

## Concept of Operations Document

### User Requirements Registry (URR)

#### DOCUMENT OVERVIEW

Building a user-driven Global Earth Observation System of Systems (GEOSS) has been the aim of the Group on Earth Observations (GEO) since its 2005 creation. User engagement *starts* with the face-to-face engagement of a “spectrum” of relevant users (often decision makers) to learn about what they do and how GEOSS could help them do it better. It *ends* with feedback from the users on whether the science or decision making improved and the anticipated impacts and societal benefits were realized.

GEOSS is intended to serve the needs of various users in a wide range of societal [benefit](#) areas in terms of Earth Observations (EOs) and derived products and information. To build a truly user-driven system, GEOSS must be guided by a set of explicitly known user needs in the nine Societal Benefit Areas (SBAs) and the observation requirements corresponding to these needs. Thus, a versatile infrastructure that can answer questions about what users need from GEOSS is a key element of the GEOSS Common Infrastructure (GCI). This infrastructure is the User Requirements Registry (URR).

Most of the current GCI registries focus primarily on the contributors or *data providers* to GEOSS. Conversely, the URR, ~~as the newest addition to the GEOSS registries,~~ focuses on *those who use* EO data.

In general, the success of [GEOSS](#) begins and ends with users. The URR is a venue for users to express their needs and for others to explore these needs. The novel concept that distinguishes the URR from many, if not all, other registries of user requirements is the information captured in the Links form. Here, links between any pair of individual entries for User Types, Applications, Requirements and other URR ~~forms~~[relations](#) can be published. In addition to the source and target entries [of a link](#), information on the societal benefits associated with the link and the implementation status can be provided. As the URR evolves, the powerful nature of this concept is slowly becoming more evident as it allows users to answer many questions, such as:

- On what applications do I directly or indirectly depend?
- What requirements need to be met in order to make these applications work?
- Are there data sets/products that meet this requirement?

This Concept of Operations document is a high-level description of the URR system development effort. This is an “evolving” document and it will change and be updated as conditions and circumstances merit.

## 1 SCOPE

The GEOSS User Requirements Registry (URR) compiles and analyzes Earth Observation (EO) user needs. The URR fills a void in the GEOSS Common Infrastructure (GCI) by offering users the opportunity to view and publish their needs and determine if they can be satisfied ~~by within~~ GEOSS or ~~by from~~ other **geospatial** sources. The URR encourages cross-discipline identification and description of user needs among the GEO Societal Benefit Areas (**SBAs**). The URR consists of a Web site and Database that allows user input such as entering new data and editing existing data, and data output such as viewing of data, discovery of data through search terms, ~~and~~ the visualization of relationships between data types, and the analysis of URR contents.

## 2 REFERENCES

### 2.1 References

[GEO 2012] “The GEOSS User Requirement Registry (URR): A Component of the GEOSS Common Infrastructure in Service of Work Plan Implementation and a User-Driven GEOSS” Version 0.4 (March 24, 2012). Draft.

[GEO 2010] “GCI Consolidated Requirements,” GEO Secretariat, 25 February 2010

[GEO 2008] “Concept of Operations Document GEOSS Common Infrastructure,” 14th Executive Committee, 18 November 2008

URR Web site: <http://www.scgcorp.com/URR>

URR tutorials: <http://www.scgcorp.com/urr/tutorials/index.html>

### 2.2 Acronyms

CSR – Components and Services Registry

DAB – Discovery and Access Broker

EO – Earth Observation

GEO – Group on Earth Observation

GEOSS – Global Earth Observation System of Systems

GCI – GEOSS Common Infrastructure

GWP – GEO Web Portal

SBA – Societal Benefit Area(s)

SIR – Standards and Interoperability Registry

SR – Semantic Registry

URR – User Requirements Registry

## 3 DESCRIPTION OF DESIRED CAPABILITIES

As described in the 2008 GEOSS Common Infrastructure (GCI) Concept of Operations document, the URR is an integral part of the GCI used to publish user-related information and to provide analysis tools that allow answering questions related to a user-driven design and functionality of GEOSS. The URR is designed to consolidate requirements for EOs. These requirements include issues such as: what is being measured, how often, where, to what resolution, to what accuracy, in what units of measure, all of these needs are based on a series of user types. The URR controlled vocabulary of EO parameters provides a means to compare registered existing and planned EO parameters with requirements and identify gaps, and the

availability of EO coverage. *(This text is outdated and not a good description. We delivered a better text to Doug Nebert.)*

“Value chains” between pairs of URR data entries (e.g., user types-applications, applications-requirements) can be constructed based on the interconnectivity captured in the Links entries~~are available~~ to illustrate the relationships among user needs. These value chains provide users with information about how to relate their needs to available datasets/products and support decision making.

**Figure 1** illustrates the interactions between the URR and other GCI components, as well as components outside the GCI. The linkages between the URR and the GCI components include both dynamic and static communication interfaces. The interface between the URR and the Discovery and Access Broker (DAB) is dynamic with the ability to initiate and receive responses to queries from the URR. Conversely, the interfaces between the URR and the Semantic Registry (SR), the Standard and Interface Registry (SIR), and the Best Practices Wiki (Wiki) are static and updated as needed based on revisions.

### 3 CONCEPTS FOR THE USER REQUIREMENTS REGISTRY

This section of the Concept of Operations (CoO) document details the general operating environment and capabilities of the URR and its interaction with users and other resources.

