

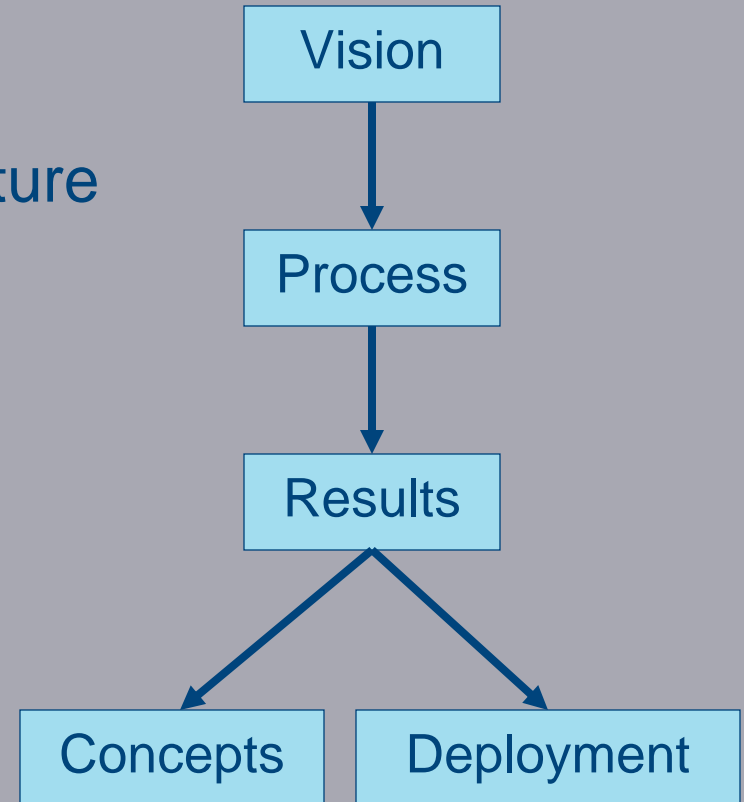
# OOI CyberInfrastructure

## Conceptual and Deployment Architecture

- CI

# Overview

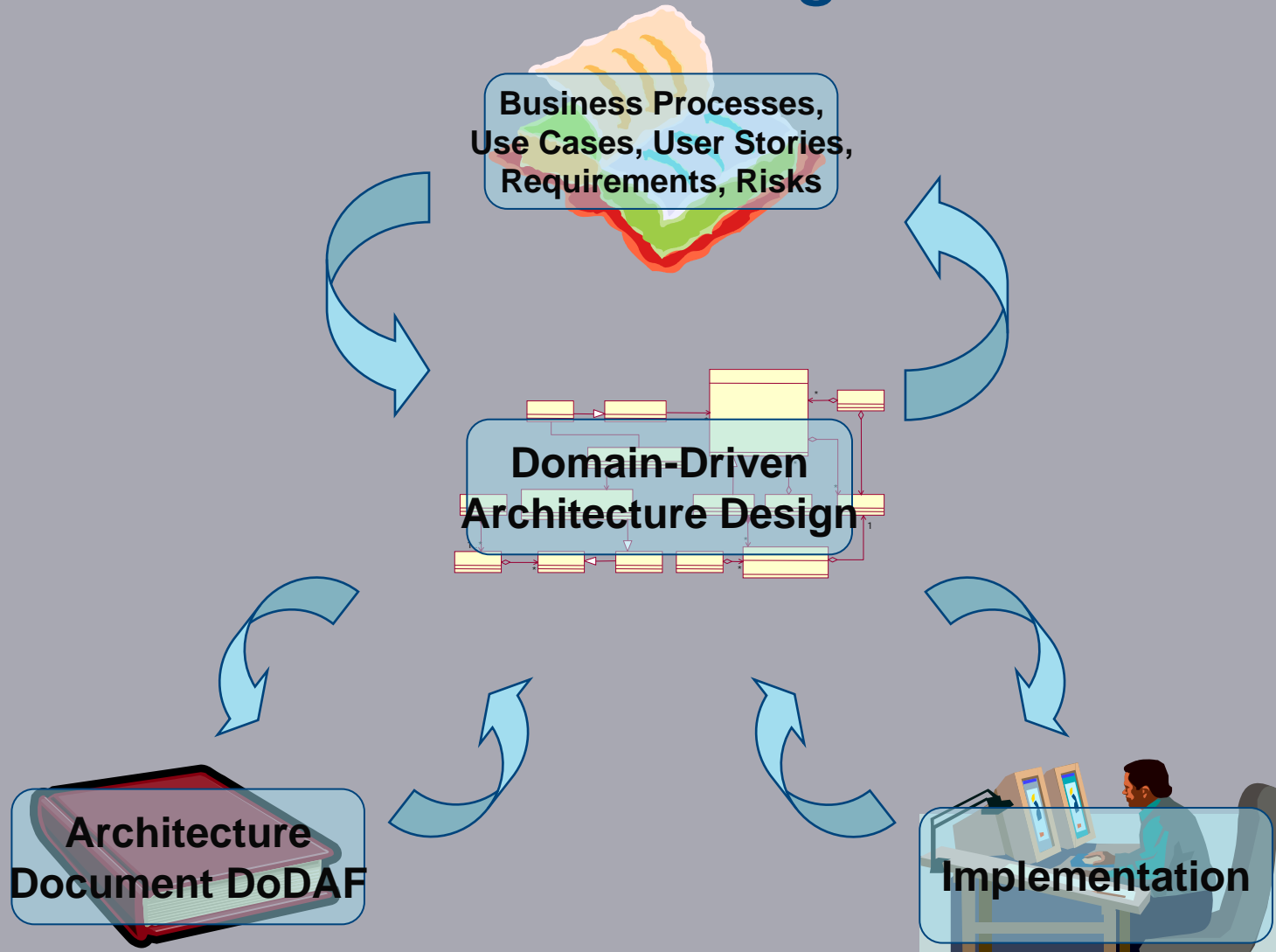
- Goals and Objectives
- From Requirements to Architecture
- OOI-CI Services Architectural Pattern
- Logical Architecture
- Domain Models
- Example Deployment Scenario



