

Chapter 7

Requirements Engineering

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Requirements Engineering-I

- Inception—ask a set of questions that establish ...
 - basic understanding of the problem
 - the people who want a solution
 - the nature of the solution that is desired, and
 - the effectiveness of preliminary communication and collaboration between the customer and the developer
- Elicitation—elicit requirements from all stakeholders
- Elaboration—create an analysis model that identifies data, function and behavioral requirements
- Negotiation—agree on a deliverable system that is realistic for developers and customers

Requirements Engineering-II

- Specification—can be any one (or more) of the following:
 - A written document
 - A set of models
 - A formal mathematical
 - A collection of user scenarios (use-cases)
 - A prototype
- Validation—a review mechanism that looks for
 - errors in content or interpretation
 - areas where clarification may be required
 - missing information
 - inconsistencies (a major problem when large products or systems are engineered)
 - conflicting or unrealistic (unachievable) requirements.
- Requirements management

Inception

- Identify stakeholders
 - “who else do you think I should talk to?”
- Recognize multiple points of view
- Work toward collaboration
- The first questions
 - Who is behind the request for this work?
 - Who will use the solution?
 - What will be the economic benefit of a successful solution
 - Is there another source for the solution that you need?

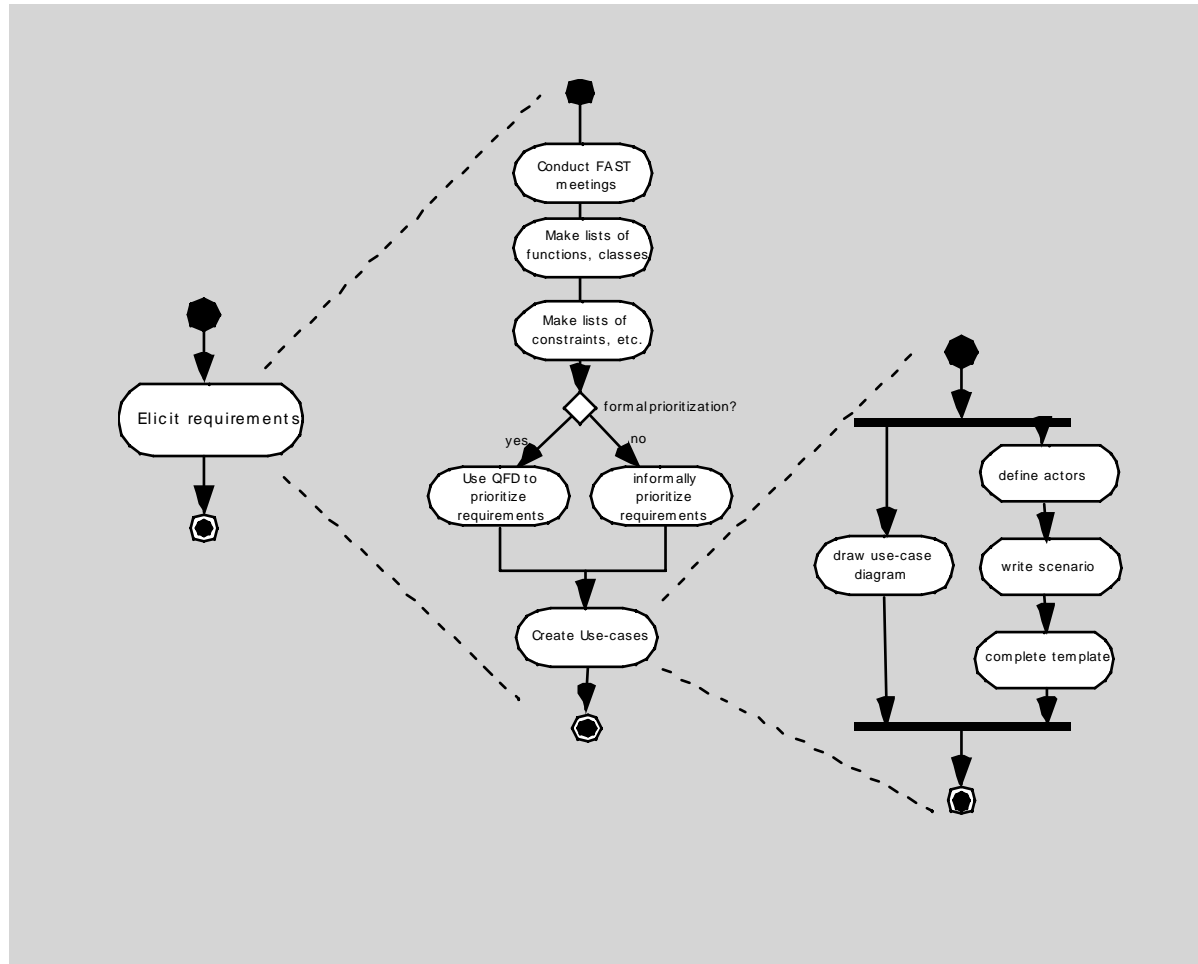
Eliciting Requirements

- meetings are conducted and attended by both software engineers and customers
- an agenda is suggested
- a "facilitator" (can be a customer, a developer, or an outsider) controls the meeting
- a "definition mechanism" (can be work sheets, flip charts, or wall stickers or an electronic bulletin board, chat room or virtual forum) is used
- the goal is
 - to identify the problem
 - propose elements of the solution
 - negotiate different approaches, and
 - specify a preliminary set of solution requirements

SafeHome: Conducting a Requirements Gathering Meeting (pg 188)

- The players:
 - Jamie
 - Vinod
 - Doug
 - 3 Marketing members
 - A facilitator

Eliciting Requirements



Quality Function Deployment

- Function deployment determines the “value” (as perceived by the customer) of each function required of the system
- Information deployment identifies data objects and events
- Task deployment examines the behavior of the system
- Value analysis determines the relative priority of requirements