#### 3.1 Background, Objectives and Scope

The URR was developed in response to the need to define EO ~~user~~ requirements resulting from user needs, coverage and gaps as described in the GEO 10-Year Implementation Plan (GEOSS 2005) and the GCI Concept of Operations document (GEO2008). As described by the GEO User Interface Committee (UIC), the goal in user engagement is to address the following questions:

- Who are the users? (e.g., user types being engaged)
- What data do they use? (e.g., issues of data availability and confidentiality)
- How do they use these data? (e.g., need for better applications or tools; science gaps need to be filled with research, etc.)
- What types of data do they need to their work better? (e.g., need for specific data sets)

The next step, which is the objective for the URR, is to translate the answers to these questions (e.g., defining user needs) into structured information that can be used to prioritize observational requirements and identify gaps in the observation system and the network of applications~~the user requirements of EOs~~. To achieve this, ~~t~~The URR collects user-related information, such as the user types, their applications and activities, the requirements of the applications in terms of observations and other products, and the needs in terms of research, infrastructure, technology, and capacity building that would enable or improve applications. This information is collected in standard formats and nomenclature across disciplines and ~~Societal Benefit Areas (SBAs)~~.

Interconnectivity of user types, applications, requirements and needs is captured with a novel link concept, and this information enables prioritization of applications, requirements and needs, gap analyses, and the determination of the relevance of a given product.

The URR Web Portal is the access point for users to execute the above capabilities, see **Figure 2**. The portal serves as the link to the URR Graphical Tool, the URR Analysis Tool, and the URR Web Server, which includes the linkages to the URR Database, the interfaces to the DAB, SR, SIR, Best Practices Wiki, and other requirements registries, such as the World Meteorological Organization Observation Requirements Registry.

Data input, such as entering and editing data, entering search terms to discover data, etc., is available via the URR Web Server. Likewise, data output, such as exporting data, viewing of data, and the visualization of relationships between data types, is available through the Web Server and Portal. Similarly, analytical tools such as the prioritization of observational requirements, gap analysis, and determination of dataset/product relevance are handled through the URR Portal.

### 3.2 Operational Policies and Constraints

As described in the GEO 10-year implementation plan, the URR, like other GCI components, operates within the context of voluntary contributions provided by Members and Participating Organizations. All of the development and operational functions (e.g., Web hosting) of the URR have been supported by the U.S. Environmental Protection Agency (EPA) through a private contractor. EPA is one of the nearly ten federal agencies that are part of the U.S. GEO. The linking of the URR to other GCI components, where appropriate, has been accomplished through the discussions supported by U.S. GEO member agencies and other GEO Members and Participating Organizations

The implementation of the 2012-2015 GEO Work Plan is monitored through Task Sheets made available at [http://www.earthobservations.org/geoss\\_imp.php](http://www.earthobservations.org/geoss_imp.php). The structure of the Task Sheets includes several areas with user-related information, which could be published in the URR and thus made available for more comprehensive analyses.

The URR provides a unique way of interconnecting all activities performed by the Work Plan Tasks and to explore several cross-cutting themes. The interconnectivity captured in the link concept of the URR provides a basis to understand the relevance of a Task activity for the overall success of GEO and GEOSS, and its importance for societal applications and users. The Strategic Targets are included in the URR as applications, which can be linked to Task activities.

The URR offers some unique cross-cutting capabilities that are currently not available within GEO. Several of the Work Plan Tasks address cross-cutting issues with relevance for many other Tasks. The data model of the URR allows one way to capture and describe the cross-cutting nature of these activities. Using this approach, the URR could support individual Task components and activities by making other tasks aware of these activities, and allow an overall evaluation of the cross-cutting issues and their relationship to the Strategic Targets.

The URR system architecture was not developed using open source platforms. The data for the URR resides in a backend database, currently an SQL Server, see **Figure 3**. These data can be accessed by users over the Internet using any standard Web browser. The data are viewed and manipulated through the Web interface, currently built using ASP.NET 4.0. Because ASP.NET and SQL Server databases can be ported to other servers, and developed in freely available tools, required licensing by Microsoft is not determined to be an issue for transferability of the URR at the completion of the support provided by the U.S. EPA. A life time, Thinkmap (Java) visualization software agreement, likewise, will be transferred with the URR coding at the completion of the U.S. EPA support.

### 3.3 Description of the URR

The URR provides tools for the collection, sharing and analysis of user needs and EO requirements. At the core of the URR is a comprehensive [relational](#) database describing the *User*

Types in the nine SBAs; the *Applications* that depend on EOs and products or information derived from EOs; and the qualitative and quantitative *Requirements* in terms of EOs and derived information. The database includes an extendable *Lexicon* containing relevant vocabulary and a *Reference* section for more background information. Furthermore, [the additional-URR forms will allow](#) the publishing of *Research*, *Technology*, *Infrastructure* and *Capacity Building Needs*.

[It is anticipated that the URR data will appeal to users \(e.g., readers\) interested in user needs and those interested in populating the URR with relevant data \(e.g., publishers\). To assist these and other types of potential URR users, four principal functions – View, Publish, Analyze, and Preferences – are available from the URR Home Page menu bar, see Figure 5.](#)

The URR View function, as its title suggests, is for users interested in reviewing available data within the various URR [formsrelations](#). In the future, the View function will offer users a more advanced *Search* function and other more comprehensive reporting features. The *Publish* function is for users interested in entering and editing data in the URR [relations through web-based](#) forms. In both of the View and Publish menus, seven URR forms [or relations](#) are available [for the basic relations of the URRto describe user EO needs](#), see **Figure 4**. These forms [are](#) [forinclude](#):

- **User Types:** generic users who are involved in applications, benefit from these, or contribute to them.
- **Applications:** processes and activities that use EOs or derived information to produce new information, arrive at decisions, or execute decisions.
- **Requirements:** specifications of observations or derived products.
- **Research Needs:** research tasks to be performed to enable applications that are currently not possible due to a lack of knowledge.
- **Technology Needs:** descriptions preferably of observational requirements that cannot be met because the technology to carry out the observations is not available, and of what this technology would be.
- **Infrastructure Needs:** descriptions of requirements that cannot be met or applications that cannot take place because of the lack of infrastructure, and of the infrastructure necessary to enable the applications.
- **Capacity Building Needs:** descriptions of problems that cannot be solved satisfactorily today because of a lack of capacity in terms of organizational or human resources and a description of the necessary capacity building that would enable applications addressing these problems.

