

Global Earth Observation System of Systems Architecture Development Using a System Specification in Terms of Viewpoints

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Agenda

- Background
- Introduction
- Overview of Use of UML for Open Distributed Processing (ODP) System Specifications
- RM_ODP Viewpoint Specifications
- RM_ODP Languages
- Overview of UML Concepts
- GEOSS Enterprise View Example
- Summary
- Questions?



Background

- Global Earth Observation System of Systems (GEOSS) will provide the overall conceptual and organizational framework to build towards integrated Global Earth observations that meet user needs
- GEOSS will be a “system of systems” made up of existing and future Earth observation systems, that supplement but do not supplant their own mandates and governance arrangements.
- It will provide the institutional mechanisms for ensuring the necessary level of coordination, strengthening and supplementation of existing global Earth observation systems
- Reinforcing and supporting them in carrying out their mandates.



Background

- **ISO/IEC 19793:2006** International Standard defines use of the Unified Modeling Language (UML 2.0 Superstructure Specification, OMG document formal/01-020-08) for expressing system specifications in terms of
- Viewpoint specifications defined by the Reference Model of Open Distributed Processing (RM-ODP, ITU-T Rec.9 X.901 to X.904 | ISO/IEC 10746 Parts 1 to 4) and the Enterprise Language (ITU-T Rec. X.911 | ISO/IEC 1541



Introduction

- Reference Model of Open Distributed Processing (RM-ODP) ISO/IEC 10746
 - Coordinating Framework for standardization of ODP
 - RM-ODP depicts an architecture that supports
 - Distribution, inter-working, and portability integration



Presentation Constraints

- Due to time allowed for presentation of one hour
 - Coverage of subject matter limited to descriptions and one example of the RM-ODP structure and framework provided by ISO/IEC 19793:2007
 - Example will cover Enterprise Specification and View using UML for one GEOSS scenario.



Unified Modeling Language

- Unified Modeling Language is used to specify and document the artifacts of the systems
- Can be applied to all major object and component methods
- RM-ODP ISO/IEC 10746 computational and engineering language uses UML 2.0 as its baseline



Unified Modeling Language

- Overview and Motivation
 - Five viewpoints, called enterprise, information, computational, engineering and technology serve as basis for specification of ODP systems
 - RMP-ODP does not prescribe a notation or model developed methodology
 - RMP-ODP documents provide the framework for ODP specifications using UML



View Point Specifications

- **Enterprise Specification** - Specifies the roles played by an IT system in its organizational environment
- **Information Specification** - Specifies system behavior to meet its objectives abstracted from implementation
- **Computational Specification** - Specifies computational structure in terms of units of functionality and distribution and their interactions
- **Engineering Specification** - Specifies the mechanisms and services to provide the distribution transparencies and meet Quality of Service (QoS) constraints required by the system
- **Technology Specification** - Specifies the hardware and software pieces from which the system is built.