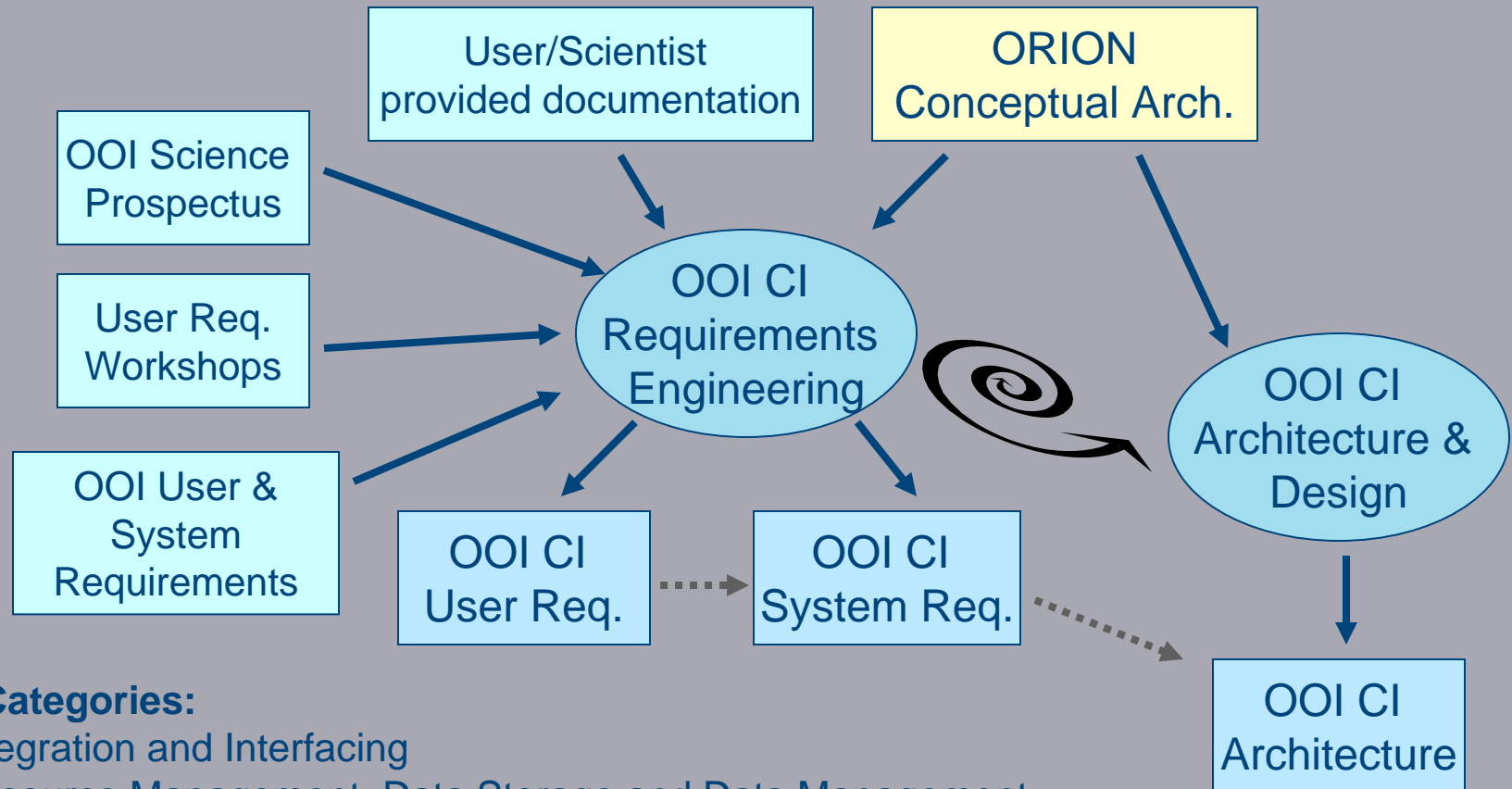
# Goals and Objectives

- Provide a consistent, structured, up-to-date representation of the OOI CI architecture and design
  - include operational views, as required by users and decision makers,
  - include deployment and process views, required by CI implementers and subsystem architecture and design teams.
- Establish a common terminology and integrated architecture
- Provide a preliminary design as a decision point for the OOI about future program development
- Establish a basis for implementation of the CI subsystems
  - In compliance with stakeholder requirements
  - As expressed by the User Requirements Document, System Requirements Document and Concepts of Operations
  - Cost-effective scalable solution

# Integrated Requirements and Architecture Design Process



# Requirements



## Req. Categories:

- Integration and Interfacing
- Resource Management, Data Storage and Data Management
- Data Analysis, Modeling and Dissemination
- Presentation and User Interfaces
- Documentation and Development Process
- Security, Safety and Privacy Properties
- Quality Properties

# Requirements to Architecture

## OOI System Requirement

1. OOI will enable powerful new scientific approaches by transitioning the community from expedition-based data gathering to persistent, controllable observations from a suite of interconnected sensors.

# Requirements to Architecture

## OOI System Requirement

1. OOI will enable powerful new scientific approaches by transitioning the community from expedition-based data gathering to persistent, controllable observations from a suite of interconnected sensors.

## OOI CI System Requirement

- a) The OOI shall enable persistent, controllable observations from a networked sensor grid

# Requirements to Architecture

## OOI System Requirement

1. OOI will enable powerful new scientific approaches by transitioning the community from expedition-based data gathering to persistent, controllable observations from a suite of interconnected sensors.

## OOI CI System Requirement

- a) The OOI shall enable persistent, controllable observations from a networked sensor grid

## Design

- Persistence:
  - Data Services Network
- Control:
  - Control Services Network
  - Common Operating Infrastructure
- Observations:
  - Modeling Services Network
  - Control Services Network
  - Data Services Network
- Networked Sensor Grid:
  - Instrument Services Network
  - Common Operating Infrastructure



# Requirements to Architecture

## OOI System Requirement

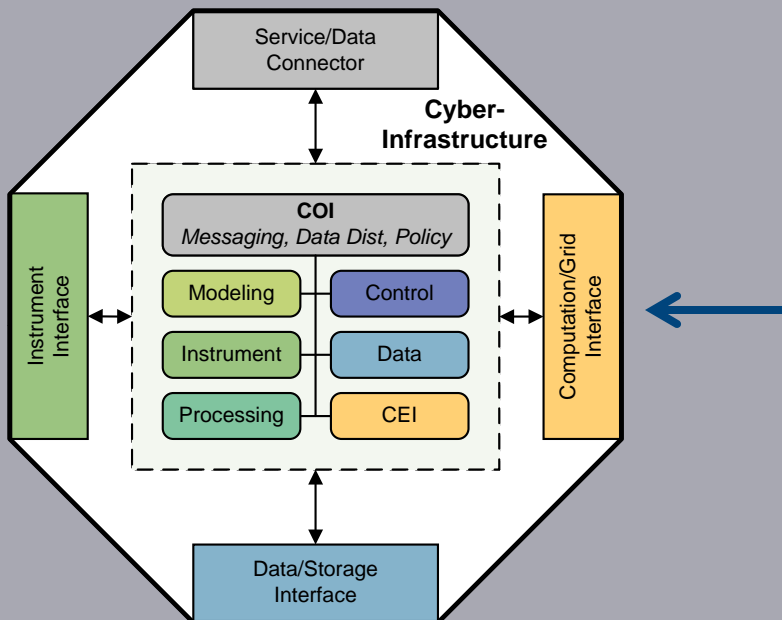
1. OOI will enable powerful new scientific approaches by transitioning the community from expedition-based data gathering to persistent, controllable observations from a suite of interconnected sensors.

## OOI CI System Requirement

- a) The OOI shall enable persistent, controllable observations from a networked sensor grid

## Design

- Persistence:
  - Data Services Network
- Control:
  - Control Services Network
  - Common Operating Infrastructure
- Observations:
  - Modeling Services Network
  - Control Services Network
  - Data Services Network
- Networked Sensor Grid:
  - Instrument Services Network
  - Common Operating Infrastructure



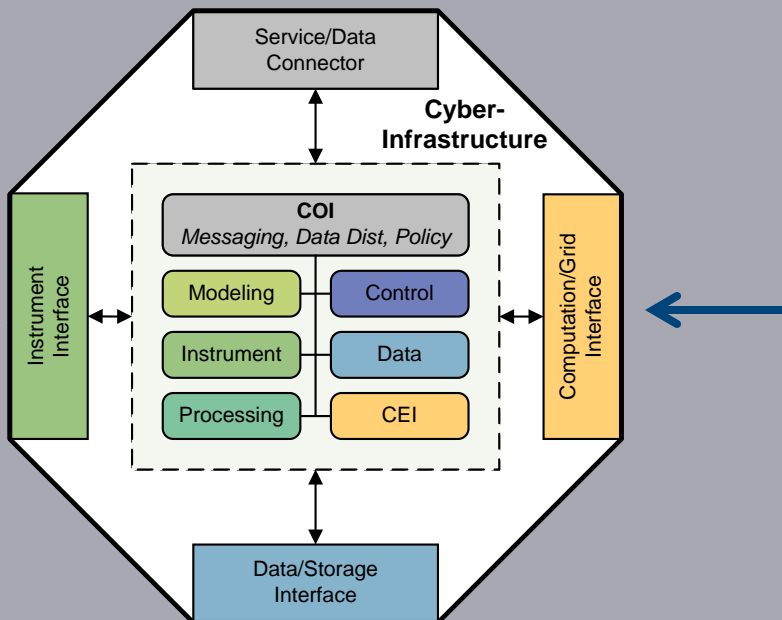
# Requirements to Architecture

## OOI System Requirement

1. OOI will enable powerful new scientific approaches by transitioning the community from expedition-based data gathering to persistent, controllable observations from a suite of interconnected sensors.