An additional URR form is used to capture the interconnectivity between entries in each of the above forms:

- **Links:** the entries in this form connect a source entry and a target entry in two different relations or in the same relation. This concept is a novel and versatile way of capturing interconnectivity. Information on the societal relevance and the implementation status of a Links entry enables the analysis of value chains from EOs to end applications.

Two auxiliary URR forms offer: (1) a lexicon of all terms used and (2) references to documents that provide additional information on the entries in the main forms:

- **Lexicon:** collects all terms used in the URR; allows for the definition of acronyms and abbreviations; and specifies units of EOs or other quantities. The Lexicon also includes



several controlled vocabularies.

- **References:** a form that collects all references to documents (e.g., publications, reports, web pages, etc.) that are used to link entries to more detailed background information.

~~It is anticipated that the URR data will appeal to users (e.g., readers) interested in EO needs and those interested in populating the URR with relevant data (e.g., publishers). To assist these and other types of potential URR users, four principal functions—View, Publish, Analyze, and Preferences—are available from the URR Home Page menu bar, see Figure 5.~~

The URR *Analyze* function will initially focus on the prioritization of user needs and observational requirements, and gap analysis. Key for all of the URR analysis features is information on the interconnectivity between specific entries in the URR, which is captured in the Links entries. In the URR, Link entries describe the relationship between two specific entries in any of the URR relations.

[The URR Preferences menu ...](#)

### [3.x Version control, testing, and releases of new versions](#)

To date, the URR system has undergone three upgrades (Version 3.0 became operational as of December 2011). Additional updates are expected in the early Summer 2012, and in the late Fall 2012. The URR system has operated on an uninterrupted basis since its launch in 2010, so its maintainability and reliability are high. Further, the URR is tested continuously as new functionality and modules are developed.

The usability of the URR is examined routinely to ensure that the data model ~~software~~ can be understood and used by average, novice users. As an operational system, multiple levels of users will access the URR, ranging from interested laypeople to geophysical scientists to software developers, underscoring the need for the system to be suitable for a variety of audiences and applications. The URR includes extensive Tutorials for each operational function; systematic instructions are available with relevant screenshots. Help windows also are incorporated in each URR form and the fields within the forms.

Each incremental change to the URR software is tested extensively in the development database before the operational site is updated with the newly validated and verified version. Alpha testing by the software developers and testers ensures preliminary confidence that the system operates as expected. This is followed by Beta testing of the components by selected users to ensure that each component is functional and user friendly before launching updates to the operational URR Web site.

## **3.4 Modes of operation**

Users have the option of viewing, publishing, and analyzing data in the URR. The URR *View* function is for users interested in reviewing available data within the various URR forms (e.g., User Types, Applications, Requirements, etc.). In the future, the *View* function will offer users an ‘Advanced Search’ feature and other more comprehensive reporting features.

The *Publish* function is for users interested in entering and editing data in the URR. To enter data into the URR, users must be registered. This is a simple task, only requiring the user’s e-mail address and a self-developed password.

Four generic approaches have been used to populate the URR: (1) Expert input based on dedicated assessment reports; (2) Open peer contributions (Wikipedia approach); (3) Harvesting existing registries; and (4) Interviews. For expert input, assessment reports of user needs in a specified field are used by one or more experts to populate the URR. This approach has been used for several fields in the Health and the Disaster SBAs. The assessment reports produced by the GEO Task US-09-01a were used for collecting user needs for infectious diseases, air quality, and aero-allergens. The requirement documents produced by the Geohazards Community of Practice (GHCP) and the Coastal Zone Community of Practice (CZCP) provided a basis for publishing information on geohazards and integrated coastal zone management (ICZM). Other Communities of Practice (CoPs) also are being asked to participate in the population of the URR using approach this approach, including the Integrated Global Water Cycle Observations (IGWCO) Community of Practice.

With the Wikipedia approach, anyone can register as a user of the URR and publish new entries or edit existing ones. By promoting this open approach in GEO communities, a larger expert base can participate in adding or improving URR contents than would be reached through using experts alone. Potentially, this approach also can lead to contributions from user communities not formally connected to GEO, or not known to GEO.

Harvesting existing registries builds on the fact that a number of domestic and international agencies have established user requirement databases in specific fields. In most cases, the data models of these databases differ significantly from the URR data model, and in most cases, these data models only cover a part of the comprehensive URR data model. To more fully develop this approach, the Observing Requirements Database of the World Meteorological Organization (WMO) is being explored. In addition, this approach requires the development of an interface that addresses the semantic issues arising from differences between controlled vocabularies of different databases.

The last publishing approach, using an interviewer, would require an expert in a particular field, to conduct interviews with users using a pre-defined set of questions. The goal of this interview is to capture a representation of the local environment of the user in terms of applications, related users, requirements, and needs. For end users close to societal decision making, this environment often is not directly linked to observational requirements, and this link emerges through several steps along the value chains captured in the URR. However, such end users are experts in their own environment providing details that often cannot be captured by those closer to the provider end of the value chain.

The key innovative element of the URR is its ability to link two entries with each other and to describe the nature of this link in detail. Thus, pairs of entries for *User Types*, *Applications*, *Requirements*, etc. can be linked together. To establish a link relationship, users complete a *Link* form describing the link function, defining a source and target between the paired ~~data-~~  
~~elements~~entries (*User Type-Application*, *Application-Requirement*, etc.) and other relevant data. By introducing this simple but flexible model of paired linked entries, the URR helps users to describe the interrelationship among their needs and ~~EO~~Earth-observations.