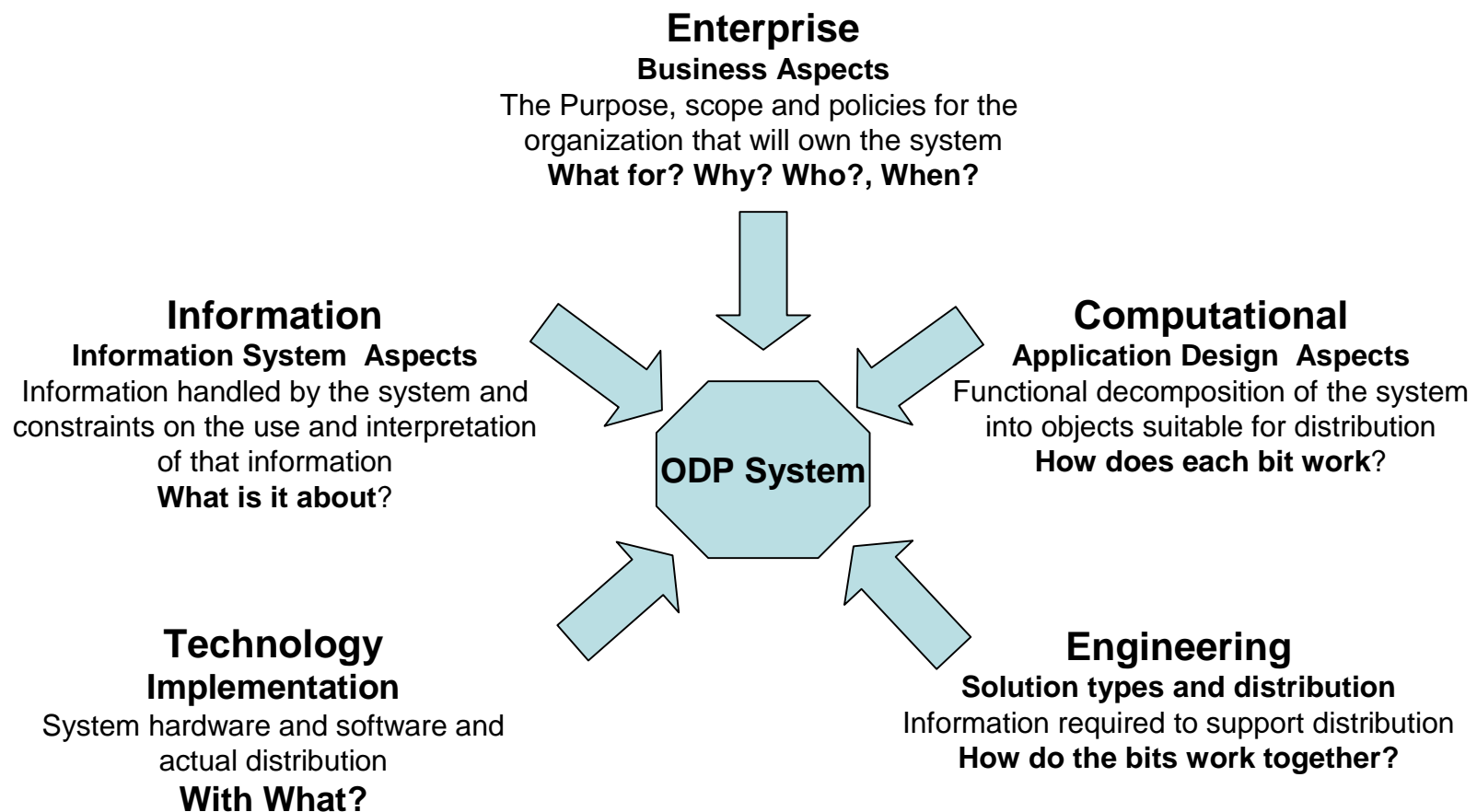


UML Profiles to be used for ODP

- **Enterprise viewpoint** -concerned with the purpose, scope and policies governing the activities of the specified system within the organization of which it is a part
- **Information Viewpoint** -concerned with the kinds of information handled by the system and constraints on the use and interpretation of that information;
- **Computational Viewpoint** -concerned with the functional decomposition of the system into a set of objects that interact at interfaces – enabling system distribution;
- **Engineering Viewpoint** - concerned with the infrastructure required to support system distribution;
- **Technology Viewpoint** - concerned with the choice of technology to support system distribution.



Viewpoint Specifications





Viewpoint Language

- Each viewpoint is associated with a viewpoint language
 - Enterprise Language
 - Modeled by one or more enterprise objects
 - Models ODP system in context of business or organization in which it operates
 - Model has one or more enterprise objects within communities of enterprise objects that model its environment
 - Roles are used to model users, owners and providers of information



Information Language

- Defines concept for the specification of the meaning of information that is stored inside, and manipulated by an ODP system
- ODP system is modeled in an information specification in terms of
 - Information Objects and relationships and behavior
 - Basic information elements modeled as atomic information objects
 - Complex information modeled as composite information objects



Computational Language

- Decomposes system into Computational objects that perform individual functions and interface at interfaces.
- computational language includes
 - Form of interface an object can have
 - Ways interfaces can be bound and forms on interaction that can take place at them
 - Actions an object can perform such as creating new objects and interfaces and establishment of bindings
- Ensures consistency between different engineering and technology specifications



Engineering Language

- Concerned with how objects interact
- Supports interactions between computational objects
- Defines mechanisms and functions required to support distributed interaction between objects in an ODP system