## OOI CI System Requirement

- b) A migration path shall be established, from expedition-based data gathering to persistent, controllable observations from a networked sensor grid



## Design

- Open SOA based architecture
- Stepwise introduction of capabilities over staged releases

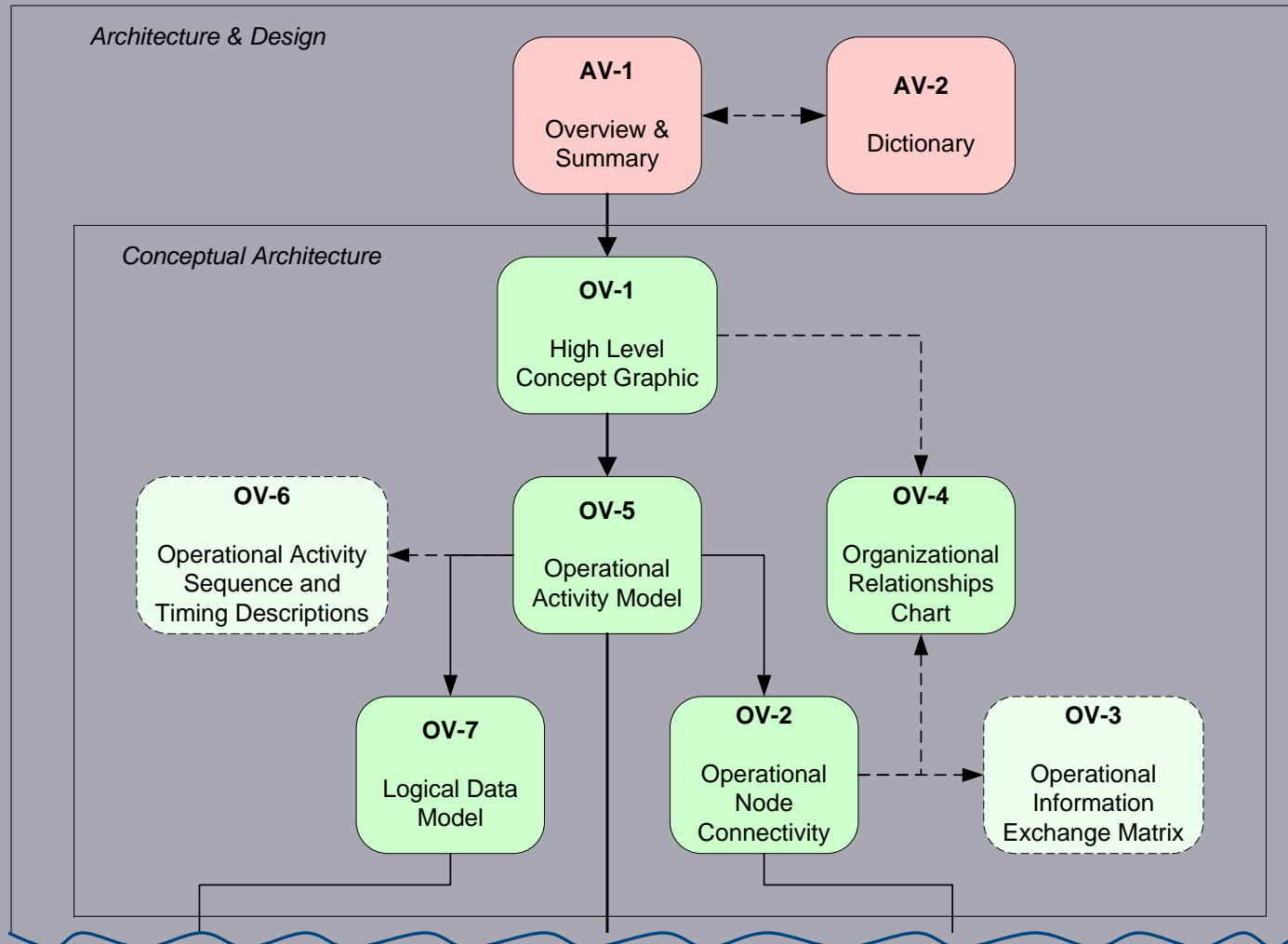
# DoD Architecture Framework

**AV**-All Views

**OV**-Operational Views

**SV**-Systems Views

**TV**-Technical Views



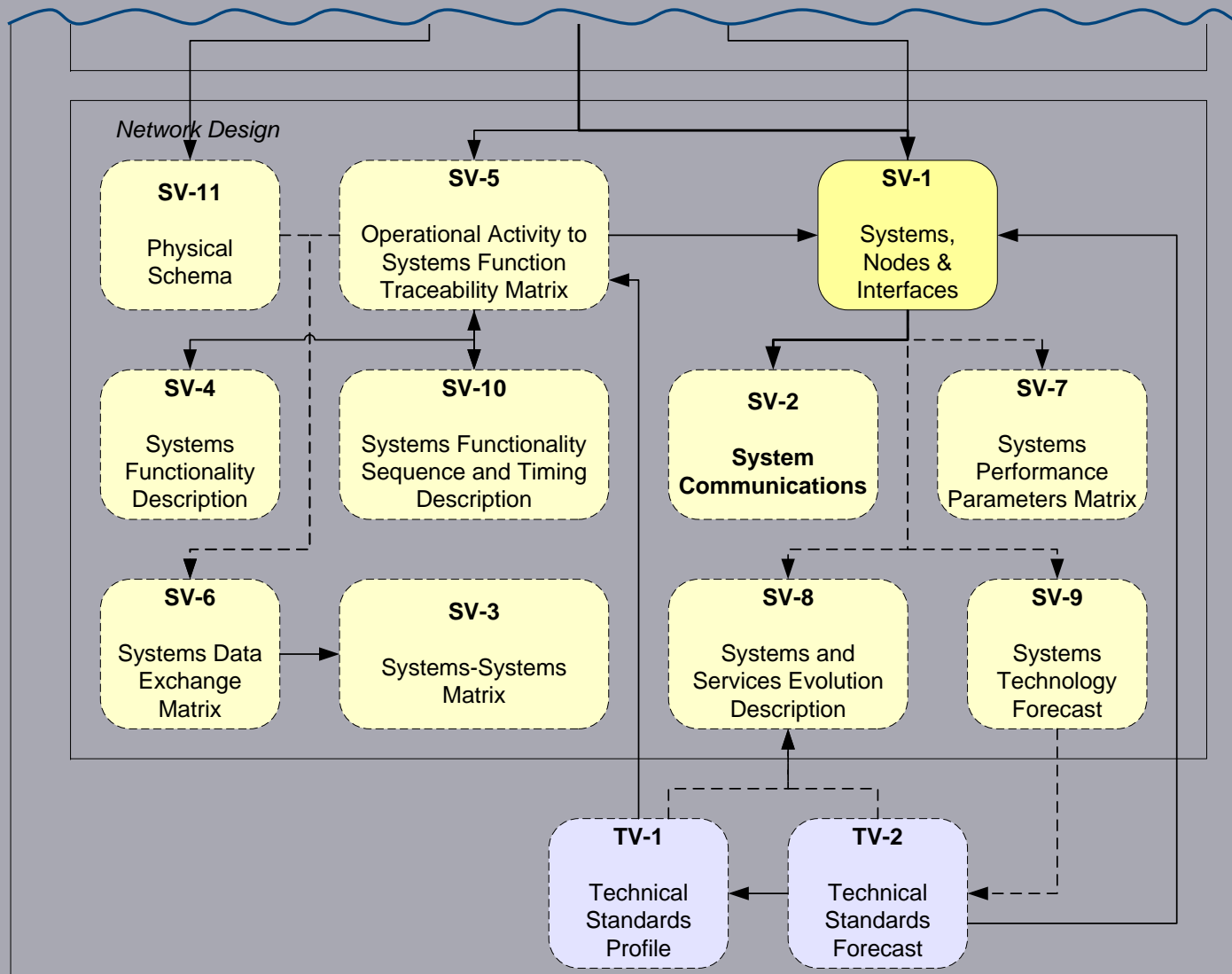
# DoD Architecture Framework

AV-All Views

OV-Operational Views

