Use Case Diagram

CSE 3223

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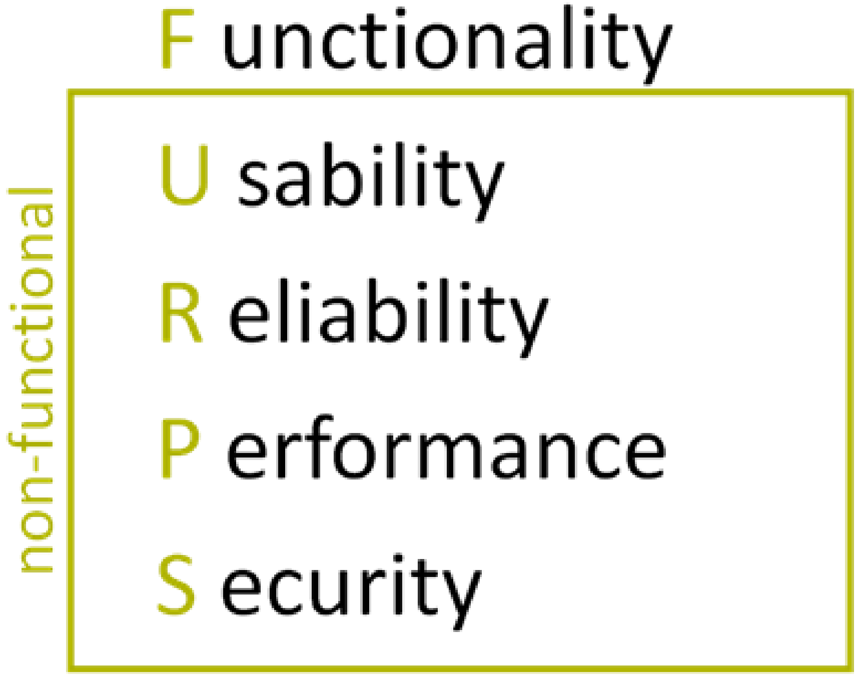
What is Use Case?

- Use cases capture the functional requirements (behavioral) of a system.
- Use cases tell us what the system should do.
- Use cases describe the interactions between various actors and 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**.

FURPS

FURPS is an acronym representing a model for classifying requirements.

- **Usability** - UX, UI, Human Factors, Aesthetics, Consistency, Documentation
- **Reliability** - Availability, Robustness, Recoverability, Stability, Accuracy
- **Performance** - Speed, Efficiency, Resource Consumption
- **Security**



F unctionality

non-functional

U sability

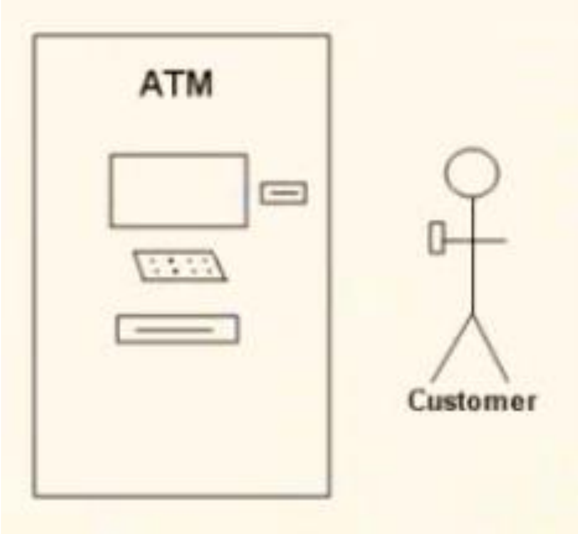
R eliability

P erformance

S ecurity

Use Case Elements

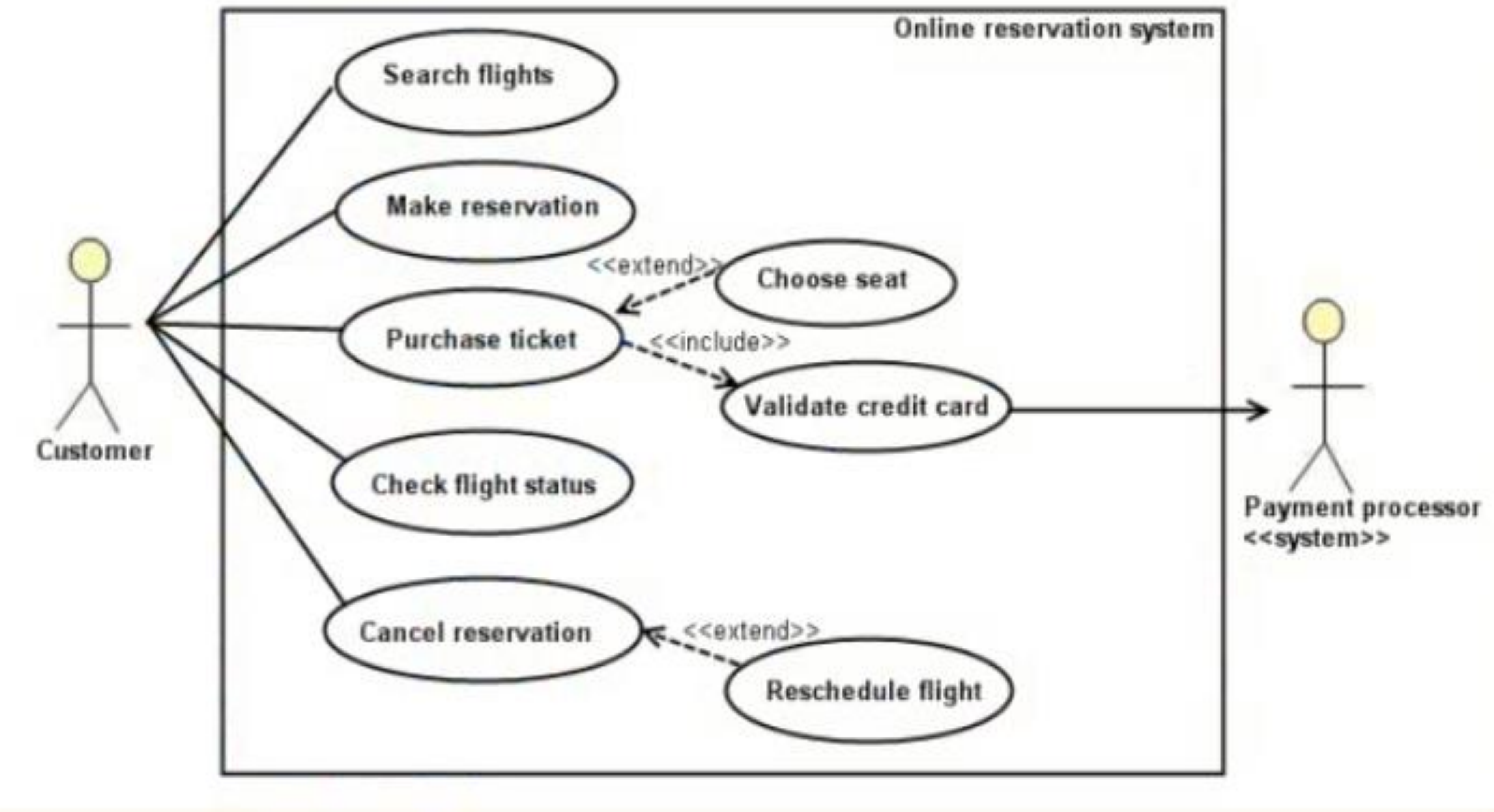
- **Actor:** Someone or something that has a goal in using the system.
- Actor can be a
  - Person or Organization or sub-system
  - For example, a timer that triggers sending of an e-mail reminder.
- **Goal:** What the actor wants to achieve by interacting with the system.
- **Use cases** captures all the different goals that various actors have in the system.
- In the form of a verb phrase [**withdraw cash**]



