

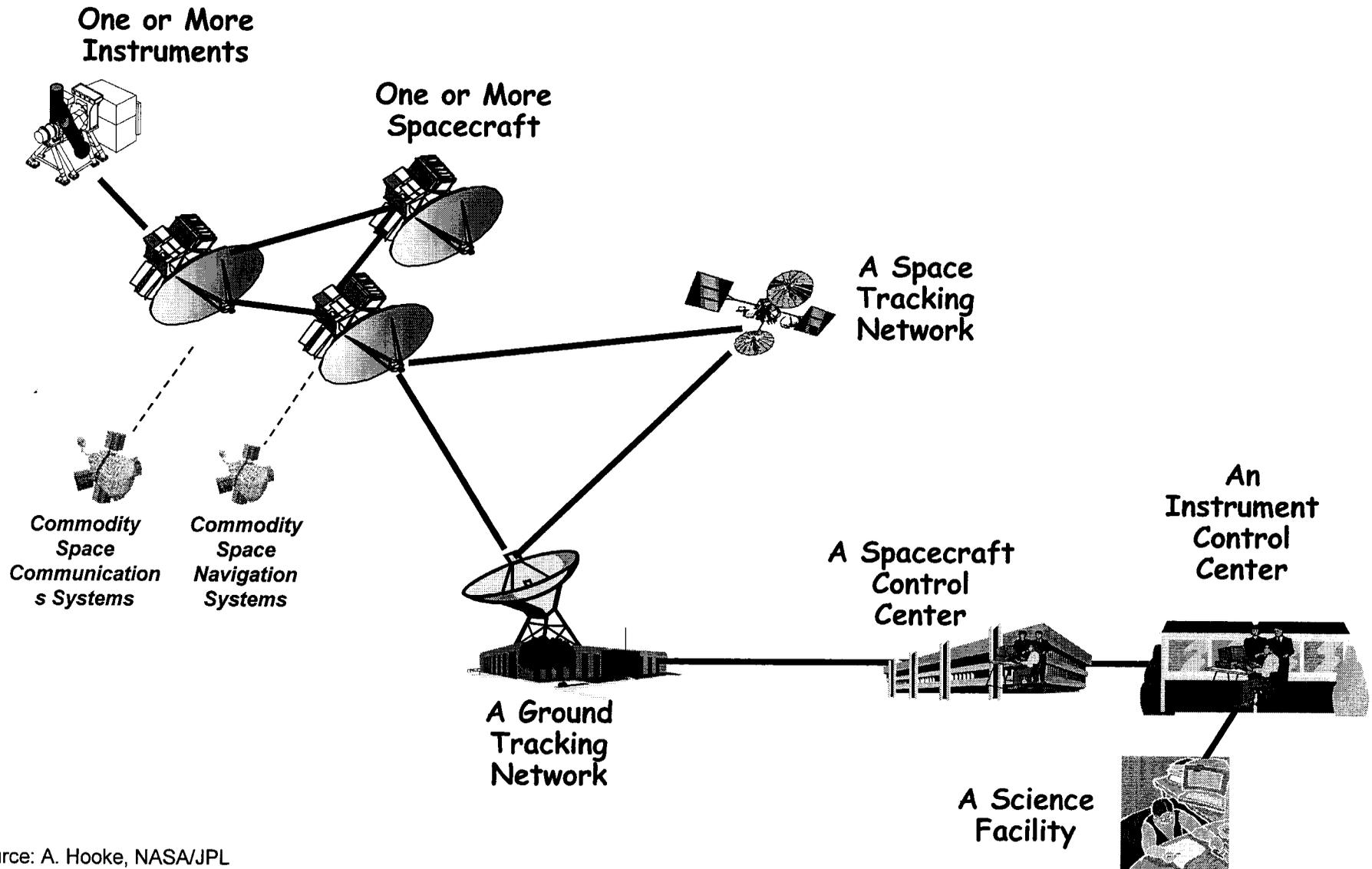
CCSDS
Architecture Working Group

Space Data Systems Reference Architecture

20 February 2003

Hooke/JPL, Reich/CSC, Sawyer/GSFC,
Shames/JPL, Yamada/ISAS, Chair

A Physical View of a Space Data System

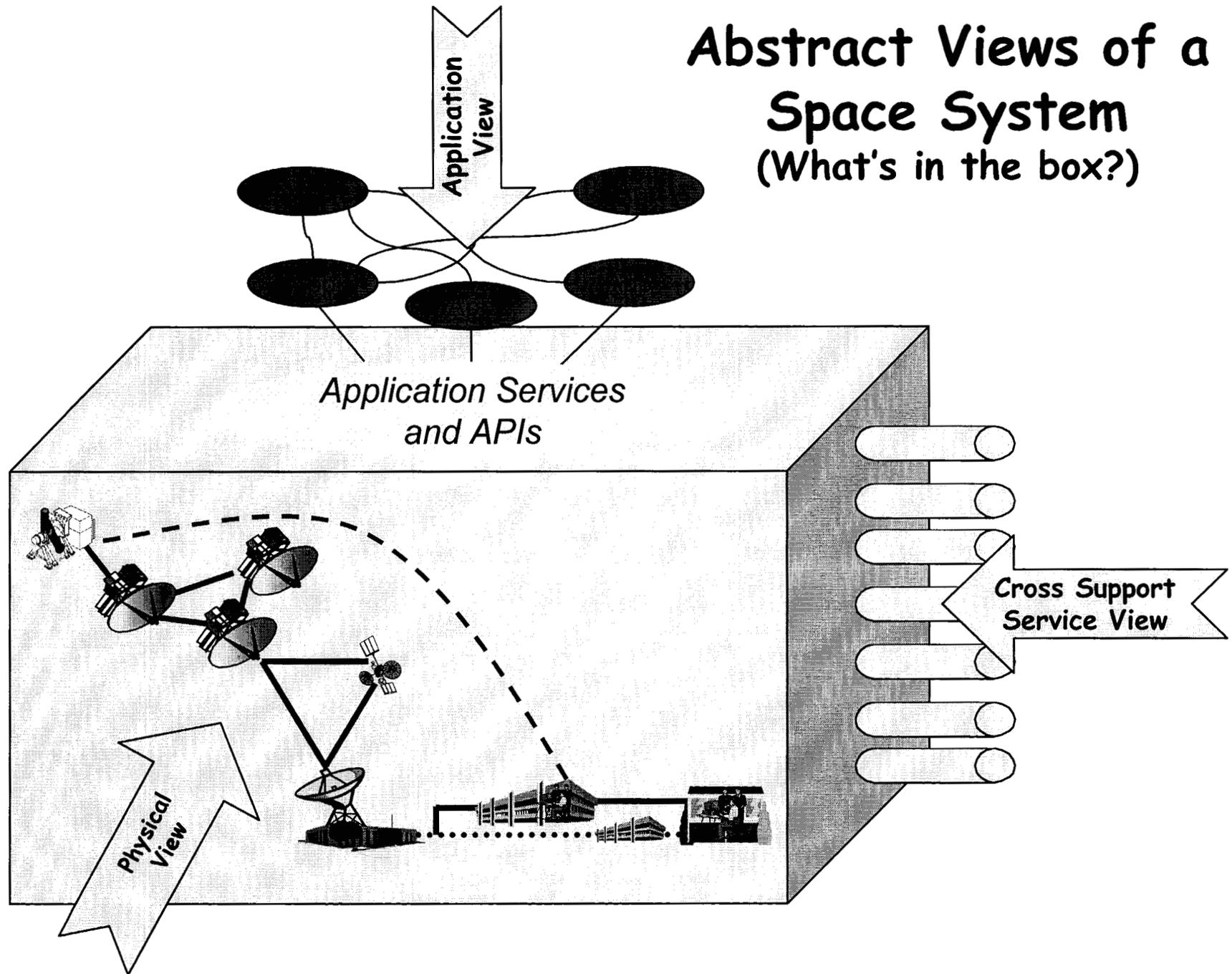


Source: A. Hooke, NASA/JPL
2/20/2003

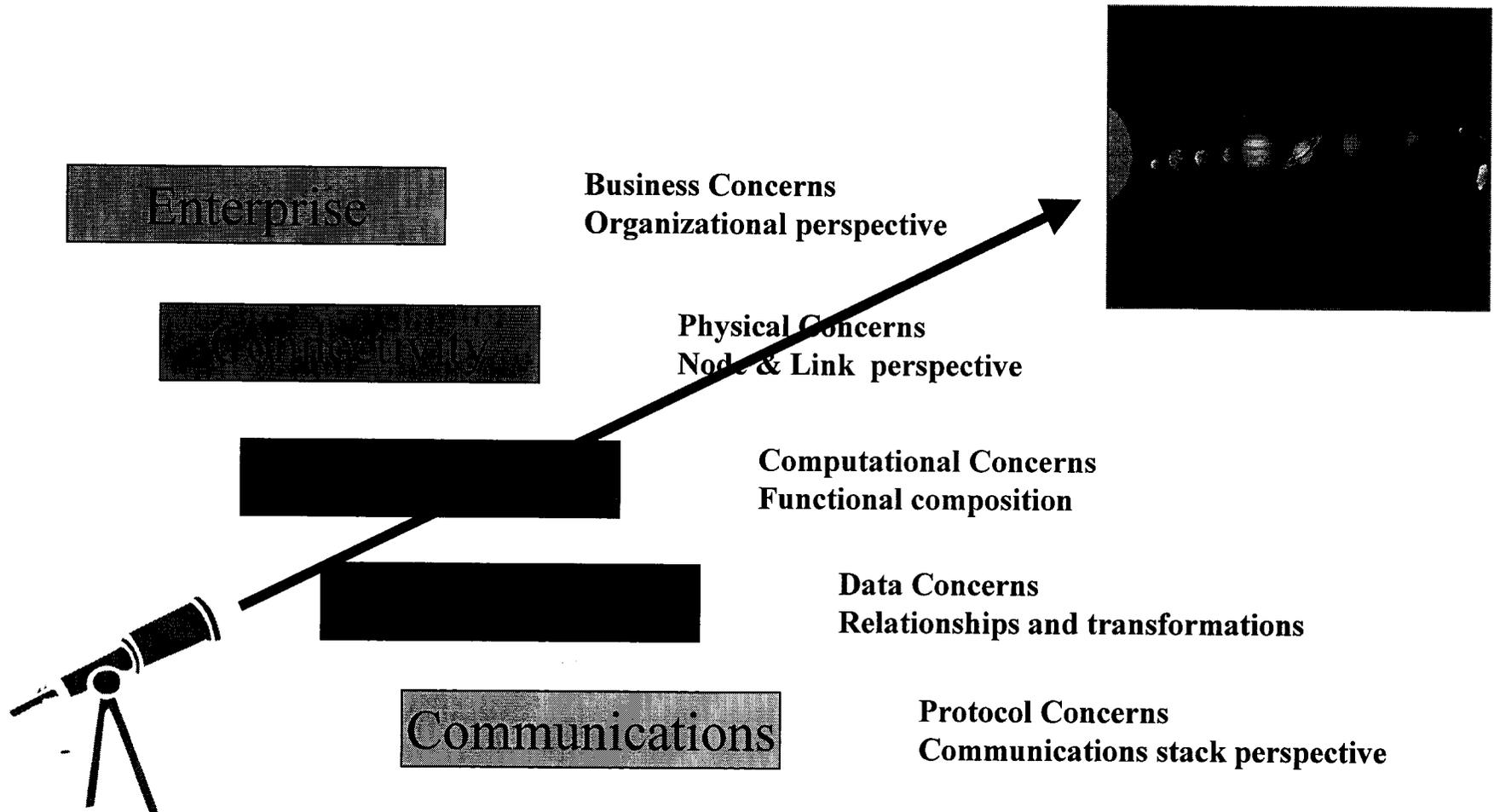
Reference Architecture Purpose

- Establish an overall CCSDS approach to architecting and to developing domain specific architectures
- Define common language and representation so that challenges, requirements, and solutions in the area of space data systems can be readily communicated
- Provide a kit of architect's tools that domain experts will use to construct many different complex space system architectures
- Facilitate development of standards in a consistent way so that any standard can be used with other appropriate standards in a system
- Present the standards developed by CCSDS in a systematic way so that their functionality, applicability, and interoperability may be clearly understood

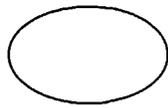
Abstract Views of a Space System (What's in the box?)



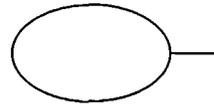
Space Data System Several Architectural Viewpoints



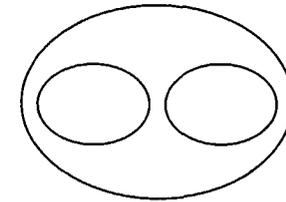
Space Data System Architectural Notation



