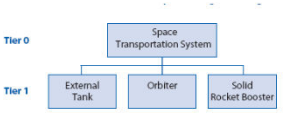

Figure 2.3-2 Product hierarchy, tier 1: first pass through the SE engine

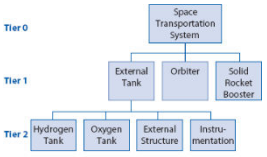

Figure 2.3-3 Product hierarchy, tier 2: external tank

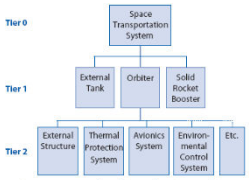

Figure 2.3-4 Product hierarchy, tier 2: orbiter

Lecture 9: System Architecture-2

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Systems Engineering Engine/Cycle

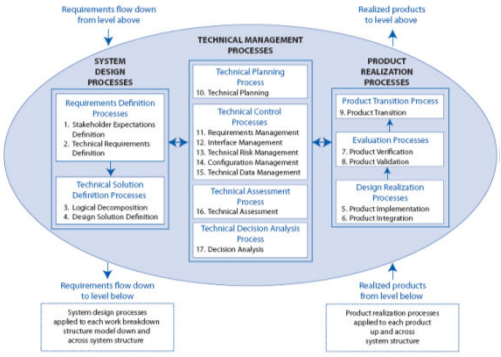


Figure 2.1-1 The systems engineering engine

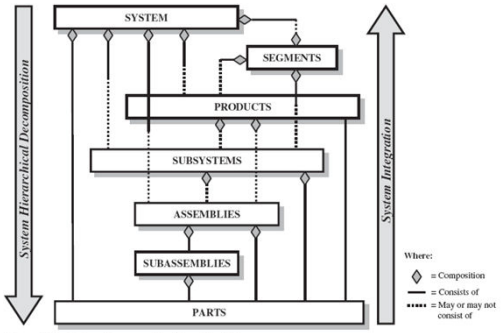


Figure 9.4 System Decomposition/Integration Rules

Components of the Architecture

- System of Interest Architecture
- Architecture of Operating Environment
- System Interfaces
- Organization Roles, Missions and System Applications
- Problem, Opportunity and Solution Spaces
- System Interaction with Operating Environment

Operating Environment

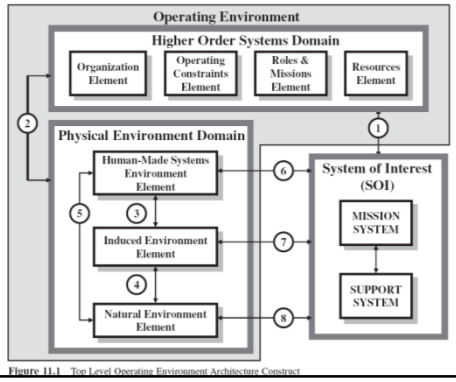


Figure 11.1 Top Level Operating Environment Architecture Construct

Physical Environment System (E-R)

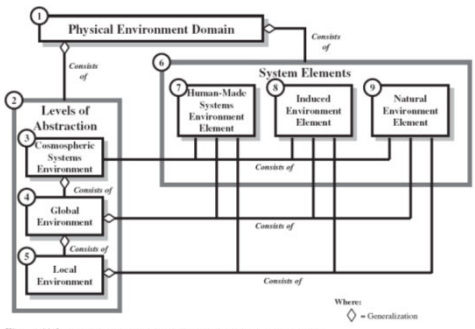
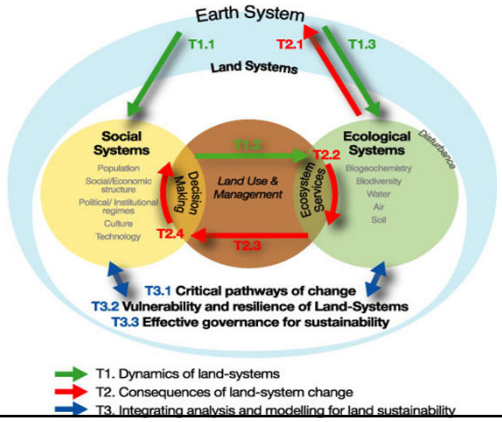


Figure 11.2 Physical Environment System Element Entity Relationships

GLOBAL LAND PROJECT: Analytical Structure



System Interfaces

- **Objective 1:** Physically link or bind two or more system elements or entities.
- **Objective 2:** Adapt one or more incompatible system elements or entities.
- **Objective 3:** Buffer the effects of incompatible system elements.
- **Objective 4:** Leverage human capabilities.
- **Objective 5:** Restrain system element or its usage.

Interoperability—The Ultimate Interface Challenge

Types of Interfaces

- Active Interfaces
- Passive Interfaces
- Combined Passive/Active Interfaces

- Logical
- Physical – Mech, Elect, Optical, Acoustic, Natural, Chemical, Biological, etc

- **Caution**: Engineers have a strong tendency to jump to defining the *physical interface* BEFORE anyone has decided WHAT the interface is to accomplish.

Understanding Interfaces

- **What Constitutes an Interface Failure?**
- **Consequences of an Interface Failure**
- **Interface Failures**
  - 1) *disruption*, 2) *intrusion*, 3) *stress loading*, and 4) *physical destruction*.
- **Interface Vulnerabilities**
- **Interface Latency**
- **Interface Failure Mitigation and Prevention**