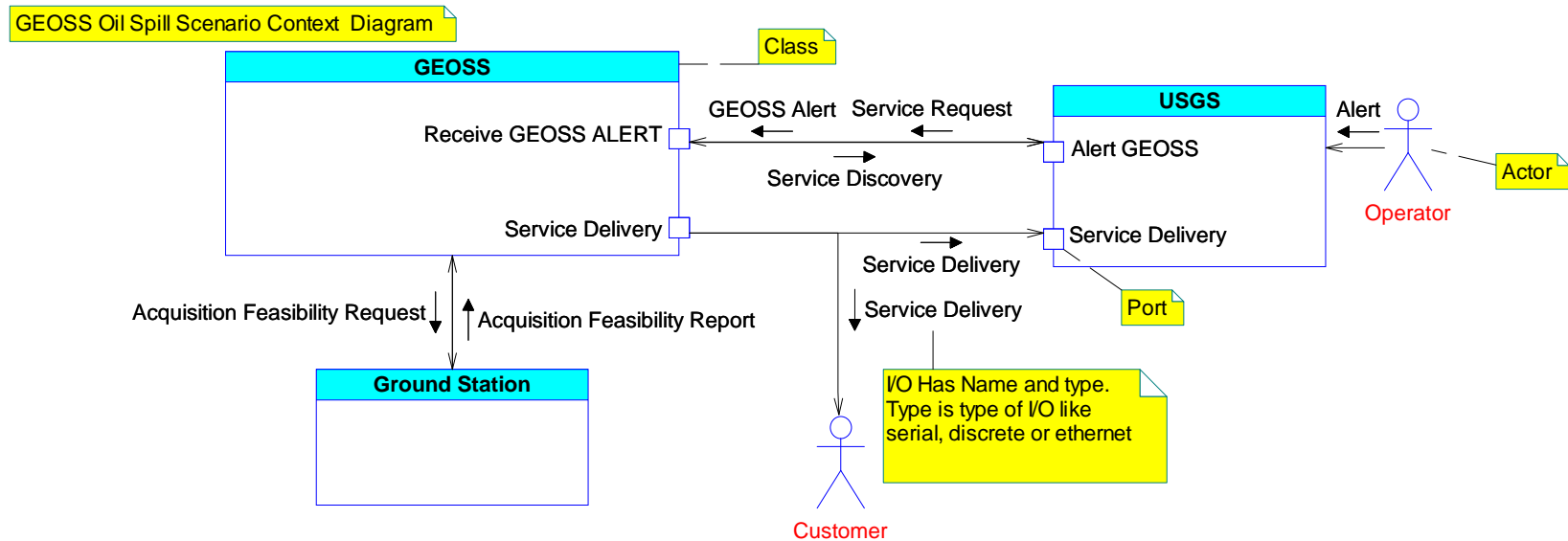


Technology Language

- Provides a link between the set of viewpoint specifications and the real ODP system implementation
- Lists the standards used to provide the necessary basic operations in the other viewpoint specifications
- Objective of the Technology specification is to provide extra information needed for implementation and testing
- Technology specification selects standard solutions for basic components and communication mechanisms