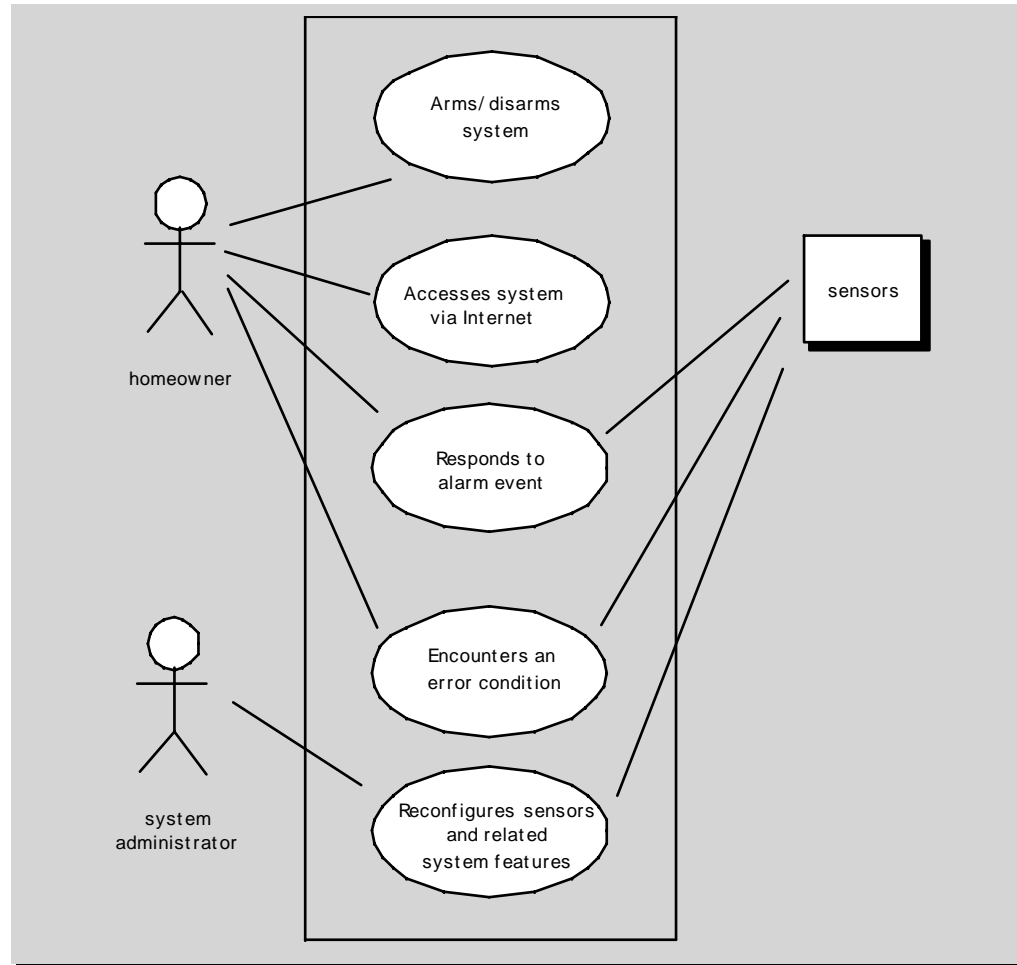
Elicitation Work Products

- a statement of need and feasibility.
- a bounded statement of scope for the system or product.
- a list of customers, users, and other stakeholders who participated in requirements elicitation
- a description of the system's technical environment.
- a list of requirements (preferably organized by function) and the domain constraints that apply to each.
- a set of usage scenarios that provide insight into the use of the system or product under different operating conditions.
- any prototypes developed to better define requirements.

Use-Cases

- A collection of user scenarios that describe the thread of usage of a system
- Each scenario is described from the point-of-view of an “actor”—a person or device that interacts with the software in some way
- Each scenario answers the following questions:
 - Who is the primary actor, the secondary actor (s)?
 - What are the actor’s goals?
 - What preconditions should exist before the story begins?
 - What main tasks or functions are performed by the actor?
 - What extensions might be considered as the story is described?
 - What variations in the actor’s interaction are possible?
 - What system information will the actor acquire, produce, or change?
 - Will the actor have to inform the system about changes in the external environment?
 - What information does the actor desire from the system?
 - Does the actor wish to be informed about unexpected changes?

Use-Case Diagram

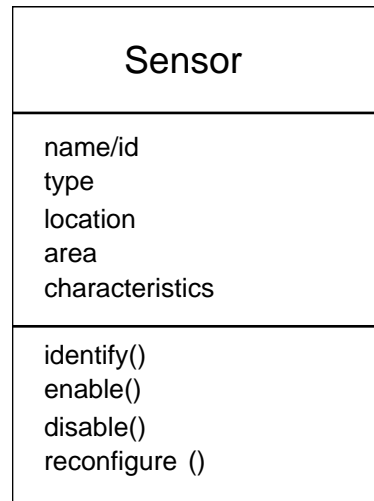


Building the Analysis Model

- Elements of the analysis model
 - Scenario-based elements
 - Functional—processing narratives for software functions
 - Use-case—descriptions of the interaction between an “actor” and the system
 - Class-based elements
 - Implied by scenarios
 - Behavioral elements
 - State diagram
 - Flow-oriented elements
 - Data flow diagram

Class Diagram

From the *SafeHome* system ...



