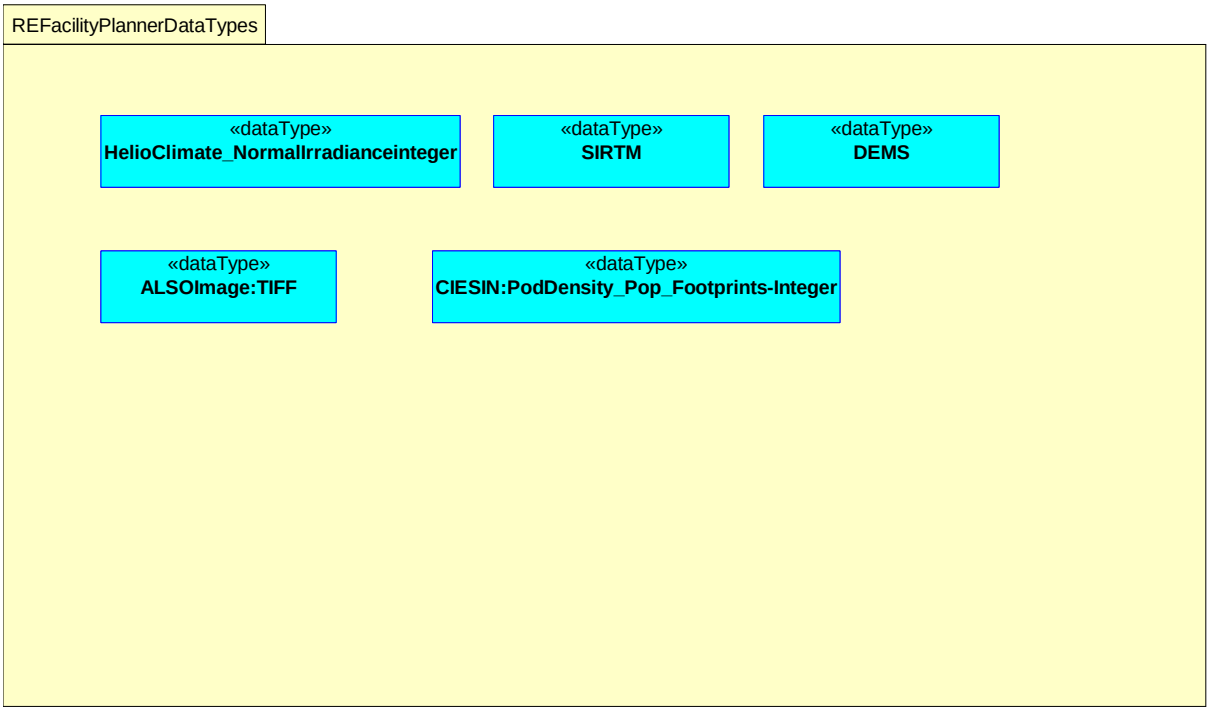


**Figure 9. Data types handled by the computational objects**

# 5. Specialized Use Cases

## 5.1 [WMS GEOTiff interaction]

The scenario addresses two kinds of resources.

1. The “core” layers

The “core” layers are built and added to the archive by internal processing of Mines ParisTech resources. These resources are made of meteorological data such as map of annual irradiation (kWh m-²) extracted from the HelioClim database. Other “core” layers include shadows (%), terrain elevation (m) and local max slope (in degree) derived by an appropriate processing of terrain data from the SRTM database. They are provided to the end users as GeoTIFF layers

2. “Optional” layers which are optional but valuable for the renewable energy planner may be provided upon user selection.

These layers will be triggered and added to the archive from already known and identified interoperable resources of GEOSS partners. A first list of such layers has been identified. It includes geographical data layers providing information on hydrological features (rivers, lake, channels), gazetteer and land use, environmental data like protected area, risks and hazards.

Core and optional layers are provided by the graphical client to the end users as GeoTIFF layers encapsulated inside a KMZ archive. This layers files are offered by various GEOSS data providers implementing interoperable Web Services covering various standard (WSDL, WMS).