The URR *Analyze* function will offer users three types of analyses – (1) Prioritization of user needs and observational requirements; (2) Gap analysis; and (3) Relevance analysis. Underlying the development of these analyses capabilities is the interconnectivity between specific entries in the URR, which is captured by the *Link* entries. In the URR, *Link* entries describe the relationship between two specific entries in any of the URR relations. Links can be defined between entries in the same or in two different relations.

In the *Preference* menu, URR users will be able to customize their inquiries based on their specific interests and needs. It is anticipated that users will be able to establish their preferences based on the URR Forms to be reviewed and fields within forms such as Societal Sectors, SBAs, Keywords, Portfolio and Lists. *Preference* forms also might allow users to select a subset of forms to be considered, for example, during an analysis or in a search. The submenu issues Societal Sectors, SBAs, ~~Subfields~~ and Keywords would allow users to select the subset in each list that will be active during their URR visit.

*Tutorials* with detailed instructions and graphics provide the user with an in-depth step-by-step understanding of the system for successfully utilizing the URR to the fullest extent. These tutorials are designed to guide users through the various workflows and to explain the underlying URR concepts. ~~Several examples~~ *An integrated Coastal Zone Management case study will be available on the URR Tutorial* illustrating a possible approaches to the analysis of user needs in a complex area and the translation of the information into the URR data model. ~~These is~~ *case studies can will* assist users in understanding the vital linkages between various URR forms.

*Searching* the URR allows a user to discover existing data, or to discover that data are missing and need to be added to the URR. A user who performs a search while publishing retrieves results that can be edited or the user may add new entries to the URR after discovering that data have not already been added to the system. Performing a search from the *View* section of the URR returns results that are read only. However, if a user has logged in, they may edit the entries that they have discovered.

*Visualization* of the URR *Links* function is another key attribute of the system. Users can select an entry in any of the URR ~~relations~~forms and see a graphic display of the relationship between entries. The *Visualization* component may be launched from various sections of the URR and allows a broad overview of the relationships that exist in the URR. A user who has stepped through the *Visualization* by following the various links will be able to backtrack by viewing a breadcrumb history of their path through the visualization software.

The *Visualization* component, **Figure 6**, allows a user to view relationships between sets of data that they may not have considered, or they may notice that relationships are missing that should exist, and add those links to the URR. From the visualization, the user can get a quick understanding of how data within the URR are related. The visualization will also be able to show any information about the relationships themselves, including, but not limited to, a description of the link, the type of link (weak, strong, crucial) and the value of the link. Selecting other elements in that image will then display a new network of links originating from the selected entity. Documenting links between these different elements demonstrate the unique URR relationship capability and should help URR users make better informed decisions.

The *Login* function is expected to be able to distinguish between different authorization levels. It is anticipated that the relevant GEO bodies will not accept the URR without some form of reviewing and controlled editing of the contents. The *Login* function is anticipated to accommodate this GEO need through the provision of different endorsement levels.

### 3.5 URR Users Types

There are different groups of user of the URR, including:

**Novice user** – inexperienced user(s) who may be visiting GEOSS for the first time but are interested in observational data and services that are relevant to their areas of responsibility.



**Experienced user** – user(s) who understand geospatial issues and are familiar with the geosciences. These users may be familiar with GEOSS and seek registered resources, or they may have general knowledge about EO parameters and are investigating relevant issues.

**Publisher** – user(s) who may be expert in their field (i.e., infectious diseases, air quality and health, water resources) and interested in entering and/or editing data about their EO user needs. Likewise, the Wikipedia approach available for URR publishing allows any registered users to make new entries or edit existing ones based on their knowledge level and interests.

**Developer** – information technology user(s) who are engaged in software and architecture system support of the URR. These users develop and maintain the system to include writing and editing the code used to support the URR data model to include the database and Web server/portal. These users also work on the URR/GCI interfaces and other URR non-GEOSS interfaces such as WMO Requirements Registry.

**Quality control official** – user(s) unfamiliar with technicalities of the URR system but can perform independent usability testing as updates are released to the beta testing server. The usability of the URR is routinely examined to ensure that the software is user friendly, the system operates reliably and in a timely manner, and the average person can understand its instructions for use.

**Reviewer/system administrator editor** – user(s) who are expert in their respective fields and capable of reviewing and editing user needs entries to ensure that they are consistent with the design criteria and specifications of the URR components.

## 5 OPERATIONAL SCENARIOS

This section contains brief narratives on how the URR system functions and interacts with users.

### 5.1 View Function

The *View* menu function includes a range of observational and search features that can introduce and educate novice and expert users alike about the URR data model and its capabilities. A routine key word search and an advanced search capability are available through this function. One unique search feature will make use of the choices made in the *Preference* submenu to constrain the search space. In the *View* function, the result of a search will be displayed either as a list of entries, from which individual entries could be selected, or as a report with the full information (e.g., all active attributes selected in *Preference*) for all entries. In both cases, the information for an entry will be shown in an easily interpretable rendering.

To allow readers to print and develop customized portfolios, the *View* function also will have ‘Print,’ ‘Export’ and ‘Add to Portfolio’ submenus, as well as a ‘Print Portfolio’ and ‘Export Portfolio’ features. The ‘Print’ and ‘Print Portfolio’ features are expected to produce a rendering appropriate for printing. ‘Export’ and ‘Export Portfolio’ features are expected to allow for several standard formats, including ‘cvs.’ Since not all systems allow printing to a pdf file, the pdf feature is expected to allow exporting in pdf with the same rendering as the print options.

