Software Engineering

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CHAPTER 5

OBJECT-ORIENTED ANALYSIS WORKFLOW

Chapter 5 Object-Oriented Analysis

- Use-Case Modeling
- Class Modeling
- Dynamic Modeling
- Testing during OOA
- Challenges of OOA

The Three Steps of OOA

1. **Use-case modeling**
   - **Determine how the various results are computed by the product (without regard to sequencing)**
   - **Largely action oriented ---- Use case diagram**
2. **Class modeling (“object modeling”)**
   - **Determine the classes and their attributes**
   - **Purely data-oriented ---- Class diagram**
3. **Dynamic modeling**
   - **Determine the actions performed by or to each class**
   - **Purely action-oriented ---- State diagram**

Use-Case Modeling

- ***What is a Use-Case Model?***
  - **A model that describes a system's functional requirements in terms of use cases.**
  - **System's environment ---- *actors***
  - **System's intended functions ---- *use cases***
  - ***Relationship* between/among actors and use cases**

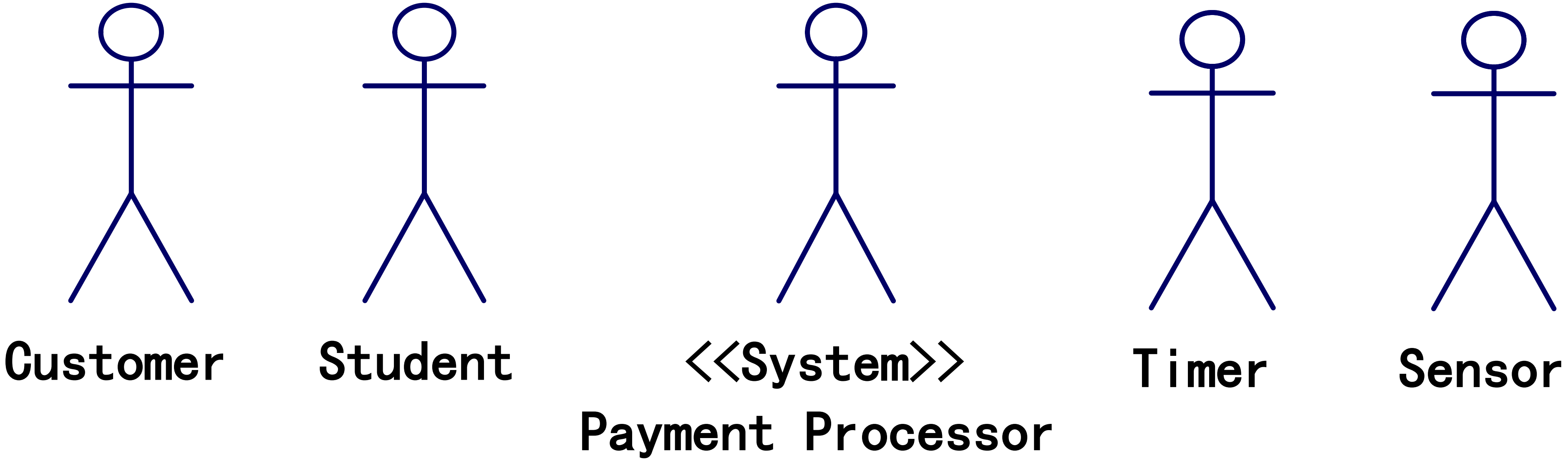
What is Actor

An actor represents a coherent set of roles that one plays when interacting with these use cases.

- **Actors are not part of the system**
  ---- *EXTERNAL*
- **Actors can represent a human, a machine, or another system that plays with the system.**
- **They can be a giver of information, or a passive recipient of information.**

Actor Symbol in Use Case Model

- Actor is represented as stickman named by singular domain-related noun, which can reflect the role that one plays or adopts in the model precisely.



What is Actor for

- Actors help delimit the system and give a clearer picture of what it is supposed to do.
- Use cases are developed on the basis of the actor’s needs, ensuring that the system turns out to be what the users expected.

What is Use Case

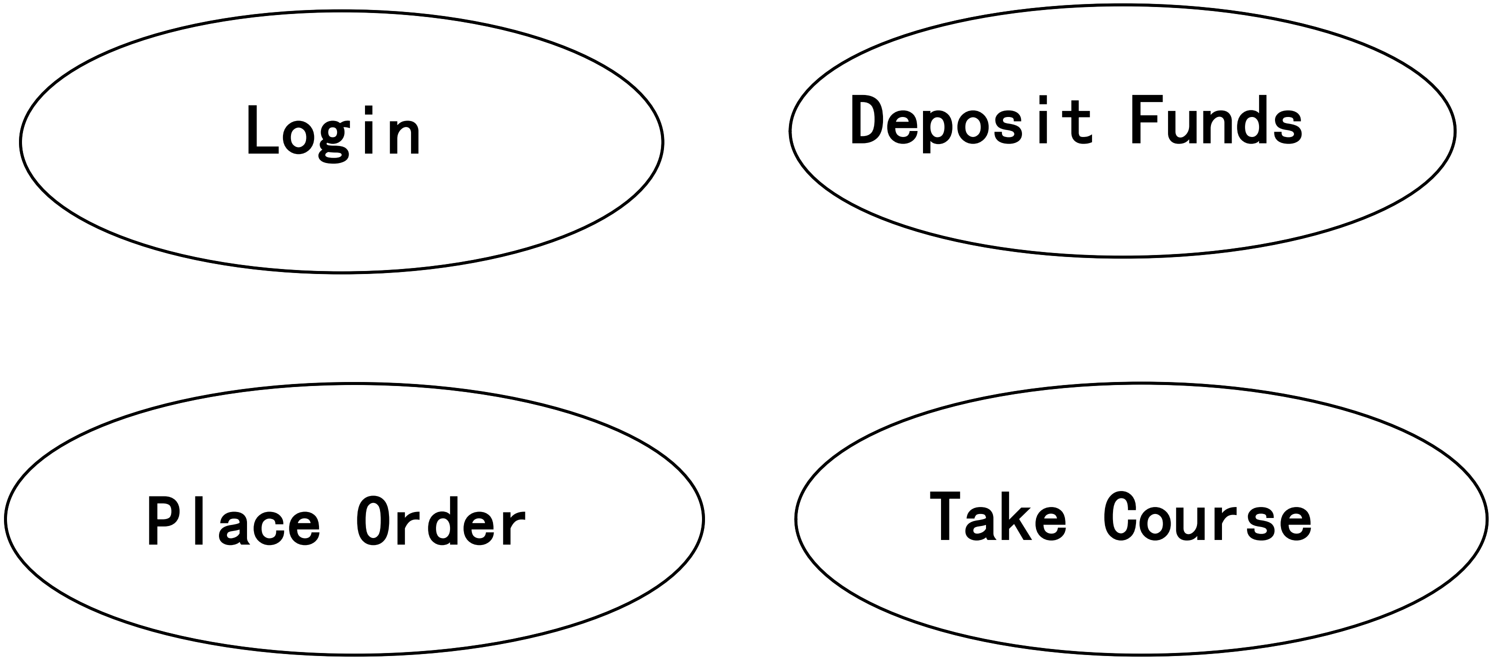
- **A use case describes a sequence of *actions* a *system performs*, which yields *an observable result of value* to *a particular actor*.**
- **A use case describes what a system does, but it does not specify how it does it.**

What is Use Case

- **Examples of use cases:**
  - **Take course**
  - **Take exam**
  - **Deposit funds**
  - **Place order**
  - **Book ticket**
  - **Borrow book**
  - **……**

Use Case Symbol in User Case Model

- A use case is represented as ellipse, with case name inside, which is domain-related and starts with strong verb.



