Rational Unified Process
Process Description and Workflows

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Describing Processes

- The RUP uses four elements to describe processes:
  - Workers – describe a role, some people have many roles.
  - Activities – small, definable, reusable tasks that can be allocated to a single worker.
  - Artifacts – usually process deliverables, like: use cases, code, plans, test cases, test results.
  - Workflows – coordinated sequences of activities.

RUP Workflows

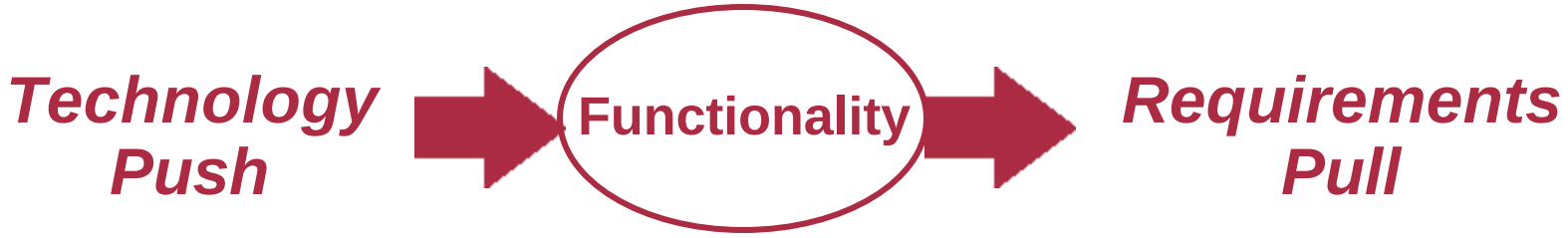
- There are 9 workflows, 6 engineering workflows:
  - Business modelling
  - Requirements
  - Development & Analysis
  - Implementation
  - Test
  - Deployment
- And 3 supporting workflows:
  - Project management
  - Configuration and Change Management
  - Environment

Requirements Workflow

- Workflows are followed iteratively through each iteration of each phase of the RUP.
- Effort expended in each workflow depends on the phase.
- We describe the requirements workflow in more detail

Capturing/discovering requirements

- More difficult and more important than writing code
- Users know what they have, not what they need
  - They will better understand what they need after they see it.
  - Nobody needed the WWW until they saw it.
  - User cannot envision the possibilities enabled by technology



Capturing/discovering requirements (continued)

- Developer is rarely the user
- Diversity of users
- Support the user's mission, not only the user
- User needs and missions are constantly changing
- The new system will impact the user's needs, resulting in new system needs (cycle)
- Complex systems are never fully understood
  - understanding evolves as the system evolves
- Hard to understand the constraints of legacy systems and the system environment