SV-Systems Views

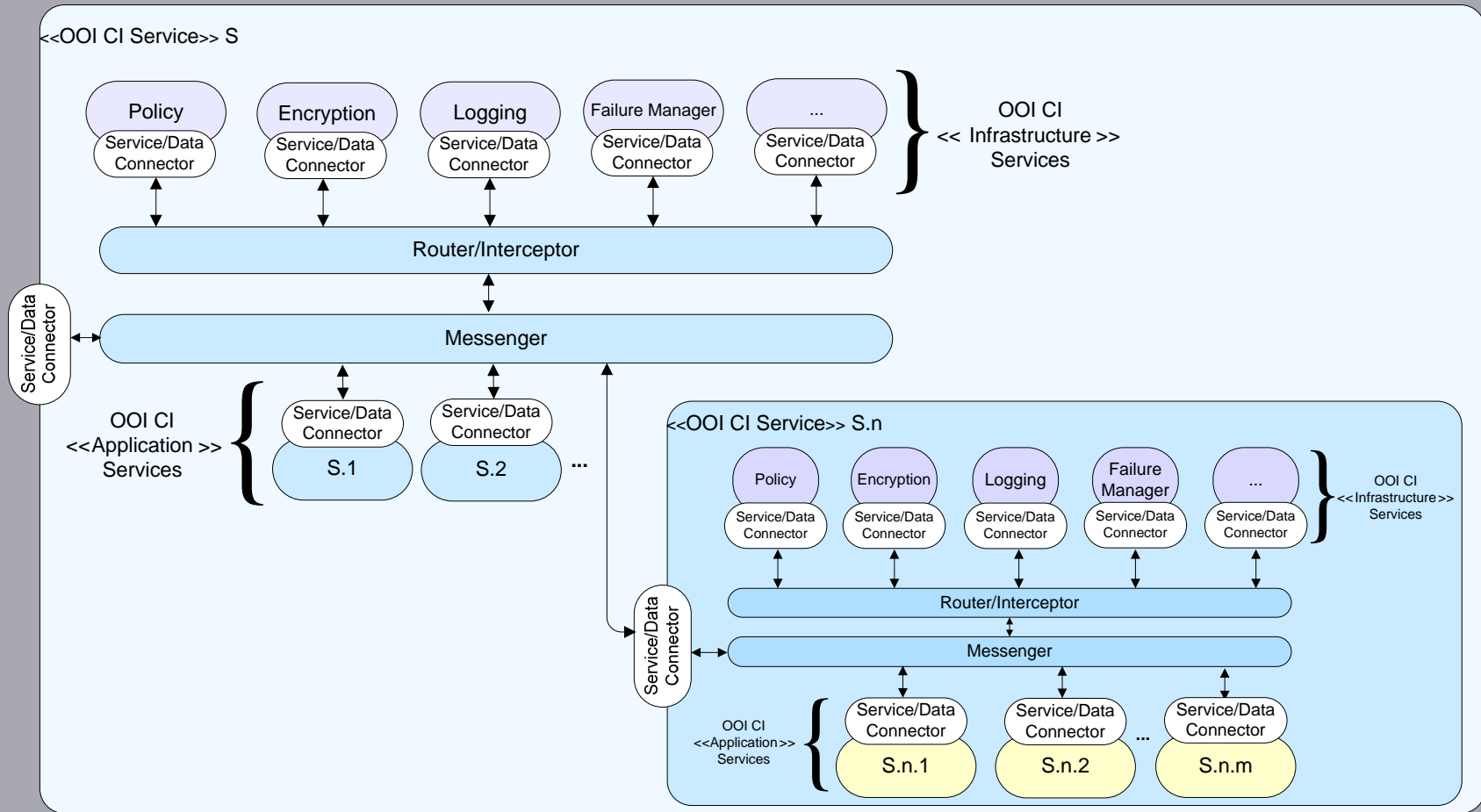
TV-Technical Views



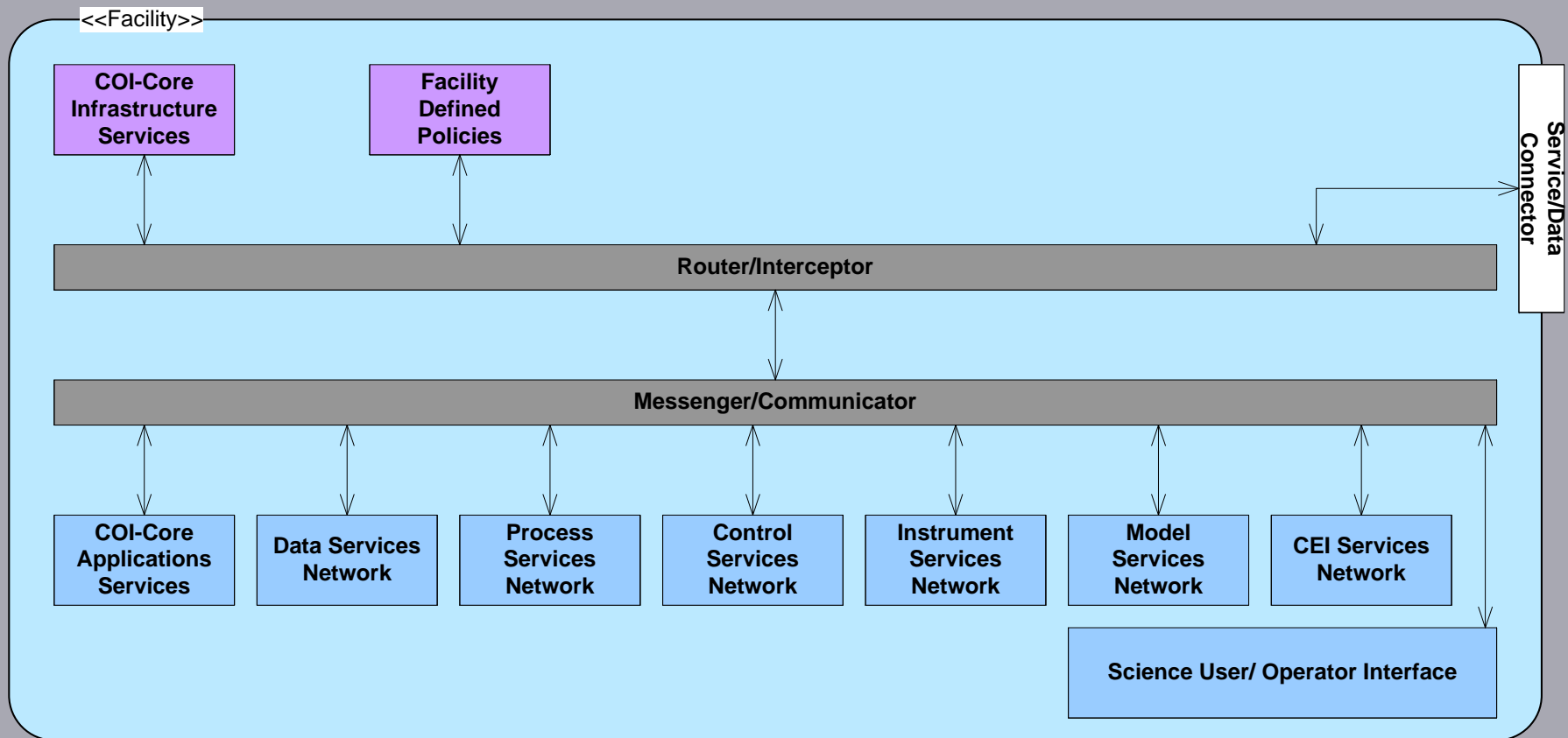
# Highlights of OOI CI Capabilities

- **Common Operating Infrastructure (COI)**
  - Integration platform, communication conduit, orchestration, cross-cutting issues including identity/policy/governance
- **Common Execution Infrastructure (CEI)**
  - Transparent execution environment on flexible compute infrastructure
- **Data Network**
  - Federated data, metadata and its preservation via data streams, repositories and catalogs
