AIP Development Process

GEOSS Architecture Implementation Pilot (AIP)

Version: 29 January 2010
Prepared for the AIP-3 Call for Participation

Preface

This document defines the development process employed on the GEOSS Architecture Implementation Pilot (AIP); a task of the Group on Earth Observations. AIP develops and pilots new process and infrastructure components for the GEOSS Common Infrastructure and the broader GEOSS architecture. The main aims of AIP are to reach consensus on Interoperability Arrangements and to register operational components and services that carry forward into persistent operations of GEOSS.

AIP employs an "evolutionary development process" whereby the architecture, the delivered systems, and the stakeholders co-evolve. Stakeholder needs are reassessed with each iteration of the architecture; the architecture is used to guide each system as it moves through development, and appropriate versions are used to evaluate each system on delivery.

The AIP Development process consists of a series of phases, e.g., phase 3 (AIP-3). Major efforts of phase of AIP are initiated with a Call for Participation (CFP). The process defined in this document is made into a plan according to the dates of the Master Schedule in the CFP for a phase.

As an element of the development, AIP has defined a System Design process structured using Scenarios and Use Cases. Scenarios describe how GEOSS is envisioned to support SBA Communities of Practice. Use Cases are reusable transverse technology approaches for implementing the scenarios.

The major deliverable items of this development in an AIP phase are:

1) Deployment and registration of components and services that continue to build GCI and the broader GEOSS,
2) Documentation of the results of the AIP Phase in Engineering Reports regarding the scenarios and technical topics, and
3) Demonstration of the newly developed functionality using the SBA Scenarios and selected technical topics.

This version of AIP Development Process was prepared in tandem with two other AIP documents:

- GEOSS AIP-3 Call for Participation, Version 29 January 2010
- GEOSS AIP Architecture, Version 29 January 2010

Both documents are available at this URL:
http://earthobservations.org/geoss_call_aip.shtml

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1 Overview

The AIP Development Plan defines the process for developing the GEOSS Architecture Implementation Pilot (AIP). The AIP Development Process is a normative reference to the AIP Call for Participation (CFP).

(The process defined in this document was initially defined based upon the OGC Interoperability Program procedures for a Pilot Initiative. More information can be found here: http://www.opengeospatial.org/ogc/policies/ippp)

2 Development process

2.1 Process overview

AIP employs an "evolutionary development process" whereby the architecture, the delivered systems, and the stakeholders co-evolve. Stakeholder needs are reassessed with each iteration of the architecture; the architecture is used to guide each system as it moves through development, and appropriate versions are used to evaluate each system on delivery. Architectures developed under this approach emphasize flexibility and adaptability. This approach is well suited to software system development where it is impossible to postulate all of the requirements and the system development can proceed iteratively.

The AIP Development process consists of a series of phases, e.g., phase 3 (AIP-3). Figure 1 shows the steps for a single phase of AIP. The main result of the Concept Development phase is a Call for Participation (CFP) that is released to the GEO Community and to the Public. Organizations that respond to the CFP then gather for a Kickoff workshop for the phase that begins the development process. The Development Phase includes design development, design review and testing activities. A phase of AIP is completed with the delivery of demonstrations, Engineering Reports, and the transition of new functionality to persistent operations of GEOSS.

The major deliverable items of an AIP phase are:

1) Deployment and registration of components and services that continue to build GCI and the broader GEOSS,
2) Documentation of the results of the AIP Phase in Engineering Reports regarding the scenarios and technical topics, and
3) Demonstration of the newly developed functionality using the SBA Scenarios and selected technical topics.