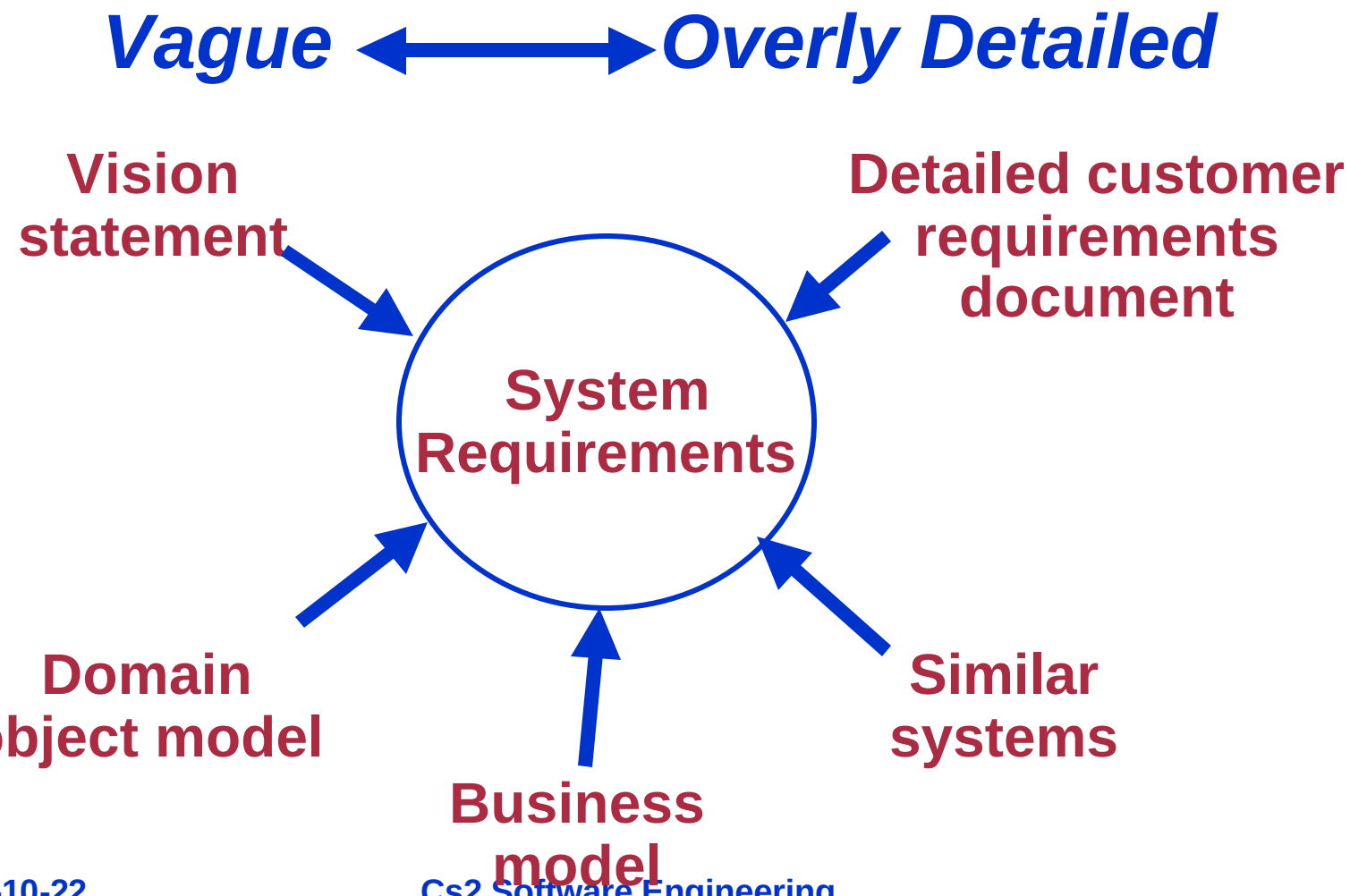
Purpose of requirements workflow

- Aim development toward the right system (I.e. support validation)
  - Other workflows focus on building the system right (I.e. support verification.)
- Describe what the system should and should not do
  - an agreement between customer (including user) and development organization
  - in the language of the customer/user

Tasks in Requirements Workflow

- List candidate requirements
- Understand system context
- Capture functional requirements
- Capture non-functional requirements
- Validate requirements (not well-developed in RUP)

Starting points



List candidate requirements → Feature list

- Candidate features that could become requirements
  - Good ideas added to feature list
  - Features taken off list when they become formal requirements
- Planning values
  - Status
  - Cost
  - Priority
  - Risk

Understand system context → Business or domain model

- Domain model
  - Identify and name important concepts and entities in the system context
  - Identify and name relations between domain objects
  - Glossary for now, possible classes in analysis and design workflows

Business or domain model?