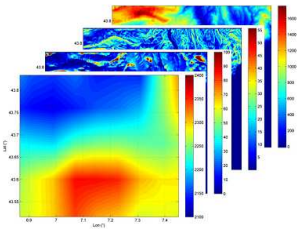

**Figure 10: "Optional" layers**

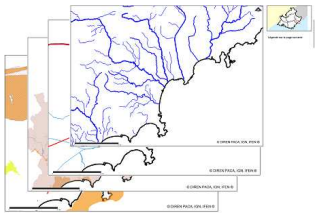

**Figure 11: "Optional" layers**

## 5.2 [Portlet integration]

The Client application or GUI (Graphical User Interface) is a JSR-168 compatible Portlet. According to JBoss terminology a Portlet is a *Java technology based web component, managed by a Portlet container, that processes requests and generates dynamic content*. This Portlet is deployed on a Liferay portal on the top of a JBoss platform. It is worth noticing that the Liferay portal that we are using within this scenario has been chosen by two of the current portal candidates in GEOSS.

The GUI elements within this Portlet include Google Map API for Area Of Iterest (AOI) selection and a set of HTML forms for the other parameters. End users are provided with meta information about the application. Such meta information includes Web service overall description, reference to IPR (Intellectual Property Rights) and credits and description of inputs and outputs. To provide a more interactive GUI, the meta information is embedded in tabs developed with AJAX technology for asynchronous browsing and querying approach.