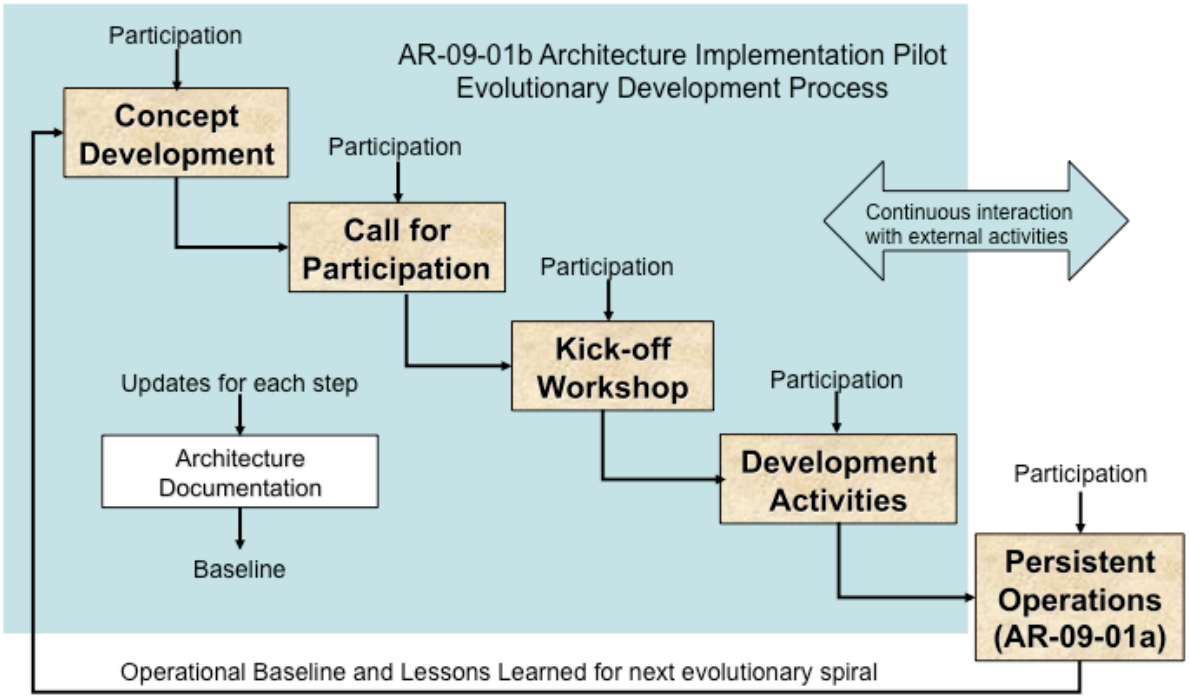

Figure 1 – AIP Development Approach

2.2 Concept development

The Concept Development phase results in an architecture, requirements and a plan sufficient to develop a Call for Participation in the Pilot Initiative.

The Architecture is refined based upon the results of previous Phases of the Pilot. This feedback is a key to this form of evolutionary development process.

Specific areas of emphasis for a phase of AIP are defined through extensive with the GEO Architecture and Data Committee (ADC). AIP also coordinates with the GEO User Interface Committee (UIC) and with GEO tasks relevant to the content of the phase. The objective is to gather broad input and agreement on the content of the phase with the GEO community.

2.3 CFP development

The second step in the AIP development process is to release a Call for Participation (CFP) and to receive and evaluate responses to this CFP.

Once a draft CFP is developed by the GEO Task Team it is presented to the GEO ADC for their review and comment. Comments are addressed and incorporated by AIP IP Team into the final version of the CFP. Once the Task Team and ADC agreed to the release, the CFP is announced through several communication mechanisms. The desire is that multiple organizations will respond to the CFP explaining the technical contribution they intend to make, how their contribution maps to the architecture, and the contributions they will make to the initiatives.

2.4 Kickoff

A key event in the AIP process is a workshop convened with the AIP Participants to begin the development phase. To be most effective, organizations that responded to the CFP are encouraged to attend the Kickoff Workshop. This allows the participants to meet in-person to plan the pilot as all subsequent activities are conducted using distributed communication mechanisms.

On receipt of the CFP responses, the AIP IP Team reviews the responses, updates the architecture and plans for the kickoff workshop.

All responding organizations should assume that their responses are accepted for participation in the Pilot unless they are notified otherwise.

The Pilot architecture, schedule, and development plan will be updated by the IP Team prior to the kickoff. The IP Team will work with the GEO Task Team and Initiative Sponsors to develop an agenda for the Kickoff Meeting.

One goal of the Kickoff Workshop is to obtain consensus on the work plans for the Pilot by all stakeholders in the initiative.

The Kickoff Workshop will address two development activities in the Pilot process: (1) component interface and protocol definitions, and (2) demonstration scenario development. The development activities will interact and affect each other, and the interaction will be iterative. During the Kickoff, both activities will be jump-started using the preliminary architecture and other assets that participants bring to pilot. Participants will be asked to volunteer to address any perceived shortfalls.

An additional product of the Kickoff meeting will be a development schedule that defines specific milestones. These milestones will include component-to-component interactions across the interfaces under development, and component insertion into demonstration scenarios. Among the milestones will be Technology Integration Experiments (TIEs). The TIEs will be conducted on a planned basis during the Execution Phase. Participants providing components shall participate in relevant TIEs.

