

Use Case Diagrams

In this Lecture you will Learn:

- The purpose of use case diagrams
- The notation of use case diagrams
- How to draw use case diagrams
- How to write use case descriptions
- How prototyping can be used with use case modelling

Purpose of Use Case Diagrams

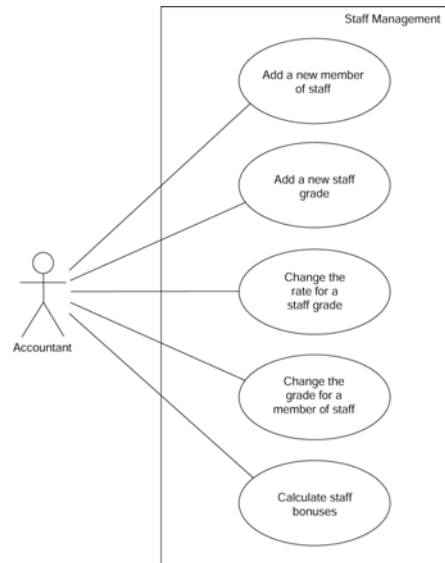
- Document the functionality of the system from the users' perspective
- Document the scope of the system
- Document the interaction between the users and the system using supporting use case descriptions (behaviour specifications)

Class Exercise

- What is the purpose of producing use cases?

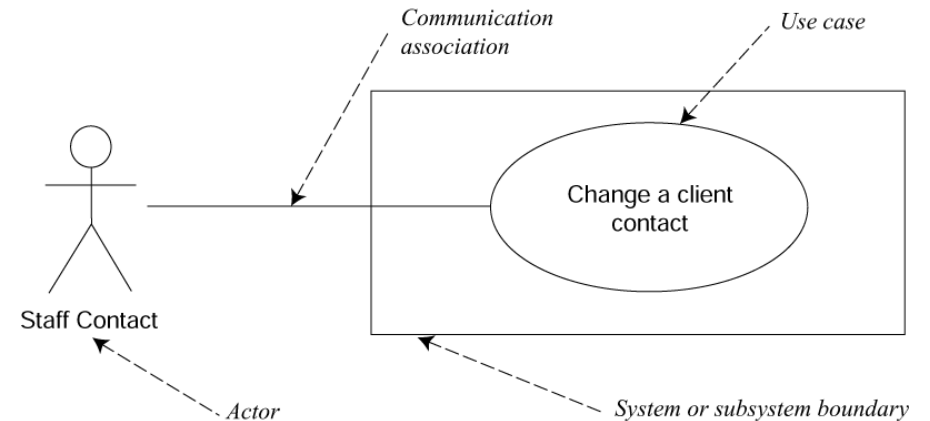
Use Case Modeling

- A **Use Case** represents the steps in a specific business function or process.
- An external entity, called an actor, initiates a use case by requesting the system to perform a function or process.



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Notation of Use Case Diagrams



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Notation of Use Case Diagrams

- Actors
 - ◆ Drawn as stick people with a name
 - ◆ The roles that people, other systems or devices take when communicating with a particular use case or use cases
 - ◆ Not the same as job titles or people
 - ◆ People with one job title may play the roles of several actors
 - ◆ One actor may represent several job titles

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Notation of Use Case Diagrams

- Use Cases
 - ◆ Drawn as ellipses with a name in or below each ellipse
 - ◆ Describe a sequence of actions that the system performs to achieve an observable result of value to an actor
 - ◆ The name is usually an active verb and a noun phrase

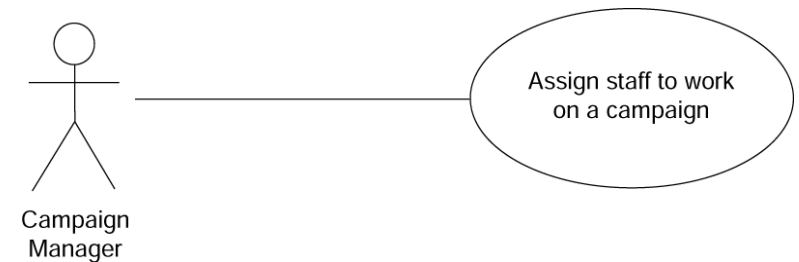
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Notation of Use Case Diagrams