### 5.2 Publish Function

The *Publish* menu function will be adapted to the capabilities available through the *Login* and *Preference* functions. In particular, for a given entry, either the last and/or complete sequence of publishers who contributed to an entry is expected to be stored and retrievable at least for an editor, if not for all publishers. In lists of entries shown for ‘Edit/List All,’ the attributes selected in *Preference* are expected to be displayed. Only active forms selected in *Preference* are expected to be available for publishing.

As more URR entries are published in a given form, the current way of loading an existing entry in a form may become too time consuming. By applying all *Preferences*, including the option to restrict the editing to the personal portfolio, the list of entries could be reduced. An additional proposed change is to modify the current selection of an existing entry: after clicking to select ‘Edit,’ a separate window could open with a clickable list of the alphabet letters on top and the list of entries with a name starting with “A” shown in the window. The user would then be able to look for an existing entry in the much shorter list of entries starting with the same letter.

In the *Publish* menu, URR users are expected to have a variety of capabilities. These capabilities include:

#### Mapping of Ontologies Into the Lexicon:

In order to conduct gap analyses, it will be necessary to map ontologies or controlled vocabularies into the Lexicon of the URR. This will require implementation of automated language processing and a manual intervention in certain flagged cases. After such a mapping is possible, a choice for active ontologies is expected to be added to the *Preference* function.

#### Harvesting of Existing Databases:

As the URR entries grow and users want to enter large data sets into the URR, the harvesting of existing databases will become more common. The decision about which existing data bases to include in the URR will require a case-by-case assessment. A prioritized list of relevant requirement databases will need to be compiled as a basis for this work.

#### Additional Populating:

Beyond the two SBAs—Disasters and Health—currently in the URR, it is anticipated that at least two additional SBAs should be pursued for URR publishing. Due to public interest and relatively well-defined and published information, two obvious SBA candidates are Climate and Water. For these SBAs, harvesting of existing databases could provide a significant contribution.

### **5.3 Analyze Function**

#### **3.x ????**

The information collected in the URR will enable users to conduct three types of analyses: (1) prioritization of user needs and observational requirements; (2) gap analyses; and (3) relevance analyses. Key for all three analyses is information on the interconnectivity between specific entries in the URR, which is captured by the *Link* entries. In the URR, *Link* entries describe the relationship between two specific entries in any of the URR relations. Links can be defined between entries in the same or in two different relations.

Prioritization uses the interconnectivity captured in the links to determine the relevance of observational requirements, applications, and needs in infrastructure, research, technology, and capacity building. The interconnectivity between all of these entities can be used to construct answers to the generic question “How relevant is entry A?” It is of value to apply the concept of relevance not only to requirements. For example, answers to questions like “How relevant is this research need?” or “How important is this infrastructure?” could help prioritize research,

development and implementation efforts. For datasets and products, the core question is “What is the societal relevance and potential impact of this dataset?”

The information published in the URR is required for one recommended approach to gap analyses (GEO Gap Analysis Task Force, 2011). Based on the interconnectivity captured by the published *Link* entries, it is possible to answer the question of whether an application, which depends on another application, can be carried out or whether the link is not implemented. Similarly, infrastructure, technology, capacity building and research needs, together with relevant link information, are often indicative of gaps to be filled.

A gap analysis in terms of observational system gaps is based on the core question of whether a specific requirement entry can be met with existing data or products. This question cannot be answered based on the information published in the URR. Answering this question necessitates a search for data that meet, or exceed, the characteristics specified for the requirement entry. This search needs to be performed by other components of the GCI, specifically the Discovery and Access Broker (DAB).

It will be important to achieve a GEO-wide consensus on the quantitative metrics for measuring relevance. For a given URR entry of a requirement, application, or need, a simple measure could consist of the number of other entries depending directly or indirectly on this particular entry. A more comprehensive measure would take into account the relevance of the linked dependent entries, especially the applications, and the strength of the links between entries. Further factors could account for the societal value of the links in the measure. A measure of relevance can also be deduced from the status of an entry in the mathematical network constituted by the entries and the links between them. Mathematical network theory can be used to support the measure of relevance.

Factors such as pervasiveness, uniqueness, difficulty, completeness, and uncertainty are also candidates to be considered. The challenge is to balance quantitative and qualitative metrics in forming a coherent evaluation. For products (observations, derived products, or services), a metric for measuring relevance could be connected to the relevance of the observational requirements this product meets. If a product meets more than one observational requirement, a challenge is in the combination of the relevance of the individual requirements into an overall relevance measure for the products.

## **5.5 Login Function**

In the *Login* menu function, when registering for a new account, a user is expected to be able to select between the levels of ‘reader’ and ‘publisher,’ with publisher including the reader level. At a later stage, it may be desirable to review requests for the publisher level and not assign it to everybody on request. The editor level could be made available on request when registering or at a later stage, or it could be assigned only after requests to the relevant GEO body. The administrator level will be restricted to those responsible for the operation of the URR, and they will probably have a few administrative functions not available at any other level.

Users logged in as publishers are expected to be able to modify the status of all entries up to the ‘Final draft’. In turn, ‘editors’ would be able to assign a specific status to an entry such as ‘In Review’ or ‘Accepted,’ thus locking these entries against further changes. Among the editors’ functions would be the ability to reduce the status of an entry from ‘In Review’ or ‘Accepted’ to ‘Final Draft,’ thus opening such entries to further edits by publishers.

For all users logged in at a level higher than ‘anonymous,’ selected preferences would be recorded and applied to future sessions.

If a GEOSS-wide user registration is implemented in 2012, then the URR *Login* user registration is expected to be compatible with the GEOSS-wide registration. Regardless, to make URR publishing and reading options compatible, the user levels outlined above need to be available for the URR.