Use Case Basics

- For each use case,
  - Describe the steps involved in an interaction between an actor and the system, beginning with a **primary actor.**
  - Start with the **main success scenario**, sometimes called a happy path.
  - Look for alternative paths
    - Exceptions: What could go wrong here?
    - Extensions: What other goals might come into play here?
- For each Actors,
  - Actor has responsibility toward the system (inputs).
  - Actor have expectations from the system (outputs).

Sample Use Case Diagram



Use Cases: Example

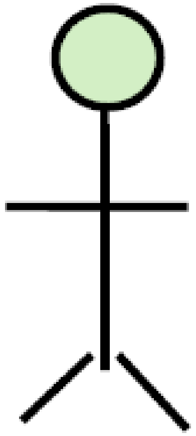
A scenario for a medical clinic.

“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

- Could be *human beings, other system, timers and clocks or hardware device.*
- 2 types of actor classification:
  - **Primary Actors:** Actors that stimulate the system and the initiator of events.
  - **Secondary Actors:** Actors that only receive stimuli from the system.
- Actor Designing Consideration:
  - Who / what will be **interested** in the system?
  - Who / what will want to **change the data** in the system?
  - Who / what will want to **interface** with the system?
  - Who / what will want **information** from the system?
- Represented by **stick figure**



Finding Actors

- External objects that produce/consume data: [**Named by noun**]
  - Must serve as sources and destinations for data
  - Must be external to the system
  - Include all ***user roles*** that interact with the system
  - Include ***system components*** only if they responsible for initiating/triggering a use case.

Humans

Machines

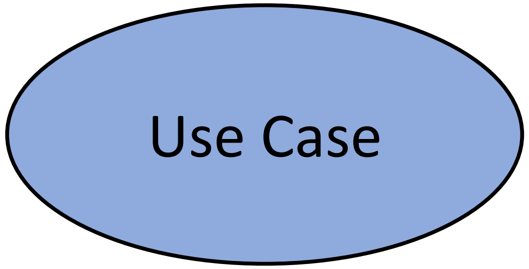
External systems

Organizational Units

Sensors

Use Case

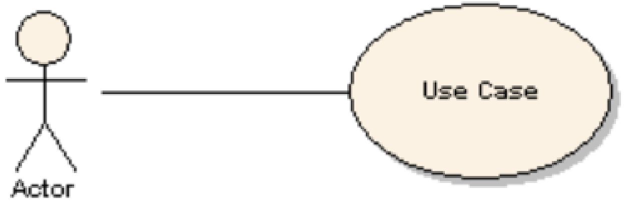
- Use case should ideally begin with a **verb**.
  - Register, wrong.
  - Register New User, right.
- Notation: an ellipse or oval (with the name inside)
- More Examples (verb phrases)
  - Check Order Status
  - Handle Products Return
  - Update Membership Record
  - Register New Member
  - Process Order
  - Schedule Delivery
  - Order Products
  - Deliver Products