- Communication Associations
 - ◆ Line drawn between an actor and a use case
 - ◆ Can have arrow heads to show where the communication is initiated (arrow points away from the initiator)
 - ◆ Represent communication link between an instance of the use case and an instance of the actor

Use Case showing actor “Campaign Manager”



Notation of Use Case Diagrams

- Sub-systems
 - ◆ Drawn as a rectangle around a group of use cases that belong to the same sub-system
 - ◆ In a CASE tool, use cases for different sub-system are usually placed in separate use case diagrams, and the rectangle is redundant

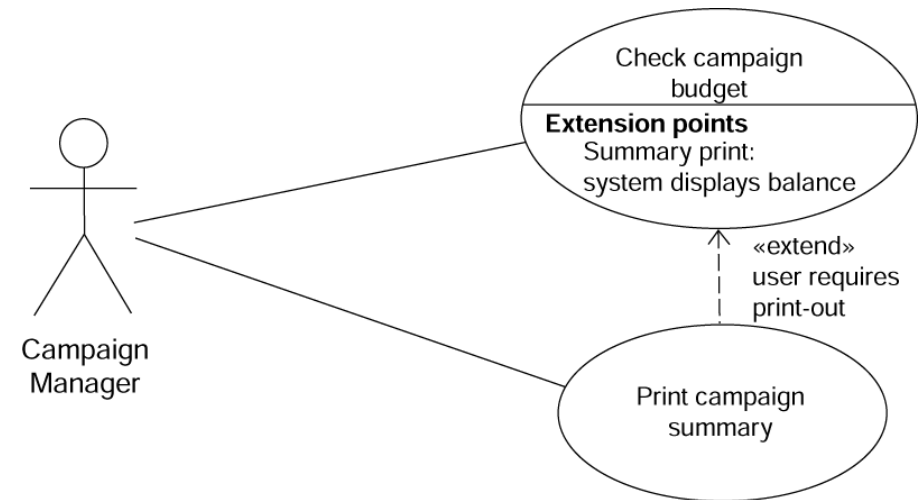
Notation of Use Case Diagrams

- Dependencies
 - ◆ **Extend** and **Include** relationships between use cases
 - ◆ Shown as stereotyped dependencies
 - ◆ Stereotypes are written as text strings in guillemets: «extend» and «include»

Notation of Use Case Diagrams

- Extend Relationship
 - ◆ One use case provides additional functionality that **may** be required in another use case
 - ◆ There may be multiple ways of extending a use case, which represent variations in the way that actors interact with the use case
 - ◆ Extension points show when the extension occurs
 - ◆ A condition can be placed next to the dependency arrow (note that it is not put in square brackets, unlike conditions in activity diagrams.)

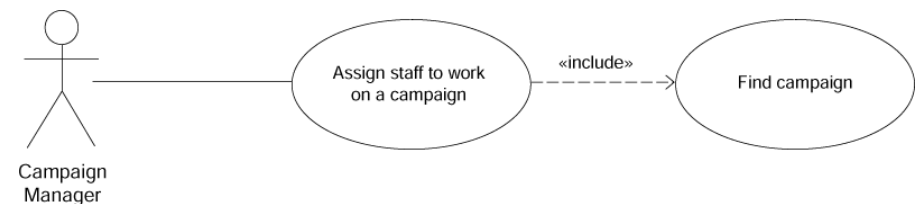
Use Case Diagram showing «extend»