At the Kickoff Workshop, there will be technical breakouts to begin developing component interface solutions. The participants are expected to have systems and/or software engineers in attendance to assist in the initial assessment and interaction of the interfaces. This may include UML modeling of the interfaces. Use cases will be made available to the demonstration development team, and the interface definition team should incorporate in their own analysis use cases provided by the demonstration development team. As a way of validating the interfaces, they will be "exercised" against the demonstration scenarios.

Simultaneously, there will be technical breakouts at the Kickoff Workshop to begin demonstration scenario design and creation. This activity will involve the development of use cases to explore the implications of the scenarios. These use cases should be made available to the interface development team, and demonstration developers should incorporate in their own analysis the use cases provided by the interface development team.

A major result of the Kickoff Workshop is the establishment of Working Groups (WGs) and agreement on a Development Plan for the pilot. The WGs are established along with the volunteers to lead the WGs.

2.5 Development

Development begins after the Kickoff Workshop and includes the elements of System Design, Component Deployment and Testing activities.

Using results of the Kickoff Workshop as the governing documents for the conduct of the initiative, the participants will begin the principal tasks of refining engineering specifications as needed, developing components, and testing those components. The key outcome of the pilot initiative will be persistent, operational exemplars and demonstrations of the exemplars.

The System Design process is structured using Scenarios and Use Cases. Scenarios describe how GEOSS is envisioned to support SBA Communities of Practice. Use Cases are reusable transverse technology approaches for implementing the scenarios. Results of the Design Process include identification Interoperability Arrangements for a deployment architecture of components and services that will achieve the objectives of the SBA scenarios and broader architecture. For a full description of the Design process see Section 6.

During the selection of Interoperability Arrangements, modifications to existing open standards specification may be found to be necessary, then a change proposal must be developed that documents the change. Change proposals do not need be adopted during the pilot; rather it is intended to serve as documentation of both the change and the requirement that led to the change. The change proposal will be submitted to an appropriate standards developing organization.

During Development, participants will have access to the GEOSS Standards and Interoperability Forum (SIF) and the GEOSS Best Practice Wiki (BPW). Use of the SIF is strongly encouraged to assist AIP participants with understanding interoperability objectives with respect to particular standards or special arrangements. Use of the BPW is strongly encouraged for AIP participants so that what is believed to be a best practice can be recorded for others to benefit from as they decide to participate in GEOSS.

The SIF's primary mission is to facilitate the interchange of information and the development of recommendations for standards and interoperability within the GEOSS. The SIF oversees a key component of the GCI - the Standards and Interoperability Registry (SIR). The goal of the SIF is to enable ever-greater degrees of interoperability among GEOSS-contributed resources through facilitation, technical analysis, advocacy and education. The SIF Interoperability Advisors provide technical assistance with questions and decisions regarding interoperability, including use of standards and special arrangements needed to implement a server or client component. SIF representatives participate in the AIP process. Online access to the SIF can be found by going to http://seabass.ieee.org/groups/geoss.

The BPW is a GCI component available to AIP participants. It should be used to capture what component providers believe could be a best practice for interoperability. The BPW is a resource for comment, contribution, development, and convergence to a best practice. Contributions to the BPW need not be finished best practices, since the BPW can be used during the AIP process to fine tune the content provided. Contributions to the BPW by AIP participants can help provide future GEOSS contributors and users with valuable information regarding the implementation and use of interoperability arrangements. AIP

participants can use the SIF if assistance is desired with the use of the BPW or with registration of content for the BPW. Access to the BPW can be found at http://wiki.ieee-earth.org where user registration is required to gain full access for contributing content.

A primary goal of a pilot is to verify by testing that interaction of a set of components that exercise a set of specifications supports SBA scenarios. Therefore, participants will conduct Technology Integration Experiments (TIEs) to determine if these components can function in an interoperable environment. Typically there will be several "software builds" until interoperability in the environment is demonstrated via the TIEs.

A TIE is generally understood to minimally include a participant providing a client component and another participant providing a server component working in conjunction to test the implementation of a particular specification.

AIP Testing is tailored to the specific environment of GEOSS considering that there is not a separate testing team. Testing is done at two levels: 1) unit testing of individual services as defined in engineering use cases, and 2) integrated testing of SBA scenarios. Testing is organized around two iterations of unit testing followed by a single scenario testing.

2.6 Demonstration

Demonstrations are conducted in AIP to communicate to GEO what new capabilities have been developed in the Phase. In order to reach the broadest audience, all demonstrations are made available via the Internet.

Participation in demonstration exercises is predicated upon full engagement with development, testing, and planning activities throughout the initiative.

To finalize the demonstrations, a Demo Capture Workshop will be convened to conduct the final integration of the components and to refine the steps in the demonstrations. During the workshop, the demonstrations will be captured through techniques such as client screen capture software. The demonstrations will then be made available for distribution.