- Business model
  - Domain (object) model plus
    - processes/behaviors
    - workers, their responsibilities and operations
- Decide whether to build a business model, a domain model, or simply a glossary of terms

Capture functional requirements → Use cases

- Capture requirements as use cases
  - Use case: a user's way of using the system
  - When an actor (user or external subsystem) uses the system, the system performs a use case
  - All use cases = all the things the system must do
- Capture user interfaces that support the use cases

Capture non-functional requirements → Supplementary requirements and use cases

- System properties
  - Environmental or implementation constraints
    - e.g. must have remote access or must run on Linux or WinNT
  - Qualities ("-ilities"): performance, reliability, security, maintainability, extensibility, usability, etc.
- Tie to use cases or domain concepts, where possible
  - those that cannot be tied (they are general) are listed as supplementary requirements

Requirements in the life cycle phases

- Inception
  - identify most of the use cases to define scope
  - detail critical use cases (10%)
- Elaboration
  - detail the use cases (80% of the requirements)
- Construction
  - identify and detail remaining use cases
- Transition
  - track and capture requirements changes

Domain modeling

- Objects or concepts: things in the system context that the system must manipulate or keep track of
- Events that transpire in the system context
- Capture as class models or (for small systems) as a glossary of terms
- Creates a common language for customer and developer
- Focus on domain modeling; defer system internal modeling to analysis, design, and implementation

Business modeling

- Business use case model
  - processes (use cases) and users (actors) in roles
  - represents system from a usage perspective and outlines how it provides value to its users
- Business object model
  - how each use case is realized by a set of workers who are using business entities and work units