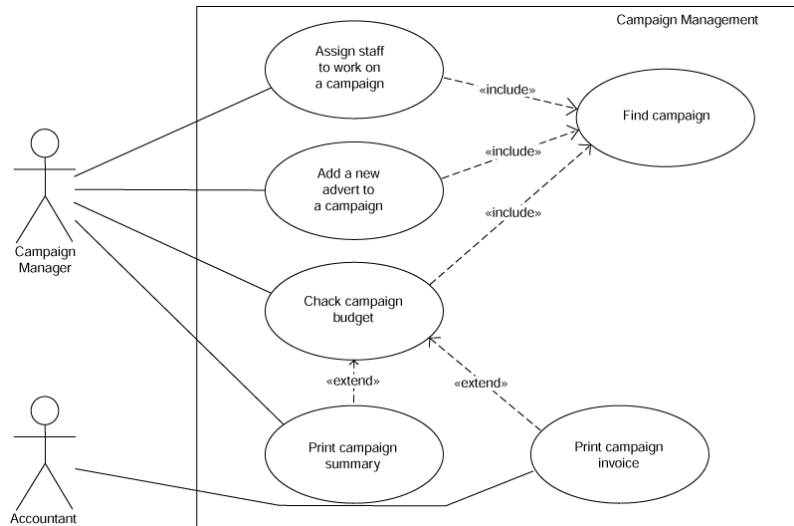
Notation of Use Case Diagrams

- Include Relationship
 - ◆ one use case **always** includes the functionality of another use case
 - ◆ a use case may include more than one other
 - ◆ can be used to separate out a sequence of behaviour that is used in many use cases
 - ◆ should not be used to create a hierarchical functional decomposition of the system

Use Case Diagram showing «include»



Use Case diagram showing both «include» and «extend»

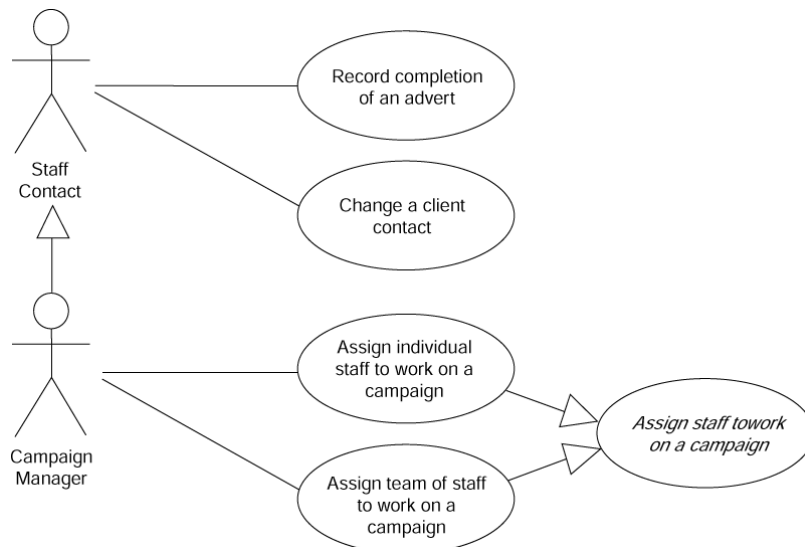


Notation of Use Case Diagrams

■ Generalization

- ◆ Shows that one use case provides all the functionality of the more specific use case and some additional functionality
- ◆ Shows that one actor can participate in all the associations with use cases that the more specific actor can plus some additional use cases

Generalization of Actors and Cases



Class Exercise

- Describe in your own words the difference between the «extend» and «include» relationships in use case diagrams.

Class Exercise

- What is the difference between an ‘essential’ and a ‘real’ use case?