Login

Deposit Funds

Place Order

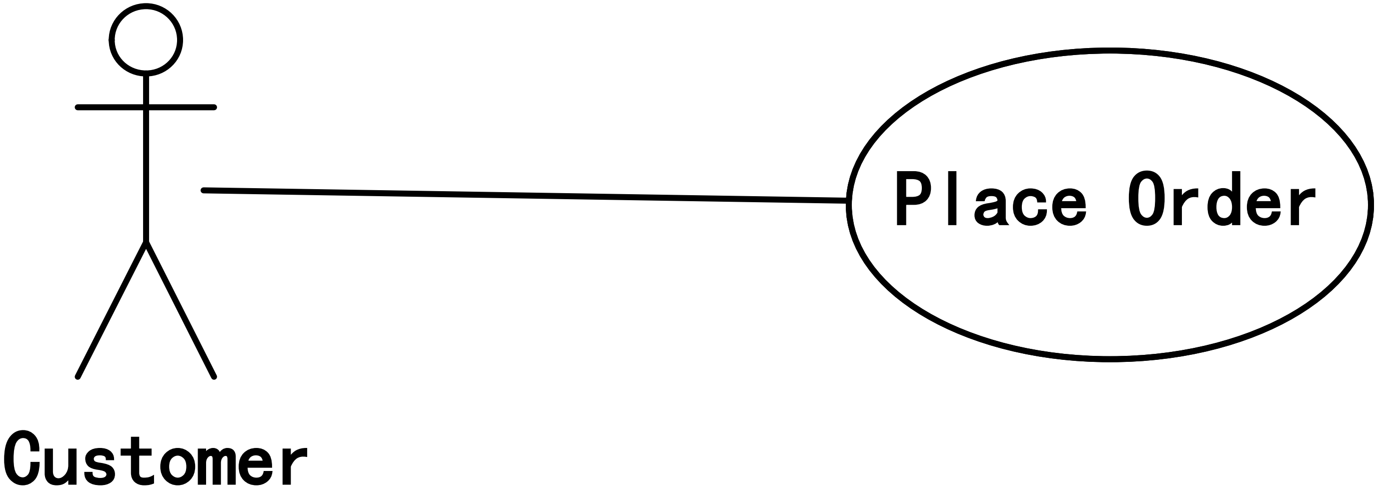
Take Course

Relationship between/among Actors and Use Cases

- A use case is initiated by an actor to invoke a certain functionality in the system.
- A use case describes the actions the system takes to deliver something of value to the actor.
- A use case models a dialogue between one or more actors and the system.

Relationship Symbol in Use Case Model

An actor is connected to one or more use cases, by an association, which is represented as a line between the actor and the use cases. An association between an actor and a use case indicates that the actor and the use case communicate with one another, each one able to send and receive messages.



What are the benefits of a Use-Case Model

- Customer
- Participant
  - **Designers**
  - **Testers**
  - **Developers of t**
  - **Documentation**
  - **Architect**
  - **Manager**

Designers use it as a basis get

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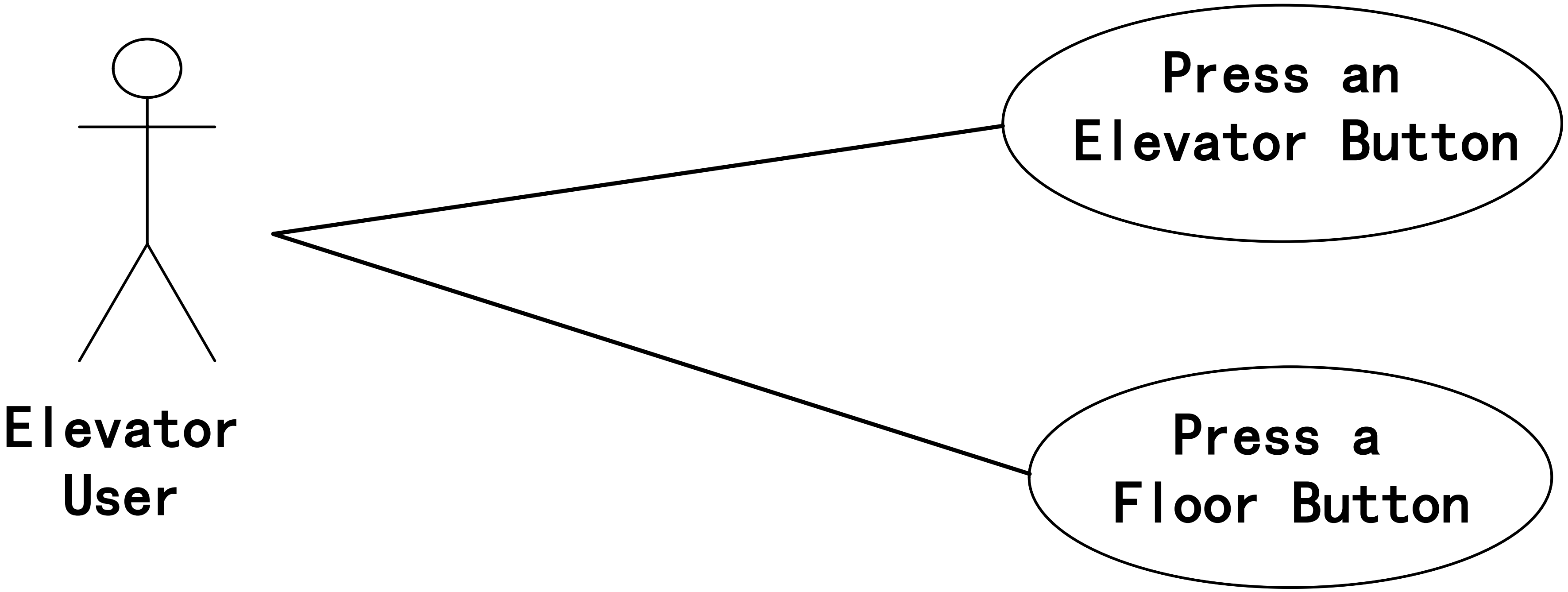
The customer approves the use-case model. When you have that approved, you know the system is what the customer wants. You can also use the model to discuss the system with the customer during development. It serves as a contract between the customer and the developers.