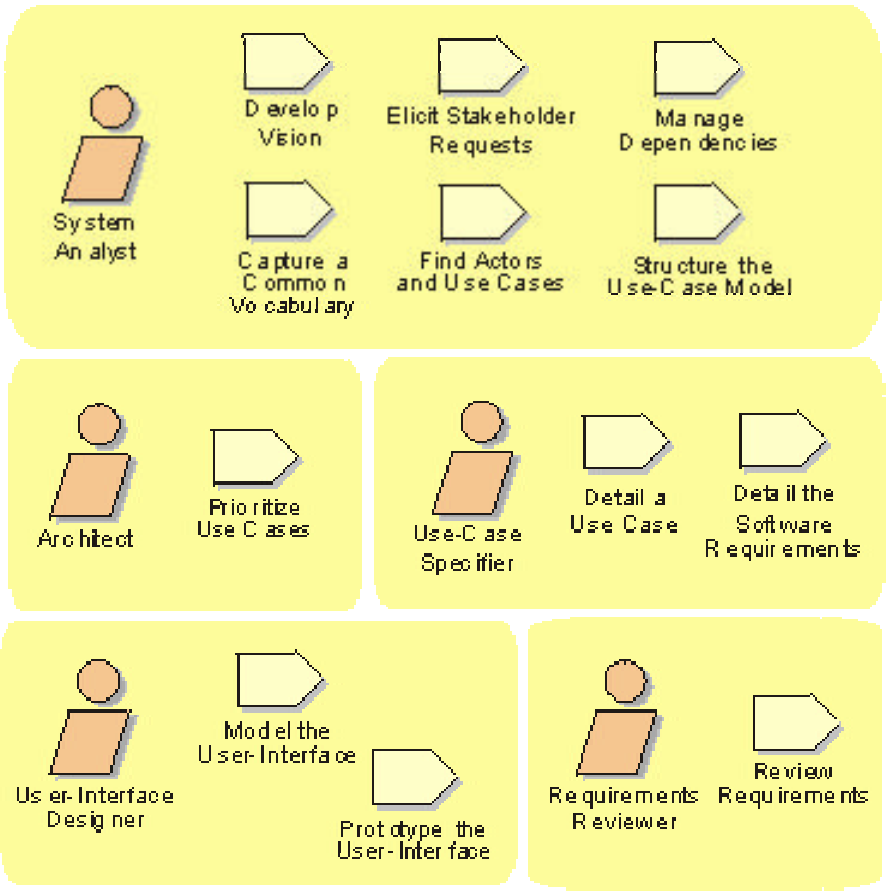
Requirements Workflow Description

- Artifacts created
- Workers participating
- Detailed workflow activity

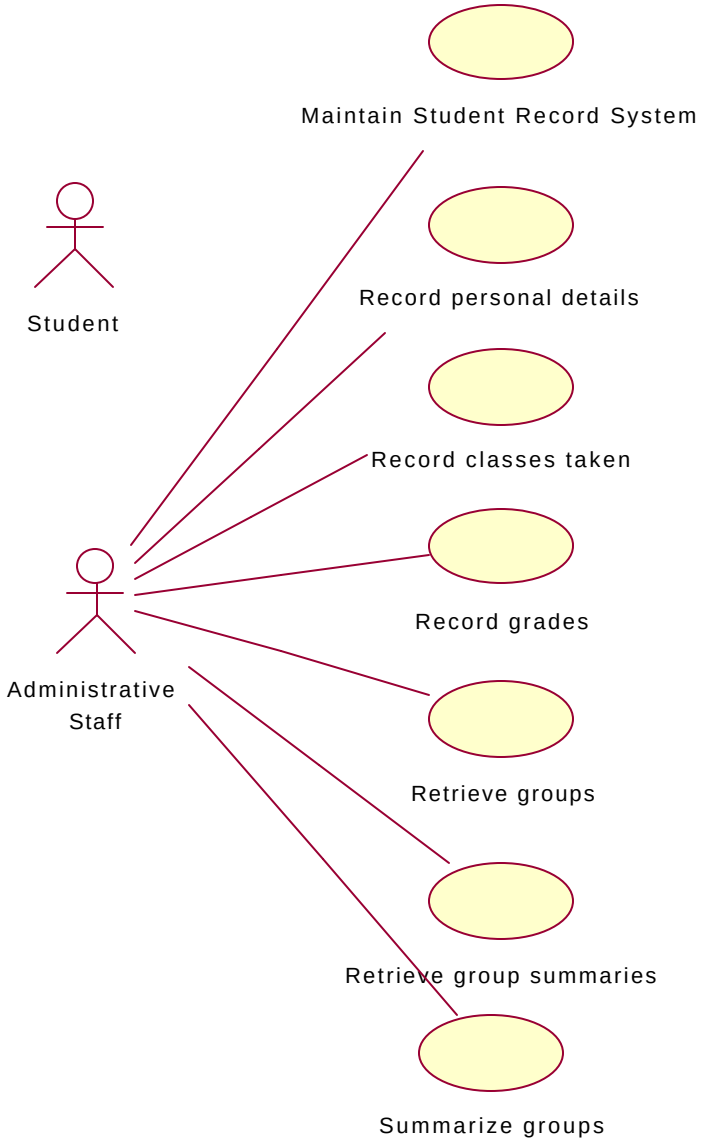
Capturing Requirements as Use Cases

- Use cases
  - Offer a systematic and intuitive way to capture functional requirements
    - complement written documents of “the system shall …” which are good for system test/verification
  - Focus on the value the system adds to each user or external system
  - Force analysts to think in terms of who the users are and their business or mission needs
  - Drive the other development workflows