State Diagram

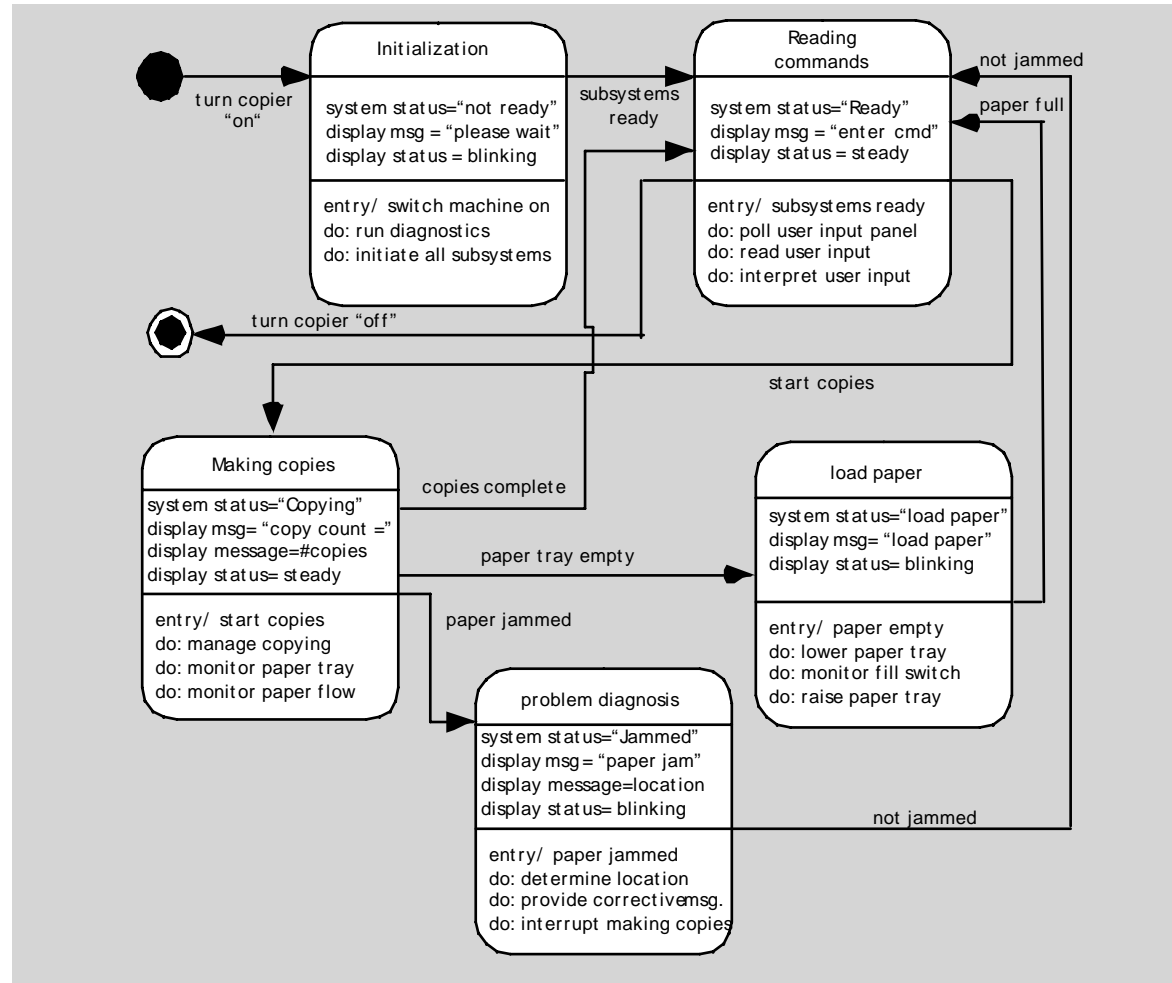


Figure 7.6 Preliminary UML state diagram for a photocopier

Analysis Patterns

- **Pattern name:** A descriptor that captures the essence of the pattern.
- **Intent:** Describes what the pattern accomplishes or represents
- **Motivation:** A scenario that illustrates how the pattern can be used to address the problem.
- **Forces and context:** A description of external issues (forces) that can affect how the pattern is used and also the external issues that will be resolved when the pattern is applied.
- **Solution:** A description of how the pattern is applied to solve the problem with an emphasis on structural and behavioral issues.
- **Consequences:** Addresses what happens when the pattern is applied and what trade-offs exist during its application.
- **Design:** Discusses how the analysis pattern can be achieved through the use of known design patterns.
- **Known uses:** Examples of uses within actual systems.
- **Related patterns:** One or more analysis patterns that are related to the named pattern because (1) it is commonly used with the named pattern; (2) it is structurally similar to the named pattern; (3) it is a variation of the named pattern.

Negotiating Requirements

- Identify the key stakeholders
 - These are the people who will be involved in the negotiation
- Determine each of the stakeholders “win conditions”
 - Win conditions are not always obvious
- Negotiate
 - Work toward a set of requirements that lead to “win-win”

Validating Requirements-I

- Is each requirement consistent with the overall objective for the system/product?
- Have all requirements been specified at the proper level of abstraction? That is, do some requirements provide a level of technical detail that is inappropriate at this stage?
- Is the requirement really necessary or does it represent an add-on feature that may not be essential to the objective of the system?
- Is each requirement bounded and unambiguous?
- Does each requirement have attribution? That is, is a source (generally, a specific individual) noted for each requirement?

Validating Requirements-II

- Do any requirements conflict with other requirements?
- Is each requirement achievable in the technical environment that will house the system or product?
- Is each requirement testable, once implemented?
- Does the requirements model properly reflect the information, function and behavior of the system to be built.
- Has the requirements model been “partitioned” in a way that exposes progressively more detailed information about the system.