During the Demo Capture workshop, demo developers coordinate on the production of the demo videos. Each of the videos is developed based upon a template common to all videos and a storyboard specific to each demo. Videos of the demo are captured and edited with desktop video tools such as Camtasia and IShowU.

The complete set of demonstration videos will be packaged with an overall menu and introduction to AIP and made available on the web and on DVDs.

2.7 Transition to operations

GEOSS Operations are the responsibility of the GEO Members and Participating Organizations. GEO Task AR-09-01b is a focal point for Enabling Deployment of a GEOSS Architecture including sustained operations, including the GEOSS Common Infrastructure (GCI).

Developments accomplished during an AIP Phase are anticipated to persist as through registration in the GEOSS registry as "Continuous Operations." AIP provides an increase in the baseline of operational components in GEOSS and provides methods to

monitor the operations of GEOSS components. AIP does not include the operations of GEOSS.

At the end of an AIP Phase, the results are communicated to GEO broadly with encouragement that the GEO maintain the results achieved. These presentations will inform the various groups of the AIP developments and new functionality that has been developed. It is anticipated that the new functionality will contribute to the advance of the GCI and the broader GEOSS.

The major deliverable items of an AIP phase are:

4) Deployment and registration of components and services that continue to build GCI and the broader GEOSS,
5) Documentation of the results of the AIP Phase in Engineering Reports regarding the scenarios and technical topics, and
6) Demonstration of the newly developed functionality using the SBA Scenarios and selected technical topics.

3 Roles in Pilot Initiative

The following roles are performed by organizations contributing to an AIP.

3.1 Participants

Participants are organizations that contribute to the definition of interfaces, prototypical implementations, scenario development and other support for an AIP. Participants are defined as organizations that have committed to contribute in a "substantial" amount. Participants are represented in an AIP by business and technical representatives.

3.2 IP Team

The AIP Interoperability Program (IP) Team is an engineering and management team to oversee and coordinate an Interoperability Initiative. The IP Team facilitates architectural discussions, synopsizes technology threads, and supports the specification editorial process. The AIP IP Team is led by the AIP Task Leader. The IP Team includes software architects who have been committed by their organizations to provide a high degree of technical leadership in the AIP.

3.1 GEO Secretariat

The GEO Secretariat contributes to the AIP process by reviewing consistency of proposals and their progress with the GEO workplan, and with activities of relevant GEO (sub)task Teams, GEO Committees and GEO Task Forces.

The Secretariat will serve as routine interface to these parties, and will request participations of IP team members or participants whenever needed. This role will be particularly relevant for crosscutting issues like implementation of data sharing principles and the quality assurance strategy.

The GEO Secretariat will also logistically support the AIP3 teleconferences and meetings.

3.2 Observers

Observers are organizations that have been granted access to the initiative communication tools but are not contributing as participants. Observers are given full access to email lists, initiative web sites and regularly scheduled initiative wide teleconferences. Observers may make recommendations and comments to the participants via any of these fora. The AIP IP Team has the authority to table any comments, recommendations or other discussions raised by observers at any point without prior warning. Failure of an observer to comply may result in suspension of access.

4 Communications plan

4.1 Distributed communication requirements

The communications plan supports development of the Initiative given the geographically distributed locations of the participants. Communication requirements include:

- The need to proactively and rapidly alert participants of events, deadlines, and decisions that affect them,
- The need to keep participants apprised of the status of all participants to ensure coordination and cross-communication,
- The need for participants to post items of interest, status reports, and software for distribution amongst the participants,
- The need for participants who are in remote locations to provide to IP Team or other participants with software for installation at various support sites, and
- The need for groups of participants to communicate/discuss and resolve ongoing definitional and development issues and related solutions.

The following sections describe communication to be used during AIP.

4.2 Webex telecons

Telecons will be conducting using the combined webex and telecon facility provided by the GEO Secretariat. Details on the operations will be provided via the mailing lists.

Nominal plan:

- Weekly telecon at about 1200 UTC
- Monthly telecons at about 2300 UTC

4.3 E-mail reflectors

E-mail will be exchanged for the GEOSS Pilot using several e-mailing listservs. The AIP e-mail lists are summarized here:

http://www.ogcnetwork.net/AIPilotLists

4.4 AIP web pages

OGC is providing a content management site for use by the AIP.

http://www.ogcnetwork.net/AIpilot

AIP Participants are encouraged to register for an account on OGC Network so as to contribute to the AIP pages.

Record of telecons and events of AIP are listed on OGC Network pages.