Activity Overview

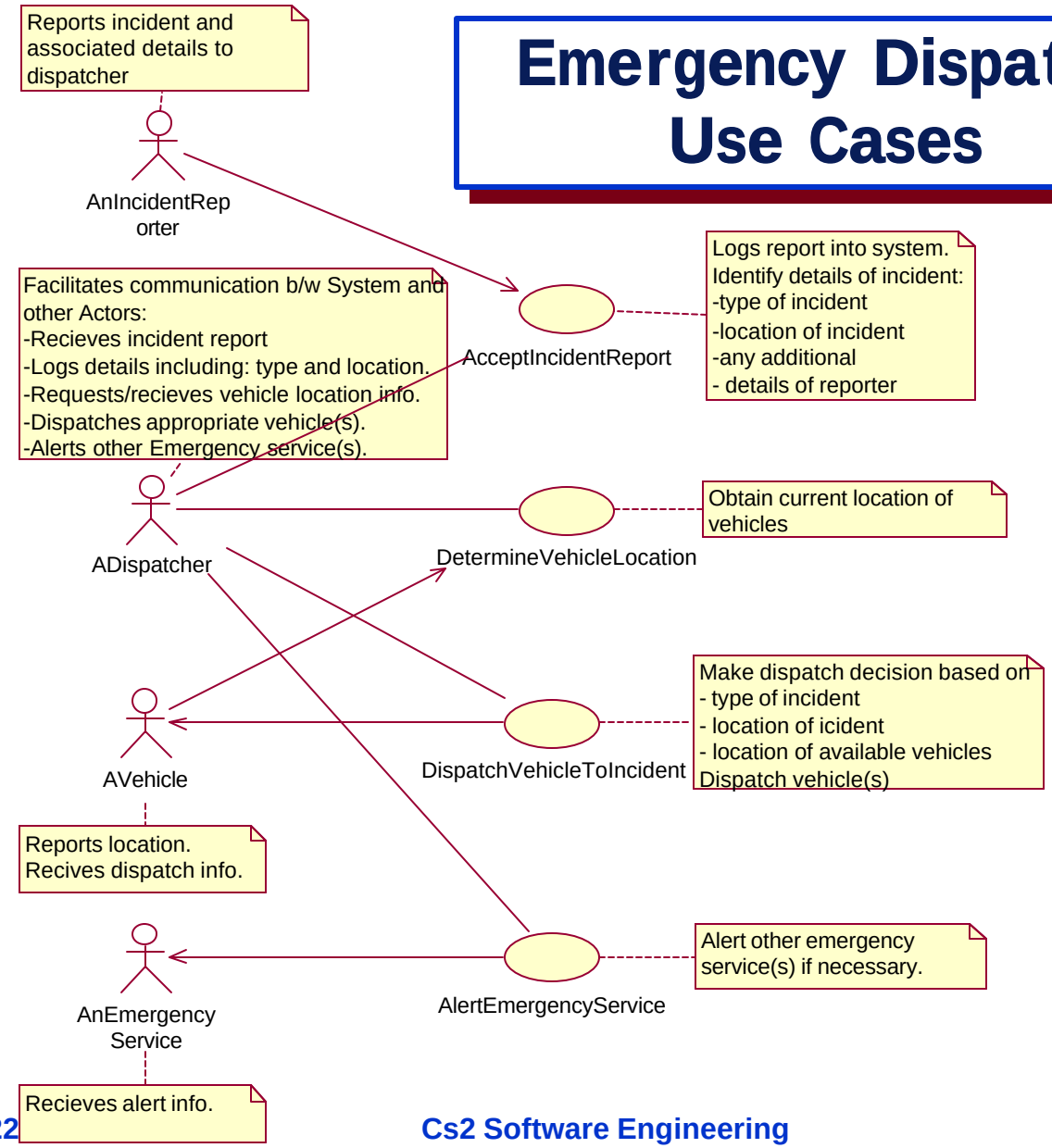


A University Support System Use Case Diagram



A use case diagram identifies identifies and names actors actors and their use cases

Emergency Dispatch Use Cases



Use-Case Model Artifact *(Actors)*

- **Actors**
  - **Each type of user and each type of external system,**
    - **parties outside the system that interact with the system**
    - **Separate actor for each role of a user**
  - **There will be (at least) one system use case for each actor role**

Use-Case Model Artifact *(Use Case, Structure)*

- **Use Case**
  - **Scenarios giving the ways actors use the system**
    - **Chunks of functionality the system offers to add a result of value to its actors**
  - **Specifies main sequence and alternative sequences of actions/events that the system can perform**
  - **Includes special requirements specific to the use-case**
- **Can structure complex or large use case models**
  - **perspectives, packages, etc.**