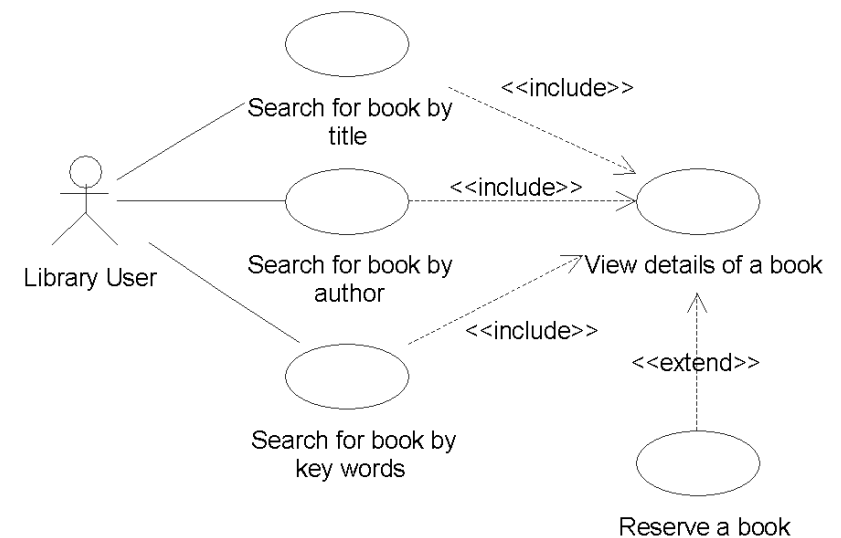
A Sample Use Case Example

- Think of the different possible uses you could make of a library computer system and draw a use case diagram to represent these use cases.
- List some non-functional requirements a library computer system that you would not model using use cases.

A Sample Use Case Example

- Typical use cases for a library system from the point of view of the user are:
 - ◆ Search for a book by title.
 - ◆ Search for a book by author.
 - ◆ Search for a book by key words.
 - ◆ View details of a book.
 - ◆ Reserve a book.

A Sample Use Case Example



A Sample Use Case Example

- The system must be capable of holding details of 20,000 users and 500,000 books (or whatever figures you think might be appropriate).
- The system will begin to respond to all user search enquiries within 5 seconds.
- Personal details of users will only be accessible to authorized staff and will be protected using a password system.

Use Case Description

- For each use case, you also develop a use case description in the form of a table.
- A use case description documents the name of the use case, the actor, a description of the use case, a step-by-step list of the tasks and actions required for successful completion, a description of alternative courses of action, pre-conditions, post-conditions, and assumptions.

Use Case Descriptions

- Can be a simple paragraph
 - ◆ *The campaign manager wishes to record which staff are working on a particular campaign. This information is used to validate timesheets and to calculate staff year-end bonuses.*

Use Case Descriptions

- Can be a step-by-step breakdown of interaction between actor and system

Assign staff to work on a campaign

Actor Action

1. The actor enters the client name.
3. Selects the relevant campaign.
5. Highlights the staff members to be assigned to this campaign.

System Response

2. Lists all campaigns for that client.
4. Displays a list of all staff members not already allocated to this campaign.
6. Presents a message confirming that staff have been allocated.

Alternative Courses

Steps 1–3. The actor knows the campaign name and enters it directly.

Use Case Descriptions

- Many projects use templates
 - ◆ Name of use case
 - ◆ Pre-conditions
 - ◆ Post-conditions
 - ◆ Purpose
 - ◆ Description
 - ◆ Alternative courses
 - ◆ Errors

Use Case Description Example

Add New Student Use Case	
Name:	Add New Student
Actor:	Student/Manager
Description:	Describes the process used to add a student to a fitness-class
Successful completion:	<ol style="list-style-type: none">1. Manager checks FITNESS-CLASS SCHEDULE object for availability2. Manager notifies student3. Fitness-class is open and student pays fee4. Manager registers student
Alternative:	<ol style="list-style-type: none">1. Manager checks FITNESS-CLASS SCHEDULE object for availability2. Fitness-class is full3. Manager notifies student
Precondition:	Student requests fitness-class
Postcondition:	Student is enrolled in fitness-class and fees have been paid
Assumptions:	None

Behaviour Specifications

- Rather than (or as well as) using text, a use case can be linked to another diagram that specifies its behaviour
- Typically a Collaboration Diagram, a Sequence Diagram or a Statechart Diagram