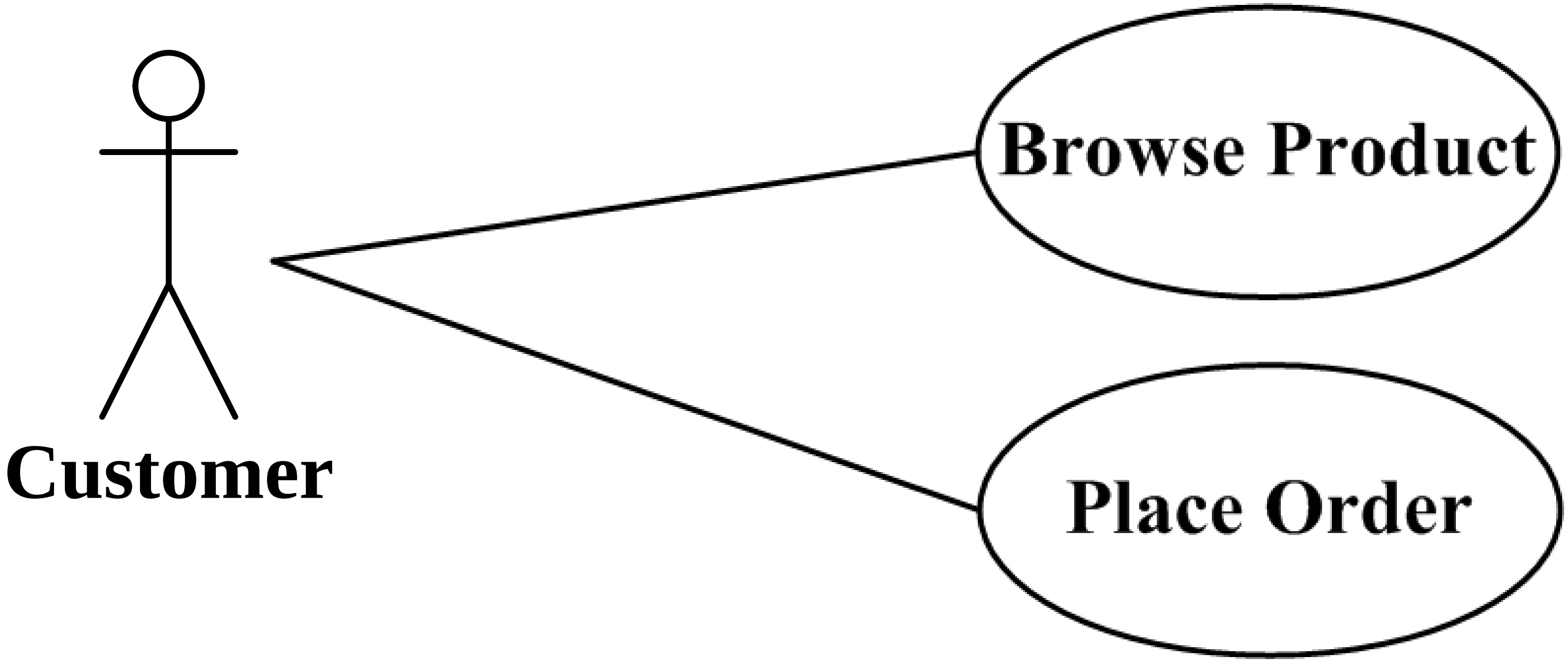
5.1.1 Use-Case Modeling

- Case 1: Elevator Problem



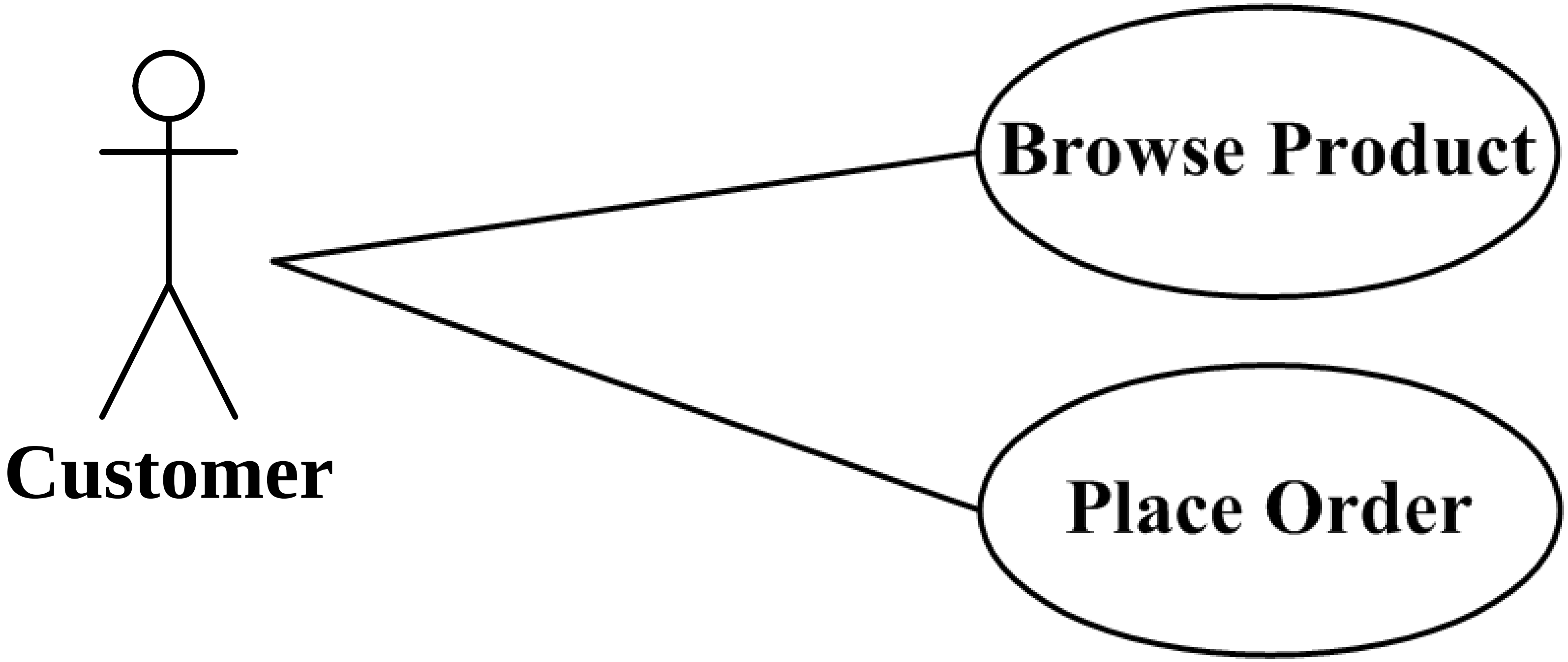
5.1.1 Use-Case Modeling

- **Case 2: On-line Shop**

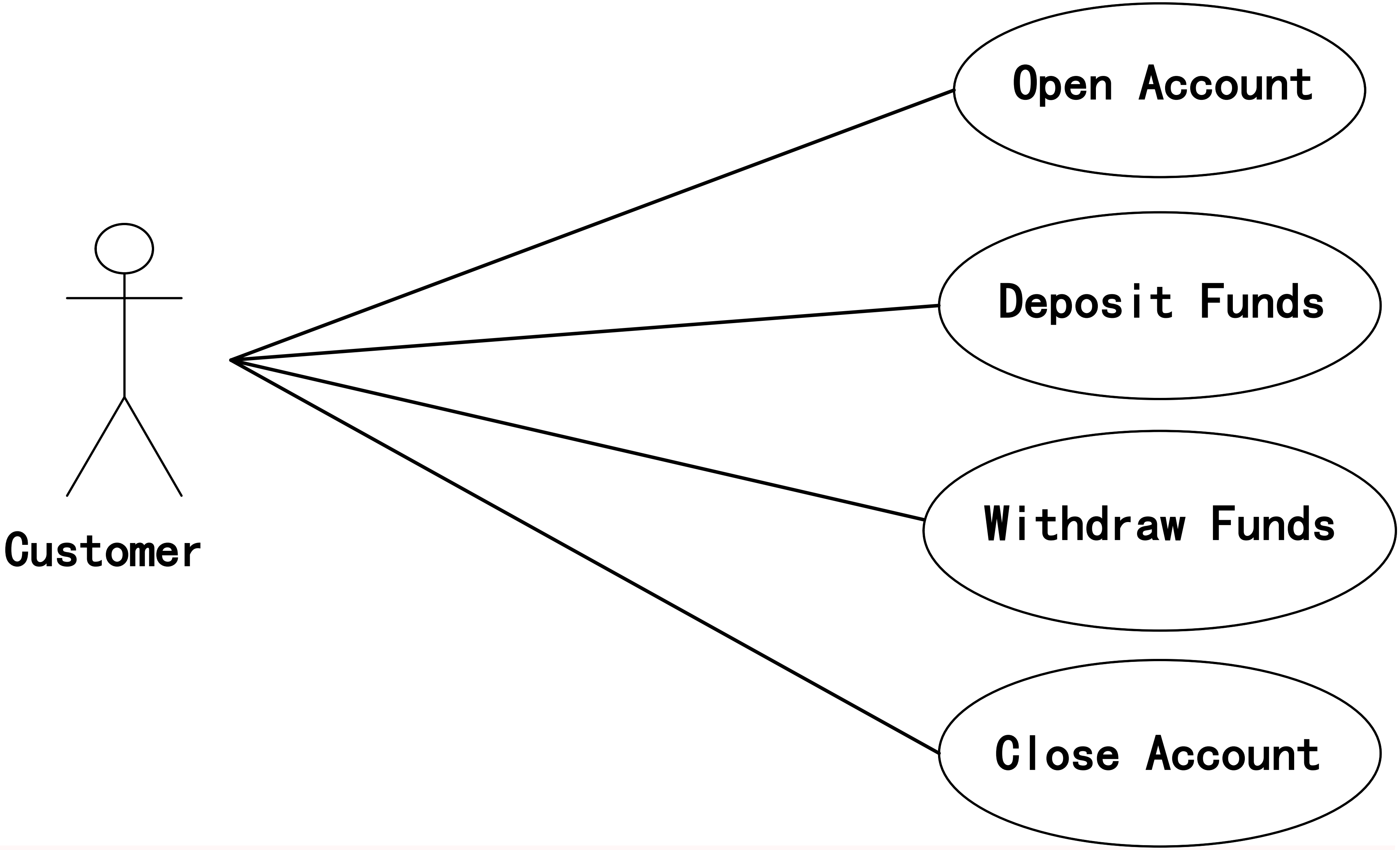


