

Lecture 11: System Archi-3

K S Rajan
IIIT, Hyderabad

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IIIT, Hyderabad

Components of the Architecture

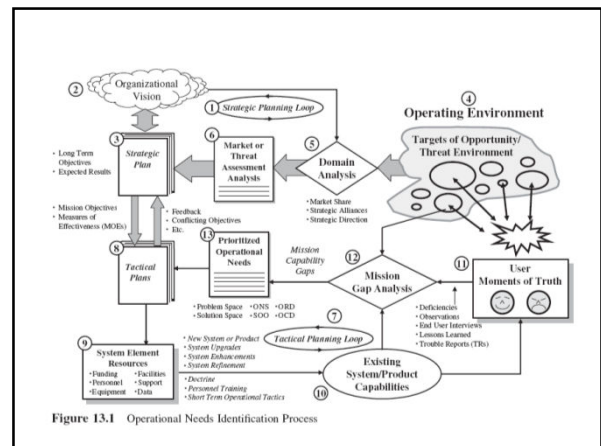
- System of Interest Architecture
- Architecture of Operating Environment
- System Interfaces
- Organization Roles, Missions and System Applications
- Problem, Opportunity and Solution Spaces
- System Interaction with Operating Environment

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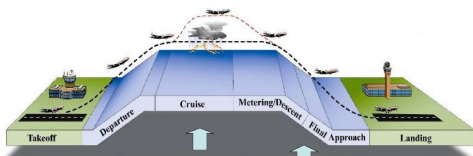
Organization Roles, Missions and System Applications

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

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

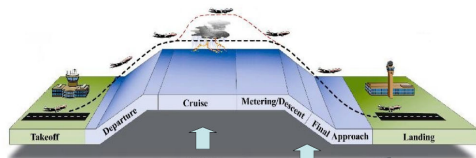


The diagram illustrates the various phases of an aircraft's mission and support systems. It shows a cross-section of a runway and the surrounding environment. The phases are labeled as follows:

- Takeoff
- Departure
- Cruise
- Metering/Descent
- Final Approach
- Landing

Below the diagram, a list of eight tasks is provided, numbered 1 through 8:

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



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2. Takeoff
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Organization – System Interaction

The diagram illustrates the entity relationships between organizational and system roles, organized into four main interconnected sections:

- Operating Environment (Top Left):**
 - Entity 1: **PHYSICAL ENVIRON.** (Human System, Natural Envir, Induced Envir)
 - Entity 3: **Problem/ Opportunity Space(s)** (*Voids, Threats, & Vulnerabilities*)
 - Entity 4: **Solution Space(s)** (*Opportunities*)
- System Owner/User Operations (Top Right):**
 - Entity 6: **Organization Roles & Missions**
 - Entity 7: **Rules of Engagement / Conduct**
 - Entity 8: **Lessons Learned**
 - Entity 9: **MISSION SYSTEM Objectives**
- Mission Requirements (Bottom Left):**
 - Entity 11: **Mission Objective(s)**
 - Entity 14: **Mission Event TimeLine(s)**
 - Entity 12: **Mission Outcome(s)**
 - Entity 15: **Measures of Effectiveness (MOEs)**
 - Entity 13: **Measures of Suitability (MOS)**
 - Entity 16: **Probability of Success**
- MISSION SYSTEM (Bottom Right):**
 - Entity 18: **Mission System Role(s)**
 - Entity 19: **Phases of Operation**
 - Entity 21: **States of Operation**
 - Entity 20: **Modes of Operation**
 - Entity 24: **Operations & Tasks**
 - Entity 23: **Operational Tactics & Procedures**
- System Requirements (Far Right):**
 - Entity 25: **System Capabilities**
 - Entity 26: **System Functions**
 - Entity 27: **Measures of Performance (MOPs)**
 - Entity 28: **Technical Performance Parameters (TPPs)**

Interactions are indicated by numbered arrows (1-28) connecting these entities across the different sections.

Figure 13.2 Understanding the Entity Relationships of Organizational & System Roles

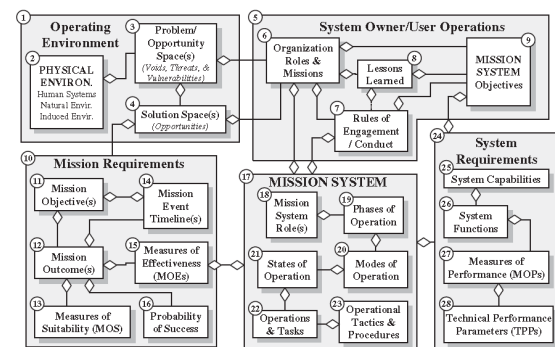


Figure 13.2 Understanding the Entity Relationships of Organizational & System Roles

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

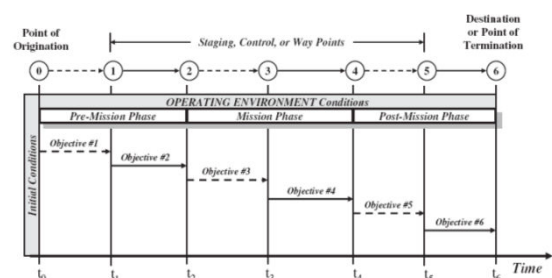


Figure 16.1 Operational Concept Timeline Example

System Use Cases

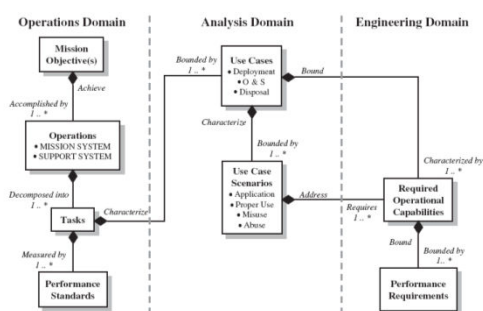
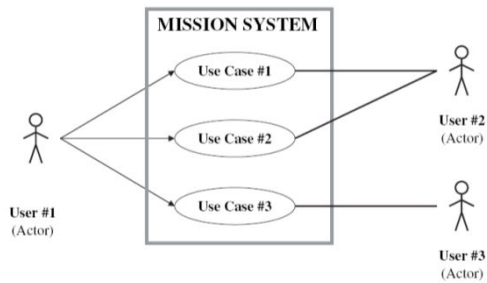


Figure 17.1 System/Product Use Cases and Scenarios Entity Relationships

Attributes of Use Case

- Unique identifier
- Objective (performance)
 - Event-based timeline
 - Frequency of occurrence and utility priorities
- 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

UML Use Case Diagram



Where: UML® = Unified Modeling Language

Figure 17.2 UML® Use Case Diagram

Use Case Sequence Diagram

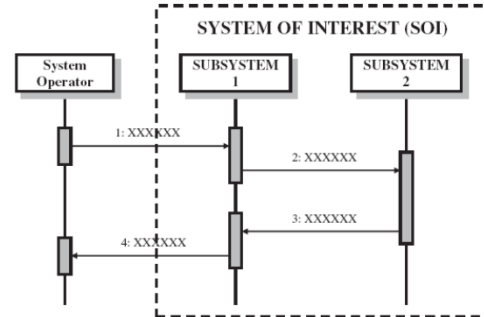


Figure 17.3 UML® Use Case Sequence Diagram