Drawing Use Case Diagrams

- Identify the actors and the use cases
- Prioritize the use cases
- Develop each use case, starting with the priority ones, writing a description for each
- Add structure to the use case model: generalization, include and extend relationships and sub-systems

Prototyping

- Use case modelling can be supported with prototyping
- Prototypes can be used to help elicit requirements
- Prototypes can be used to test out system architectures based on the use cases in order to meet the non-functional requirements

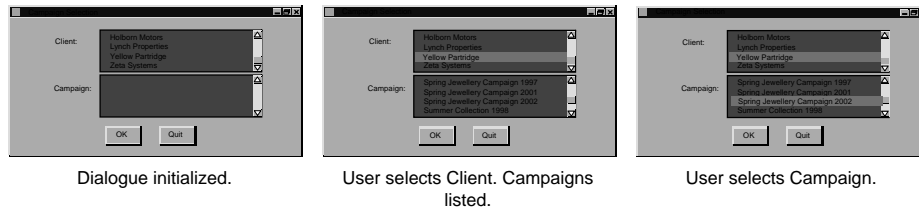
Prototyping

- For user interface prototypes, storyboarding can be used with hand-drawn designs

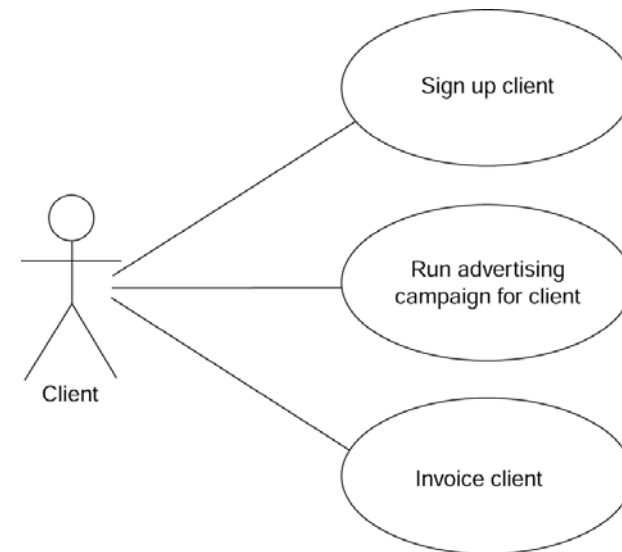


Prototyping

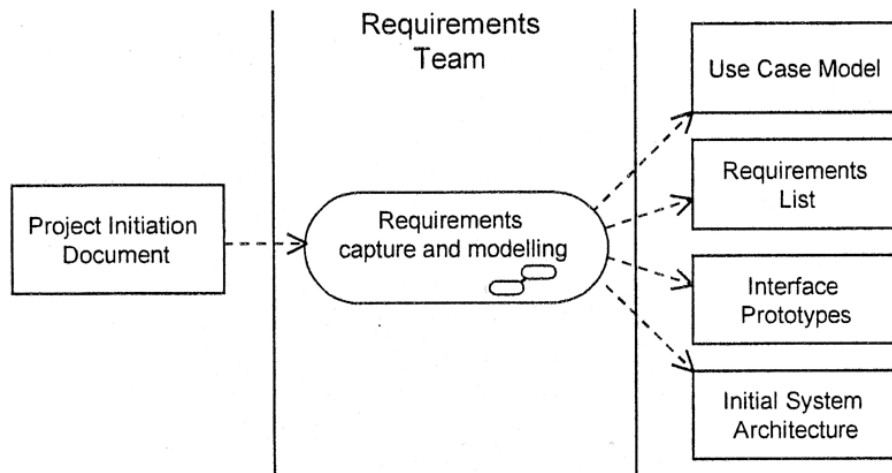
- User interface prototypes can be implemented using languages other than the one that the system will be developed in



Example of Business Modeling with Use Case



Activity Diagram for “Requirement Capture and Modeling”



Class Exercise

- In what way are use case diagrams different when used for business modeling?