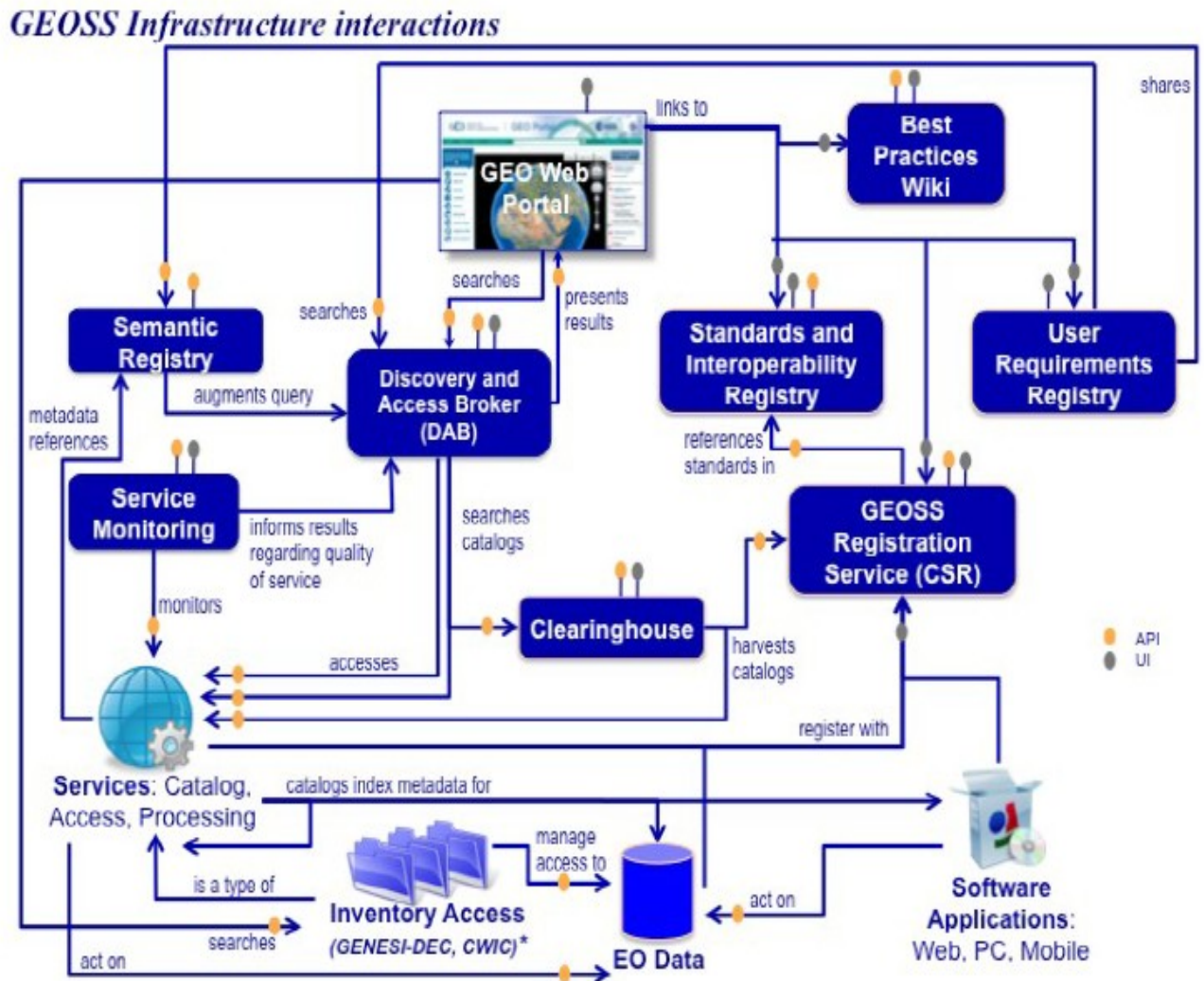
## **5.6 Preference Function**

In the *Preference* menu function, URR users are expected to be able to personalize the URR appearance and function to satisfy their interests and needs. Although the number and type of *Preference* submenus will have to evolve with experience and user feedback, it is expected that they will include issues such as: Forms, Societal Sectors, SBAs, Subfields, Keywords, Portfolio and Lists.

*Preference* forms might allow users to select a subset of forms to be considered, for example, during an analysis or in a search. The submenu of Societal Sectors, SBAs, Subfields and Keywords would allow users to select the subset in each list that will be active during their URR visit. To narrow relevant activities, only entries that fall into those subsets will be considered. For example, if a user selected the Water and Disasters SBAs, then only entities that have Water or Disasters data as a relevant SBA will be considered in any function of the main menu items. The ‘Portfolio’ submenu would allow a user to narrow the set of entities to be considered in certain menu functions (e.g., in Analyze or View) to specifically selected entries. Once a user has initialized a portfolio, there are expected to be several options to add entries to the portfolio.