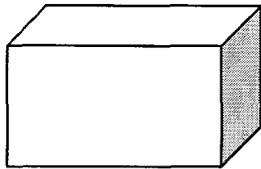
Object



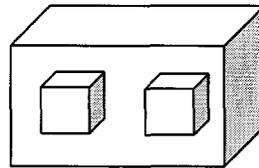
**Object with
Interface**



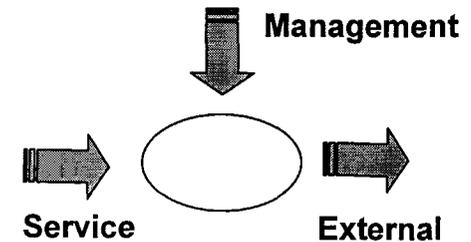
**Object
Encapsulation**



**Node
(physical location)**



**Node Encapsulation
(physical aggregation)**



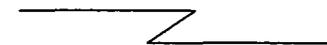
Concerns



**Logical
Link**

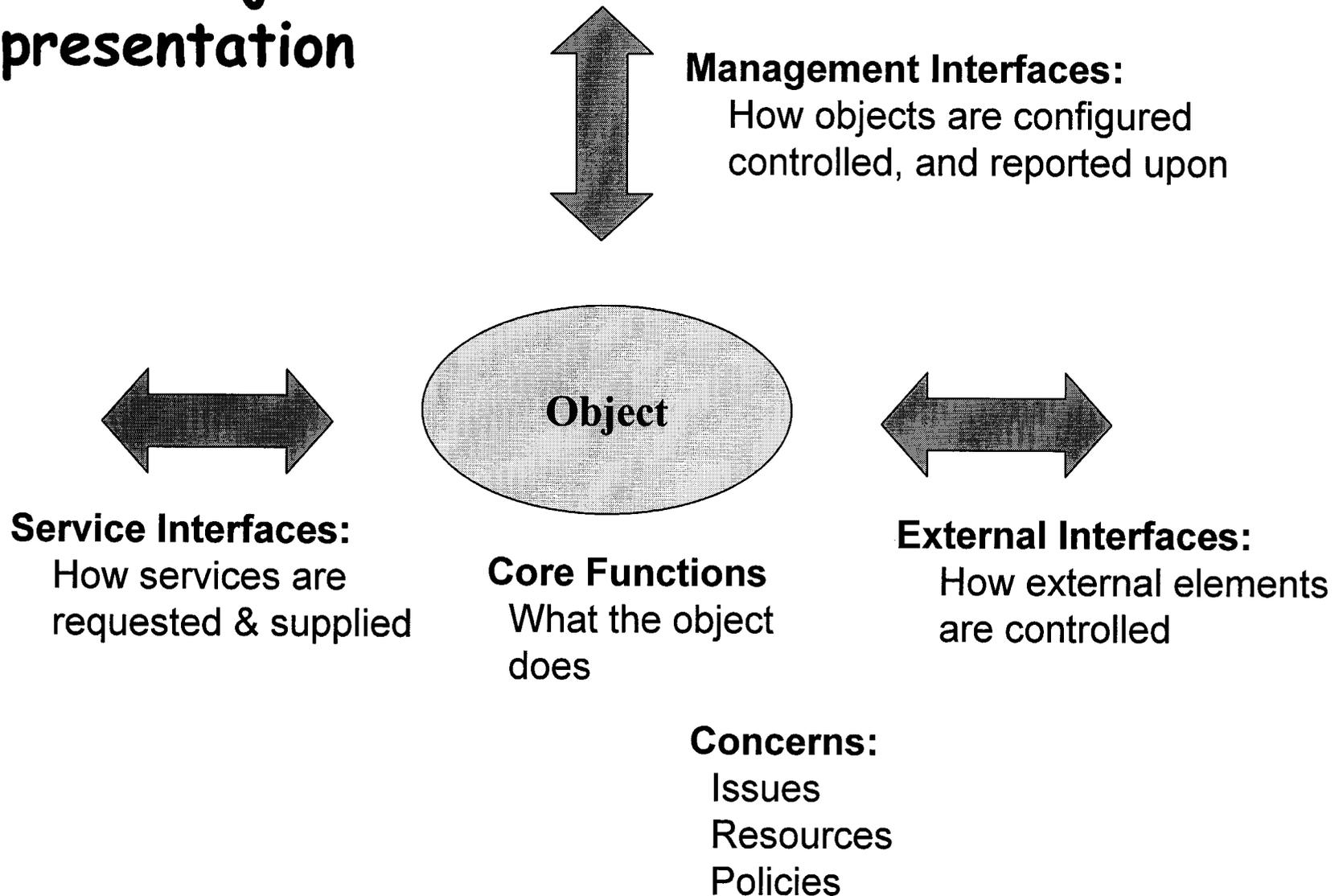


**Physical
Link**