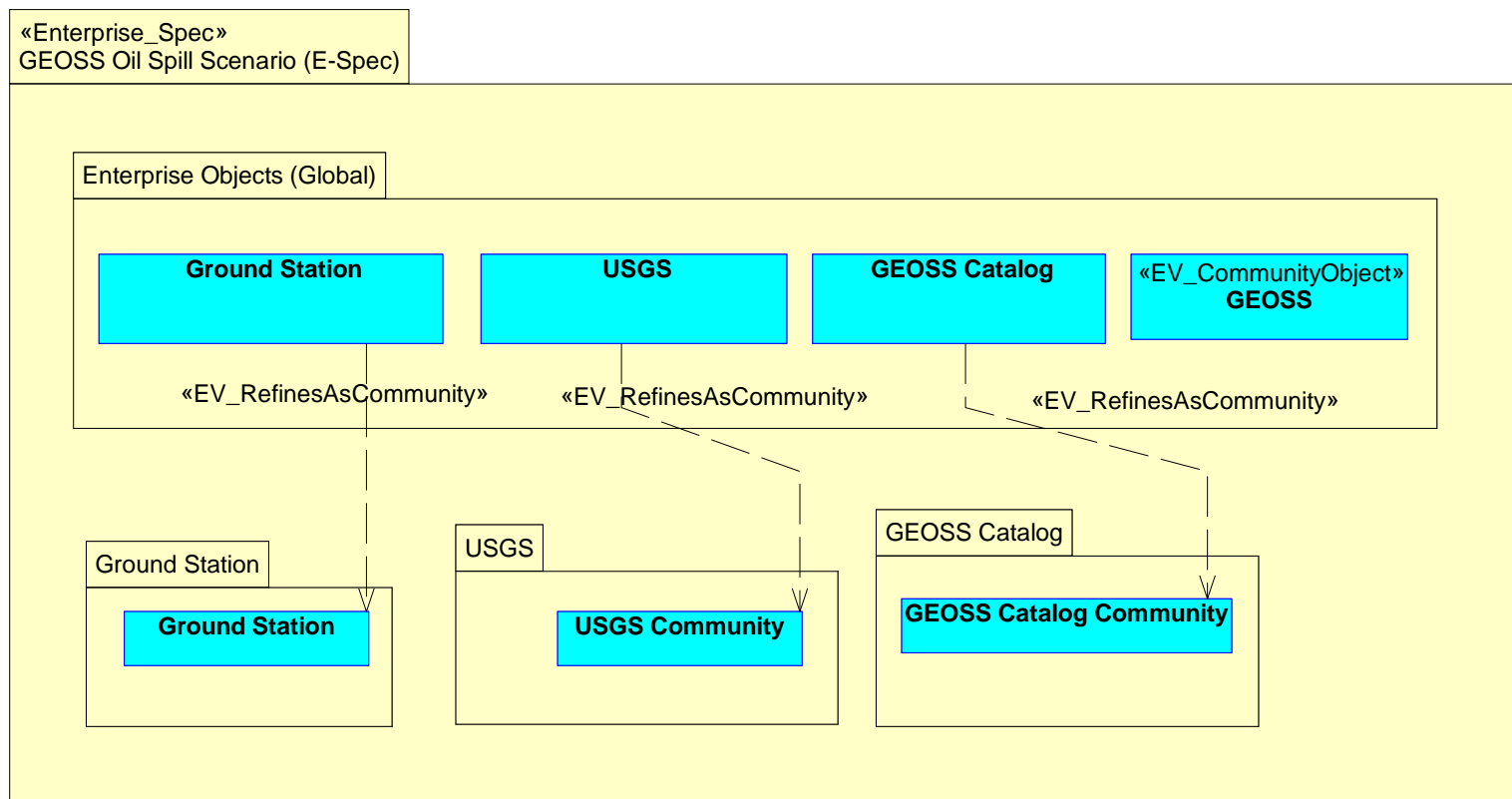


Oil Spill Scenario Context Diagram



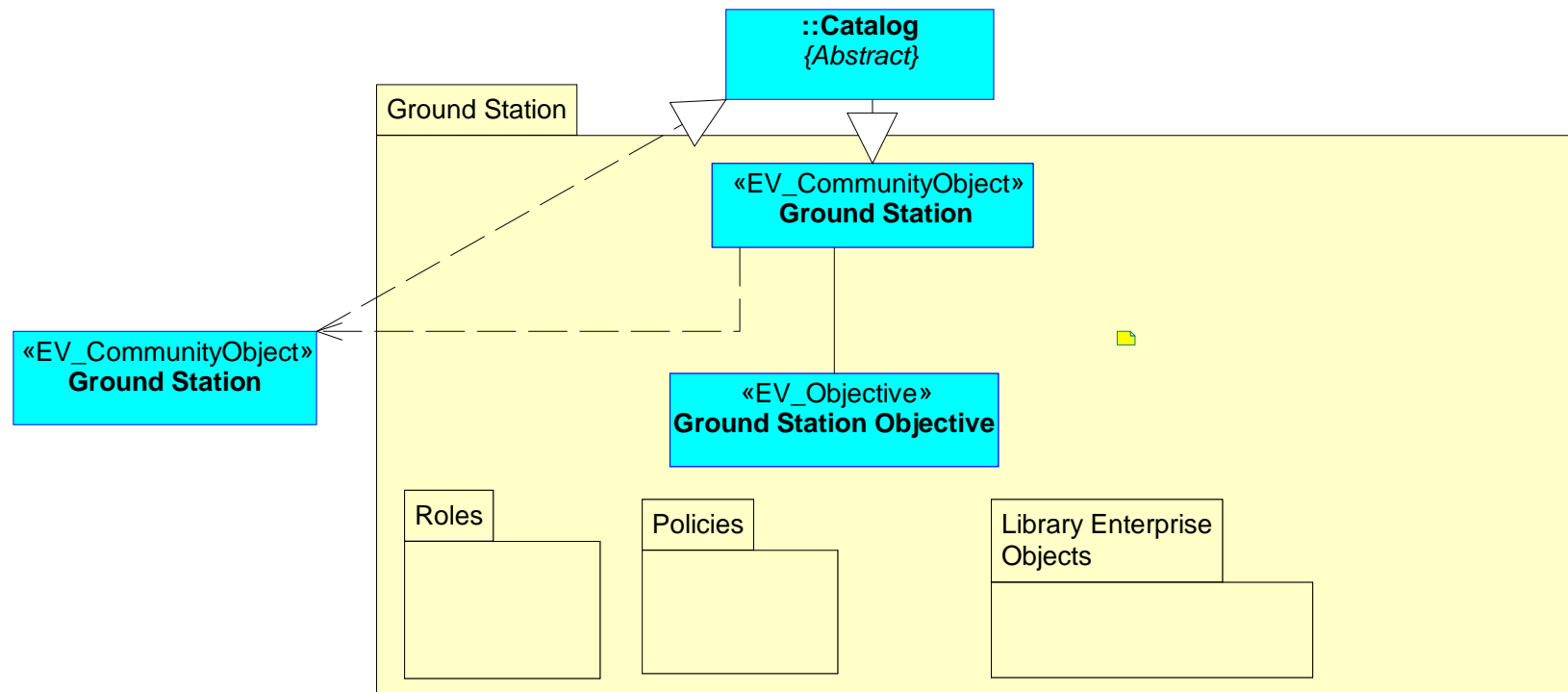


GEOSS Oil Spill Scenario Enterprise Specification