4.5 Google sites

The diversity and pace of participation in AIP benefit from use of an external facility for online collaboration during the pilot. Many of the documents, diagrams, and notes are actively maintained and shared by means of a wiki pages on Google Sites (http://sites.google.com/site/geosspilot2/Home).

AIP-3 will make use of somewhat broader facilities offered by Google Apps. These include Google Sites with increased storage as well as Google Calendar for scheduling activities and Google Docs for collaborative preparation of documents such as engineering reports and specifications.

All collaboration pages and documents will be publicly available to read throughout the pilot activity. Each registered pilot participant will be able to contribute and edit content throughout the site. The Google Apps site will be managed during the pilot to support a free and informal style of collaboration. As consensus is reached on persistent artifacts of the pilot, these will then be transitioned to the OGC Network site for longer-term availability.

4.6 GEO best practice wiki

The BPW is a GCI component available to AIP participants. It should be used to capture what component providers believe could be a best practice for interoperability. The BPW is a resource for comment, contribution, development, and convergence to a best practice.

Access to the BPW can be found at http://wiki.ieee-earth.org where user registration is required to gain full access for contributing content.

5 Principles of conduct

5.1 GEOSS references

The GEOSS approach to Governance is defined here:
http://www.earthobservations.org/about/about_GEO.html#governance

The GEO Rules of Procedure (GEO 0205-10) are available here
http://www.earthobservations.org/docs/GEO-II/GEO%200205-10%20GEO%20RULES%20OF%20PROCEDURE.pdf

5.2 Principles of conduct

While non-binding, the following principles of conduct can support an effective pilot process:

1. Pilot participants extend respect and courtesy to their colleagues at all times.

Initiative participants come from diverse origins and backgrounds and are equipped with multiple capabilities and ideals. Regardless of these individual differences, participants treat their colleagues with respect as persons--especially when it is difficult to agree with them. Seeing from another's point of view is often revealing, even when it fails to be compelling.

English is the de facto language of the process, but it is not the native language of many process participants. Native English speakers attempt to speak clearly and a bit slowly and to limit the use of slang in order to accommodate the needs of all listeners.

2. Pilot participants develop and test ideas impartially, without finding fault with the colleague proposing the idea.

We dispute ideas by using reasoned argument, rather than through intimidation or ad hominem attack. Or, said in a somewhat more consensus-like way: "Reduce the heat and increase the light."

3. Pilot participants think globally, devising solutions that meet the needs of diverse technical and operational environments.

The goal of the initiative is to maintain and enhance a working, viable, scalable, global set of interfaces and protocols that provide a framework for interoperability in the geospatial domain. Many of the problems we encounter are genuinely very difficult. Participants use their best engineering judgment to find the best solution for the whole domain of geospatial interoperability, not just the best solution for any particular network, technology, vendor, or user.

4. Participation in AIP Demonstrations is predicated upon full engagement with development, testing, and planning activities throughout the initiative.

The purpose of AIP is to develop and pilot new process and infrastructure components for the GCI and the broader GEOSS architecture. Demonstrations are developed to inform the broader GEO community of the primary activities regarding GEOSS architecture development and deployment. Participation in AIP Demonstrations is reserved to those organizations that participate in the collaborative development of AIP.

6 System Design Process

AIP uses a system design process to implement SBA Scenarios into the GEOSS AIP Architecture based upon engineering use cases. This process is reusable for deploying SBA scenarios in a Service-oriented Architecture (SoA). This "SBA to SoA process" can be reused by organizations external to AIP developments.

6.1 Introduction

An objective for GEOSS is to provide decision-support tools to a wide variety of users. As with the Internet, GEOSS will be a global and flexible network of content providers allowing decision makers to access an extraordinary range of information at their desk. To achieve this goal, the GEOSS Architecture must provide an easy process to integrate the GEOSS components in support of many SBA communities. This section describes a process for implementing the needs of an SBA community into the GEOSS architecture. The process is reusable for the various SBAs and it reuses the GEOSS architecture across the SBAs.

The core of the reusable process are community *Scenarios* and transverse *Use Cases*.[1] *Scenarios* are narrative description of the activities of the SBA communities with minimal discussion of the implementation architecture. *Scenarios* provide an end user view of the value of GEOSS. *Scenarios* are implemented in the GEOSS architecture by *use cases*. *Use cases* describe reusable functionality of the GEOSS service oriented architecture implemented through *Interoperability Arrangements*. This process builds on these core concepts using a system modeling process based on international standards tailored to the GEOSS environment.

