FAA Requirements Engineering Management Handbook

1. System Overview

SAnToS Laboratory
Kansas State University

Steps in the REMH

1. **Develop the System Overview**
2. Identify the System Boundary
3. Develop the Operational Concepts
4. Identify the Environmental Assumptions
5. Develop the Functional Architecture
6. Revise the Architecture to Meet Implementation Constraints
7. Identify System Modes
8. Develop the Detailed Behavior and Performance Requirements
9. Define the Software Requirements
10. Allocate System Requirements to Subsystems
11. Provide Rationale

System Overview: Goals

- Provide an overview of the system that:
  - Includes a brief synopsis
  - Describes all contexts in which the system will be used
  - Lists the primary goals, objectives, and constraints
- Define system scope while requirements are still under development
- Provide a quick orientation to a new reader

System Overview: Artifacts

- System Overview
  - Brief description of entire system
- System Context
  - Where the system fits into a larger context
- System Goals
  - High-level goals the system will accomplish

1 The System Overview

2.1 Develop the System Overview: Develop an overview of the system that includes a brief synopsis, describes all contexts in which the system will be used, and lists the main goals, objectives, and constraints of the system. This helps to define the system scope while the requirements are being developed and serves as a means to quickly orient a new reader of the requirements.

2.1.1 Develop the system overview early in the requirements engineering process and use it as the introduction to the requirements specification. Keep the overview at a high level so it can be used to quickly orient new readers.

2.1.2 Provide a short textual synopsis of the system as the first part of the system overview. The synopsis should name the system, describe its purpose, and summarize the system capabilities.

2.1.3 Consider the entire life cycle of the system and identify each distinct context in which it will be used.

2.1.4 Use context diagrams in the system overview to provide a high-level, graphical depiction of the system, the external entities it interacts with, and those interactions.

2.1.5 For each context diagram, **provide a brief description of each external entity** and its interactions with the system.

2.1.6 Capture a preliminary set of system goals early in the requirements engineering process so they can be used to guide the development of the requirements.

2.1.7 Depending on the size and volatility of a project, **collect and maintain the information about each system goal** necessary to continuously assess its importance relative to the other goals.

1.1 Develop the System Overview Early

The system overview should…

- Introduce system requirements
- Quickly orient the reader to environment
  - *Does not* attempt to completely describe system
- Provide:
  - High-level view
  - How the system interacts with its environment
  - Why the system is necessary
- Include:
  - Short synopsis of entire system,
  - One (or more) context description(s)
  - Description of external entities in context
  - High level goals, objectives, and constraints

1.2 Provide System Synopsis

The system synopsis should…

- Give a brief narrative to start overview
  - Short, clear, avoids implying a specific design
- Name the system
- Describe its purpose
- Summarize the system's capabilities

Example System Synopsis

"The system being specified is the Thermostat of an Isolette. An Isolette is an incubator for an Infant that provides controlled temperature, humidity, and oxygen (if necessary). Isolettes are used extensively in Neonatal Intensive Care Units for the care of premature infants."

"The purpose of the Isolette Thermostat is to maintain the air temperature of an Isolette within a desired range. It senses the Current Temperature of the Isolette and turns the Heat Source on and off to warm the air as needed. If the temperature falls too far below or rises too far above the Desired Temperature Range, it activates an alarm to alert the Nurse. The system allows the Nurse to set the Desired Temperature Range and to set the Alarm Temperature Range outside the Desired Temperature Range of which the alarm should be activated."