5.1.1 Use-Case Modeling

- Case 2: On-line Shop

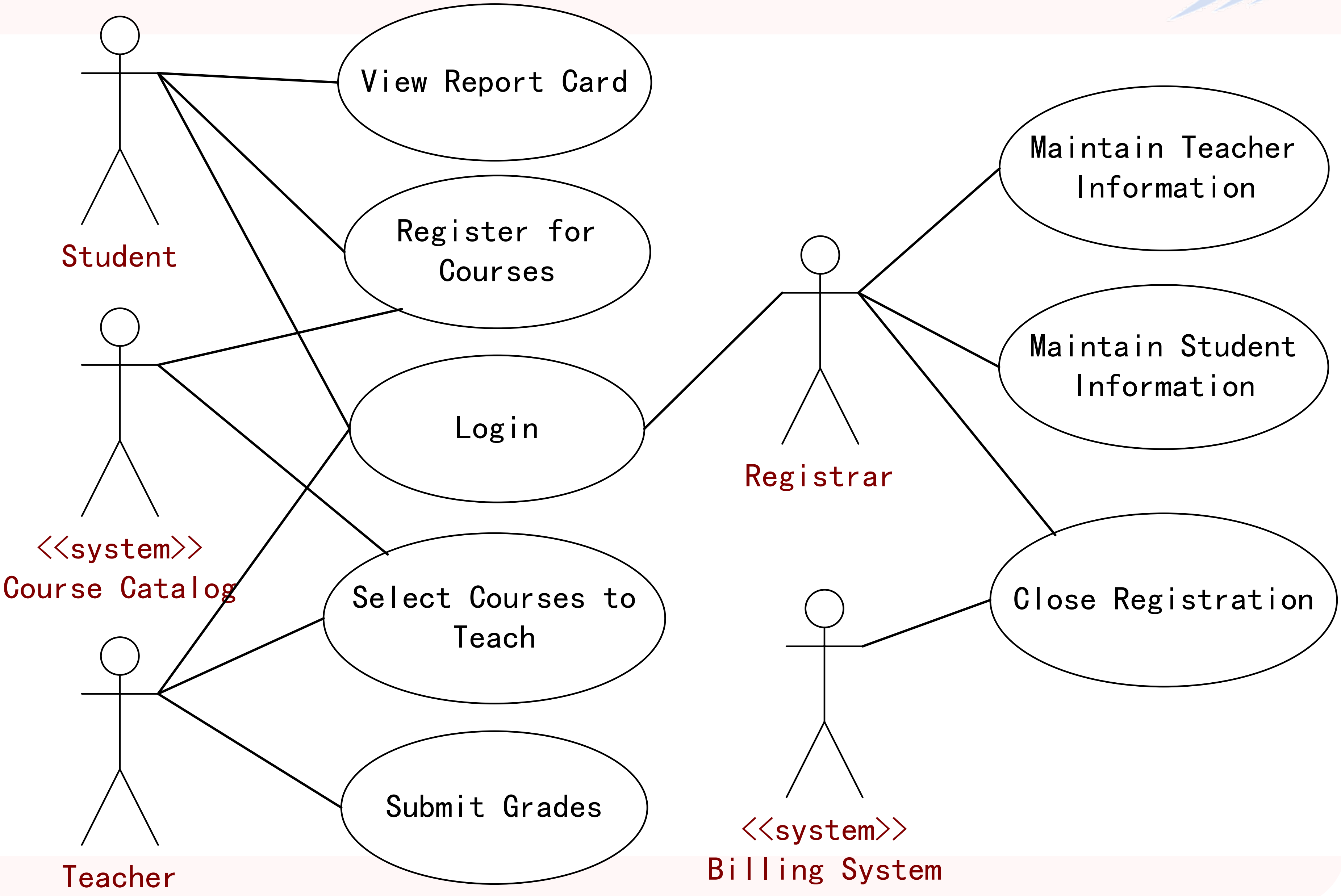


Case 3: Bank Customer Service System



- **Case 4: Course Registration System**

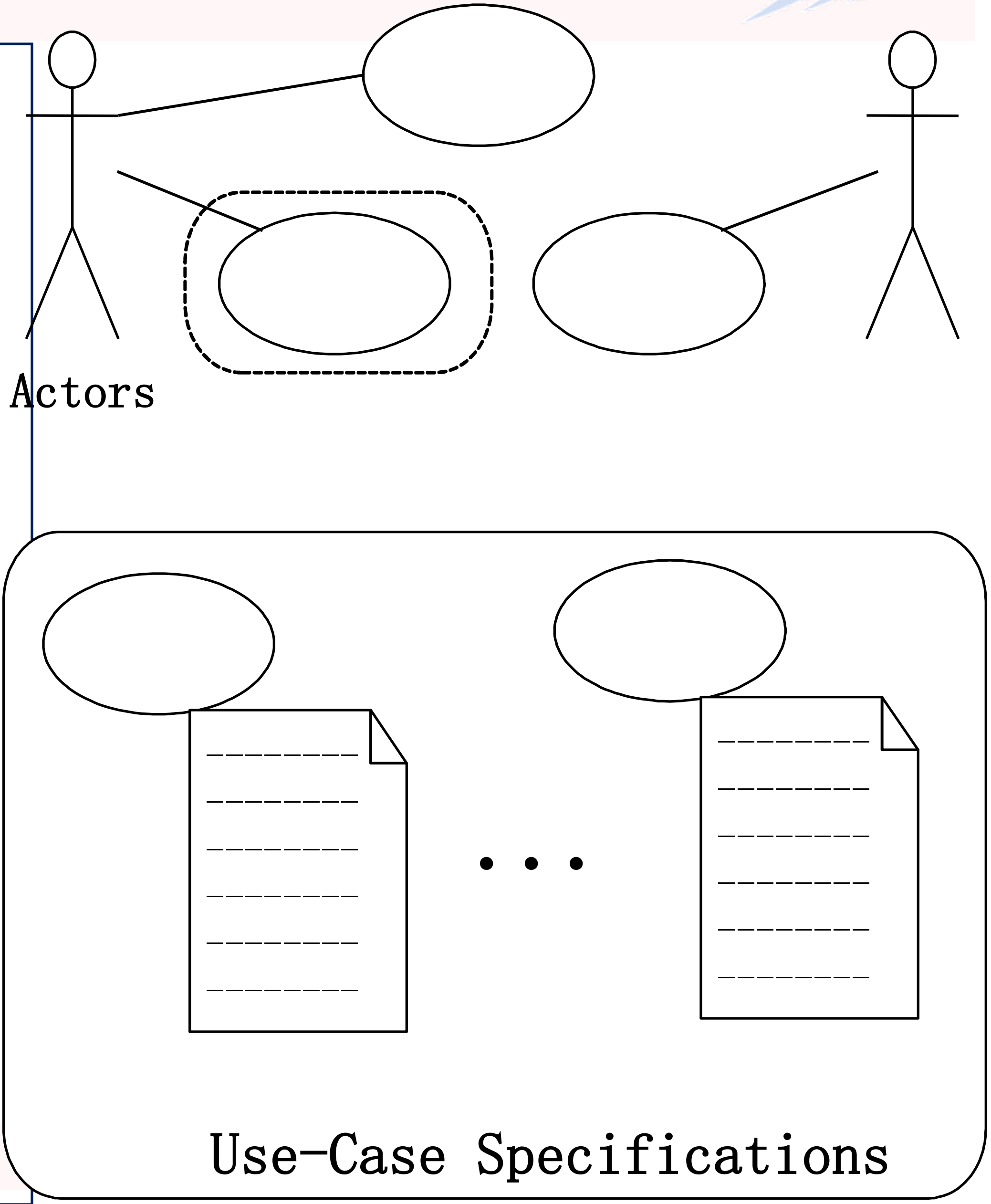
How would you read this diagram?