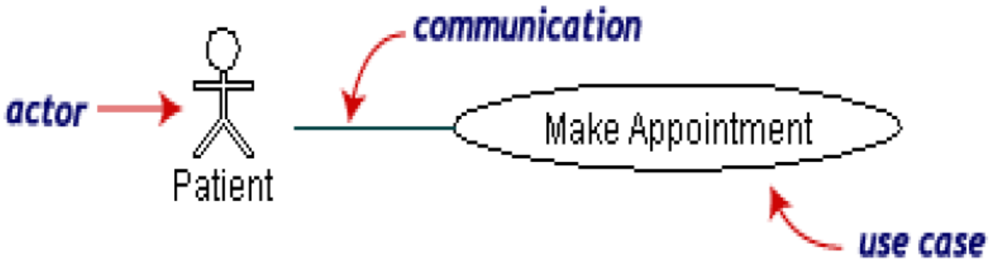
Use Case

Association or Communication

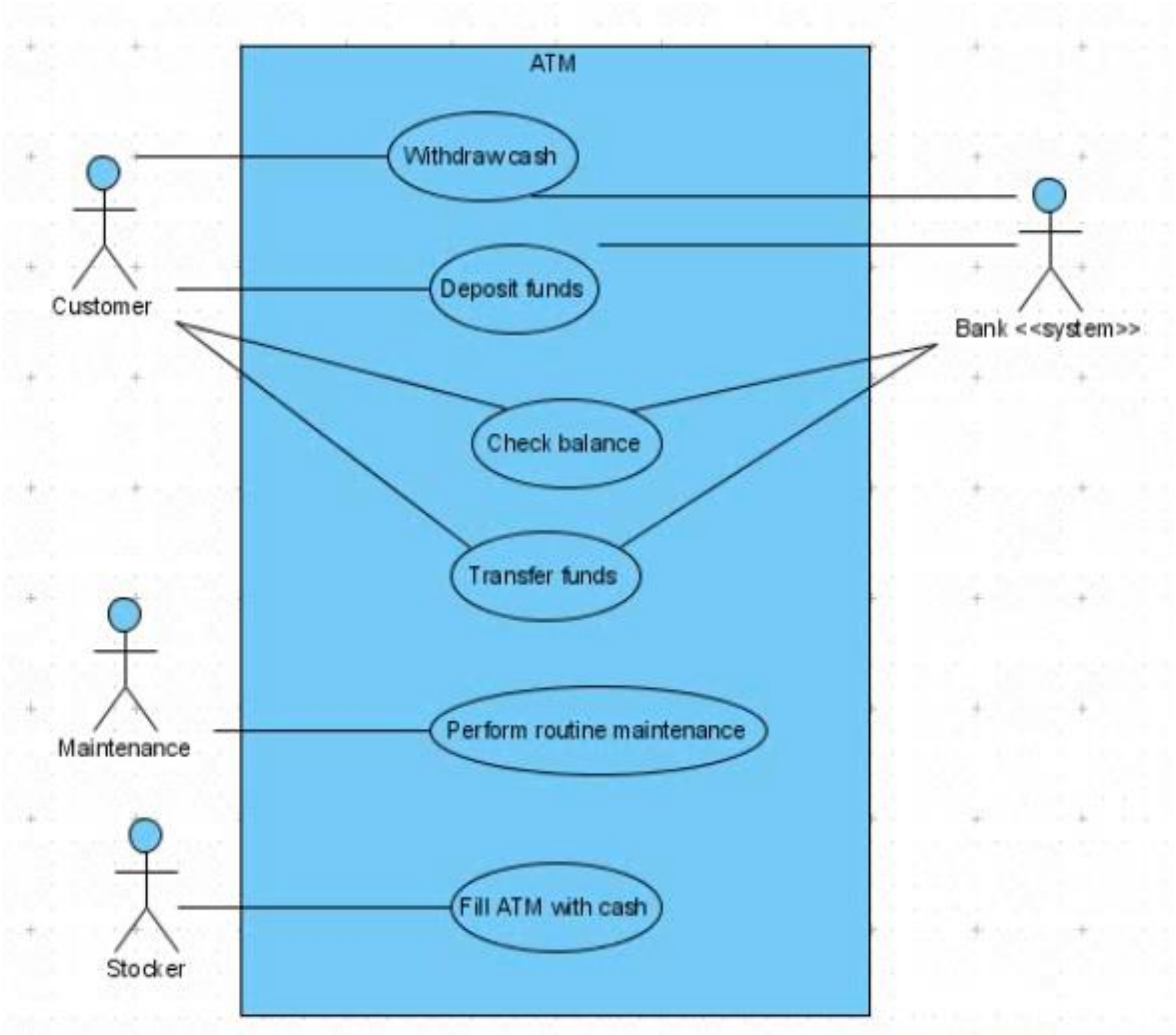
- The **communication** line or **association** to show how the actors communicate with the use case.



- “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.”*



Simple ATM Example



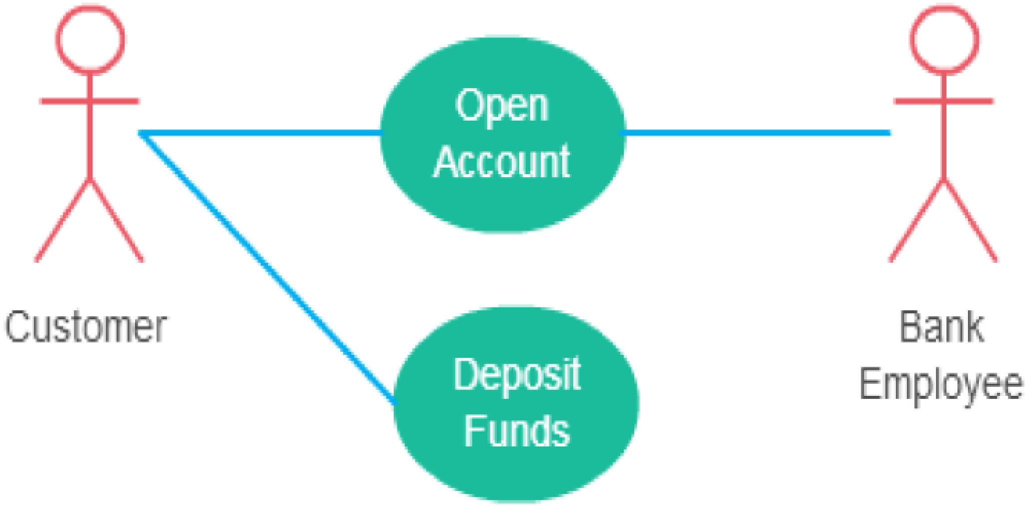
Use Case Diagrams - Relationships

There can be 5 relationship types in a use case diagram.

- Association between actor and use case
- Generalization of an actor
- Generalization of a use case
- Extend between two use cases
- Include between two use cases