Name

Purpose

Capabilities

1.3 Identify System Contexts

The system context…

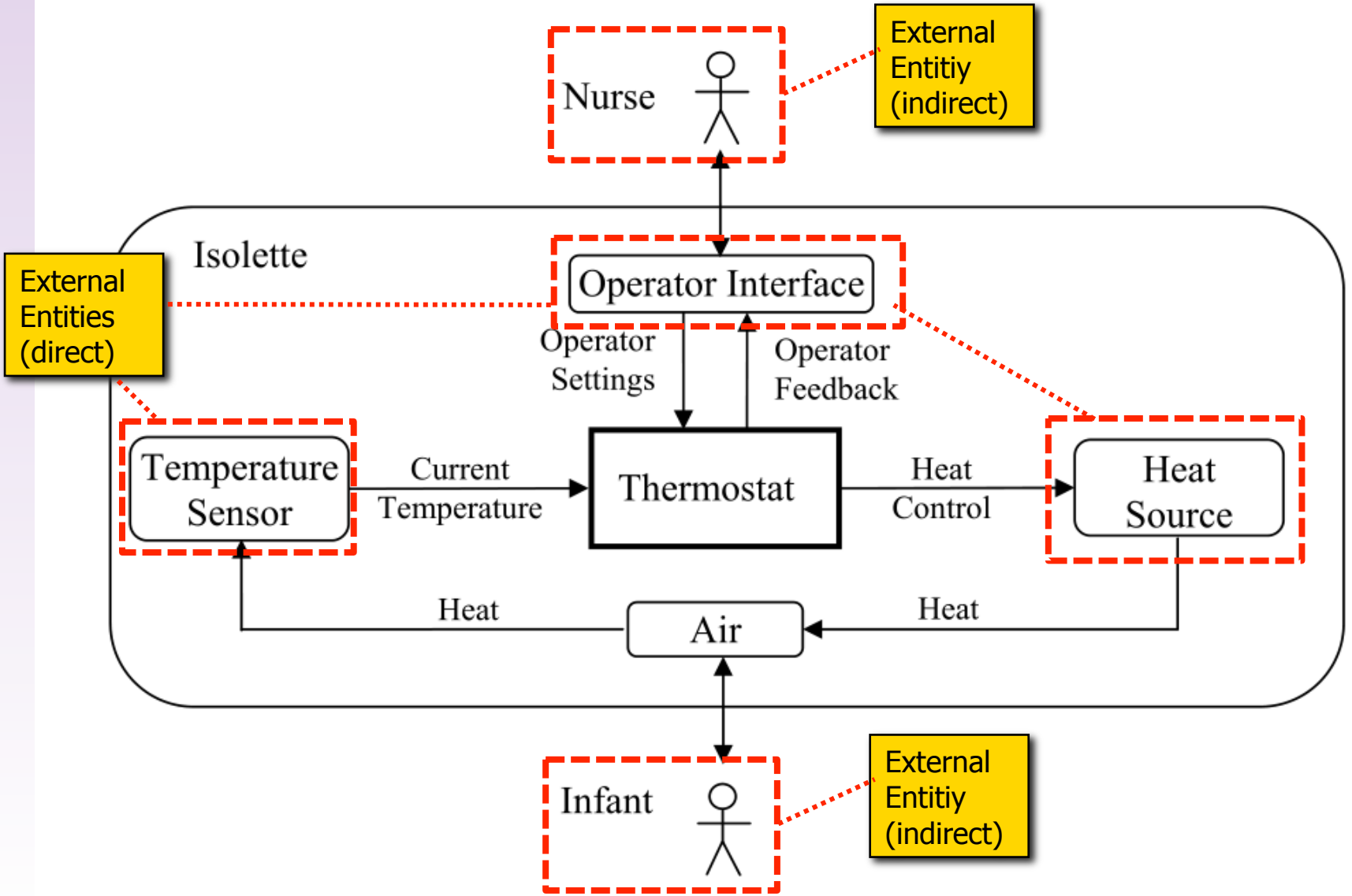
- Describes (at a high level):
  - The external entities the system will interact with, and
  - The nature of the interactions
- May consist of multiple contexts, including
  - Operational (the system as it is used)
  - Testing
  - Maintenance
- Note that different contexts will be important to different users

1.4 Use Context Diagrams

Context diagrams…

- Graphically depict each external entity and its interaction with the system
- Present the system itself is a “black box” with no internal structure

Example Context Diagram



1.5 Describe External Entities

Descriptions should…

- Include each external entity
  - And its interactions with the system
- Not go into great detail

Example Context Description

- The Thermostat interacts directly with three entities that are part of the Isolette:
  - The Temperature Sensor provides the Current Temperature of the air in the Isolette to the Thermostat.
  - The Heat Source heats the Air in the Isolette. It is turned on and off by the Heat Control.
  - The Operator Interface provides the Operator Settings for the Thermostat and receives Operator Feedback from the Thermostat.
- The Thermostat also interacts indirectly with other entities outside of the Isolette:
  - The Nurse who uses the Operator Interface to enter the Operator Settings and view the Operator Feedback.
  - The Air in the Isolette.
  - The Infant that is placed in the Isolette and is warmed by the Air

External Entitiy

...nature of interactions

External Entitiy

...nature of interactions

1.6 Capture Preliminary System Goals

Preliminary System Goals…

- Give informal statements of system stakeholders' needs
  - Not verifiable
  - Not detailed enough to guide system development
- Provide guidance on what is being built and why it is important
- May conflict with one another
- Should be presented early
  - Small projects can use the system overview, but
  - Large projects may need a separate section or document

Example Isolette Thermostat System Goals

- G1: The Infant should be kept at a safe and comfortable temperature.
- G2: The Nurse should be warned if the Infant becomes too hot or too cold.
- G3: The cost of manufacturing the Thermostat should be as low as possible.

1.7 Maintain System Goal Information

- Goal management is an ongoing process
  - Both requirements and operational concepts trace to system goals
- Simple projects can have all goals on one page
  - Maintenance consists of periodic reviews
- Larger projects will take significantly more effort
- Goals can be sourced from customers, users, regulatory bodies, and previous development.
- Goal information might include information on:
  - Origin, origin date, author, priority, stakeholders, stability, (estimated) completion date

Summary

The System Overview rapidly orients a stakeholder to the requirements document

- System Synopsis – Short narrative of system and purpose
- System Context – Interactions with external entities
  - Use a context diagram
- System Goals

For You To Do

- State the primary content of the system synopsis
- Describe the purpose of the system context description

Acknowledgements

- The material in this lecture is based almost entirely on
  - *FAA* DOT/FAA/AR-08/32*, Requirements Engineering Management Handbook.* David L. Lempia & Steven P. Miller.