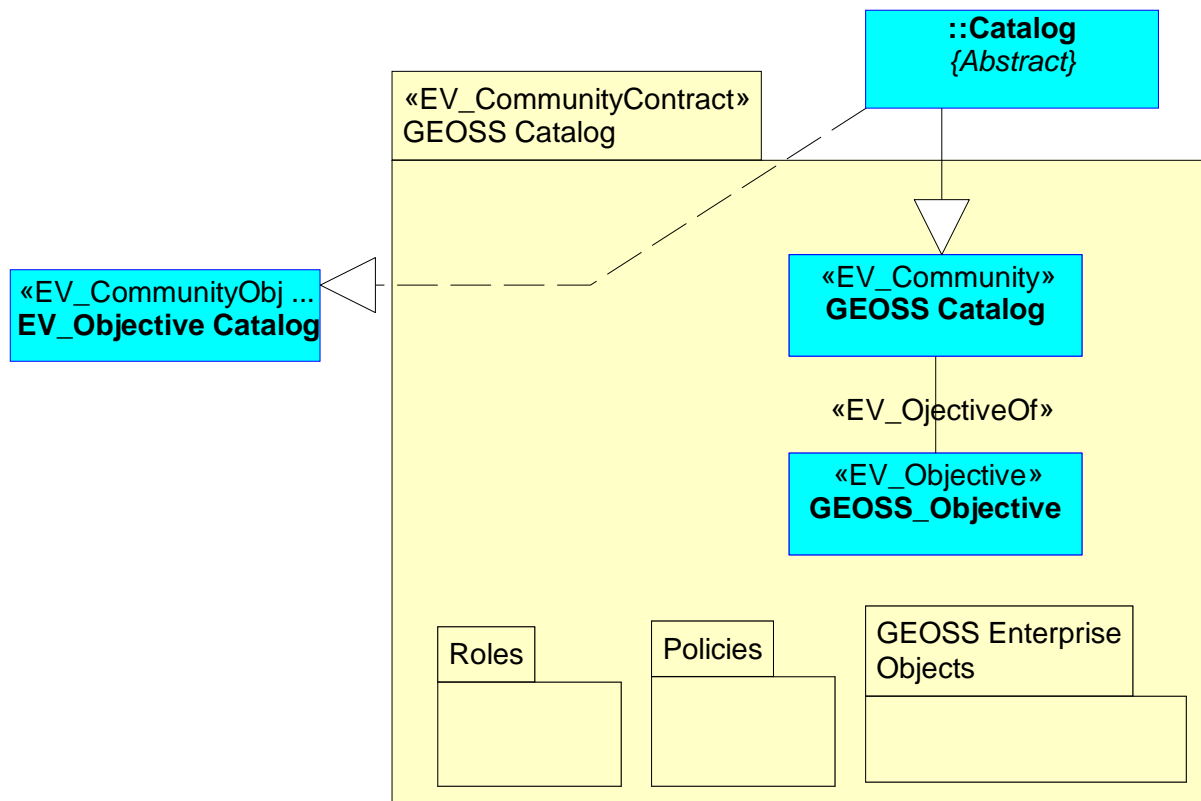


UML Specification of Ground Station Community





UML Specification GEOSS Catalog Community

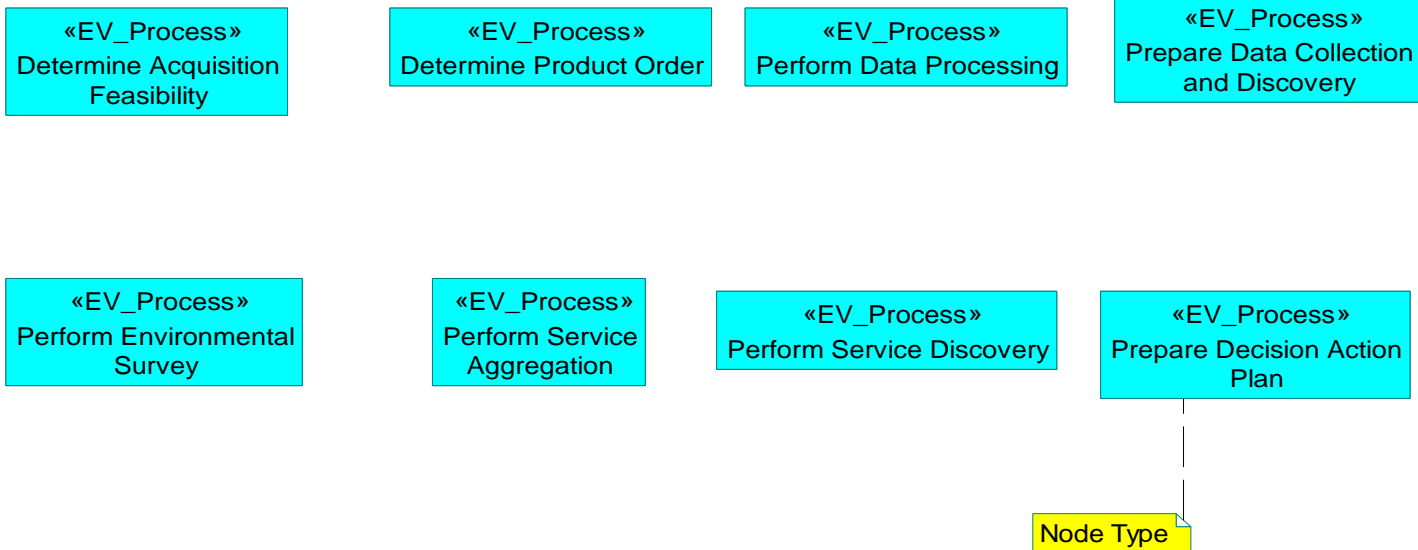