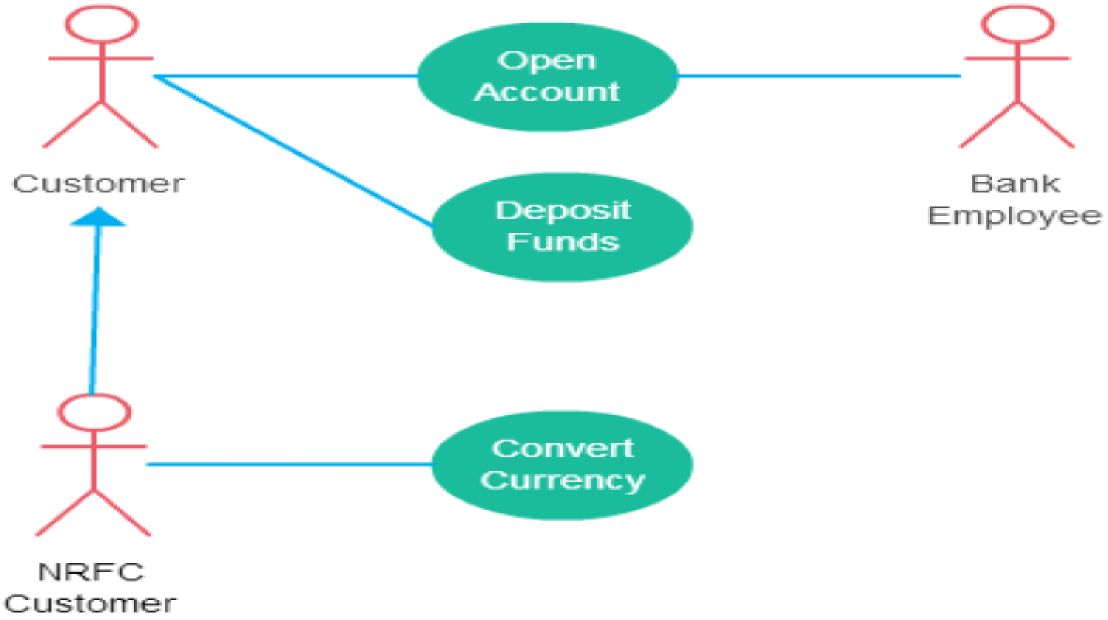
Association Between Actor and Use Case

- An actor must be associated with at least one use case.
- An actor can be associated with multiple use cases.
- Multiple actors can be associated with a single use case.



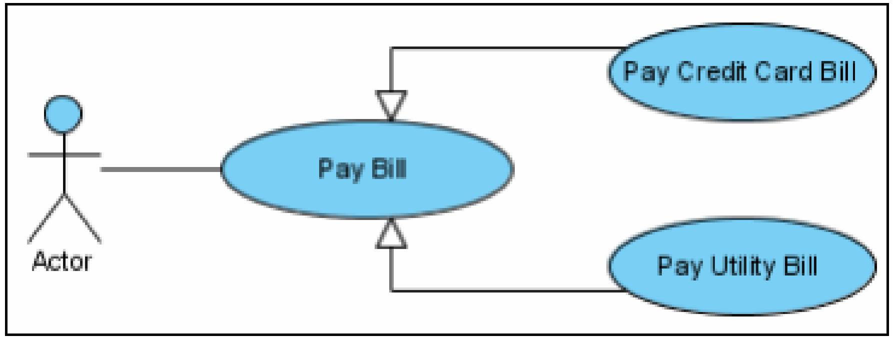
Generalization of an Actor

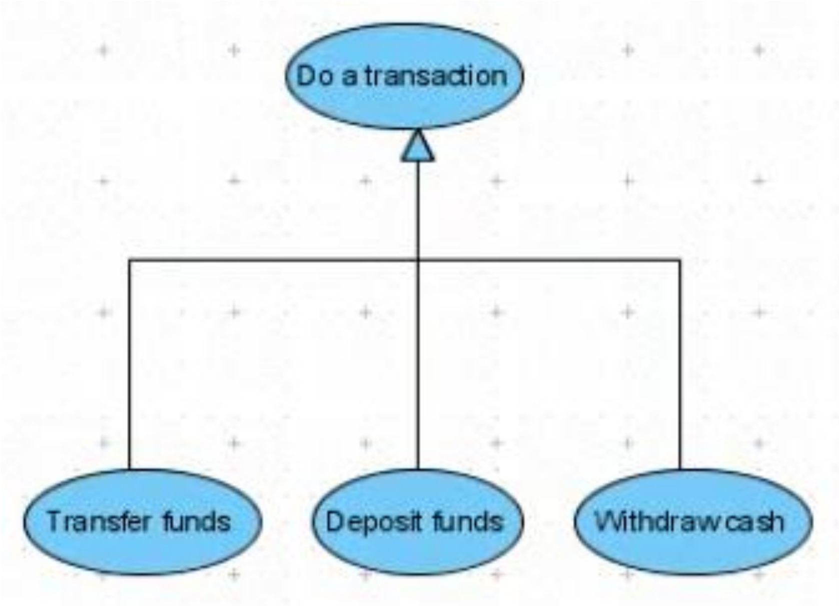
- Generalization of an actor means that one actor can inherit the role of an other actor.
- The descendant inherits all the use cases of the ancestor.



Generalization of a Use Case

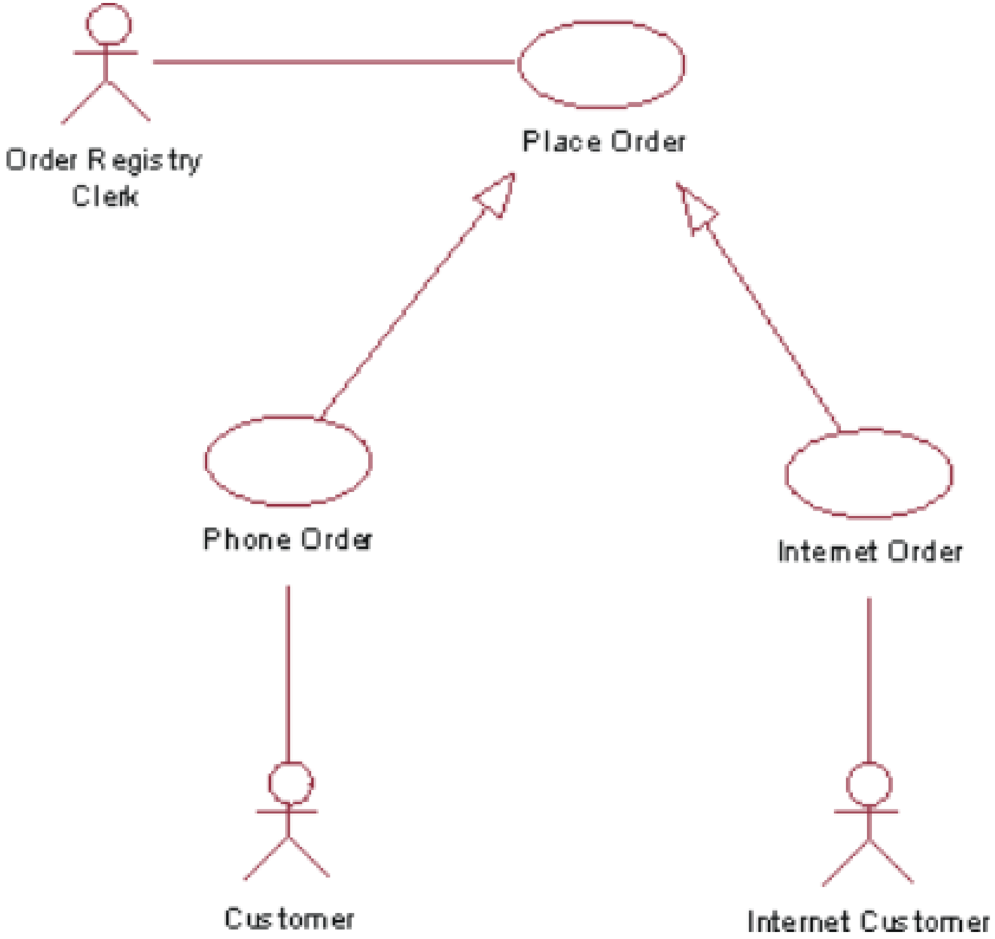
- Used when you find 2 or more use cases that have commonalities in behavior, structure and purpose.
- **For example**, suppose the ATM system can be used to pay bills. Pay bills has two child use cases : ***Pay Credit Card Bill*** *and* ***Pay Utility Bill***



