Lecture 11: System Archi-3

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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

Organization Roles, Missions and System Applications

- The Planning process
  - Strategic
  - Tactical
  - Frame of Reference or Terms of References
- System Objectives and Mission Objectives
- Contextual Roles
  - Mission system
  - Support system

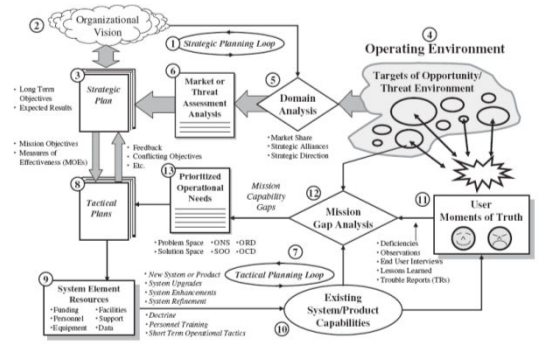
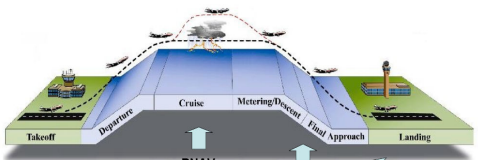


Figure 13.1 Operational Needs Identification Process

Example: Mission and Support Systems – in different Phases of an Aircraft motion



1. Taxiing
2. Takeoff
3. Departure
4. Cruise
5. Descent
6. Landing
7. Taxiing to Gate/Bay
8. Parking

Organization – System Interaction

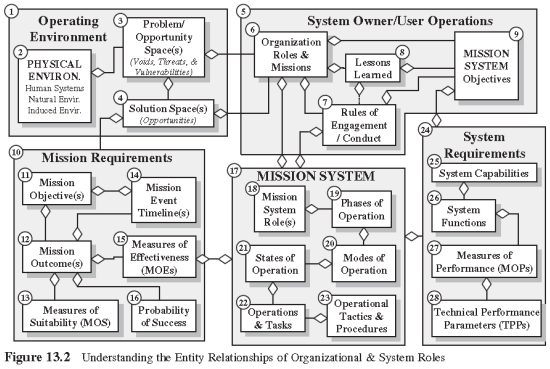


Figure 13.2 Understanding the Entity Relationships of Organizational & System Roles

Problem, Opportunity and Solution Spaces

- Problem space and Opportunity Space
  - Risk mitigation; vulnerability assessment
- Look at what you have – products, services, etc that can fit
- Modify the products, if need
- One's Problem is Other's Opportunity
  - Example: Saint-Gobain's DryWall

Problem Space

- Problem vs Symptom solving
- Dynamics of the problem
  - Dynamic nature of the problem vs Static view
- Forecasting of the Problem
  - Gap → Problem
- Establish Problem Space Boundaries
  - Control, resources or spheres of influence
- Partition the Problem Space

Solution Spaces

- Depends on the Boundary conditions
  - Clear, rigid vs. Fuzzy vs. Overlapping/Conflicting
- Force Multipliers
- Selecting Candidate solutions
- Operating Environment

Mission Event Timeline

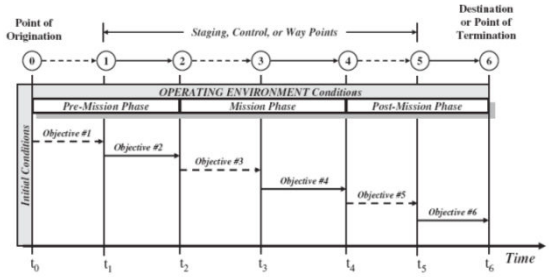


Figure 16.1 Operational Concept Timeline Example

System Use Cases

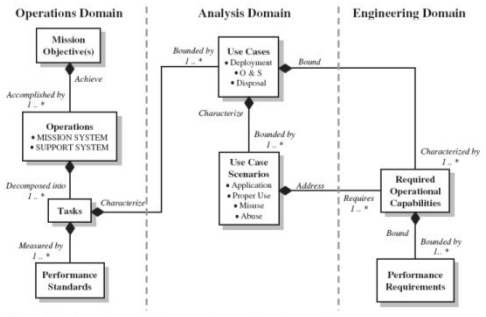
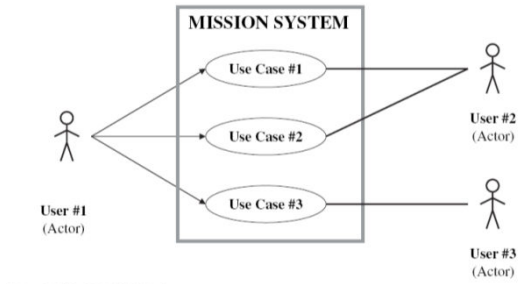


Figure 17.1 System/Product Use Cases and Scenarios Entity Relationships

Attributes of Use Case

- Unique identifier
- Objective (performance)
- Outcome-based results
- Assumptions
  - Initial state
  - Final state
  - Environmental conditions
  - Preceding circumstances (optional)
  - Operating constraints
  - External inputs
  - Resources
- Processing capabilities / response function
- Scenarios and consequences
  - Probability of occurrence
  - Use case scenario actors
  - Stimuli and cues
  - Consequences
  - Compensating/mitigating actions
  - Event-based timeline
  - Frequency of occurrence and utility priorities

UML Use Case Diagram



Where: UML® = Unified Modeling Language

Figure 17.2 UML® Use Case Diagram

Use Case Sequence Diagram

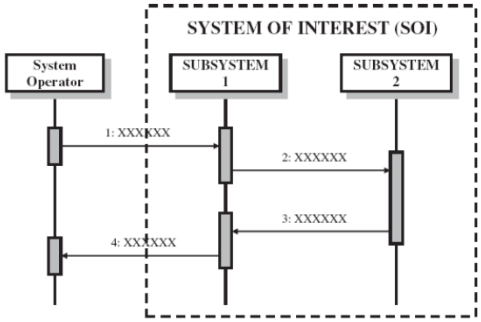


Figure 17.3 UML® Use Case Sequence Diagram