GEOSS Catalog Processes Activity Diagram

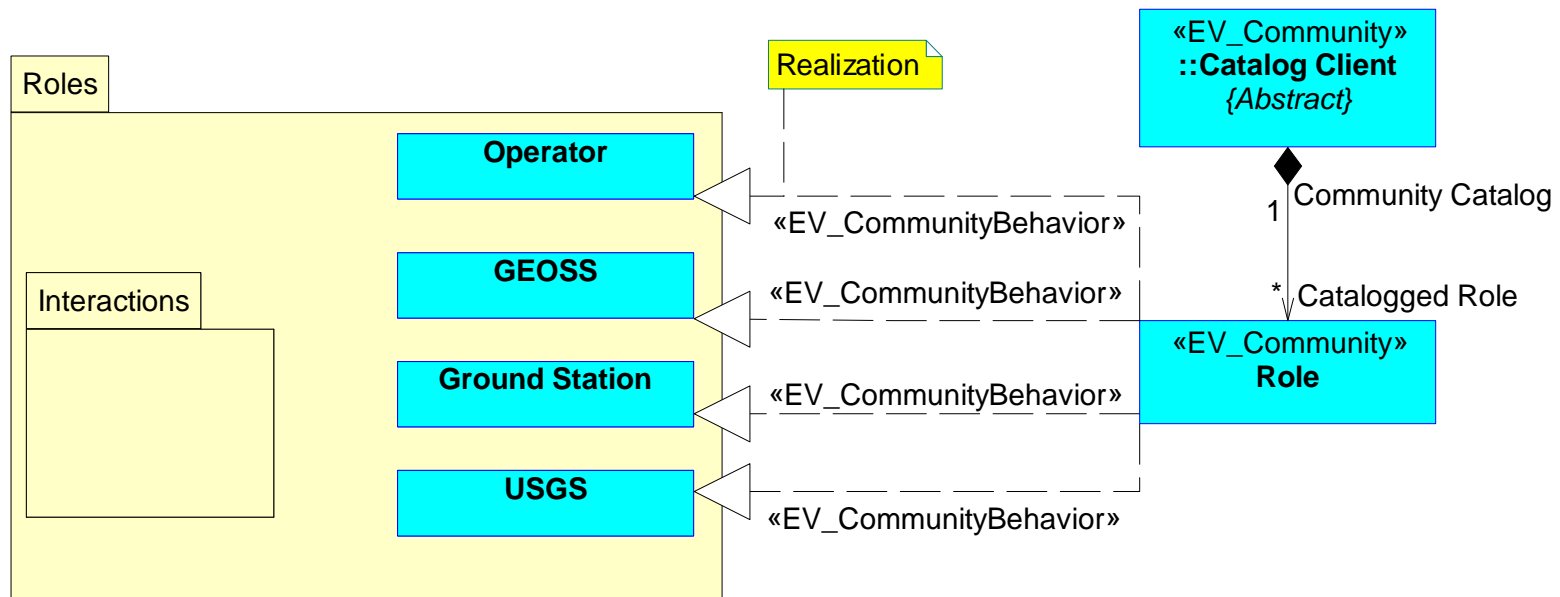
«EV_Community»
GEOSS Clearinghouse

GEOSS Catalog Processes AD