**Space Link
(rf or optical)**

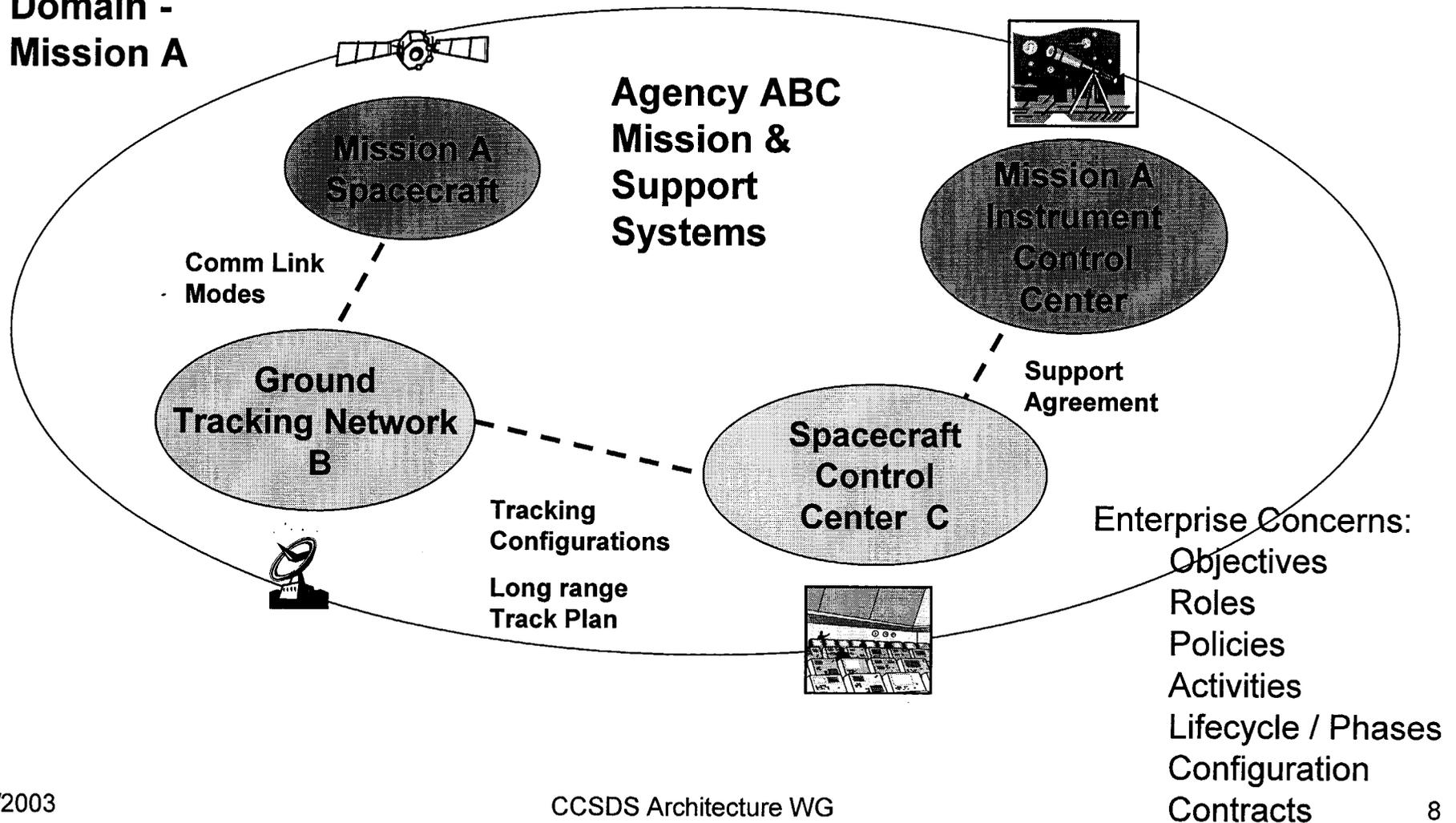
Unified Object Representation



Enterprise View

Single Agency Mission Domain & Enterprise Objects Operations Planning Phase

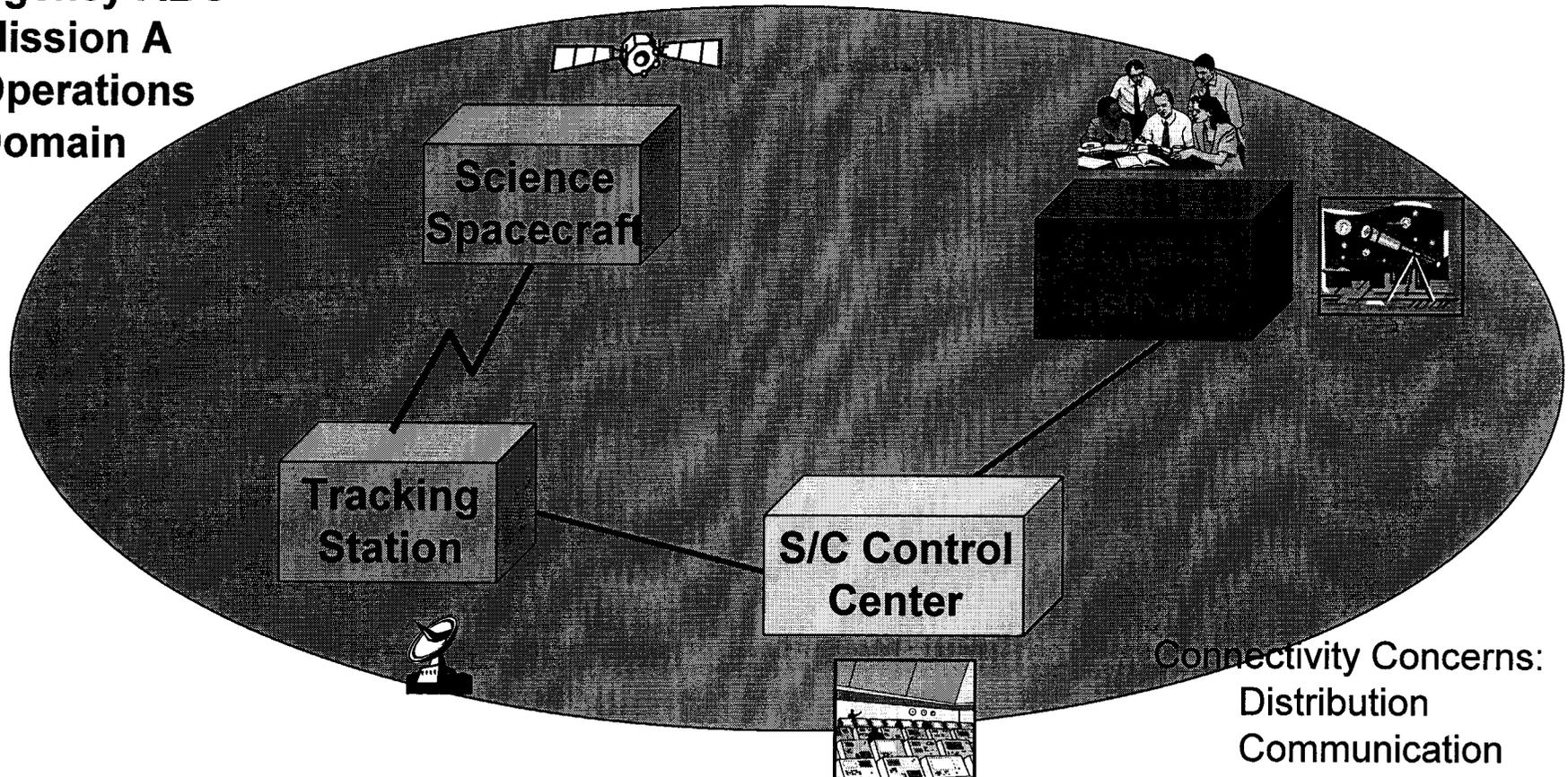
Operations
Domain -
Mission A



Connectivity View

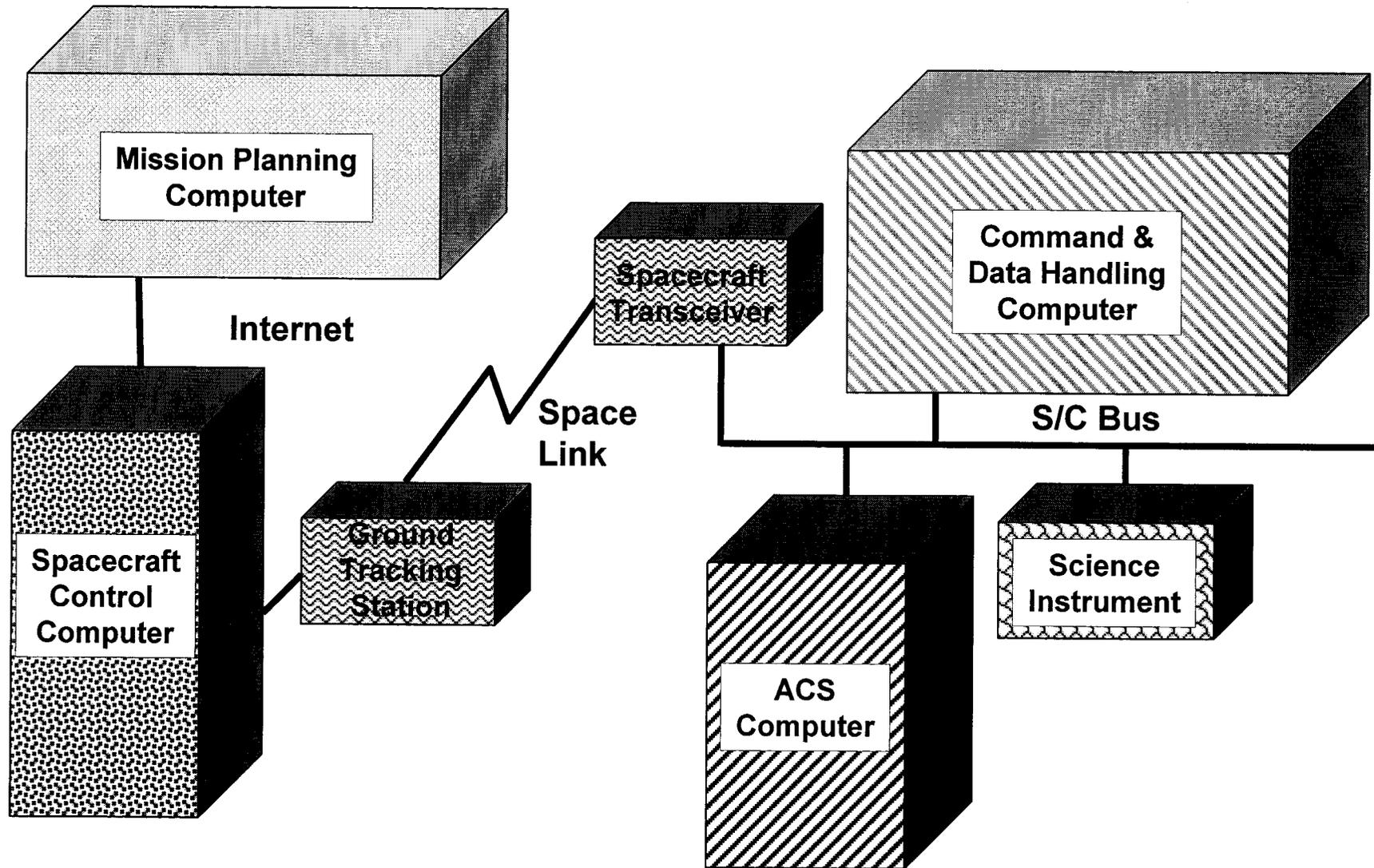
Single Agency Mission Domain & Nodes

Agency ABC
Mission A
Operations
Domain