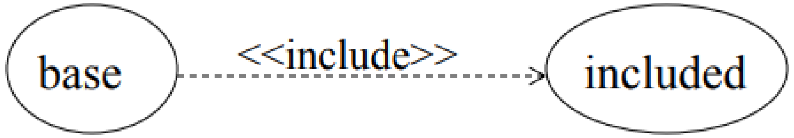


Generalization Example

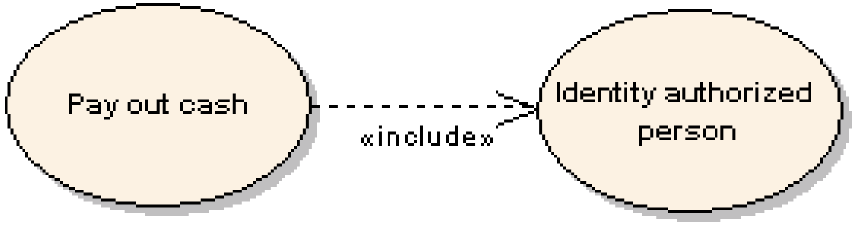
- The actor Order Registry Clerk can instantiate the general use case Place Order.
- Place Order can also be specialized by the use cases Phone Order or Internet Order.

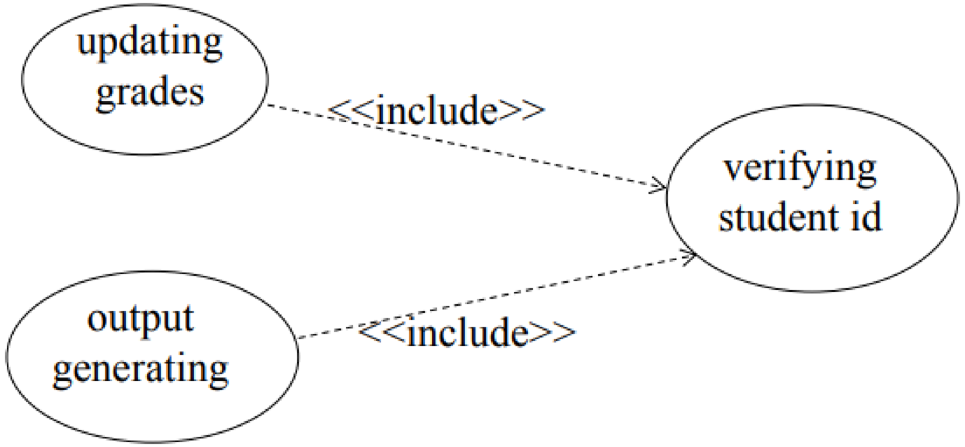


Include relationships



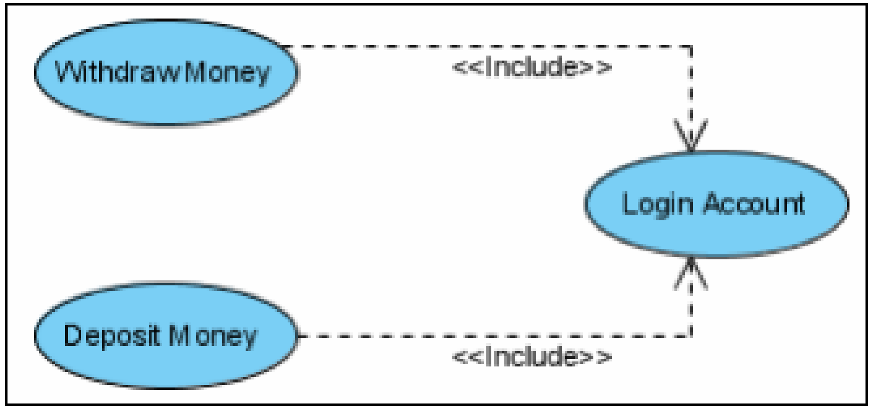
- One use case (base) includes the functionality of another (inclusion case)
- The included use case never stands alone. It only occurs as a part of some larger base that includes it.
- Enables us to avoid describing the same flow of events several times by putting the common behavior in a use case of its own. Supports re-use of functionality