Development of architecture models is a step towards a mature GEOSS: "Creating explicit models of a system's design is the step leading from art to practice."[2] AIP begins with the typical architecture practice of describing a system from multiple viewpoints.[3] The AIP process tailors international standards for system architecture by considering the environment of GEOSS, in particular: 1) GEOSS is a system-of-system development that does not begin with a "blank sheet" but rather requires iteration of design synthesis with existing implementations, and 2) Contributions are made by GEO Members with no central procurement authority.

6.2 Process description

The reusable process for deploying SBA Scenarios into the GEOSS AIP Architecture is shown in Figure 2 and described in Table 1. This process is iterative with the main flow of activities as shown in the Figure, but the process is not accomplished in one pass. It is important that the SBA communities are considering the SoA technology when conceiving of their objectives as SoA provides capabilities that not previously available.

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[1] Definitions for terms in *italic* typeface are listed in Section 6.3

[2] Cf., "Notes on the Synthesis of Form," Christopher Alexander, Harvard Press, 1964, and "Systems Architecting," Eberhardt Rechtin, Prentice Hall, 1991

[3] International standards for architecture all require a set of views: IEEE 1220, ISO/IEC 10746, ISO/IEC 19793

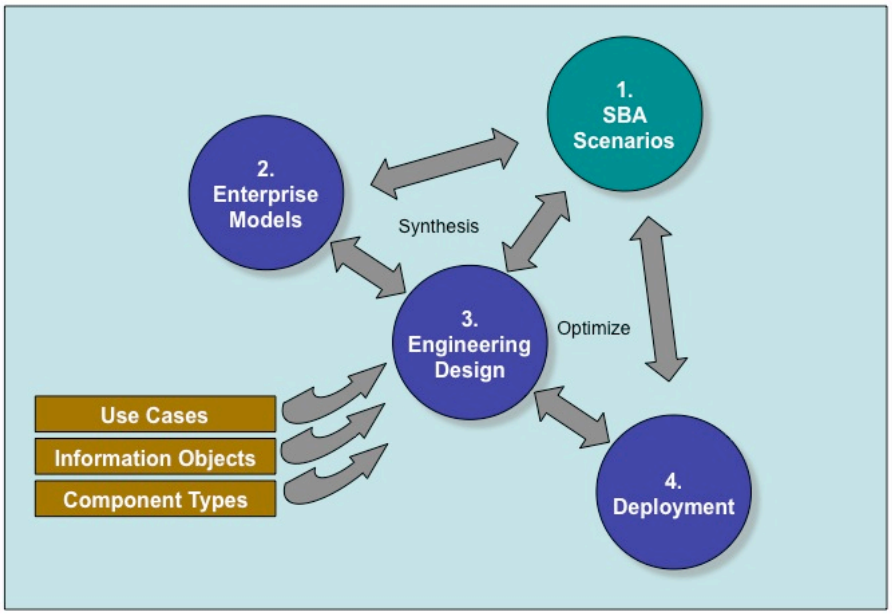

Figure 2 – Design Process to Deploy SBA Scenarios

Table 1 – SBA Scenario Deployment Process Steps

Step	Activities	Artifacts
1. Scenarios	SBA community experts develop narrative descriptions of *processes* for the desired behavior of decision makers using Earth Observations in the context of GEOSS Scenario development occurs with a general understanding of GEOSS. The SBA community experts develop the narrative with an understanding of the basic GEOSS architecture, e.g. the *generalized use cases*.	• Objectives • *Scenarios* • *Processes*
2. Enterprise Models	AIP system engineers - working with SBA community experts - elaborate and specify the scenarios into enterprise models. Steps in the *processes* are detailed in *activity* actions.	• *Activity diagram* • *Enterprise objects* • Context diagram
3. Engineering Design	AIP architects - working with the SBA Community experts and AIP system engineers - develop optimized designs for the enterprise models by applying and refining SoA *use cases*, *information objects,* and *component types*. Each *activity* action is assigned to a pre-existing *generalized use case* or a *specialized use case* is developed. Interoperability arrangements are chosen and to the Standards and Interoperability Registry as necessary with support from the SIF.	• Refinement of *Generalized use cases* • *Specialized use cases* • *Information objects* • *Component Types* • *Interoperability Arrangements*
4. Deployment	Component providers – working with AIP architects and Community Moderators – identify, develop (as necessary) and register a set of *component instances* based upon the engineering design into the Components and Services Registry. Components include those provided by the community and discovered in the wider GEOSS. Deployment includes testing that the components meet the community objectives. Demonstrations are developed to communicate the system operation to users. Best practices are identified. With SIF assistance, if necessary, the component provider and community should enter best practice drafts into the Beat Practices Wiki for further editing and formalization.	• *Component Instances* • *Persistent Exemplars* • *Demonstrations* • Components and Services Registry • Best Practices Wiki • SIF

6.3 Process Terminology

This section lists terminology used in the AIP Modeling process. The terms are taken from several standards. Some terms are unique to the AIP process. Figure 3 shows relationships between some of the terms.

