# System models

### Interaction models

All systems involve interaction of some kind...

- This can be user interaction, which involves user inputs and outputs
- Interaction between the system being developed and other systems
- Or interaction between the components of the system

Use case modeling, which is mostly used to model interactions between a system and external actors (users or other systems).

**Sequence diagrams**, which are used to model interactions between system components, although external agents may also be included.

## Use case Modeling

- Use case modeling was originally developed by Jacobson et al. (1993) in the 1990s
- Incorporated into the first release of the UML (Rumbaugh et al., 1999).
- use case modeling is widely used to support requirements elicitation.

## Use case Modeling

- A use case model represents a use case view of the system how the system is going to be used.
- From an end-user's perspective it describes the **functional** requirements of the system.
- To a developer, it gives a clear and consistent description of **what** the system should do.
- As an aid to the tester, it provides a basis for performing system tests to verify the system.

### Use Case Components

The use case has three components.

The **use case**: task referred to as the use case that represents a feature needed in a software system.

The **actor(s)** who trigger the use case to activate.

The **communication** line to show how the actors communicate with the use case.

## Use Cases: Example

Here is a scenario for a medical clinic.

A patient calls the clinic to make an appointment for a yearly checkup. The receptionist finds the nearest empty time slot in the appointment book and schedules the appointment for that time slot."

write a use case for this scenario?

### Actors

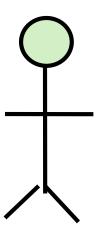
#### Step 1: Identify the actors

• As we read the scenario, define those people or systems that are going to interact with the scenario.

An Actor is outside or external the system.

#### It can be a:

- Human
- Peripheral device (hardware)
- External system or subsystem
- Represented by stick figure



So as we read our scenario, what or who is the actor?

A patient calls the clinic to make an appointment for a yearly checkup. The receptionist finds the nearest empty time slot in the appointment book and schedules the appointment for that time slot."

• The actor is a **Patient**.

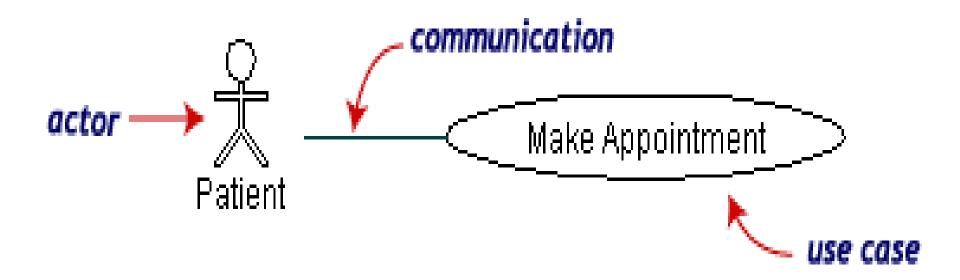


So What is the Use Case?

The Use Case is **Make Appointment.** 

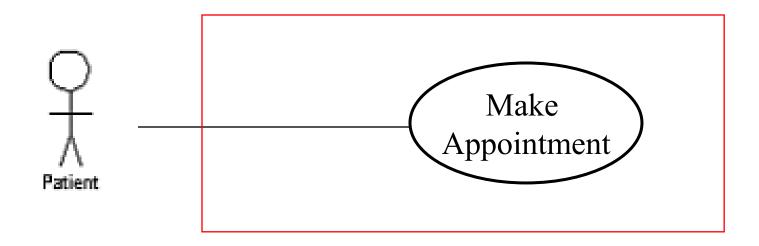
It is a use case for the medical clinic.

- The picture below is a **Make Appointment** use case for the medical clinic.
- The actor is a **Patient**. The connection between actor and use case is a **communication association** (or **communication** for short).
- Actors are stick figures. Use cases are ovals. Communications are lines that link actors to use cases



#### Boundary

 A boundary rectangle is placed around the perimeter of the system to show how the actors communicate with the system.



### Use Case Elaboration

After the derivation of the use case model, each use case is elaborated by adding detail of interaction between the user and the software system.

An elaborated use case has the following components:

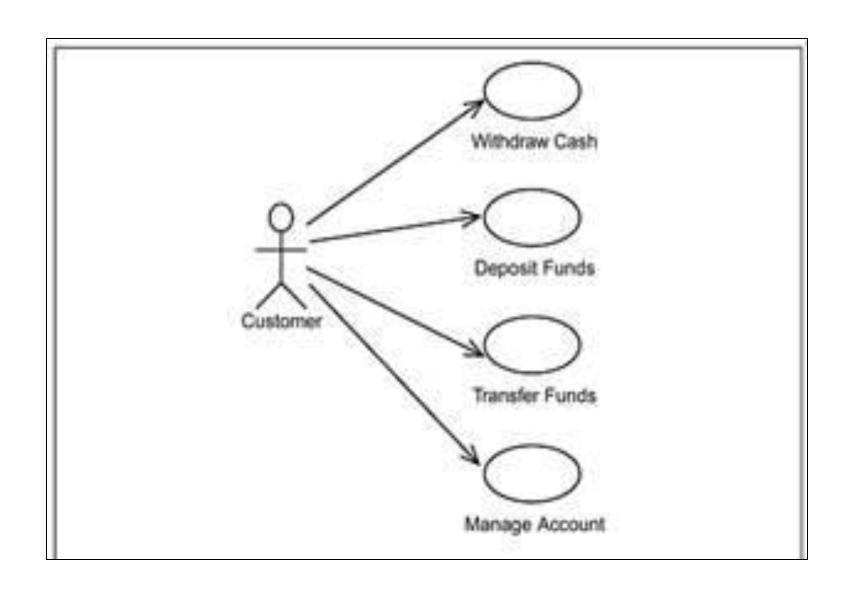
- Use Case Name:
- Actors: names of the actors that use this use case.
- Summary: a brief description of the use case.
- *Precondition:* the condition that must be met before the use case can be invoked.
- *Post-Condition:* the state of the system after completion of the use case.