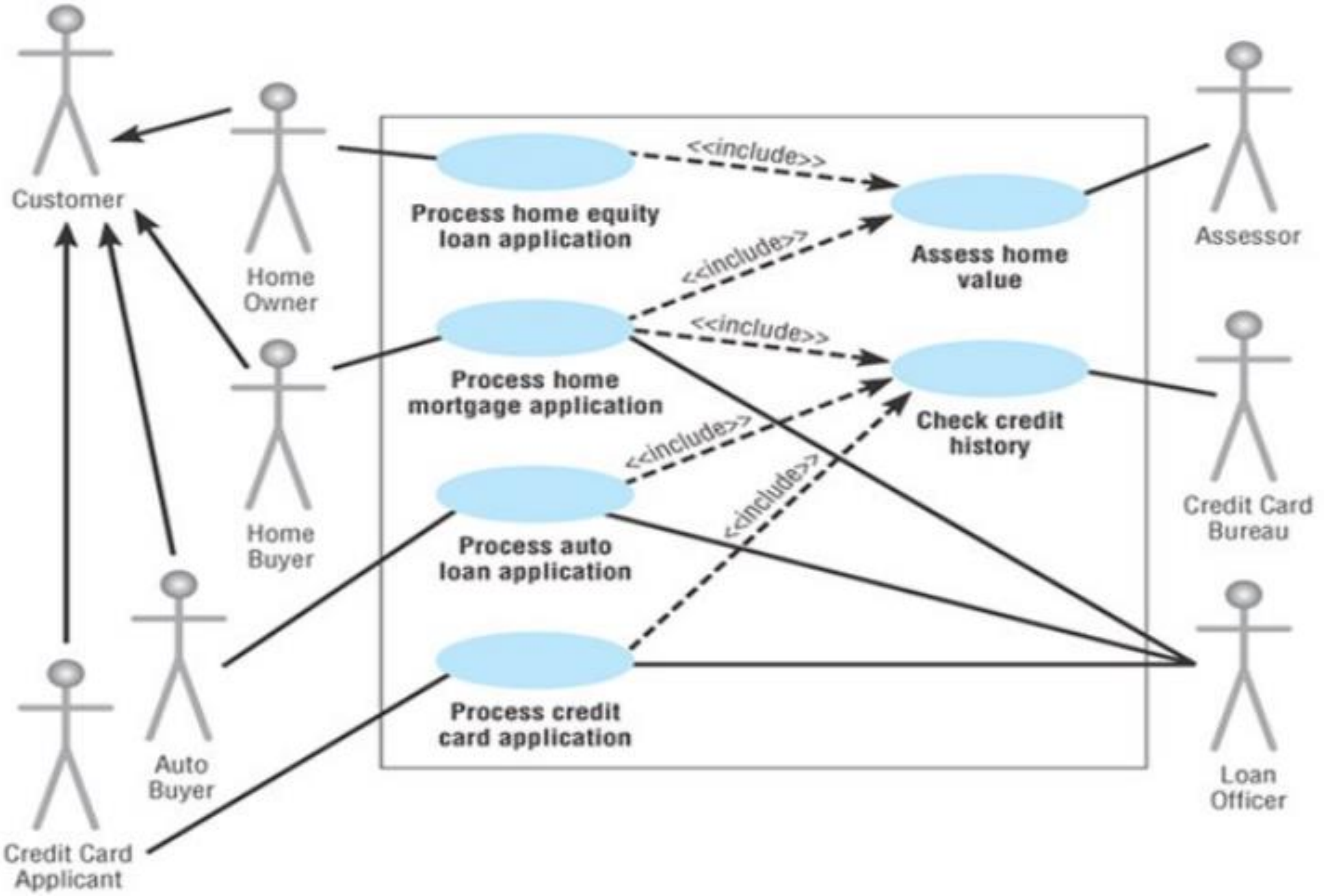


Include relationships

- Include relationship – a standard case linked to a mandatory use case.
- **Example:** to Authorize Car Loan (standard use case), a clerk must run Check Client's Credit History (include use case).
- Standard use case can NOT execute without the include case → ***tight coupling*** .
- **For example**, in the ATM system example, such as Withdraw Money, Deposit Money or Check Balance, all share the inclusion use case Login Account.

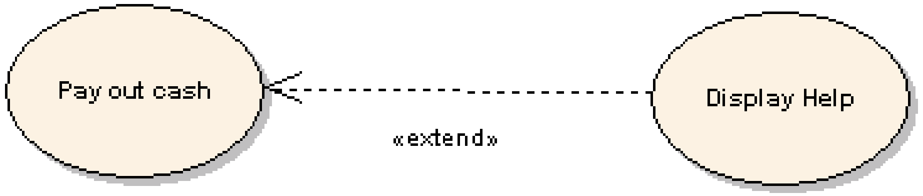


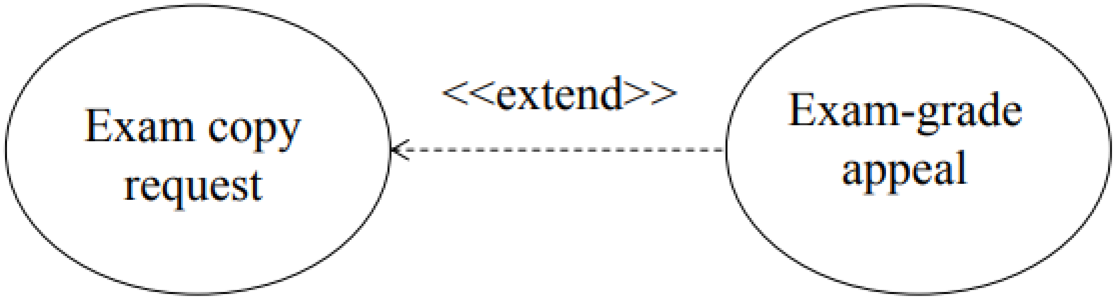
Include Example



Extend relationships

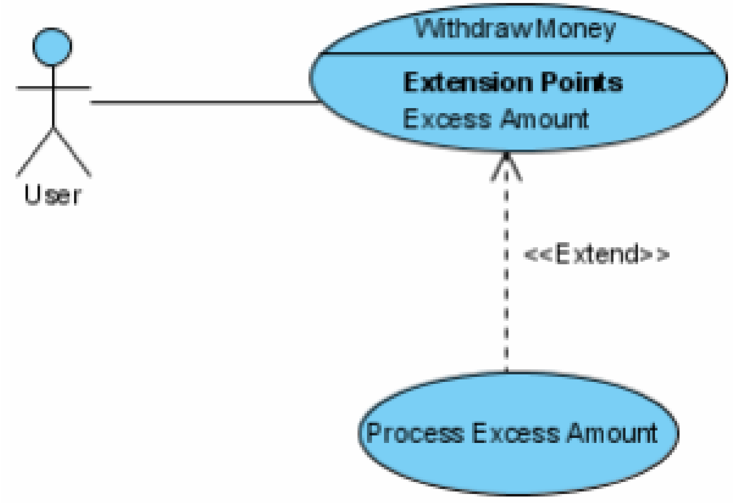
- One use case (extension) extends the behavior of another (base)
- The base use case may stand alone, but under certain conditions its behavior may be extended by the behavior of another use case.
- Enables to model optional behavior or branching under conditions.