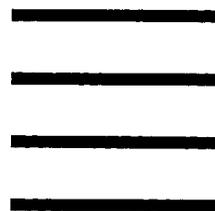
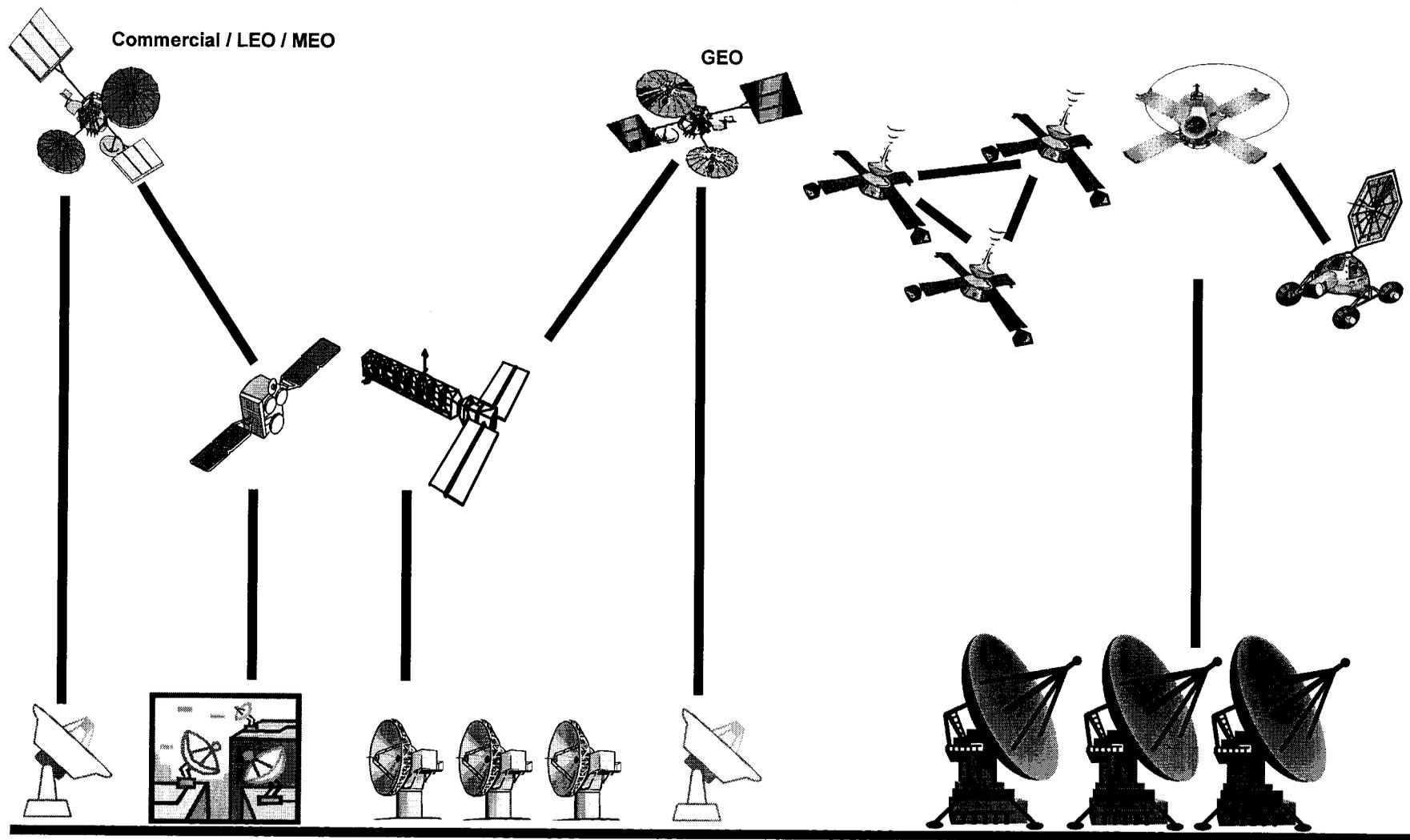


Connectivity Concerns:
Distribution
Communication
Physical Environment
Behaviors
Constraints
Configuration

Connectivity View Nodes



Connector Properties: Types of Space Links



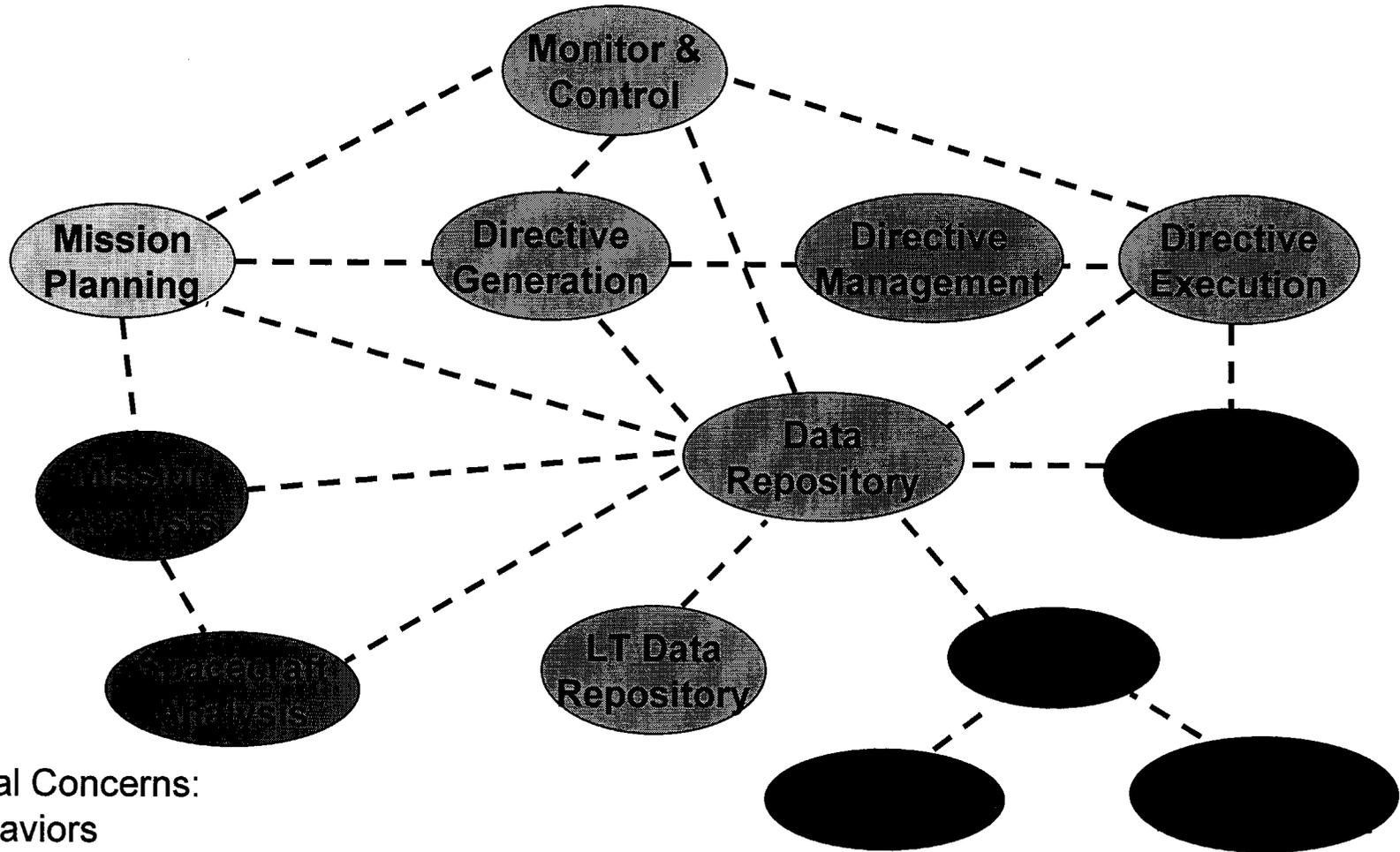
Near-Earth, LEO Direct
Near-Earth, GEO Relay
Near-Earth, Commercial LEO/MEO Relay
Near-Earth, Direct Broadcast