- **Control Network**
  - Management of stateful and taskable resources
- **Modeling Network**
  - Coherent frameworks for modeling, analysis, and consumption of data
- **Processing Network**
  - Resource access & scheduling of computations/execution
- **Instrument Network**
  - Interactive and coordinated access to instrument platforms & instruments

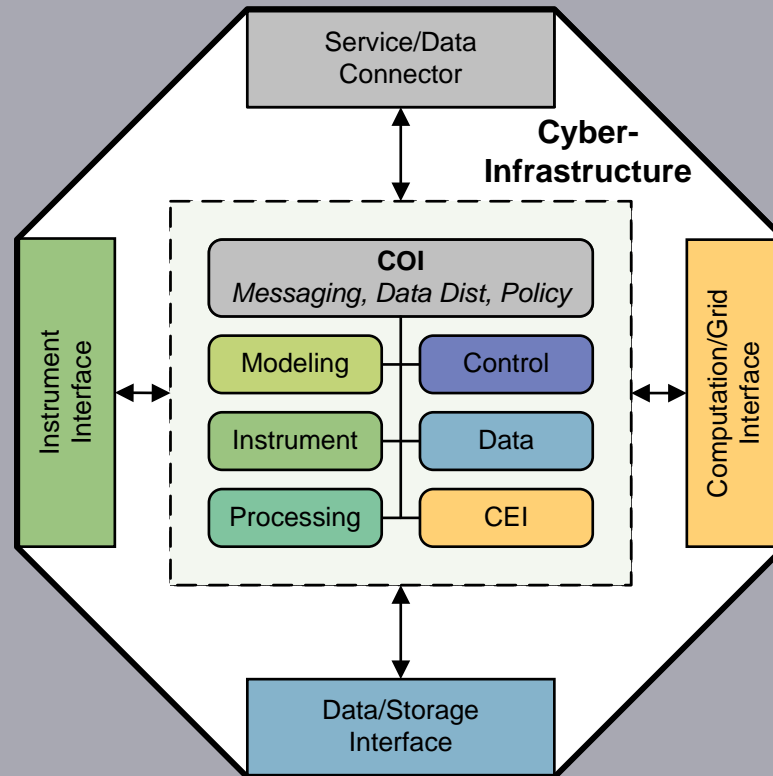
# OOI-CI Services Architectural Pattern



# OOI-CI Services Architectural Pattern

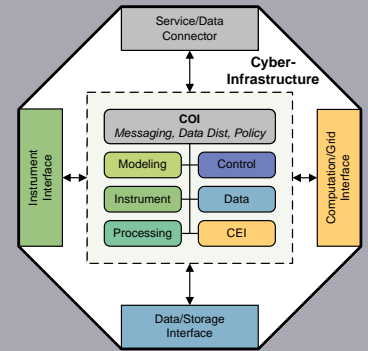
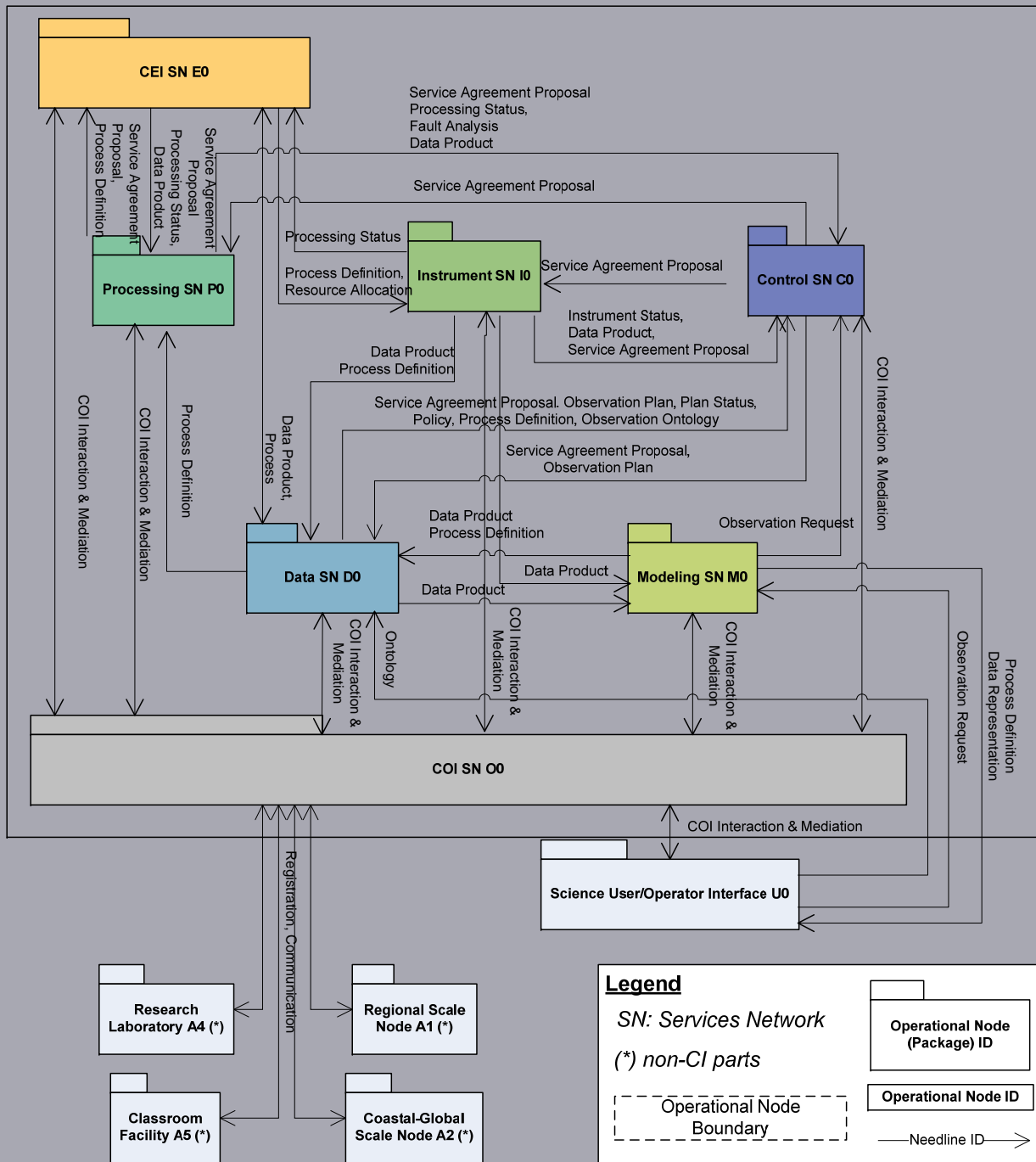


