Use Cases

Object-Oriented Modeling and Design with UML (Second Edition)
Blaha & Rumbaugh
Sections 7.1, 8.1

Use Case Diagrams

Use case:

- A written description of one use of the system.
  - Who will use the system?
  - What will they be able to do with it?
  - No standard for format and content.

- Use case *diagram*
  - A graphical representation of a use case.
  - A diagram type defined in UML.
Componenets of a use case diagram:

- System
- Actors
- Use Cases
- Relationships

**Figure 2-1** A UML use case diagram describing the functionality of a simple watch. The WatchUser actor may either consult the time on her watch (with the ReadTime use case) or set the time (with the SetTime use case). However, only the WatchRepairPerson actor can change the battery of the watch (with the ChangeBattery use case). Actors are represented with stick figures, use cases with ovals, and the boundary of the system with a box enclosing the use cases.
Use Case Example

Figure 2-13  An example of a UML use case diagram for First Responder Interactive Emergency Navigational Database (FRIEND), an accident management system. Associations between actors and use cases denote information flows. These associations are bidirectional: they can represent the actor initiating a use case (FieldOfficer initiates ReportEmergency) or a use case providing information to an actor (ReportEmergency notifies Dispatcher). The box around the use cases represents the system boundary.
Use Case Diagrams

- Use case diagrams give a *high level* view of the system.
  - Outline
  - Table of Contents

- *Starting point* for saying what the system does.
  - Don’t try to say too much.
  - Details will come later.
Generalization in Use Cases

Use case diagrams can show relationships among different use cases.

- Trade Bonds use case “is a” Make Trade use case.
- Generalization is used to indicate inheritance.
  - Factor out common behavior in related use cases.

Blaha and Rumbaugh, page 149.
The Include Relationship for Use Cases

- “Subroutine” for use cases.
- Note “guillemets” around the word include.
- Means that the included use case is *always* a part of the including use case.
The Include Relationship for Use Cases

- Use the Include relationship when the same functionality appears in logically unrelated use cases.
  - Factor out common functionality.
  - Should be a well defined, meaningful activity.
A teacher will record grades and update grades.
In either case, grades will *always* be saved.
Only describe “save grades” in one place.
Indicates potential for factoring out and reusing functionality in the system that will be developed.
The Extend Relationship for Use Cases

This means that the extending use case *may* be a part of the extended use case.

- Compare to *always* for the include relationship.

Note direction of arrow.

Use Extend for functionality that only applies in exceptional cases.
When the teacher either records grades or updates grades, the grades are always saved and guardians *may* be notified.
Includes vs. Extends

- By analogy with programming languages
  - Include is like a function
    - Must be explicitly “called” in the including use case.
    - Normally called from more than one place
      - multiple use cases.
  - Extend is like an exception
    - “Just happens”
    - Not mentioned in the extended use case.
    - Might be possible anywhere in the extended use case.
    - Might be possible only at a given point or range in the extended use case.
How to Model Use Cases

• Identify the actors and use cases
• Prioritize the use cases.
• Detail each use case.
• Structure the case model.
• Prototype user interfaces.

Identify the Actors and Use Cases

- Talk to the stakeholders.
  - Product Manager
  - Customers
  - Users
Questions for Identifying Actors

- Who will use the system in their work?
- Who will perform administrative or maintenance functions?
- What external hardware or software will the system interact with?
Identifying Actors

- Who/What is an actor vs. part of the system?
  - May depend on where you draw the boundary

- Example: Database System

Once actors are identified

Determine functionality accessible to each actor
Scenarios

- Narrative description of somebody doing something with the system.
- Specific, not abstract

- Think of a movie scenario.
  - Describes exactly what happens throughout a scene.
<table>
<thead>
<tr>
<th>Scenario name</th>
<th>warehouseOnFire</th>
</tr>
</thead>
</table>
| Participating actor instances | bob, alice: FieldOfficer  
john: Dispatcher |
| Flow of events | 1. Bob, driving down main street in his patrol car, notices smoke coming out of a warehouse. His partner, Alice, activates the “Report Emergency” function from her FRIEND laptop.  
2. Alice enters the address of the building, a brief description of its location (i.e., northwest corner), and an emergency level. In addition to a fire unit, she requests several paramedic units on the scene, given that the area appears to be relatively busy. She confirms her input and waits for an acknowledgment.  
3. John, the Dispatcher, is alerted to the emergency by a beep of his workstation. He reviews the information submitted by Alice and acknowledges the report. He allocates a fire unit and two paramedic units to the Incident site and sends their estimated arrival time (ETA) to Alice.  
4. Alice receives the acknowledgment and the ETA. |
What is the difference between a scenario and a use case?

A scenario is an instance of a use case.

- Scenario describes a specific case of someone making use of some piece of functionality.
- Use case describes the functionality in general terms.
  - Covers all possible scenarios for this functionality.
Where do we start?

- Suggestion:
  - Sketch use case diagrams.
  - Write scenarios
  - Derive use case descriptions
  - Iterate
Detail each use case.

- Describe interactions in detail.
  - Remember: Still from external point of view

- Look for gaps and inconsistencies.
- Dig for details.

- May need to do additional interviews to answer questions and fill in details.
Structure the Use Case Model.

- Look for relationships
  - Generalizations
  - Includes
  - Extends

- Draw the use case diagrams.
- Write use case descriptions.
<table>
<thead>
<tr>
<th>Use case name</th>
<th>ReportEmergency</th>
</tr>
</thead>
<tbody>
<tr>
<td>Participating actors</td>
<td></td>
</tr>
<tr>
<td>Flow of events</td>
<td></td>
</tr>
<tr>
<td>Entry condition</td>
<td></td>
</tr>
<tr>
<td>Exit condition</td>
<td></td>
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<tr>
<td>Quality requirements</td>
<td></td>
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**Flow of events**

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**Quality requirements**
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<td>3. The FieldOfficer fills out the form by selecting the emergency level, type, location, and brief description of the situation. The FieldOfficer also describes possible responses to the emergency situation. Once the form is completed, the FieldOfficer submits the form.</td>
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<td>4. FRIEND receives the form and notifies the Dispatcher.</td>
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<td>5. The Dispatcher reviews the submitted information and creates an Incident in the database by invoking the OpenIncident use case. The Dispatcher selects a response and acknowledges the report.</td>
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<td>6. FRIEND displays the acknowledgment and the selected response to the FieldOfficer.</td>
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3. The FieldOfficer fills out the form by selecting the emergency level, type, location, and brief description of the situation. The FieldOfficer also describes possible responses to the emergency situation. Once the form is completed, the FieldOfficer submits the form.  
4. FRIEND receives the form and notifies the Dispatcher.  
5. The Dispatcher reviews the submitted information and creates an Incident in the database by invoking the OpenIncident use case. The Dispatcher selects a response and acknowledges the report.  
6. FRIEND displays the acknowledgment and the selected response to the FieldOfficer. |
| Entry condition | • The FieldOfficer is logged into FRIEND. |
| Exit condition  | • The FieldOfficer has received an acknowledgment and the selected response from the Dispatcher, OR  
• The FieldOfficer has received an explanation indicating why the transaction could not be processed. |
<p>| Quality requirements | |</p>
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<td>• The <strong>FieldOfficer</strong>’s report is acknowledged within 30 seconds. &lt;br&gt;• The selected response arrives no later than 30 seconds after it is sent by the <strong>Dispatcher</strong>.</td>
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