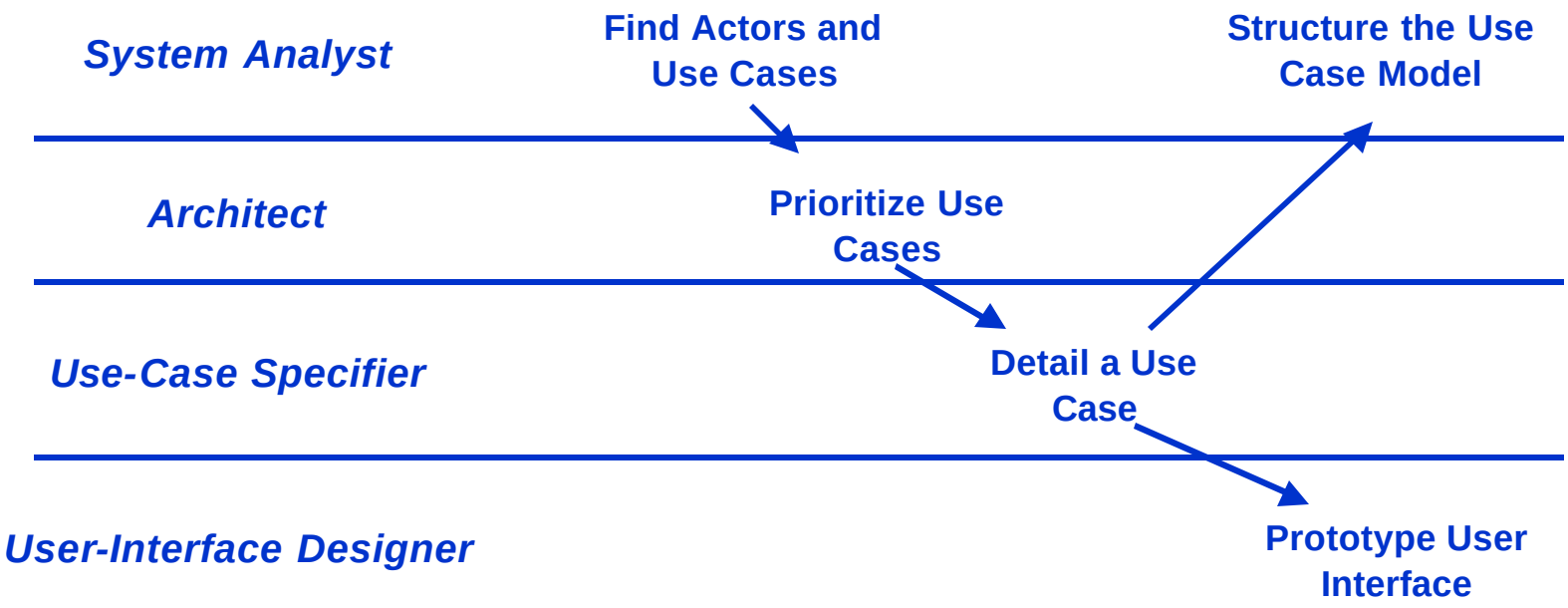
Other Requirements Workflow Artifacts

- Architectural view of use-case model
  - shows the architecturally significant use cases
    - important and critical functionality
    - important requirements to develop early
    - input to use case prioritization
  - corresponding use case realizations usually appear in architectural view of analysis and design models
- Glossary
  - Important and common terms
  - Consensus agreement on meaning
  - Less formal view of business/domain model
- User-interface prototype
  - help understanding of user/system interaction

Worker Responsibilities

- System analyst
  - Identify actors and use cases
  - Create complete and consistent set of use cases and requirements (but not for details of each individual use case)
  - Develop glossary to facilitate complete/consistent requirements set
- Use-case specifier
  - Detail one or more use cases
- User-interface designer
  - Define the “visual shape” of the user interface for one or more actors
    - layout, behavior, inter-screen flow
- Architect
  - Describe architectural view of use-case model

Core Workflow



Repeat and Iterate

Activity: Find Actors and Use Cases

- Purpose
  - System boundary: delimit system from environment
  - Outline actors and their use cases
  - Capture and define common terms (glossary)
- Inputs
  - Stakeholders (especially customers, users, other analysts)
  - Business/domain model, vision document, customer requirements specification
- Activity steps
  - Find actors
  - Find use cases
  - Describe each use case
  - Describe use case model as a whole (including glossary)