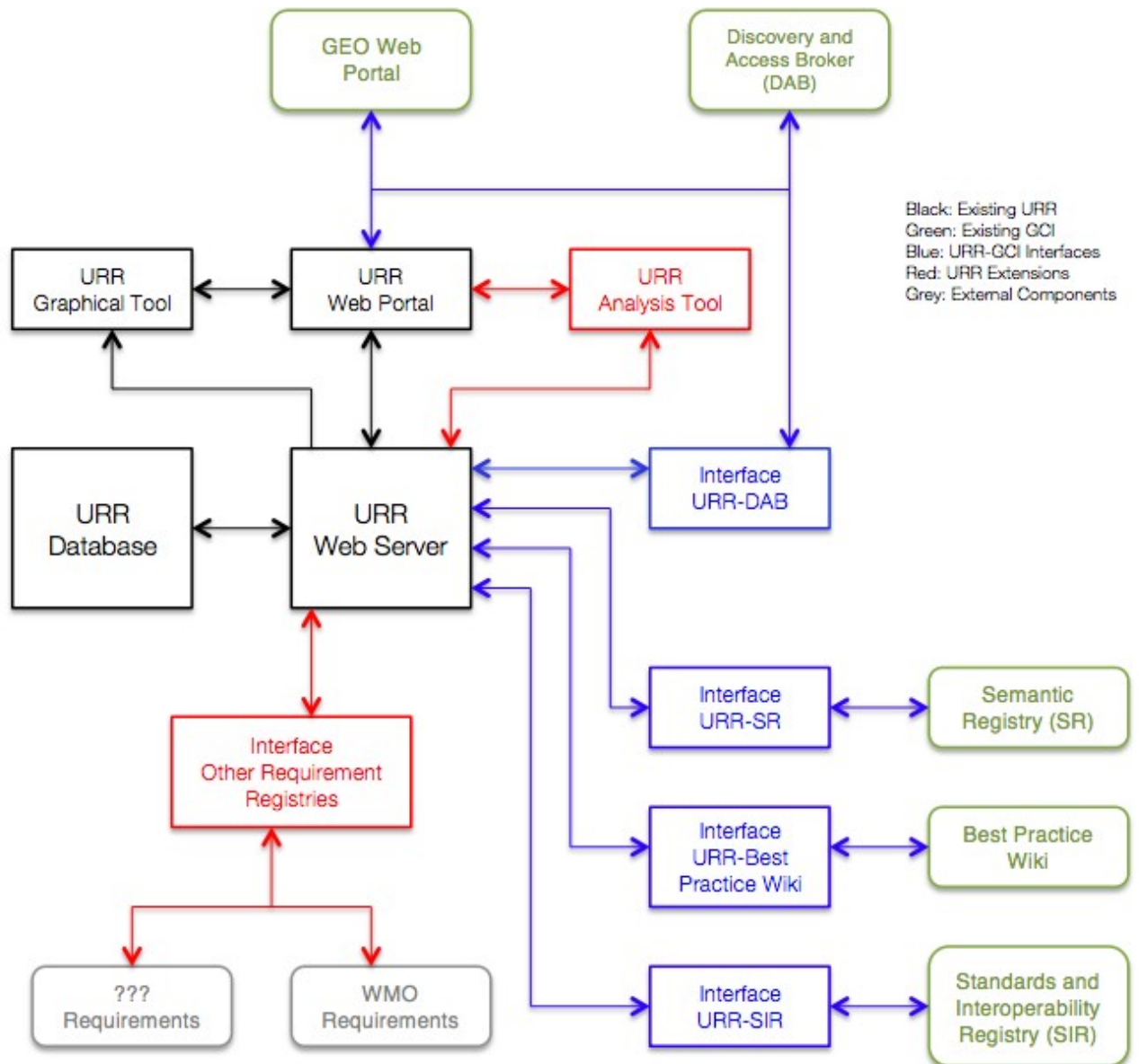
For a users not logged in under a personal account (i.e., internally handled as an anonymous user), the availability of any selected preference would be limited to the current session.