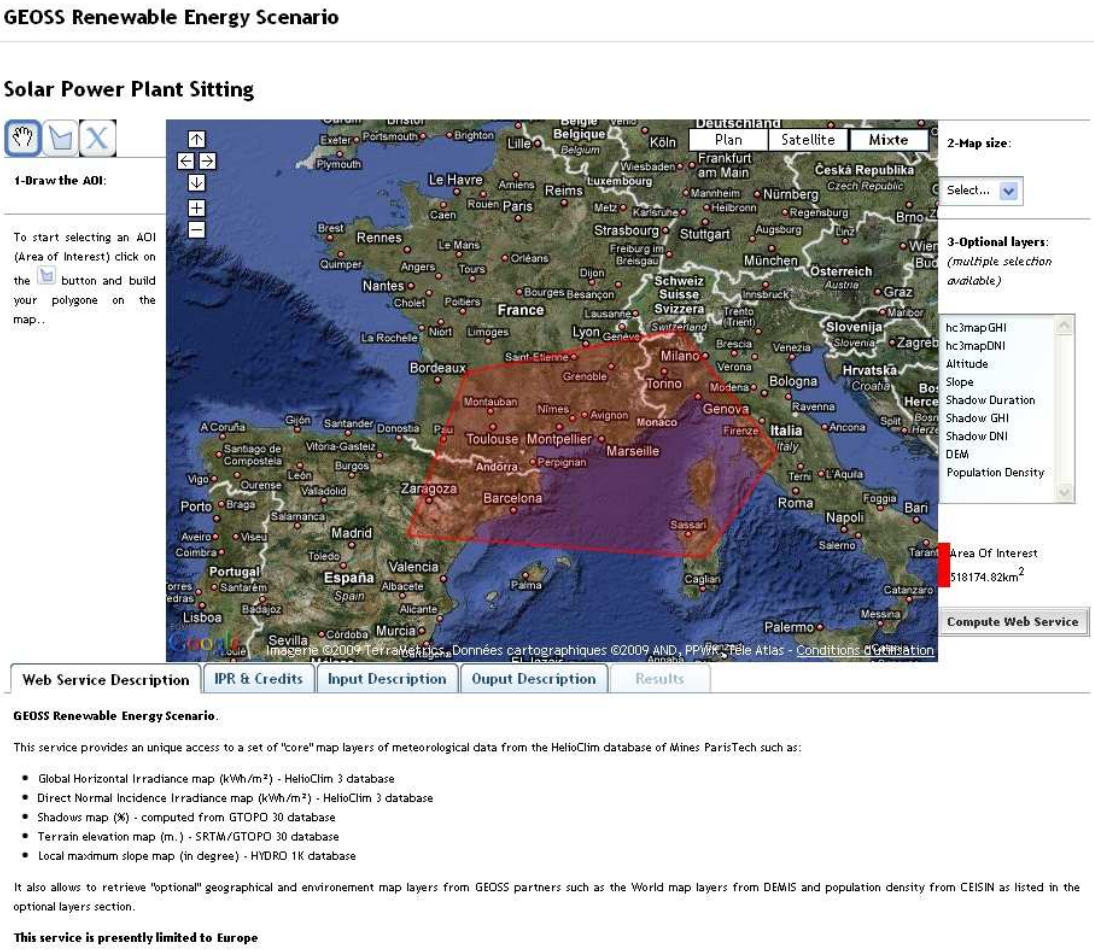


**Figure 12: GEOSS Client Portlet**

## 5.3 [Web Accessible Folder and ISO 19119 INSPIRE Metadata]

As the RE community has developed already several W3C Web services, this implies the ability of the GEOSS to build metadata and catalogue upon W3C WSDL Web services. This approach exploits INSPIRE ISO-19119 metadata for resources description and Web Accessible Folder (WAF) for cataloguing purpose. The INSPIRE metadata have been generated thanks to the INSPIRE metadata editor available on-line at the INSPIRE web site. This easy-to-use editor allows to generate ISO 19119 compliant metadata that describe W3C Web services through simple forms displayed in various tabs. Once the metadata are ready, they can be saved on the user's computer. In order to provide a repository for those metadata in the community portal, a new component was designed: the Web Accessible Folder (WAF). The WAF is a basic directory visible and accessible on the community portal where all the metadata XML files are stored. It is registered as a GEOSS standard component within the GEOSS component registry in order to offer search and discovery capabilities. This registry in then harvested by the GEOSS crawlers of the GEOSS Clearinghouse to allow the search and discovery actions of Web services in the GEOSS portals. Valid requests for searching and discovering W3C Web Service parameters have been successfully achieved and demonstrate the usefulness of such an approach.

A UC#03 specialized Use Case is identified for registering a WAF (Web Accessible Folder) Component in the GEOSS Registry.

A UC#03 specialized Use Case is identified to harvest a WAF from a Clearinghouse.

# 6. AIP-2 Implementation of SBA Scenario

## 6.1 Demonstration

This Renewable Energy scenario illustrates how a data provider on the one hand and a consulting company looking for the best place to sit a solar power plant on the other hand, both benefit of using a centralized point of access such as GEOSS .

The video can be viewed or downloaded in various output formats at the Renewable Energy Community Portal:

http://www.webservice-energy.org/resources.html

The dedicated client showed in the video allowing access to selected data set through Web Service chaining mechanism is accessible here:

http://project.mesor.net/web/guest/geoss_re_scenario

## 6.2 Next Steps

Within this AIP-2 Pilot phase 15 interoperable resources have been developed and published allowing access to either W3C Web Services end points and/or to Graphical User Interface dedicated Portlet clients.

The full list of W3C Web Services is provided at the Renewable Energy Community Portal http://www.webservice-energy.org/web_services.html Those Web Services are fully operational on a persistent and scalable infrastructure for the benefit of the community.

A set of dedicated clients (JSR-168 Portlet) have been developed to access either single or multiple W3C Web Services allowing in the latter case Web Services Chaining mechanism for value added products. Those clients are available at the MESoR Web site: http://project.mesor.net/web/guest/unifying

All these Portlet will be maintain for at least a two years period from the present report but moreover they will be enhanced and redeployed on the future SoDa platform that will use the same technology based on Portlet and W3C Web Services. The new SoDa portal operated by Transvalor a French valorisation company will host both community and business bases Renewable Energy services.