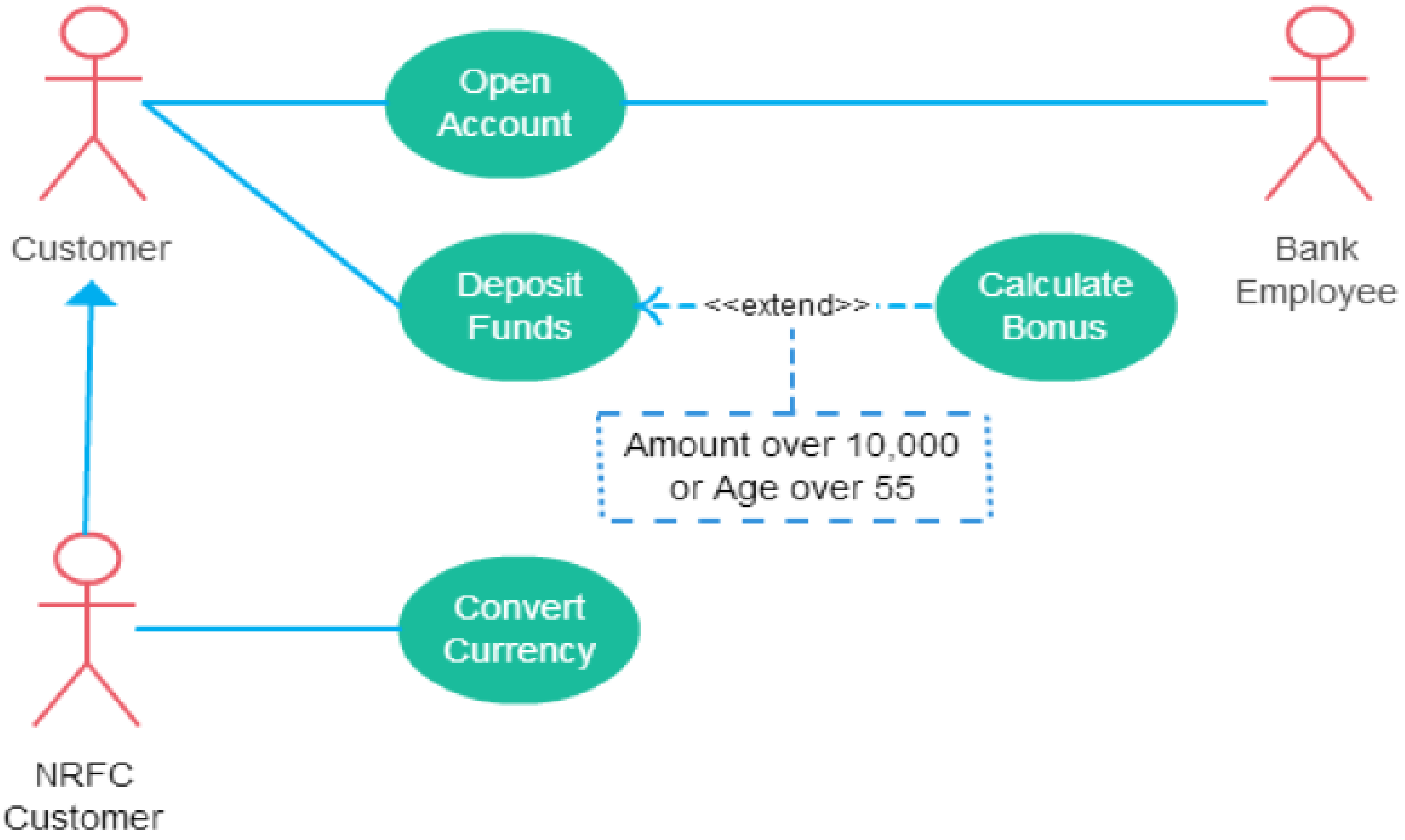


Extend relationships

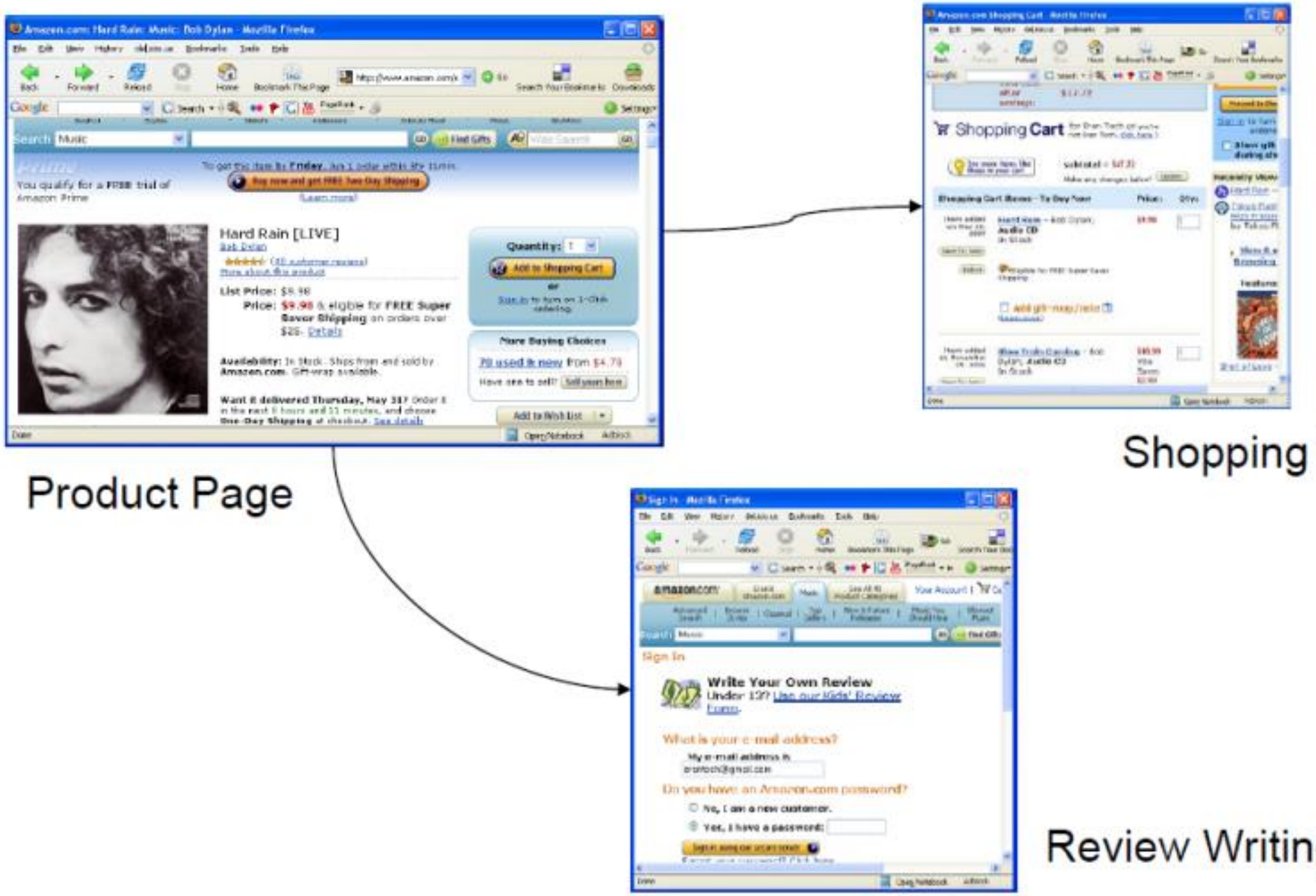
- Extend relationship – linking an optional use case to a standard use case.
- Example: *Register Course* (standard use case) may have *Register for Special Class* (extend use case) – class for