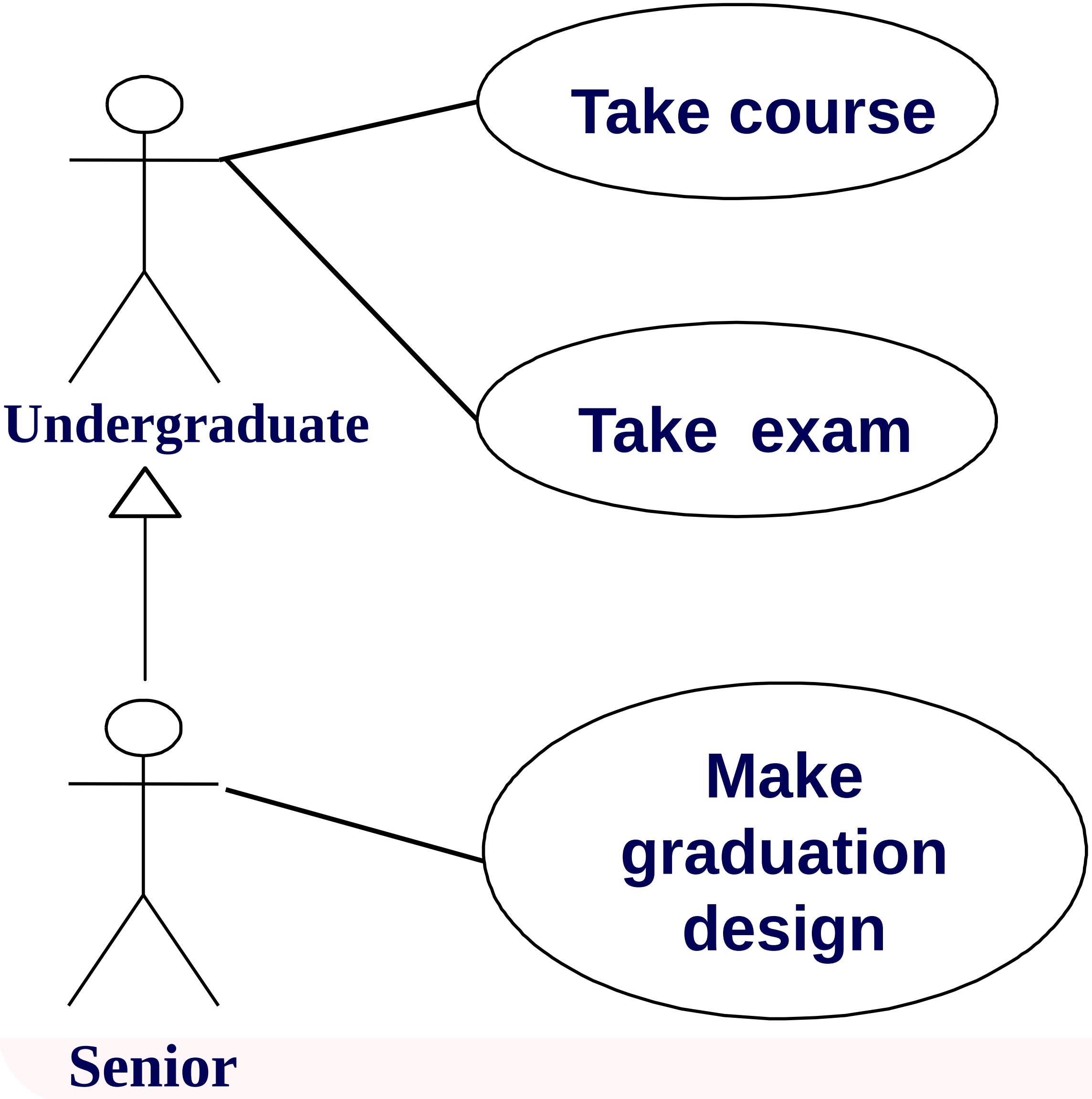
Use-Case Specifications

- Use case name
- Brief description
- Flow of Events
- Special requirements
- Pre-conditions
- Post-conditions
- ……
- Example:

  Borrow Book

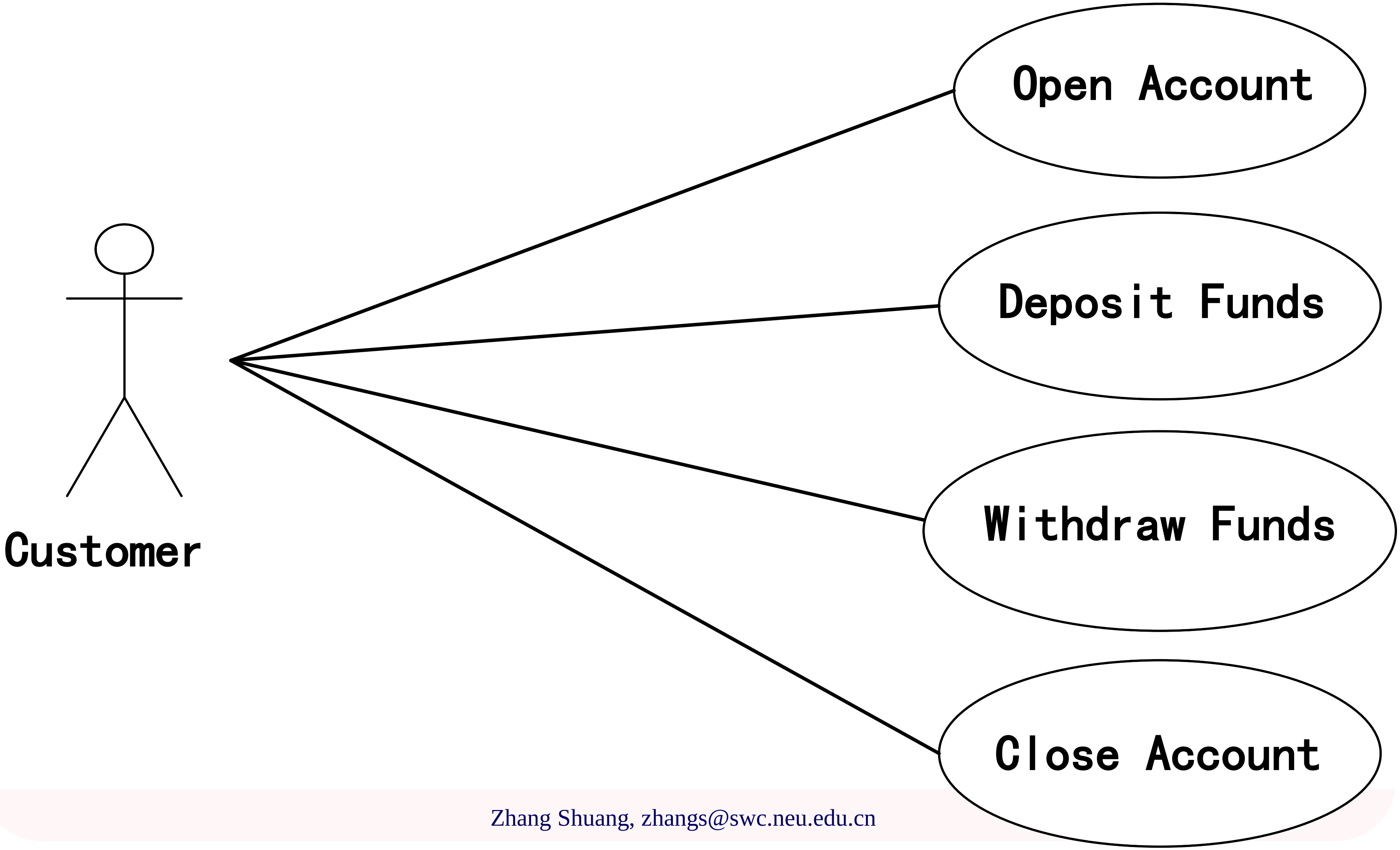


The Relationship between Actors ---- Generalization

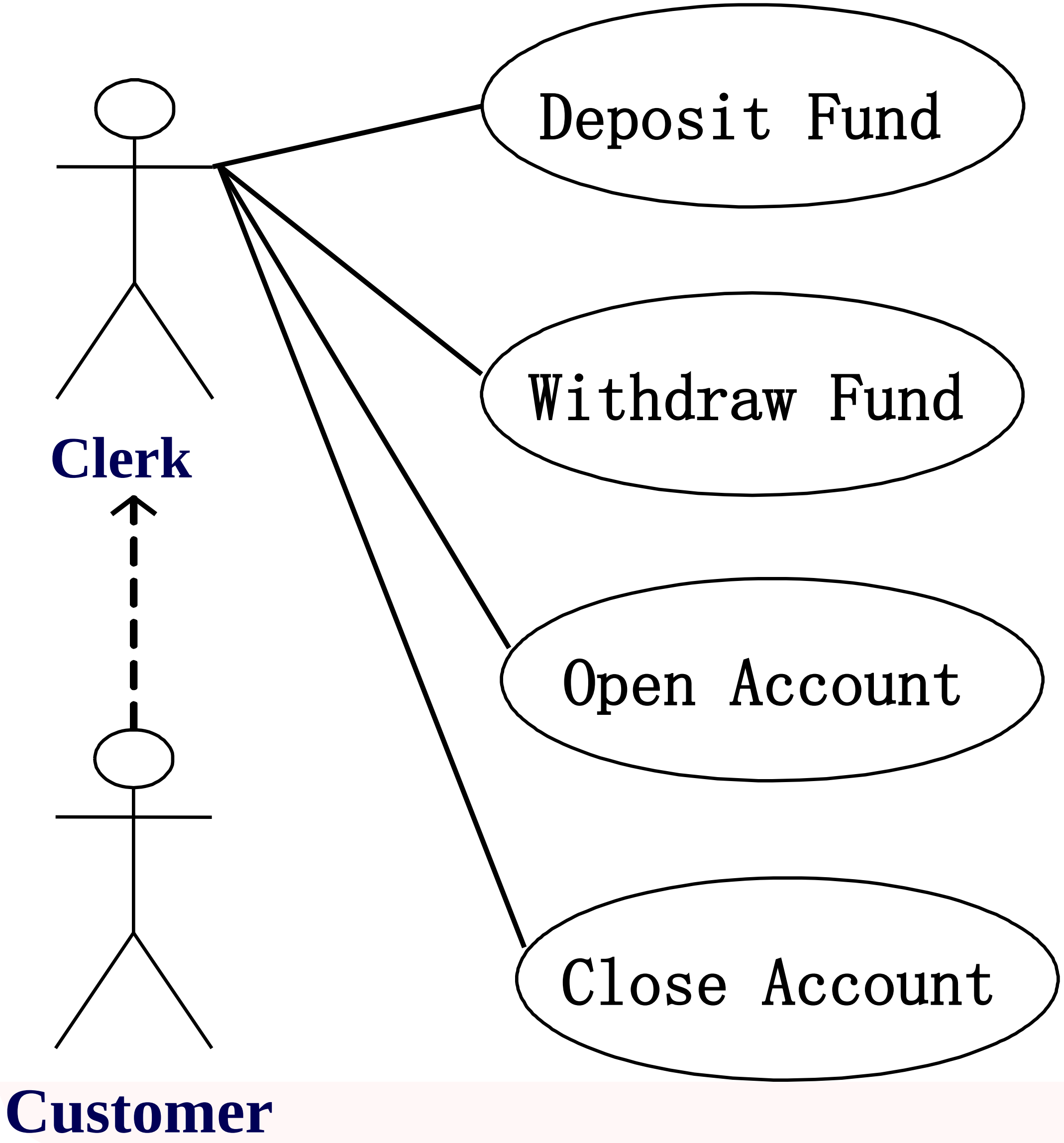


- Sub-actor inherits super-actor’s actions
- Sub-actor can also have his own actions