## 7. References

1. The SoDa web site offering Web service to access the NASA SSE and HelioClim Databases of Solar Radiation: http://www.soda-is.com/eng/services/meteo_eng.html#ssehc
2. The Web Services on Energy Community Portal that hosts standard Web Services in energy: http://www.webservice-energy.org/
3. The AIP-2 Renewable Energy Scenario Portlet client: http://project.mesor.net/web/guest/geoss_re_scenario
4. The European project MESoR "Management and Exploitation of Solar Resource Knowledge": http://www.mesor.org
5. Results of the GEOSS Energy Community of Practice on-line survey on users' requirements of wind energy information: http://www.geoss-ecp.org/sections/wind/users-requirements-wind
6. Results of the IEA SHC Task 36 on-line survey: " Customers' Requirements of Solar Energy Resource Information": http://www.geoss-ecp.org/sections/solar/iea-shc-task36-survey-on
7. "Test of several approaches for the composition of web services in meteorology", Proceedings of EnviroInfo 2007, Benoît Gschwind, Lucien Wald, Robert Mahl, Francois Irigoin and Lionel Menard: http://www.cri.ensmp.fr/classement/doc/A-387.pdf
8. "A Proposal for a Thesaurus for Web Services in Solar Radiation" Benoît Gschwind, Lionel Menard, Thierry Ranchin, Lucien Wald, Paul Stackhouse, Proceedings of EnviroInfo 2007
9. "Sitting of a solar power plant: Development of Web service based on GEOSS data and guidance", Lionel Ménard, Lucien Wald, Philippe Blanc, Thierry Ranchin Mines ParisTech, 33 ISRSE Conference Stresa 2009

## 8. AIP-2 Transverse Technology Use Case Summaries

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 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. The transverse technology use cases, on the other hand, describe reusable functionality of the GEOSS service oriented architecture implemented through Interoperability Arrangements.

In AIP-2, the transverse technology use cases supporting the community scenarios were grouped in five categories, as shown in **Erreur ! Source du renvoi introuvable.** and in Table 3. The use cases are described in detail in a separate AIP-2 Engineering Report.[2]

