Use Case Diagrams

Introduction

- Getting started is the most difficulty part of any new process.
- In software modelling, the first thing you need to do is understand what are you going to model and ultimately develop.
- Creating a highest form details about a system--use case diagram--is an almost natural point of origin for the software design.
- A use case diagram is an excellent way to communicate to management, customers, and other non-development people what a system will do when it is completed.

University Record System (URS)

- A University record system should keep information about its students and academic staff.
- Records for all university members are to include their id number, surname, given name, email, address, date of birth, and telephone number.
  - Students and academic staff each have their own unique ID number: studN (students), acadN (academic employee), where N is an integer (N>0).
- In addition to the attributes mentioned above:
  - Students will also have a list of subjects they are enrolled in. A student cannot be enrolled in any more than 10 subjects.
  - Academic employees will have a salary, and a list of subjects they teach. An academic can teach no more than 3 subjects.

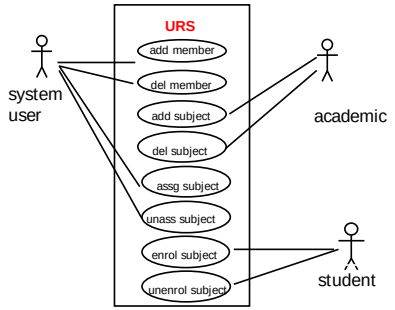
Some Actions Supported by URS

- The system should be able to handle the following commands.
  - Add and remove university members (students, and academic staff)
  - Add and Delete subjects
  - Assign and Un-assign subjects to students
  - Assign and Un-assign subjects to academic staff.

Use Case Diagrams

- Use Case diagrams show the various activities the users can perform on the system.
  - System is something that performs a function.
- They model the dynamic aspects of the system.
- Provides a *user's* perspective of the system.

Use Case Diagram - URS System

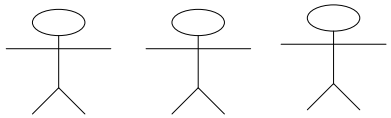


Use Case Diagrams

- A set of *ACTORS*: roles users can play in interacting with the system.
  - An actor is used to represent something that users our system.
- A set of *USE CASES*: each describes a possible kind of interaction between an actor and the system.
  - Uses cases are actions that a user takes on a system
- A number of *RELATIONSHIPS* between these entities (Actors and Use Cases).
  - Relationships are simply illustrated with a line connecting actors to use cases.

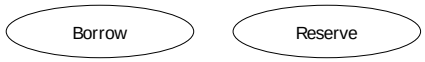
Use Case Diagrams - Actors

- An *actor* is a user of the system playing a particular role.
- Actor is shown with a stick figure.

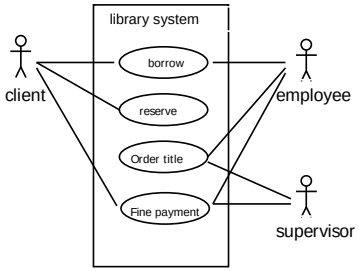


Use Case Diagrams – Use Cases

- Use case is a particular activity a user can do on the system.
- Is represented by an ellipse.
- Following are two use cases for a library system.

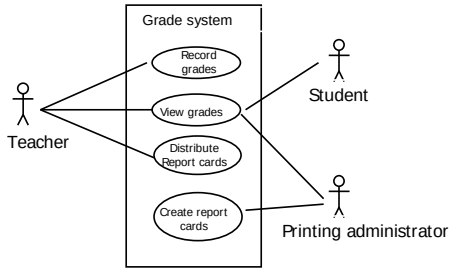


Use Case Diagram – Example1 (Library)



A Library System.

Use Case Diagram for Student Assessment Management System



Use Case Vs Scenarios

- Each use case is one or more scenarios.
  - Add Subject Use Case :
    - Scenario 1 : Subject gets added successfully.
    - Scenario 2 : Adding the subject fails since the subject is already in the database.
  - Enroll Subject Use Case:
    - Scenario 1 : Student is enrolled for the subject.
    - Scenario 2 : Enrollment fails since the student is already enrolled in the subject.
- Each scenario has a sequence of steps.