# OOI-CI Services Architectural Pattern

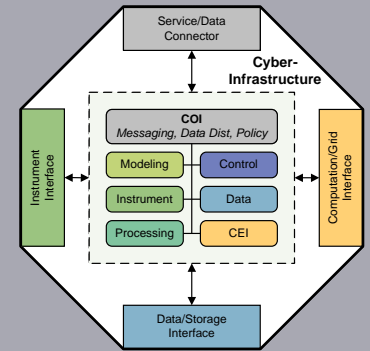
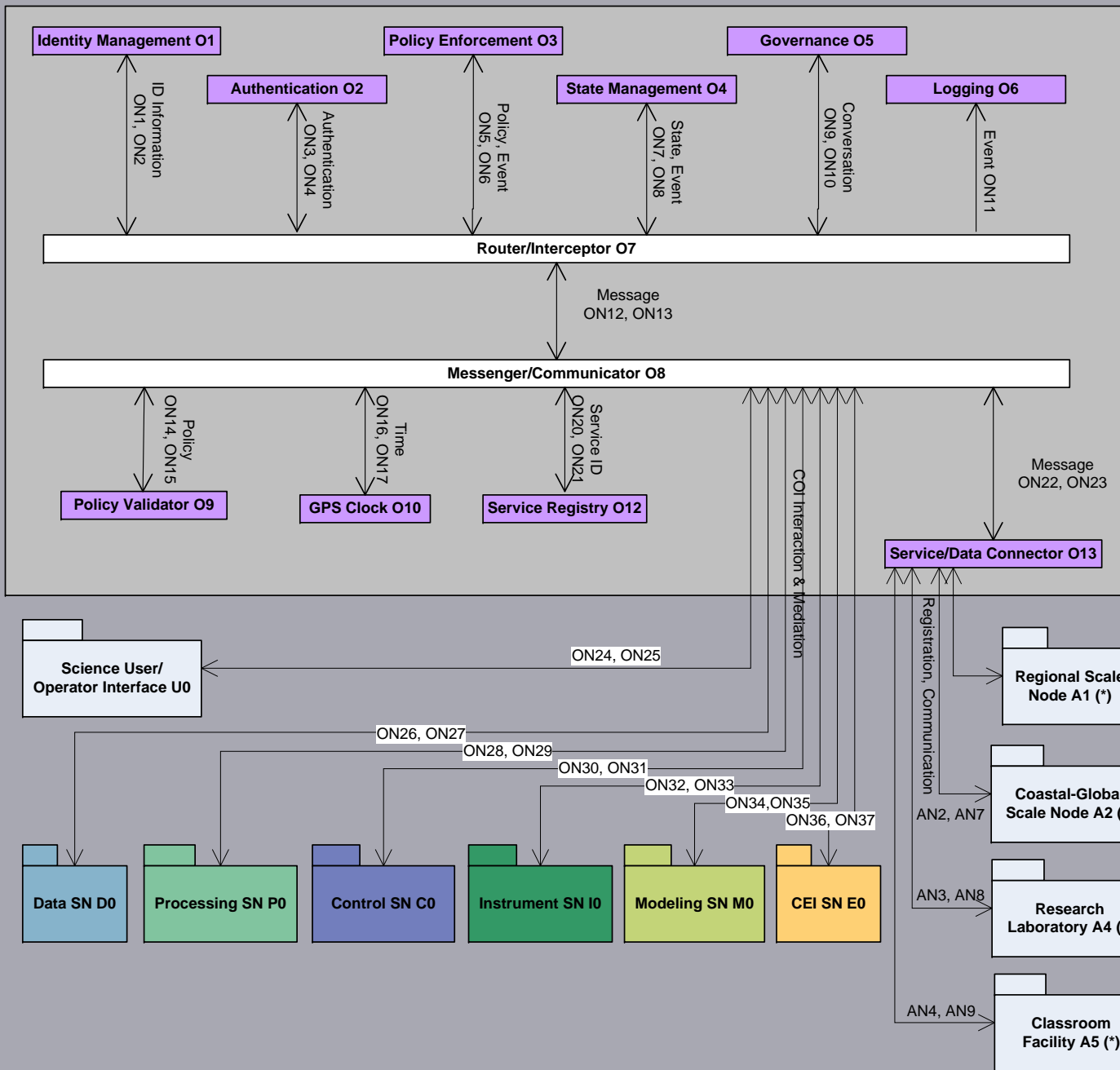