**Figure 1 – GEOSS Common Infrastructure (GCI)**

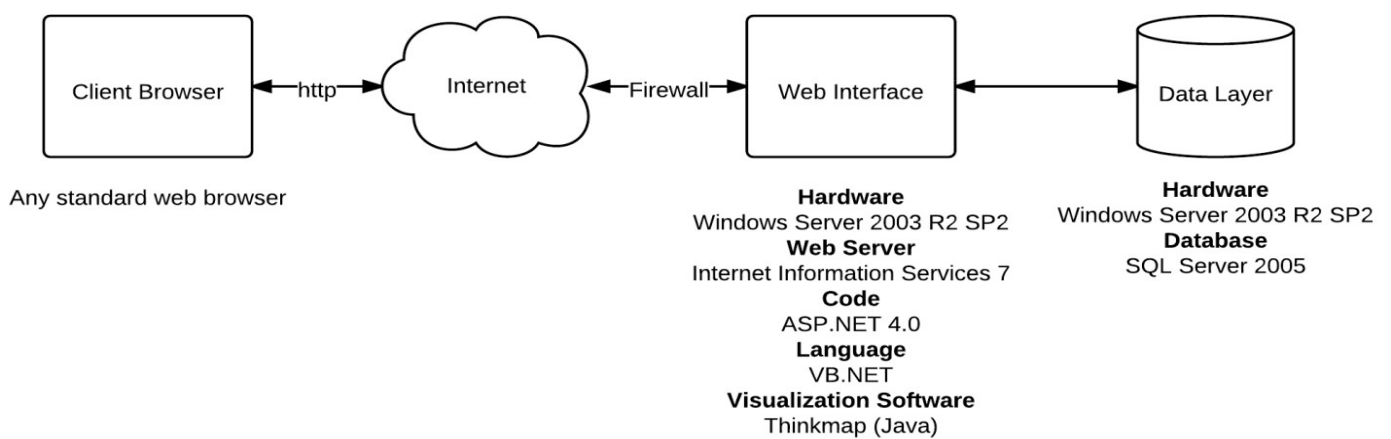




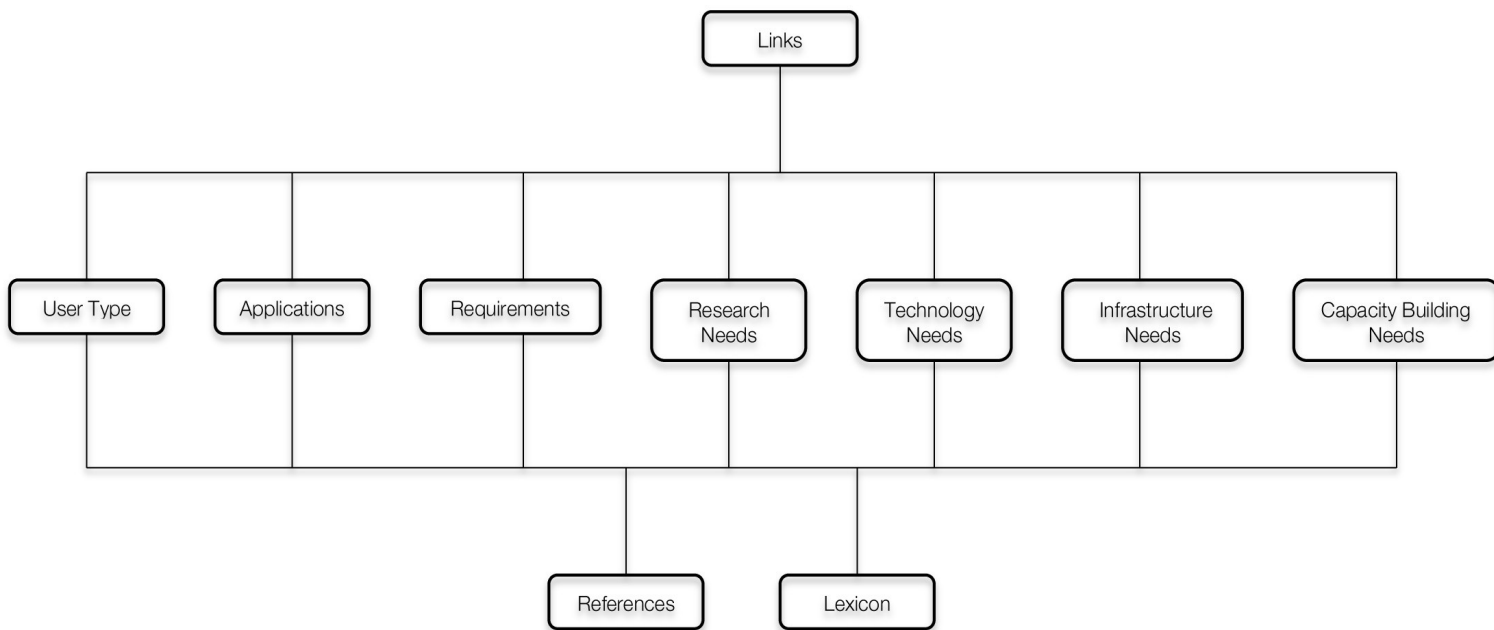
**Figure 2. User Requirements Registry System Architecture**



**Figure 3 – User Requirements Registry Network Diagram**



**Figure 4 – User Requirements Registry Forms**



**Figure 5 - User Requirements Registry Home Page**  
(<http://www.scgcorp.com/urr>)

## Home

The Intergovernmental Group on Earth Observations (GEO) is implementing the Global Earth Observation System of Systems (GEOSS) and developing tools to help users better understand earth observation data to a variety of societal areas. A suite of GEOSS Registries is at the core of these tools. These registries provide the means to register GEOSS components, services, data sets, and other relevant information resources. They are designed to enable users of Earth observations to access, list, search, and use the data and services available through GEOSS.

GEO is building GEOSS as a user-driven system. The GEO User Requirements Registry (URR), which is part of the GEOSS Registries, allows users to publish their needs in terms of Earth information, and it enables users and providers to analyze the value chains from Earth observations to end users. In order to collect and update information on user needs, GEO has established several processes to engage users depending directly or indirectly on Earth observations. The URR is one of the principal user engagement mechanisms in GEOSS. The core of the URR is a comprehensive database with information on user types, applications, and requirements as well as their inter-connectivity.

A key innovative feature of the URR is its capacity to generate and analyze links between the different types of functions—User Types, Applications, Requirements, Research Needs, Technology Needs, Infrastructure Needs, and Capacity Building Needs. Creating these connections allows publishers (those entering data) and readers (those viewing data) to understand the interconnected nature of the various functions. Relationships between functions can be viewed in the URR Links page and illustrated graphically within each URR form. [Figure 1](#) illustrates a representative Links visualization, showing a "User Type" (Aerobiologist; yellow circle) linked to an "Application" (Land-use management; blue circle) that is in turn related to various "Requirements" (e.g., Biogeochemical assessment and Ecosystem health assessment; green circles). Selecting other elements in the image will then display a new network of links originating from the selected entity. Documenting links between these different elements demonstrate the unique URR relationship capability and should help URR users make more informed decisions.

Population of the URR is based on peer contribution similar to the Wikipedia system. Moreover, relevant information from the reports produced by the GEO Work Plan Task US-09-01a has been extracted and entered into the URR. Engineers, scientists and policy makers world-wide who contributed the US-09-01a reports are being asked to assist in populating the URR. As far as possible, information is also harvested from other databases with information on user needs. But the biggest contribution will have to come from individual users who publish their needs. Please view this recent [URR publication](#) for more information.

You are invited to visit and search the URR for information related to user needs, applications, and observational requirements. If you have information on these items, you are invited to publish your information and thus enrich the URR. If you intend to publish information in the URR it is strongly recommended that you first visit the URR Tutorials. In particular, the tutorial on the general concept of the URR is designed to introduce you to the type of information that should be published in the URR. It is also very helpful to scroll through one of the specific tutorials on publishing information. [Visit the URR Tutorials](#).

See also the [Brief Introduction to the URR](#), an [article in Imaging Notes](#), and the [URR Concept of Operations](#) for additional background information.

GEOSS depends on user feedback, and so does the URR. Give us your feedback by filling out the [Questionnaire](#).

Figure 6 - User Requirements Registry Links Function