Scenarios

- Each scenario has a sequence of steps.
  - Scenario 1 : Student is enrolled for the subject.
    - Student chooses the “enroll subject” action.
    - Check the student has enrolled in less than 10 subjects.
    - Check if the subject is valid.
    - Assign the subject to the student.

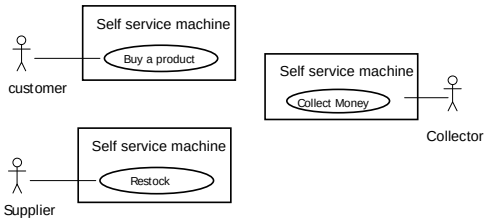
Scenarios

- Each scenario has a sequence of steps.
  - Scenario 2 : Enrolling fails since the student is already enrolled in 10 subjects.
    - Student chooses the “enroll subject” action.
    - Check the student has enrolled in less than 10 subjects.
    - Return an error message to the student.

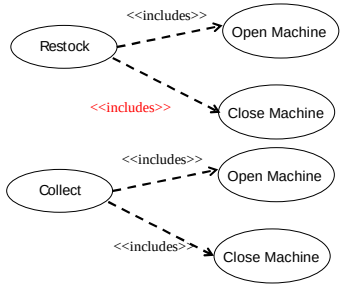
Use Case Diagrams - Relationships

- Inclusion
  - *Inclusion enables to reuse one use case’s steps inside another use case.*
- Extension
  - *Allows creating a new use case by adding steps to existing use cases*
- Generalization
  - *Allows child use cases to inherit behavior from parent use cases*

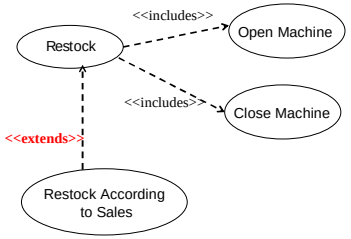
Use Case – Example (self service machine)



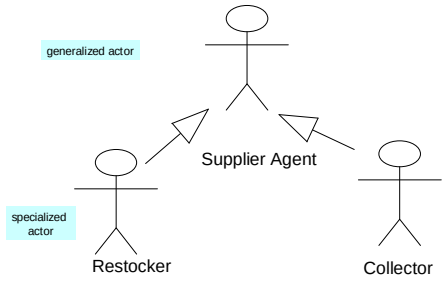
Use Case – Example (self service machine – includes relationship)



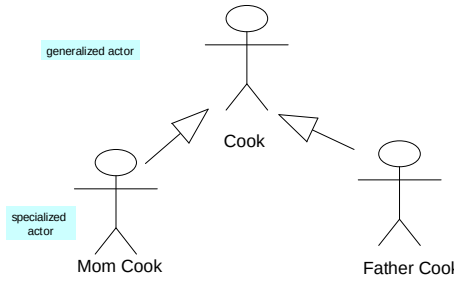
Use Case – Example (self service machine – extends relationship)



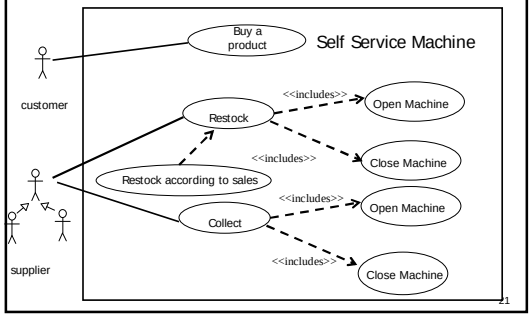
Use Case – Example (self service machine – generalize relationship): Actor-to-Actor relationship



Use Case – Example (self service machine – generalize relationship): Actor-to-Actor relationship – example 2



Use Case – Example (self service machine)



From Use Case to Classes

Identify Classes (Extract Nouns)

- A **University record system** should keep information about its **students** and **academic staff**.
- **Records** for all **university members** are to include their **id number**, **surname**, **given name**, **email**, **address**, **date of birth**, and **telephone number**.
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- In addition to the attributes mentioned above:
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Nouns which are potential classes

- A ***University record system*** should keep information about its ***students*** and ***academic staff***.
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Classes identified in the first pass

- UniversityRecordSystem - URS
- Student
- Academic Staff
- UniversityMembers
- Subject

URS - High Level Class Diagram