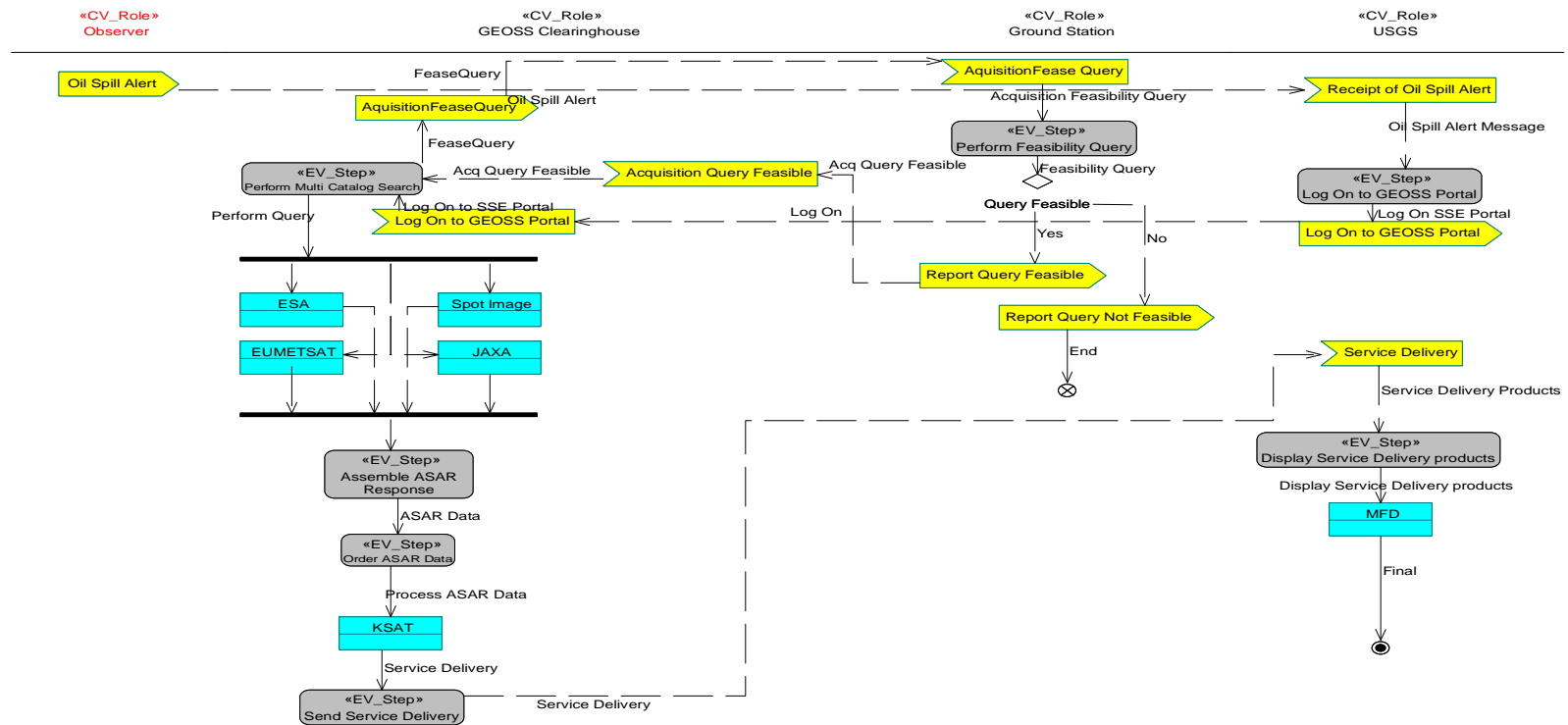


GEOSS Catalog Client Community Roles



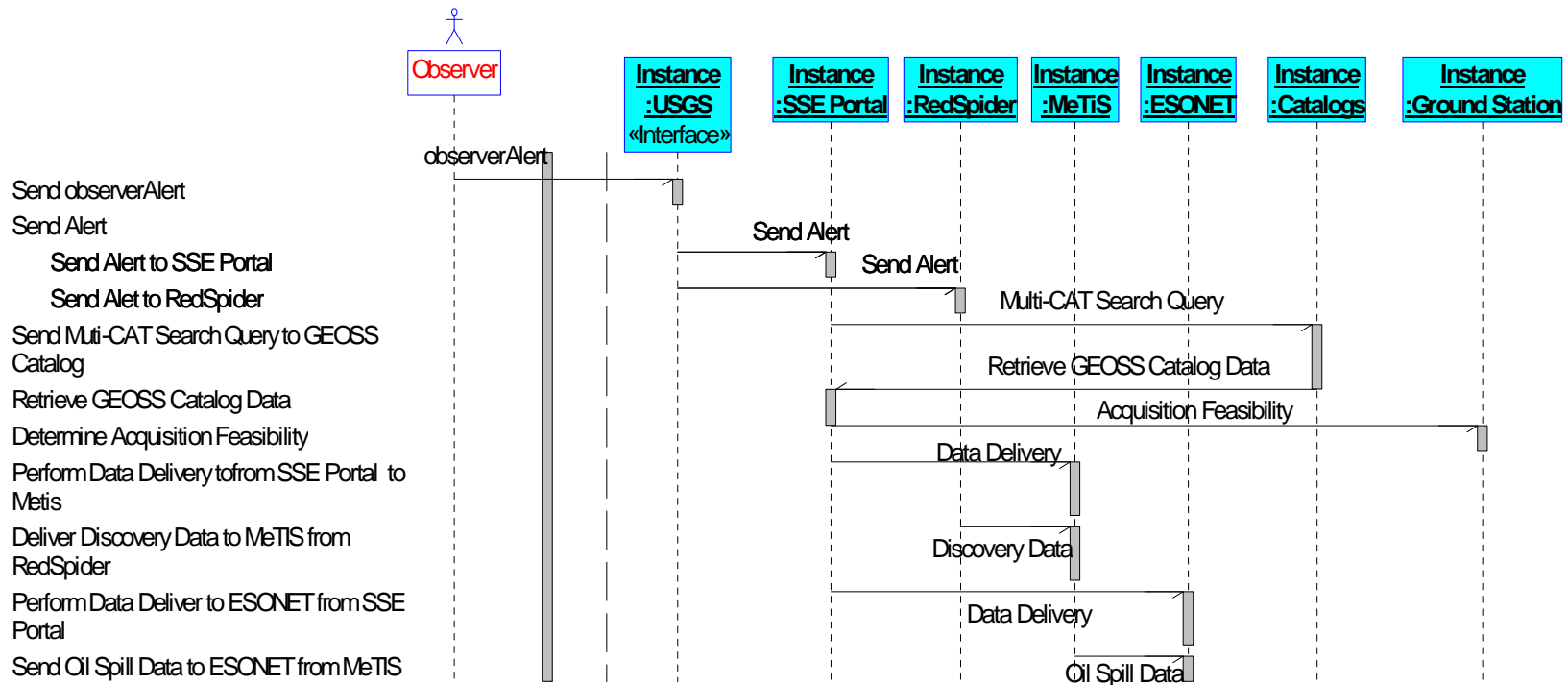


GEOSS Oil Spill Action Plan Activity Diagram