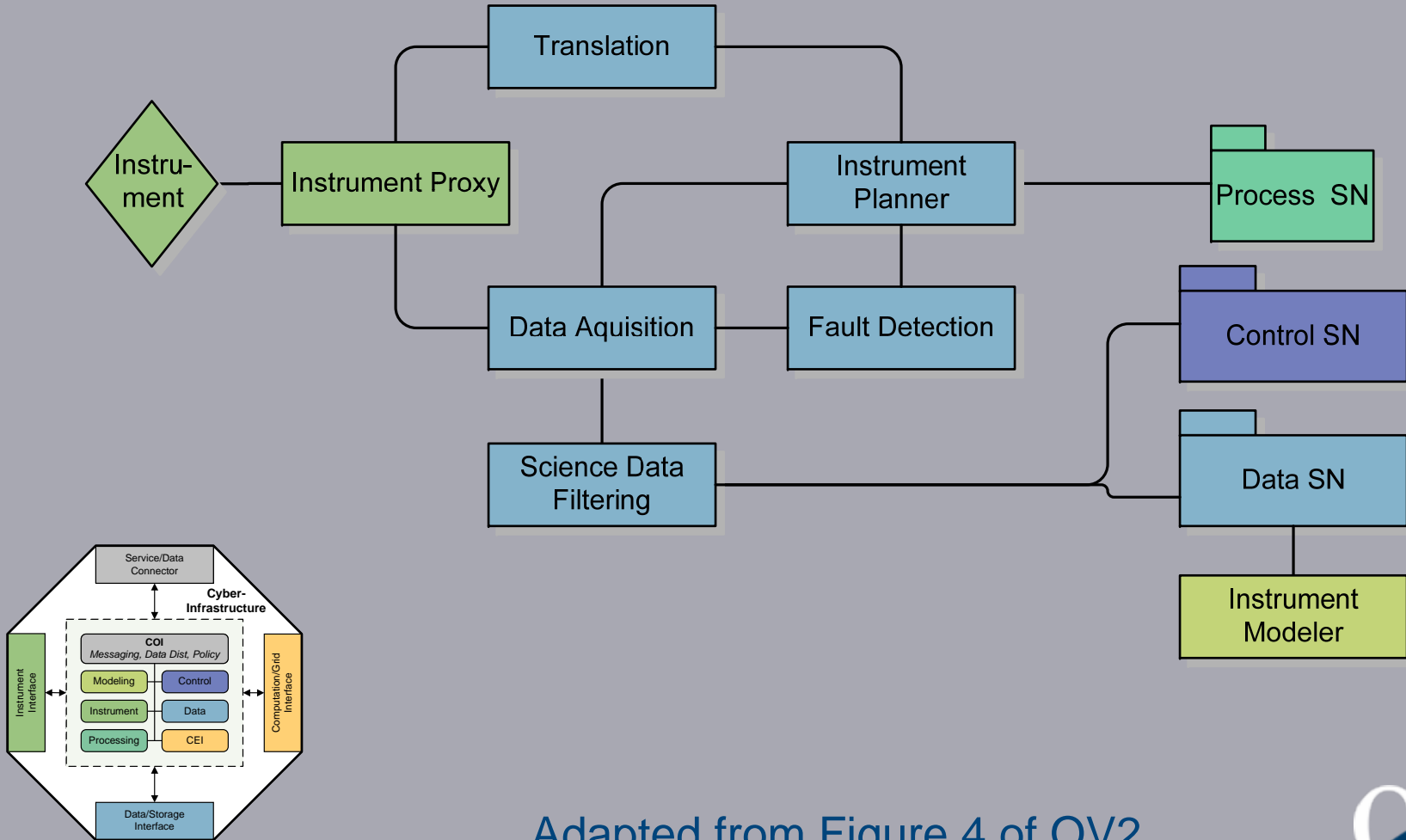
# OOI CI Model



# COI Services Network

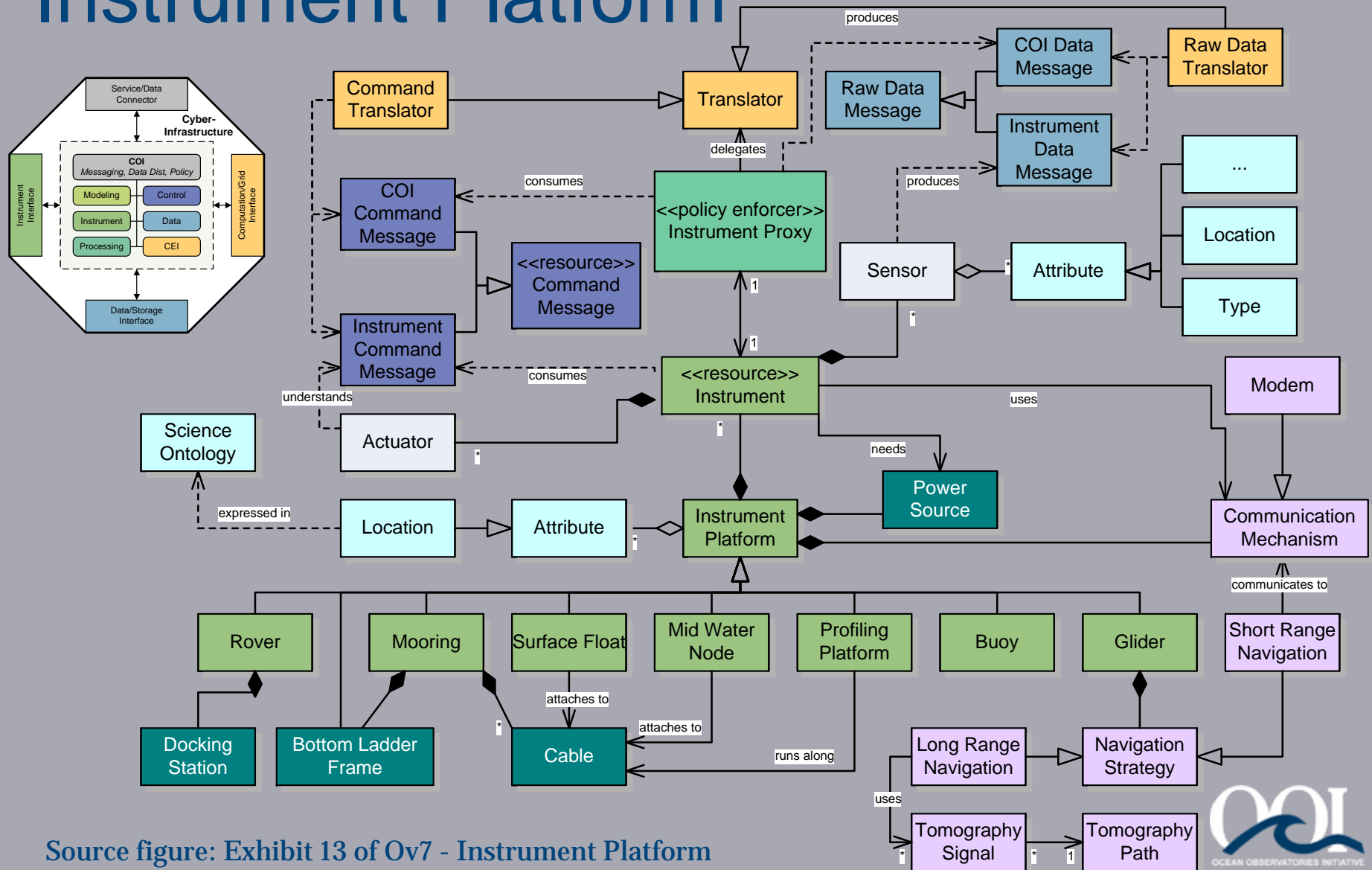


# Instrument Services Network (high-level & in context)



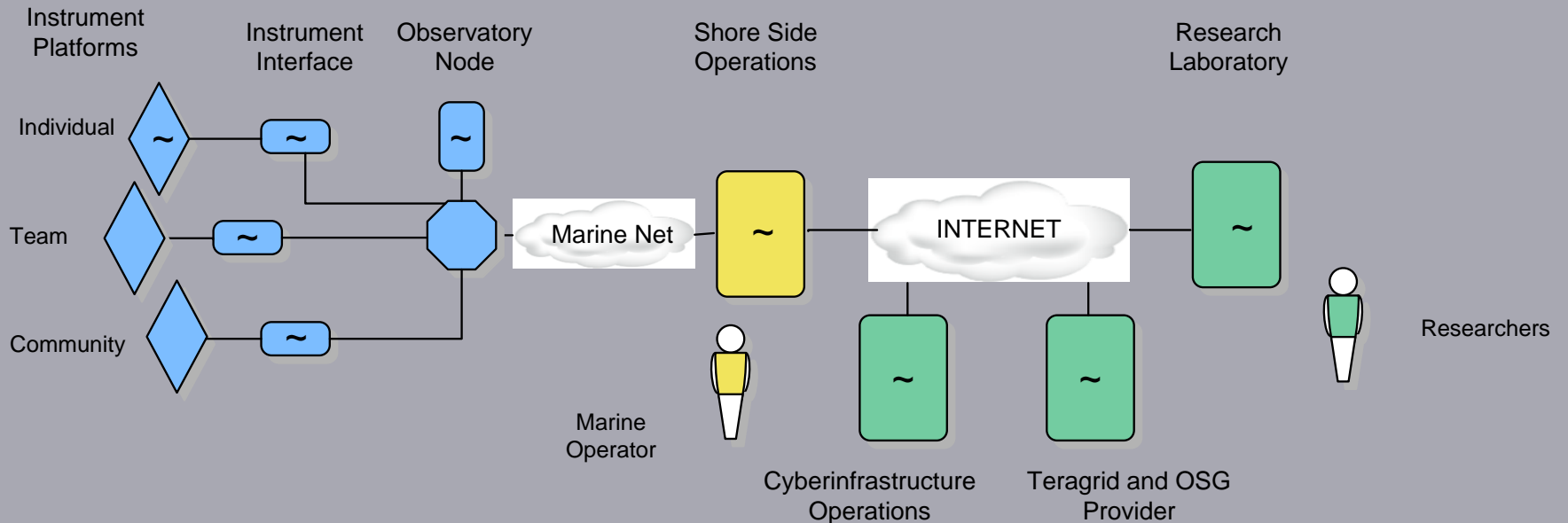
Adapted from Figure 4 of OV2

# Detailed Model of an Instrument Platform




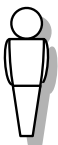



Source figure: Exhibit 13 of Ov7 - Instrument Platform

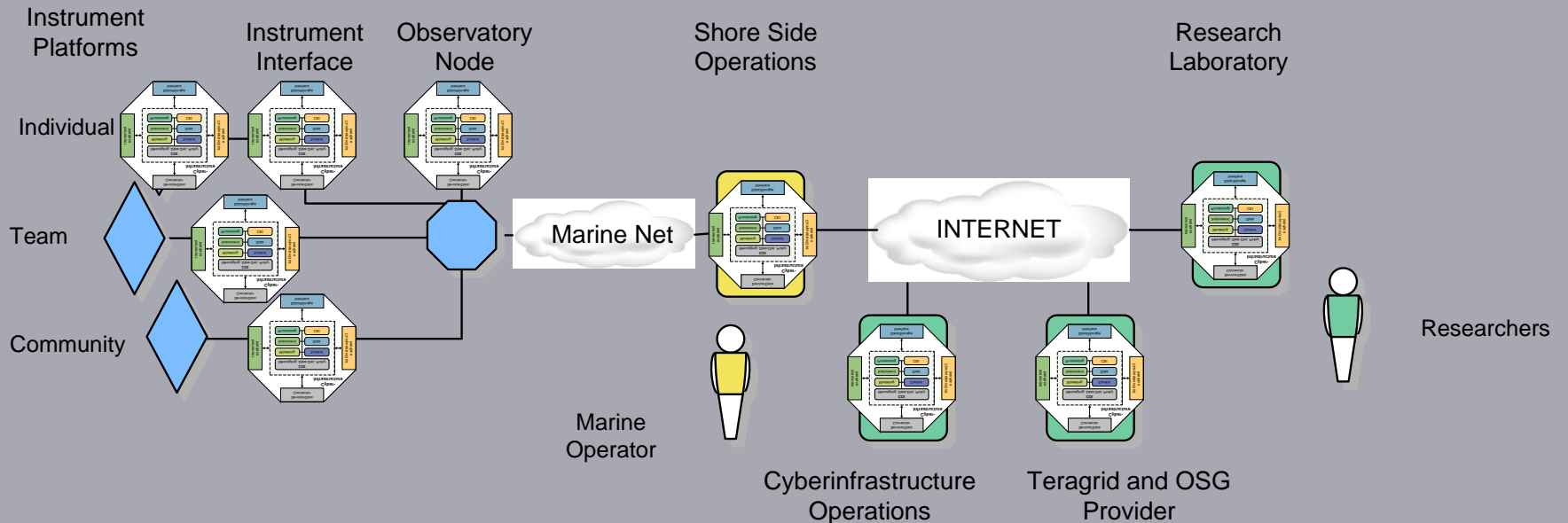