### Use Case Elaboration

- Normal Course of Events: sequence of actions in the case of normal use.
- Exception: course of action in the case of some exceptional condition.

## Example

Using your knowledge of how an ATM is used, develop a set of use cases that could serve as a basis for understanding the requirements for an ATM system.



### **Use Cases**

- Withdraw cash
- Deposit Funds
- Transfer Funds
- Manage Account

Use Case Name: Withdraw cash

Actors: Customer, ATM, Accounting system

Inputs: Customer's card, PIN, Bank Account details

Outputs: Customer's card, Receipt, Bank account details

#### **Normal operation:**

The customer inputs his/her card into the machine.

He/she is prompted for a PIN which is entered on the keypad.

If correct, he/she is presented with a menu of options.

The Withdraw cash option is selected.

The customer is prompted with a request for the amount of cash required and inputs the amount.

If there are sufficient funds in his/her account, the cash is dispensed, a receipt if printed and the account balance is updated. Before the cash is dispensed, the card is returned to the customer who is prompted by the machine to take their card.

#### **Exception:**

Invalid card. Card is retained by machine

Incorrect PIN. Customer is request to rekey PIN. If incorrect after 3 attempts, card is retained by machine and customer advised to seek advice.

Insufficient balance .Transaction terminated. Card returned to customer.

### Exercise

Consider the online student registration system. The students can perform the following functions:

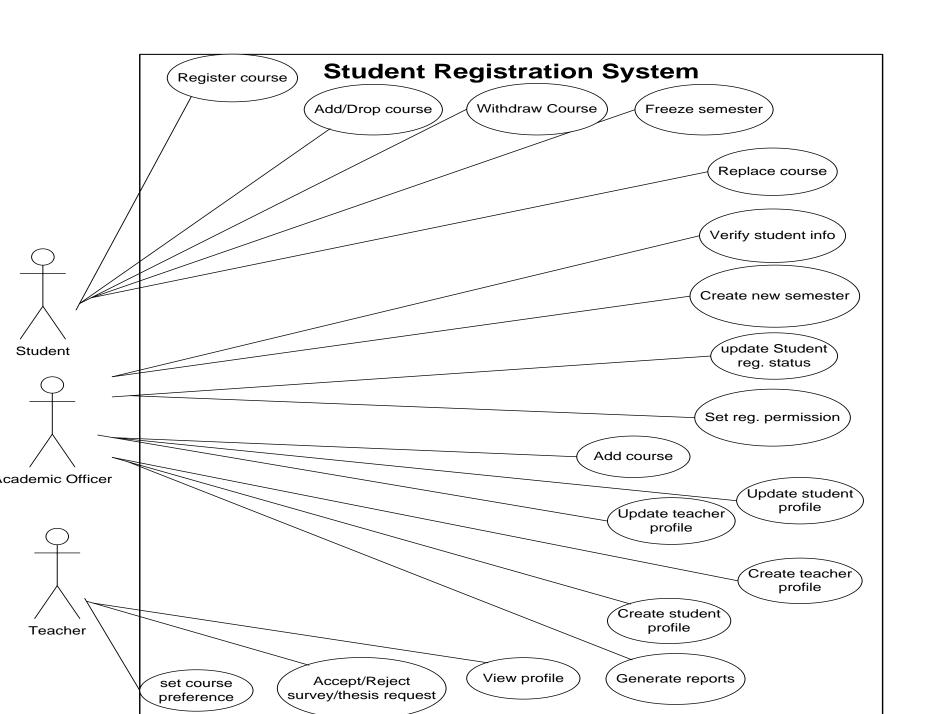
Register courses online, add/drop course(s), place a survey/thesis request, withdraw course, freeze a semester, course replacement The academic officer can perform the following functions:

Set registration settings (creation of new semester, adding courses, setting registration permissions), verifies the student information, changing student registration status, creation and updation of teachers' and students' profile, generate reports

The teacher can perform the following functions:

View profile, accept/reject survey/thesis request, and set courses preferences.

Draw use case Diagram



#### The **strengths** of a Use Case Diagram include:

- Easy to comprehend
- Clear indication of system boundary
- Identification and documentation of high-level internal system functionality

#### The weaknesses of a Use Case Diagram include:

• Shows only limited internal connectivity between system functions