Deep Space Direct (DSN, other)
In-Space Proximity/Relay

Functional View

Example Functional Objects & Interactions



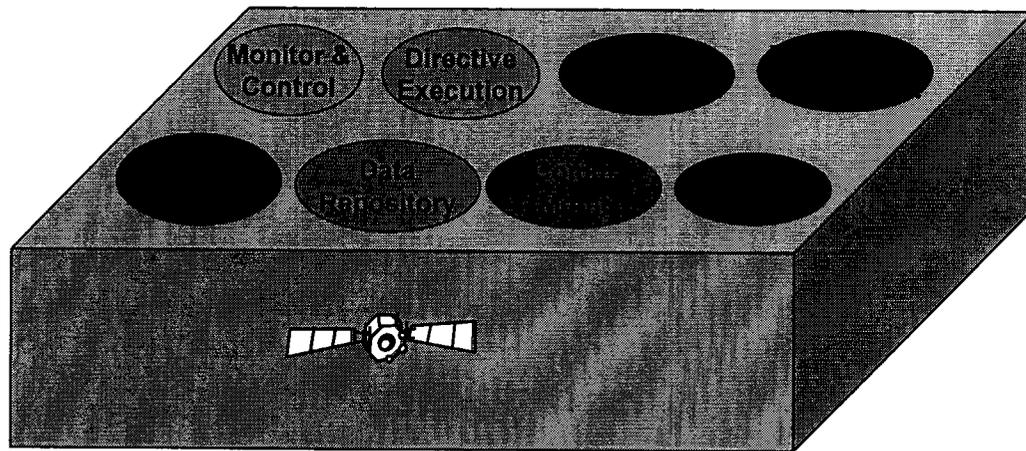
Functional Concerns:

- Behaviors
- Interactions
- Interfaces

Connectivity View - Redux

Mapping Functions to Nodes

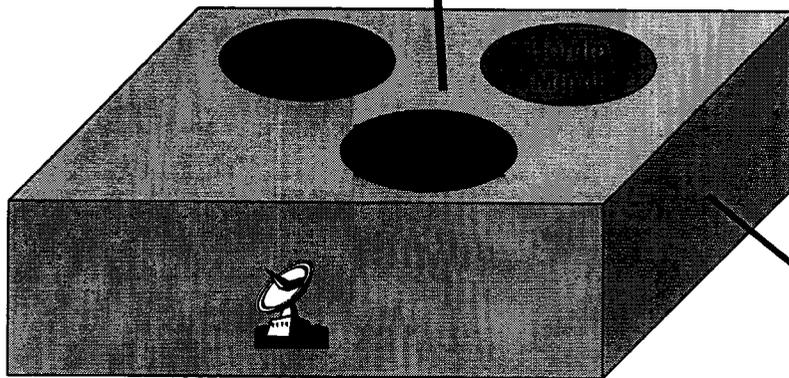
Science Spacecraft



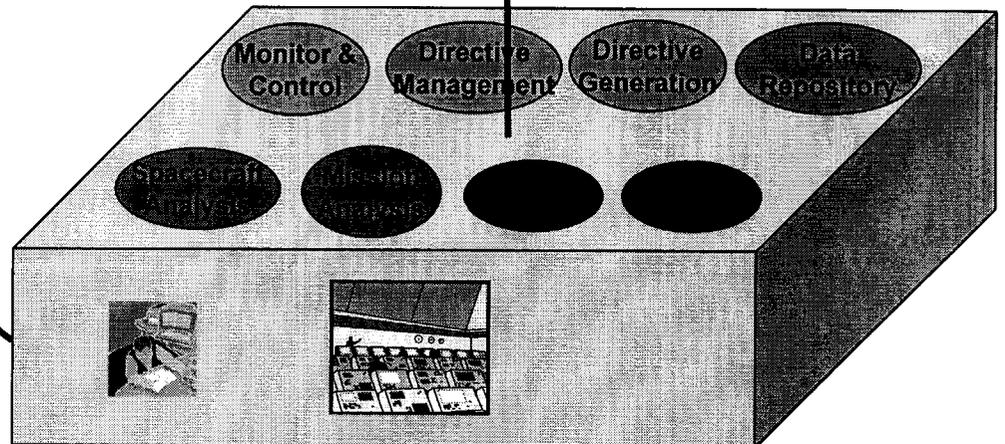
Science Institute



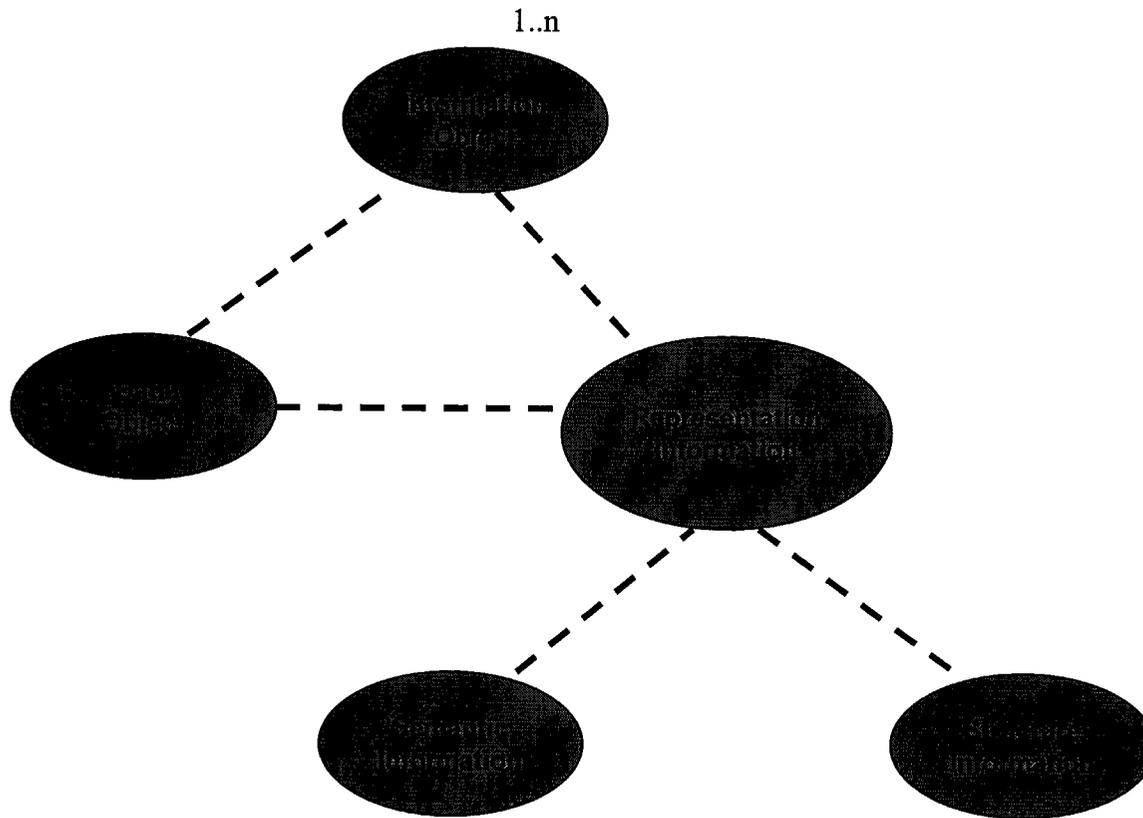
Tracking Station



S/C Control Center

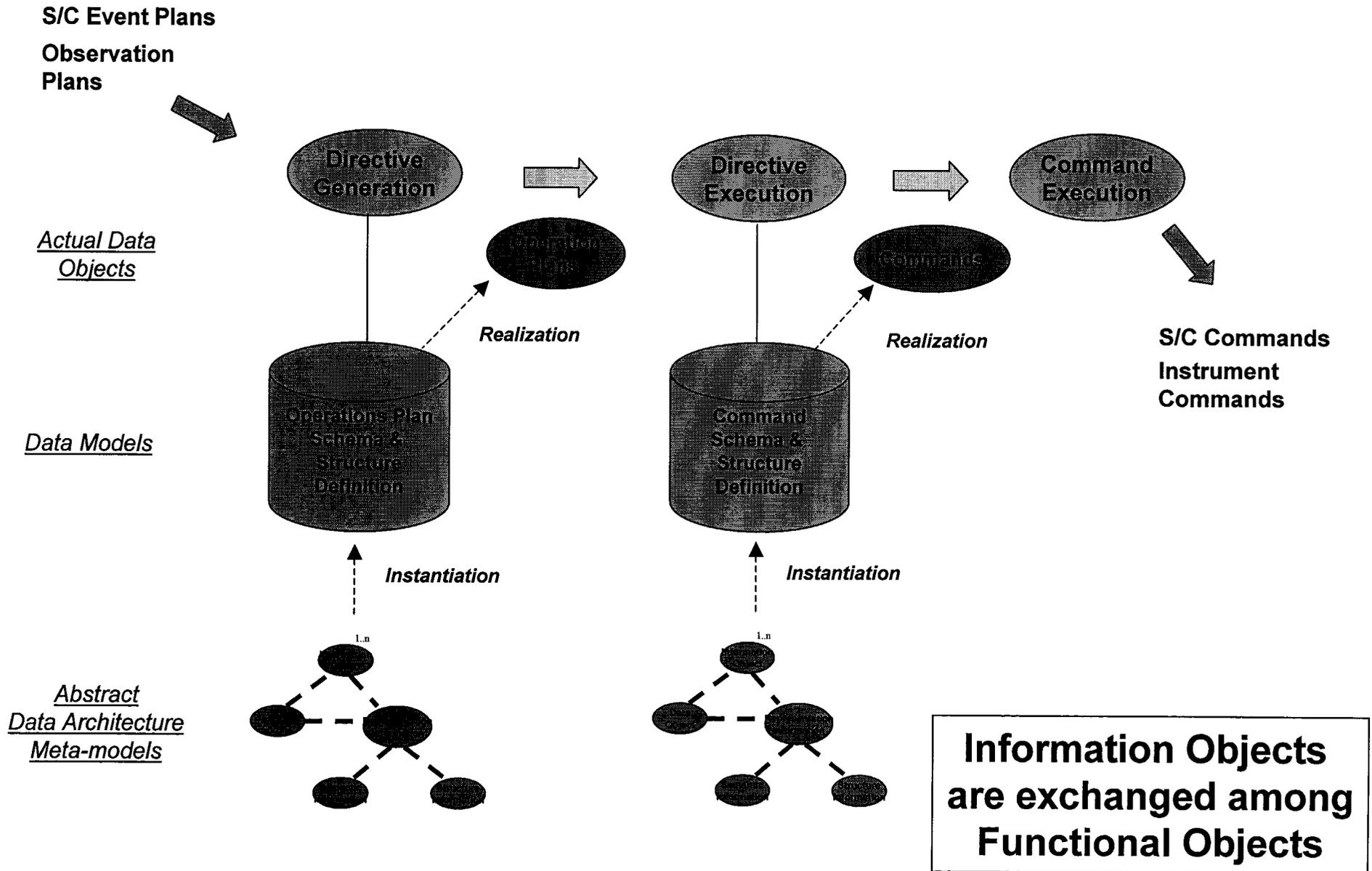


Information Object Basic Relationships

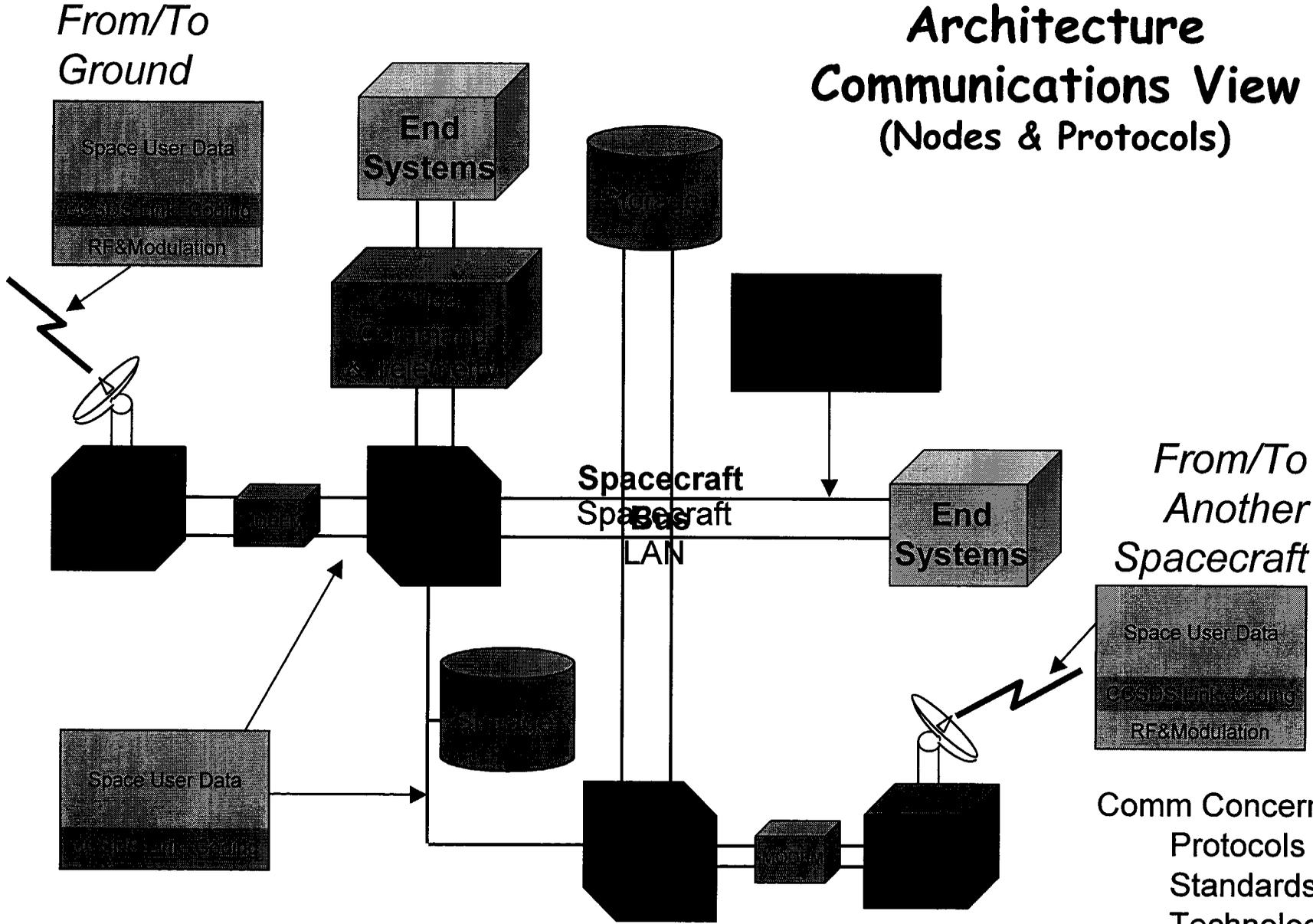


Information Concerns:
Structure
Semantics
Relationships
Permanence
Rules

Information Objects Relationship to Functional View

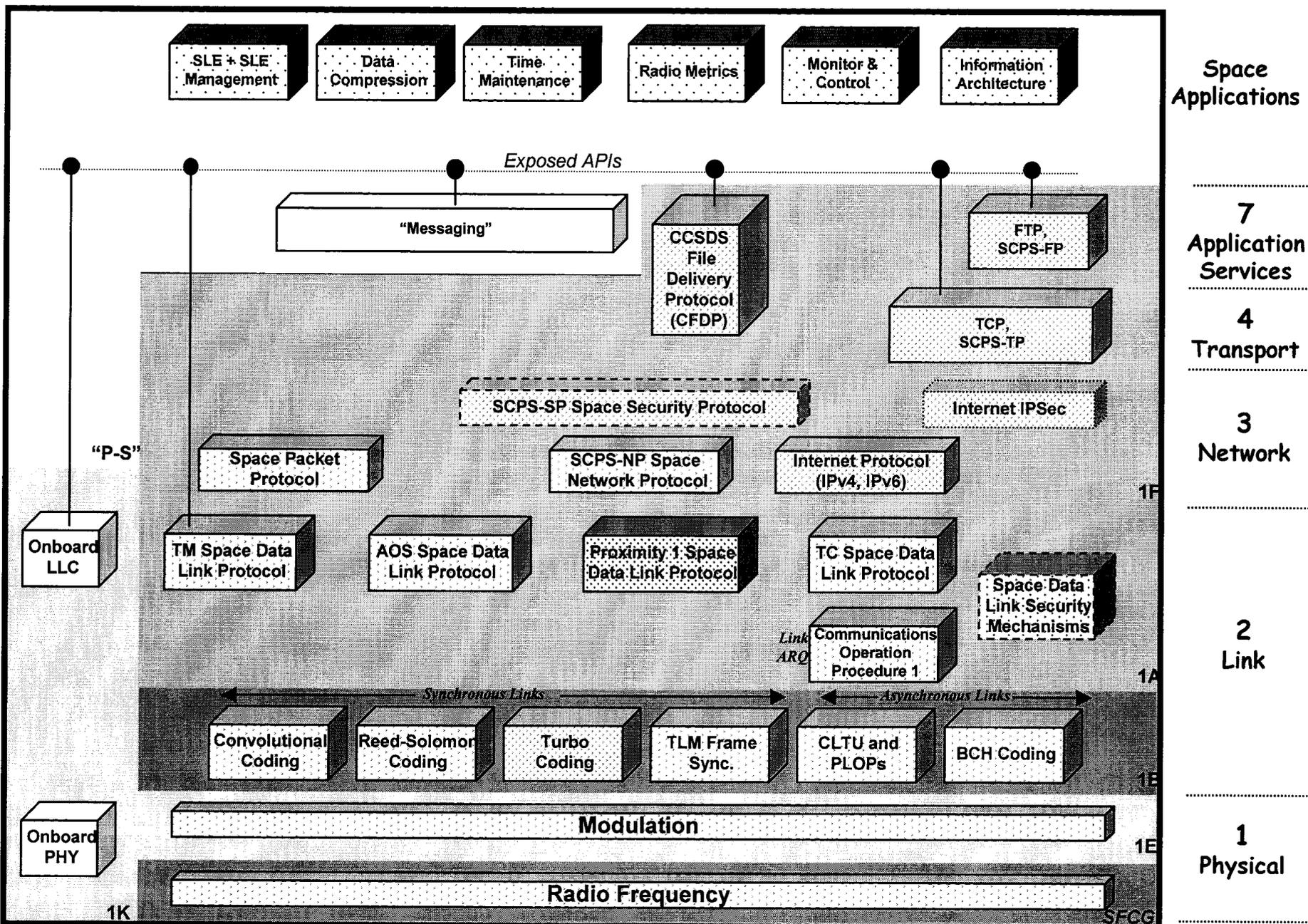


A Spacecraft Internal Communications View (Nodes & Protocols)



Comm Concerns:
 Protocols
 Standards
 Technology
 Comm Environ
 Suitability 16

CCSDS Space Communications Standards



Architecture Working Group

Future Activities

- AWG will refine the conceptual model and define the Architect's Toolkit
 - Toolkit will support description of structure and behavior of space data system architectures
 - Toolkit will eventually permit modeling and simulation of active behavior of systems
- The AWG will evolve and maintain the toolkit in response to changing technologies and external requirements.

BACKUP SLIDES

Basic Layered Structure of RASDS Software Systems