# Candidate Deployment for CI



**Geographical Location**

	Water		Candidate Sites for Cyber Points of Presence
	Shore Side		Operational Authority
	Land		

# Candidate Deployment for CI

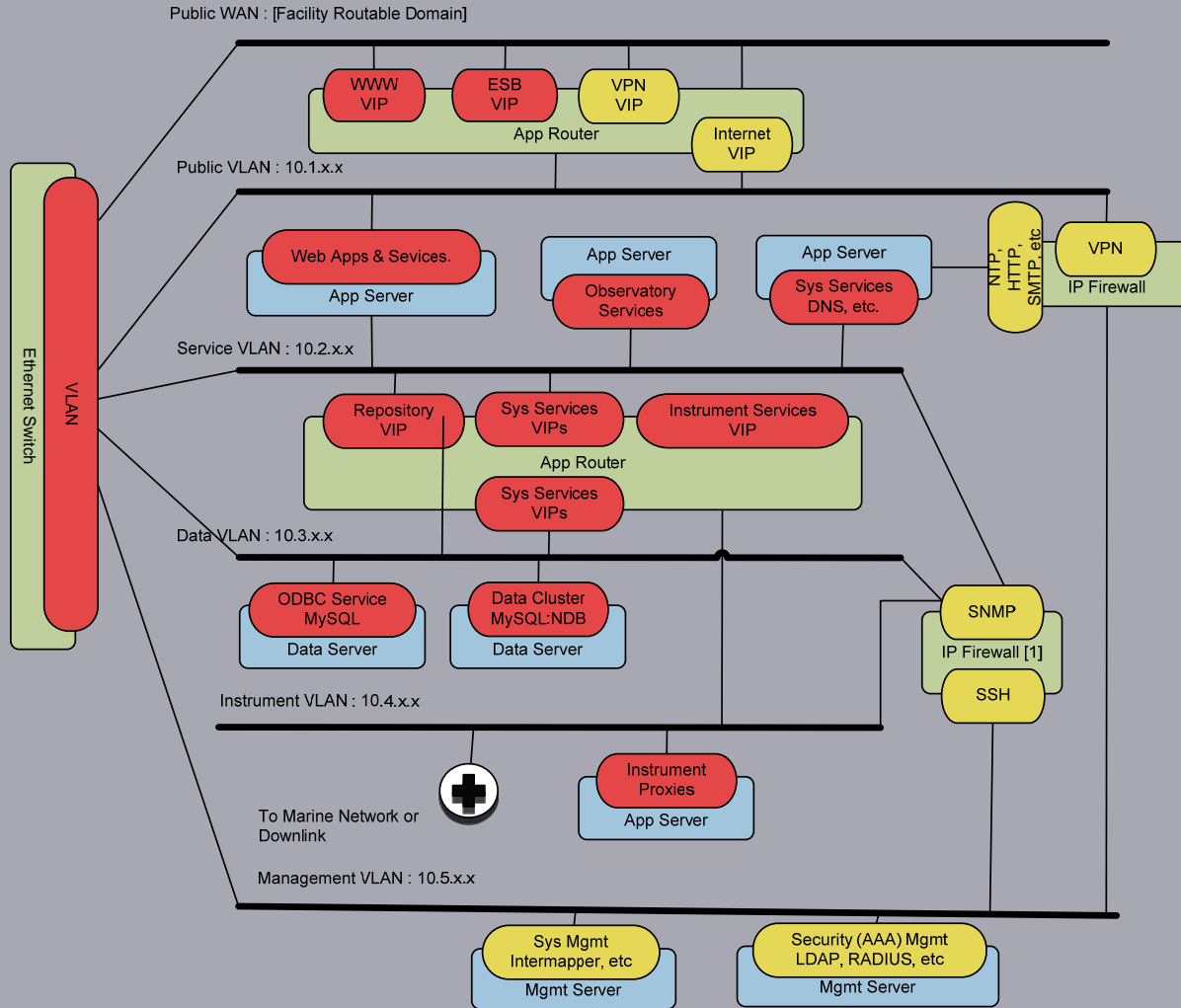


**Geographical Location**

- Water
- Shore Side
- Land
- Candidate Sites for Cyber Points of Presence
- Operational Authority

Thank you

# Internals of a CyberPoP Network Design Scenario



## Deployment Concerns:

- Security
- Performance
- High-availability
- Scalability
- Offsite Mgmt
- Scheduling
- Resource Mgmt