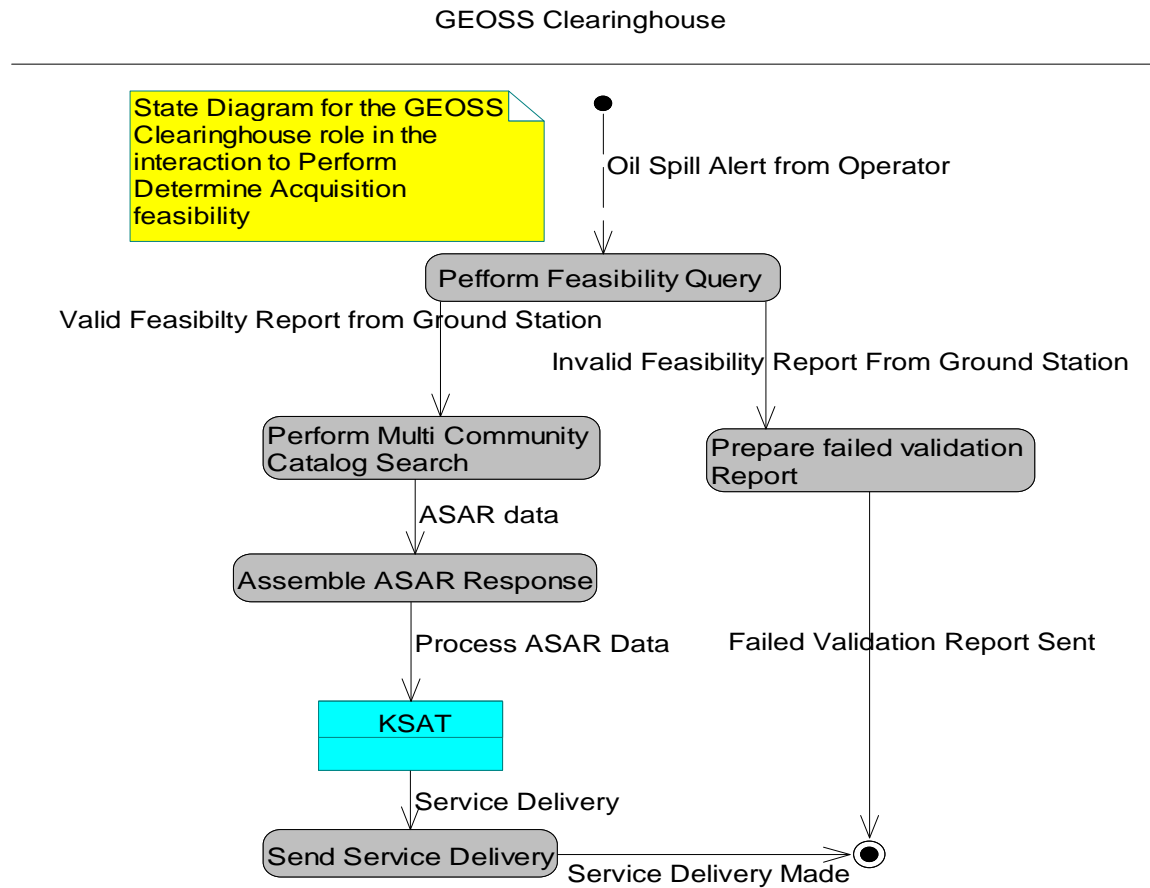


GEOSS Oil Spill Action Plan Iteration Diagram (UML Sequence Diagram)





GEOSS Clearing House State Diagram





Questions?