The following references are used in this section. The references in order of precedence:

1. UML4ODP (ISO 19793)
2. RM-ODP (ISO 10746-2):
3. UML (OMG 07-02-05, UML 2.1.1))

Scenario (as used in AIP-2, scenario can be best understood considering the term Process from [UML4ODP])

- The modelling of *behaviour* may be structured into one or more *processes*, each of which is a graph of *steps* taking place in a prescribed manner and which contributes to the fulfillment of an objective. In this approach, a *step* is an abstraction of an *action* in which the *enterprise objects* that participate in that *action* may be unspecified. [UML4ODP])
- Scenario defines the "business" objectives of the Community in using the GEOSS architecture.
- A template for SBA Scenarios was developed early in AIP-2 process implicitly defining concepts. Refinement of the template based upon the preceding paragraph results in these concepts: A *scenario* may contain one or more *processes*. A *process* is defined in narrative form as a set of *steps* in a table.

Activity (Diagram):

- An *activity* is a single-headed directed acyclic graph of *actions*, where occurrence of each *action* in the graph is made possible by the occurrence of all immediately preceding actions (i.e. by all adjacent actions which are closer to the head). [RM-ODP]
- The notation for an *activity* is a combination of the notations of the nodes and edges it contains, plus a border and name displayed in the upper left corner. [UML]
- *Activity* replaces ActivityGraph in UML 1.5. *Activities* are redesigned to use a Petri-like semantics instead of state machines. [UML]

Enterprise object

Community object

- Each *enterprise object* models some entity (abstract or concrete thing of interest) in the Universe of Discourse. A particular kind of *enterprise object* is a *community object*, which models, as a single object, an entity that is elsewhere in the model refined as a community. [UML4ODP]

Role: Identifies a specific behaviour of an enterprise object in a community. [UML4ODP]

Action: Something that happens [RM-ODP]

Use Cases:
Generalized Use Case
Specialized Use Case

- A *use case* is the specification of a set of actions performed by a system, which yields an observable result that is, typically, of value for one or more *actors* or other stakeholders of the system. [UML]
- Each *use case* specifies a unit of useful functionality that the subject provides to its users (i.e., a specific way of interacting with the subject). [UML]
- AIP defines both *generalized use cases* and *specialized use cases*. A *generalized use case* specifies *actions* of value to GEOSS in general. A *specialized use case* refines a *generalized use case* as needed for a specific SBA community's requirements.
- *Use cases* for AIP focus on *services* and *interoperability arrangements*.

Actor

- An *actor* specifies a role played by a user or any other system that interacts with the subject. (The term "role" is used informally here and does not necessarily imply the technical definition of that term found elsewhere in this specification.) [UML]
- *Actors* may represent roles played by human users, external hardware, or other subjects. [UML]
- *Actors* are external to the subject of the use case. [UML paraphrased]

Service:

- A *service* is a distinct part of the functionality that is provided by an entity through *interfaces* [ISO 19119:2005]
- In AIP-2, *services* are types of computational objects as defined in [RM-ODP].

Interface

- An *interface* is an abstraction of the behaviour of an object that consists of a subset of the interactions of that object together with a set of constraints on when they can occur.
- RM-ODP defines three types of *interfaces*: 1) A signal interface is an interface in which all the interactions are signals; 2) An operation interface is an interface in which all the interactions are operations; 3) A stream interface is an interface in which all the interactions are flows.
- For SoA: an *interface* is a named set of operations that characterize the behaviour of an entity [ISO 19119]
- In GEOSS, agreements about interfaces are termed *interoperability arrangements*.

Interoperability arrangements

- GEOSS *interoperability arrangements* are to be based on the view of complex systems as assemblies of components that interoperate primarily by passing structured messages over network communication services. [GEOSS Strategic Guidance Document, October 2007]
- By expressing interface interoperability specifications as standard service definitions, GEOSS system interfaces assure verifiable and scalable interoperability, whether among components within a complex system or among discrete systems. [GEOSS Strategic Guidance Document, October 2007]

Information object[4]

Information held by the ODP system about entities in the real world, including the ODP system itself, is modeled in an information specification in terms of *information objects*, and their relationships and behaviour. [UML4ODP]

Component type

Component instance

A *component* represents a modular part of a system that encapsulates its contents and whose manifestation is replaceable within its environment. [UML]

A *component* is modeled throughout the development life cycle and successively refined into deployment and run-time. [UML]

For AIP-2, *component types* are design concepts that encapsulate *information objects* and provide *services* on the information through *interfaces*. *Component instances* are developments that have been deployed and are accessible at a network address. *Component instances* are registered in the GEOSS CSR.