Finding the Actors

- Example actors or actor categories
  - Business workers, business actors
  - The person/system asking the question, making the decision
  - External systems
  - System maintenance and operational support
- Criteria
  - Must be at least one real user who can enact the candidate actor
  - Minimum overlap between roles
- Capture
  - Actor name
  - What the actor uses the system for; actor (role) needs and system responsibilities
  - What the system uses the actor for; actor (role) responsibilities and system needs

Finding the Use Cases

- Examples: deliver an observable ***result of value*** to a ***particular actor***
  - Use case(s) for every role of every worker
  - Use case to support user's need to create, change, track, remove or study business objects
  - Use case to allow user to tell system of event or for system to tell user of event
  - Use cases for system startup, termination or maintenance
- Use case name: verb phrase describing result of interaction
- Use case scope and boundaries are hard to find
  - Decouple them in time and data sharing
  - Iterate with architecture tasks

Describing the Use Cases

- Description iterations add detail
  1. Name
  2. Few words
  3. Few sentences to summarize actions
  4. Detailed step-by-step action/response
  5. Formal models

Use Case Model as a Whole

- Model as a whole
  - Glossary of common terms
  - Survey description: interaction of actors, interaction of use cases
    - Use case generalizations and extensions
    - Flows between use cases
      - Activity diagrams
      - Post-conditions of one use case establish pre-conditions of others
  - Group by business use case, by actor, by coupling, etc.

Review

- Review items
  - Use case list is complete
  - Sequences of actions are correct, complete and understandable
  - All use cases have value to actors

Prioritize and Detail Use Cases

- Prioritize based on clarity of system scope, architecture impact, and risk
- Detail event flow, use case start/end, actor interaction
  - Pre-conditions; basic flow through states; post-conditions
  - Alternative flows to accommodate…
    - actor choice
    - influence of other actors
    - actor error
    - system error or failure

Detailed Use Case Description

- Start states (preconditions)
- The first action to perform
- Action order
  - Basic/normal
  - Alternates
  - Constraints
- How the use case ends
- Possible end states (postconditions)

- System interaction with actor and what they exchange
  - Clarify which does what
    - Actor initiation, system response
    - System initiation, actor response
  - If “actor” is an external system, specify protocol
- Usage of system objects, values and resources
- Non-functional requirements

Review:

understandable, correct, complete, consistent

Activity: Prototype User Interfaces

- Inputs to activity: use-case model, detailed use-case descriptions, supplementary requirements, glossary (or business/domain model)
- Actor interacts by viewing and manipulating elements that represent attributes of use cases
  - Assure each use case is accessible to the actors through the user interface
  - Assure well-integrated, easy-to-use, consistent, navigable user interfaces
    - Analyze usability; don't be fooled by wording of use case
- Build physical prototype to validate UI ***and*** the use cases

Activity: Structure the Use-Case Model

- General and shared functionality: “uses”
  - Like inheritance: specific (real) uses general (abstract)
  - The generalization captures overlap between use cases
- Additional or optional functionality: “extends”
- Be careful in structuring use-case model
  - Reflect real use cases
  - Keep things understandable and manageable
  - Decompose functionality in the analysis model, not the use-case model
    - Object-oriented decomposition, not functional decomposition

Summary of Requirements Workflow

- Capture requirements as
  - Business model, domain model or glossary to capture system context
  - Use-case model that captures functional requirements and use-case-specific nonfunctional requirements
    - Survey description of model as a whole
    - Set of diagrams
    - Detailed description of each use case
  - Set of user-interface sketches/prototypes for each actor
  - Supplementary requirements specification for requirements not specific to a use case
- Next steps
  - Use cases drive use-case realization in analysis and design and test cases in testing
  - Analysis: reformulate use cases as interacting objects