Case 2: Bank Customer Service System

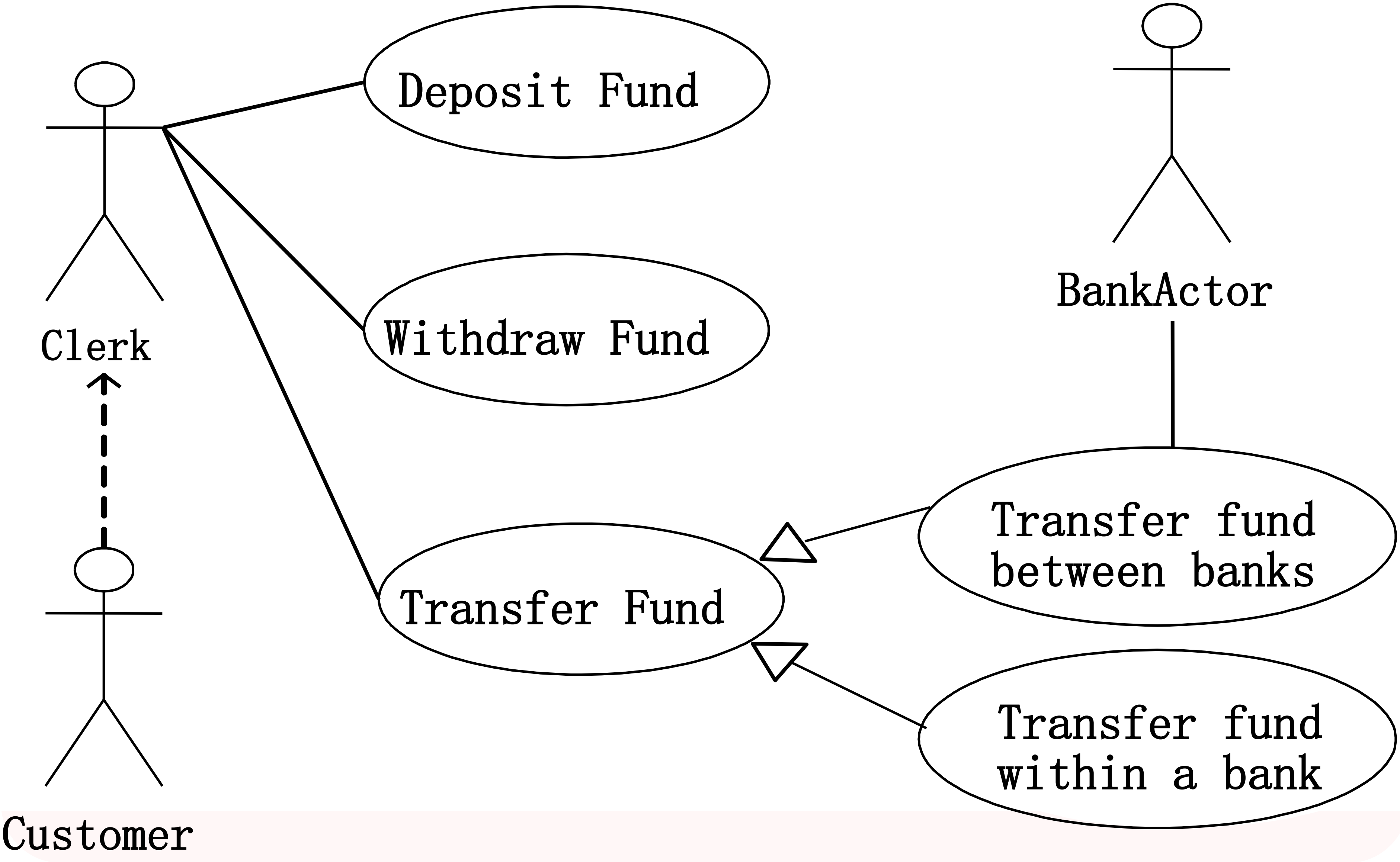


The Relationship between Actors ---- Agency

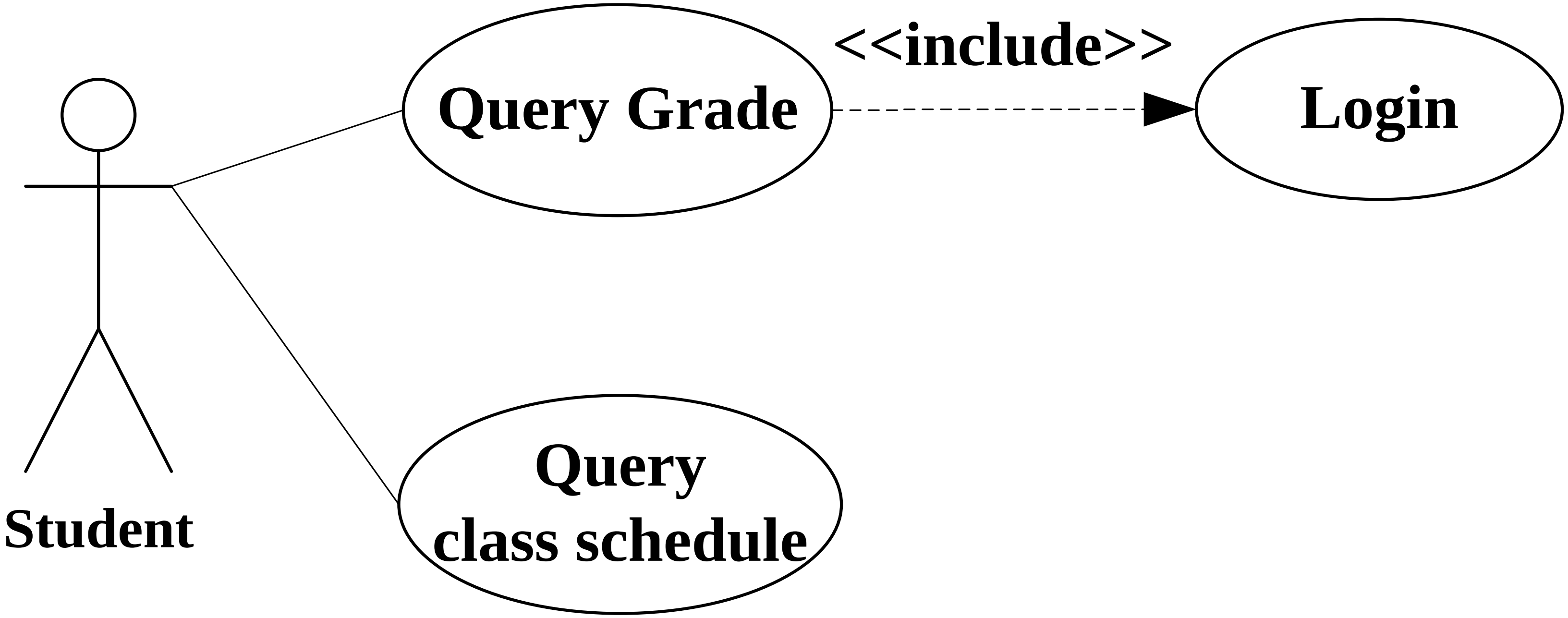


- Dotted line directs from agency requestor to agent

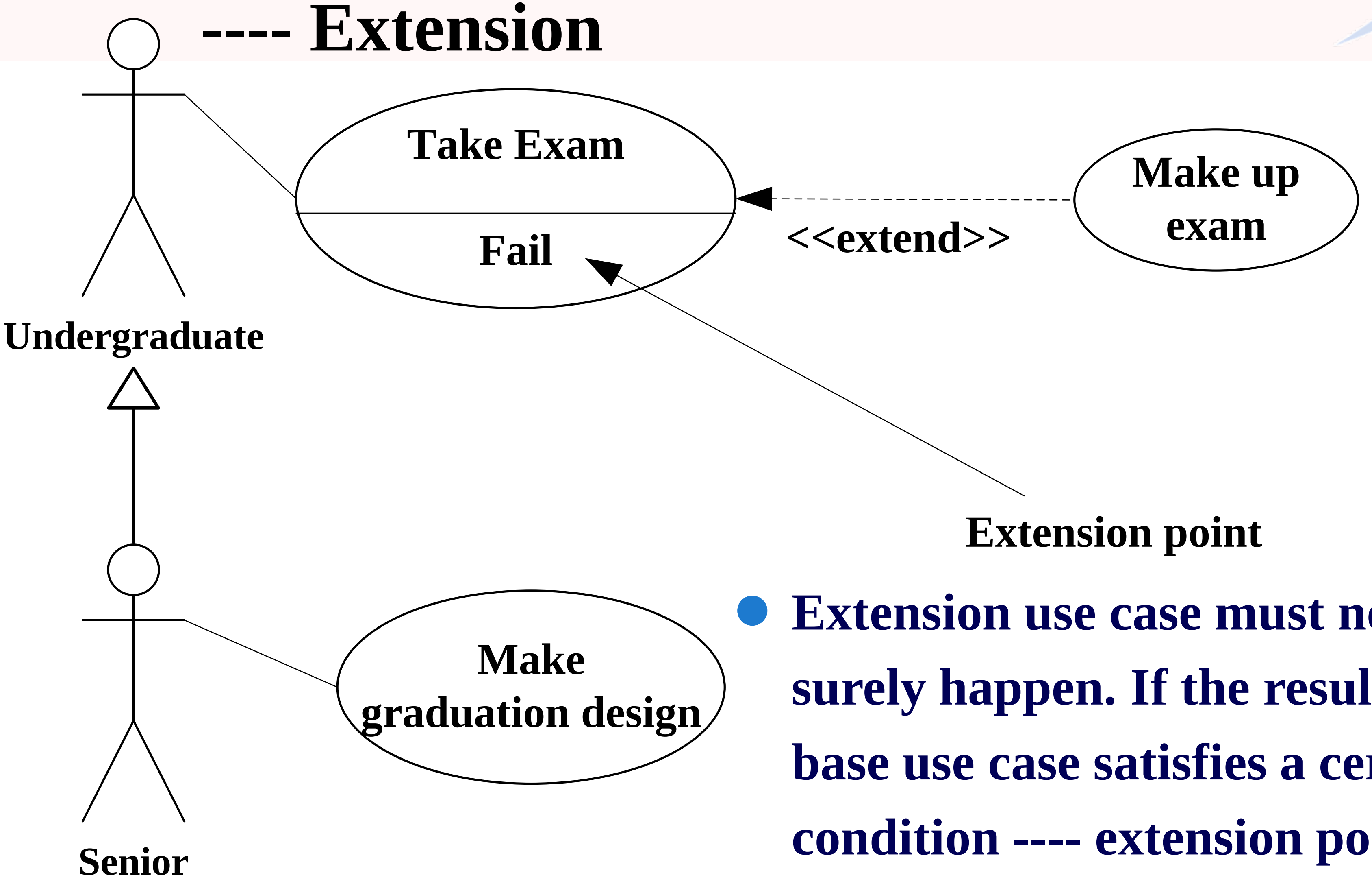
The Relationship between Use Cases ---- Generalization