[4] To date, modeling of the Information Viewpoint in AIP has been minimal, the single term "Information Object" is used as general concept that will be detailed in future AIP activities.

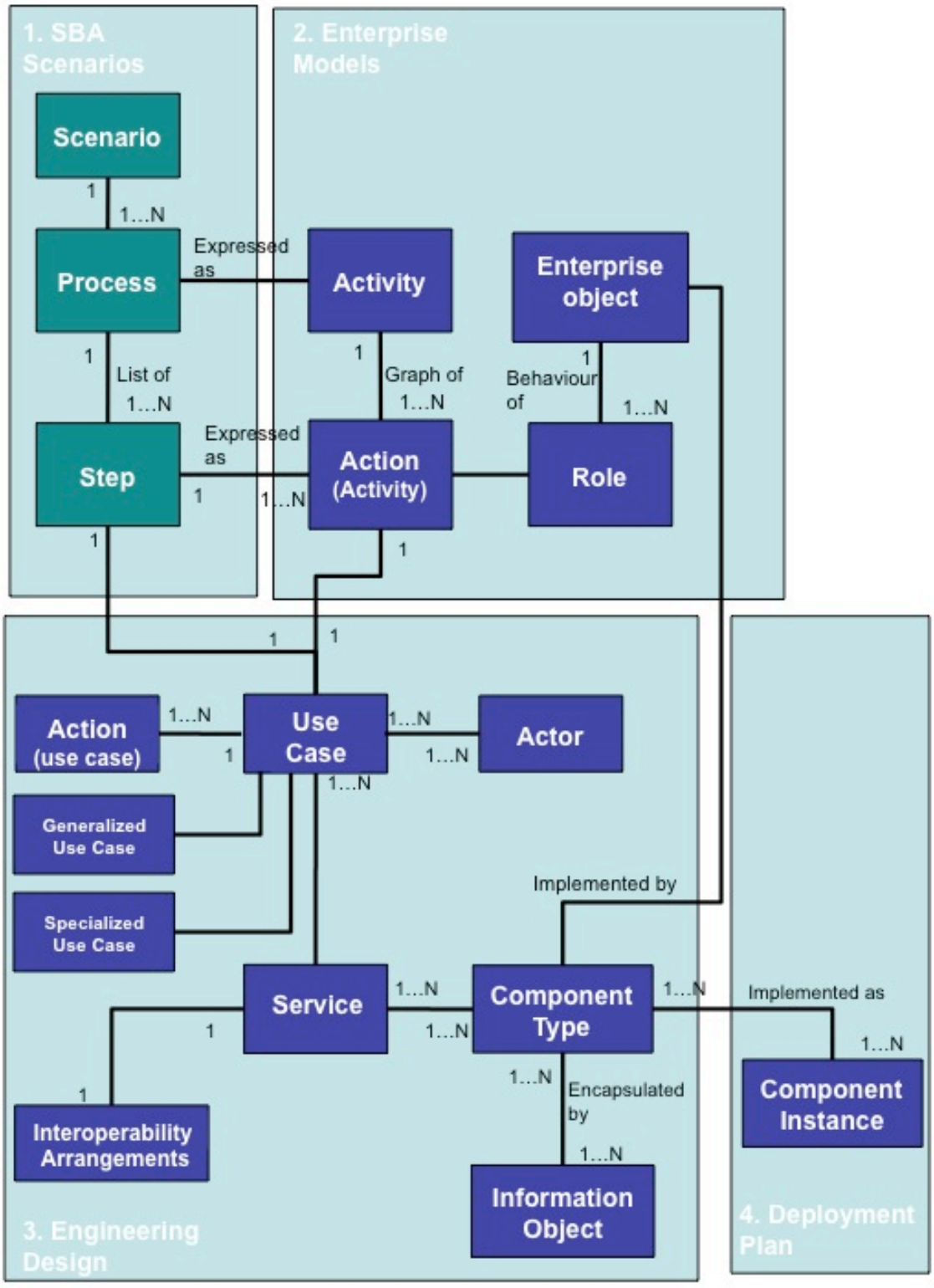

Figure 3 – Modeling Terminology