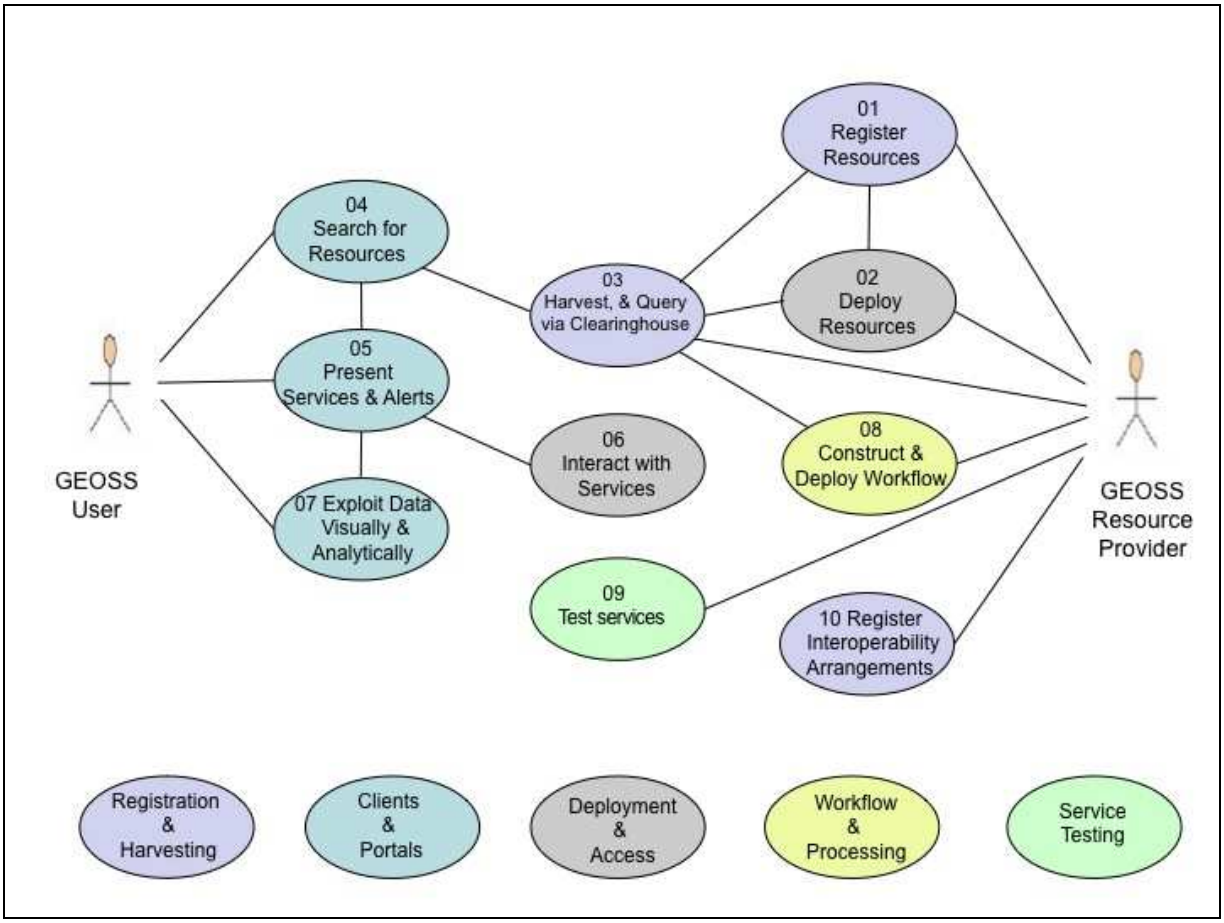


**Figure 13 GEOSS Transverse Technology Use Cases**

[2] http://www.ogcnetwork.net/AIP2ERs#UseCases

**Table 3 – AIP-2 Use Case Summaries**

| Use Case | Title | Actors and Interfaces |
|---|---|---|
| Registration and Harvesting Use Cases | | |
| 1. Register Resources | Register resources in GEOSS Components and Services Registry (CSR) or Community Catalog | # Service Provider<br># Components and Services Registry<br># Community Catalog Provider |
| 10. Register New Interoperability Arrangements | Register, in the GEOSS Standards and Interoperability Registry (SIR), new and recommended interoperability arrangements) as well as utilized standards. | # Service Provider<br># Components and Services Registry<br># Standards & Interoperability Registry<br># SIF Moderator |
| 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 GEOSS Clearinghouse | # Service Provider<br># GCI Registry<br># GEOSS Clearinghouse<br># Client Application |
| Clients and Portals Use Cases | | |
| 4. Search for Resources | Steps for portals and application clients to support the GEOSS user in searching for resources of interest via the GEOSS Clearinghouse or Community Catalogs | # GEOSS User<br># Portals and Client Applications<br># GEOSS Clearinghouse<br># Community Catalog |
| 5. Present Services and Alerts | Present GEOSS User with services and alerts as returned per the user's search criteria | # GEOSS User<br># Portals and Client Applications<br># GEOSS Service Providers |
| 7. Exploit Data Visually and Analytically | Steps for exploitation in Client Applications of datasets served through Web Services and online protocols as used within GEOSS. | # GEOSS User<br># Components and Services Registry<br># GEOSS Service Providers<br># Portals and Client Applications |
| Deployment and Access Use Cases | | |
| 2. Deploy Resources | Deploy Resources for use in GEOSS | # Service Provider<br># Components and Services Registry |
| 6. Interact with Services | Interact with Services | # Service Provider<br># Portals and Client Applications |
| Service Testing Use Cases | | |
| 9. Test Services | Service Provider tests its service using a proper Test tool discovered in the GEOSS CSR. | # Service Provider<br># Components and Services Registry # Test Facility/Tool<br># Relevant Standards Authority |
| Workflow Use Cases | | |
| 8. Construct and Deploy Workflow | Design, deploy and execute a workflow. described in Business Execution Language (BPEL) or any other script language. | # GEOSS Integrator<br># Client Application<br># Service Provider |