The relationship between use cases ---- Inclusion



The Relationship between use cases ---- Extension

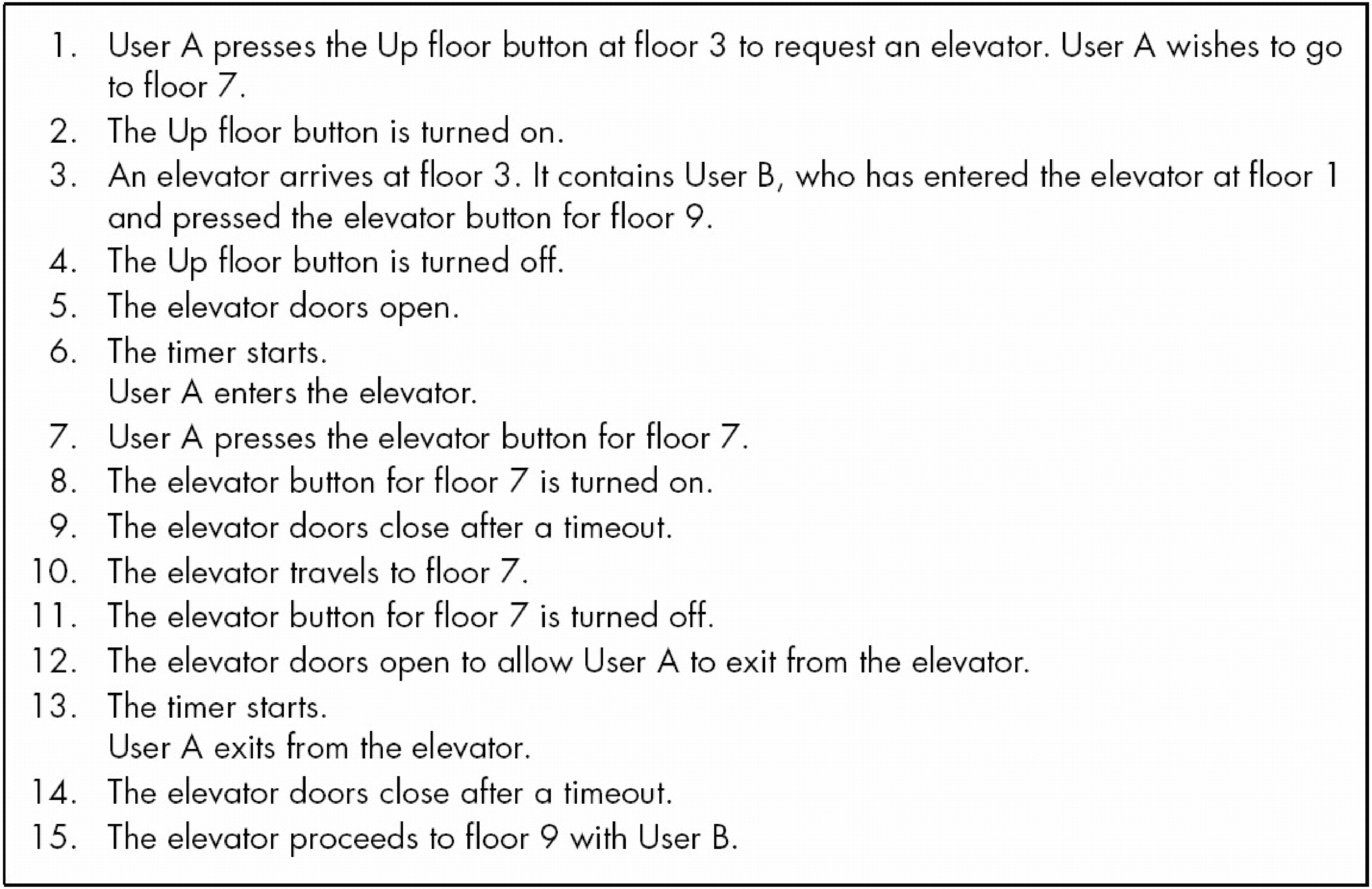


- Extension use case must no surely happen. If the result of base use case satisfies a certain condition ---- extension point, extension use case happen and base use case is extended.

Scenarios

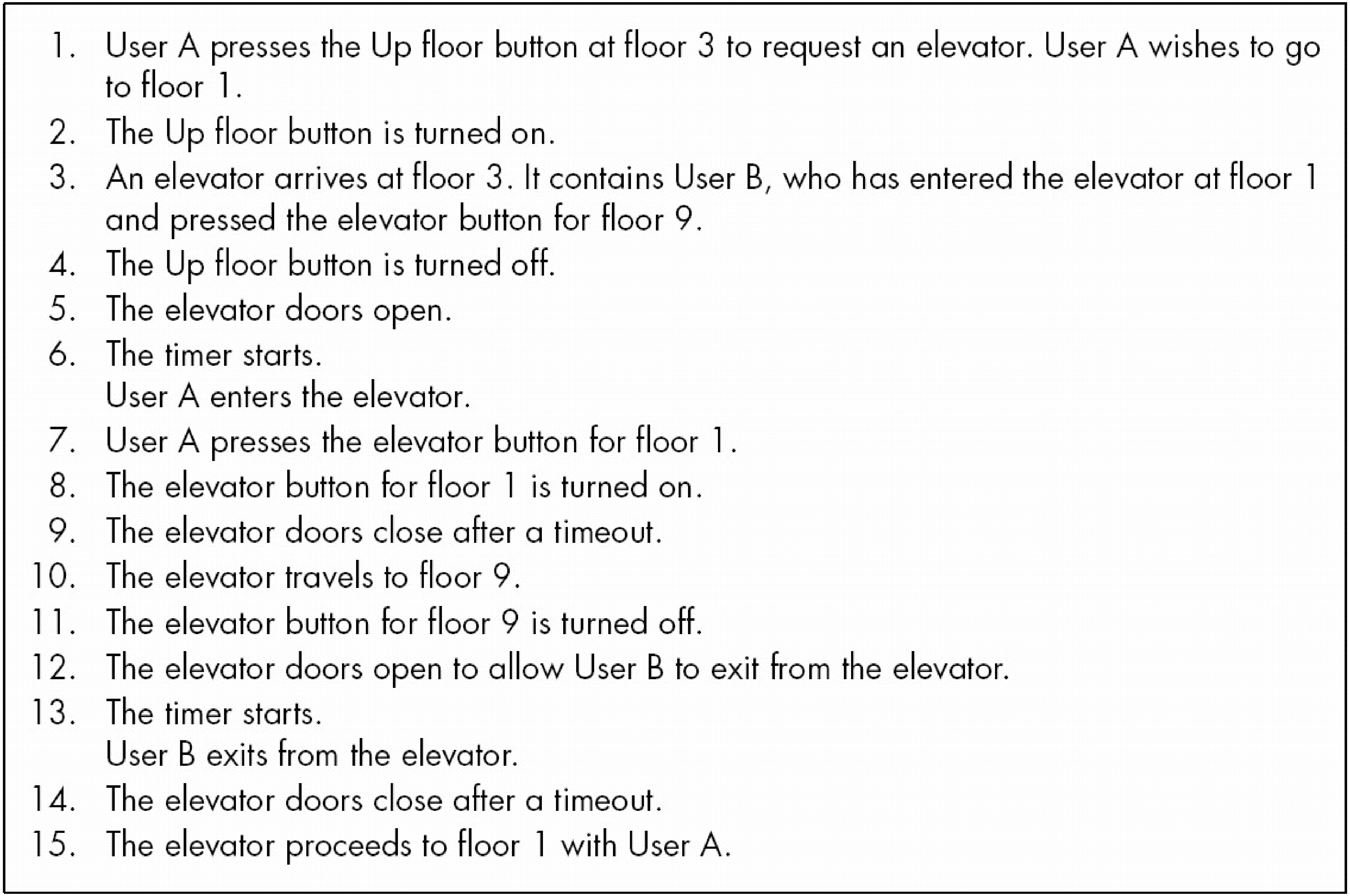
- A scenario is an instance of a use case. It is one flow through a use case.
- How many scenarios are needed?
- Scenarios make excellent test cases.

Normal Scenario



1. User A presses the Up floor button at floor 3 to request an elevator. User A wishes to go to floor 7.
2. The Up floor button is turned on.
3. An elevator arrives at floor 3. It contains User B, who has entered the elevator at floor 1 and pressed the elevator button for floor 9.
4. The Up floor button is turned off.
5. The elevator doors open.
6. The timer starts.
   User A enters the elevator.
7. User A presses the elevator button for floor 7.
8. The elevator button for floor 7 is turned on.
9. The elevator doors close after a timeout.
10. The elevator travels to floor 7.
11. The elevator button for floor 7 is turned off.
12. The elevator doors open to allow User A to exit from the elevator.
13. The timer starts.
    User A exits from the elevator.
14. The elevator doors close after a timeout.
15. The elevator proceeds to floor 9 with User B.

Exception Scenario



1. User A presses the Up floor button at floor 3 to request an elevator. User A wishes to go to floor 1.
2. The Up floor button is turned on.
3. An elevator arrives at floor 3. It contains User B, who has entered the elevator at floor 1 and pressed the elevator button for floor 9.
4. The Up floor button is turned off.
5. The elevator doors open.
6. The timer starts.
   User A enters the elevator.
7. User A presses the elevator button for floor 1.
8. The elevator button for floor 1 is turned on.
9. The elevator doors close after a timeout.
10. The elevator travels to floor 9.
11. The elevator button for floor 9 is turned off.
12. The elevator doors open to allow User B to exit from the elevator.
13. The timer starts.
    User B exits from the elevator.
14. The elevator doors close after a timeout.
15. The elevator proceeds to floor 1 with User A.

Experiments

- **OOA: get use case diagram for your team project.**

Thank You !