non-standard students, in unusual time, with special topics, requiring extra fees…).
- Standard use case can execute without the extend case → ***loose coupling***.



Extend Example



Extend Example



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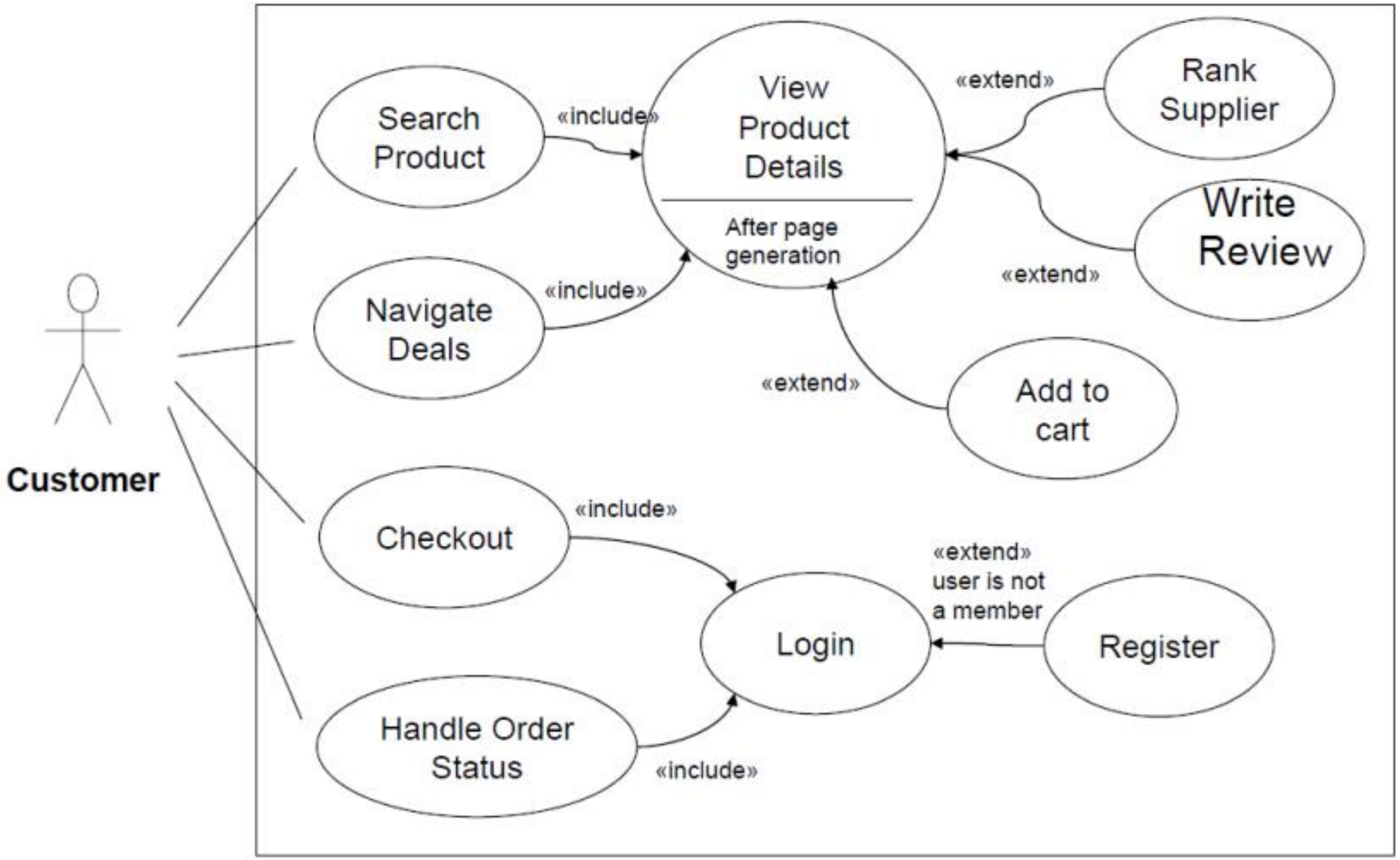
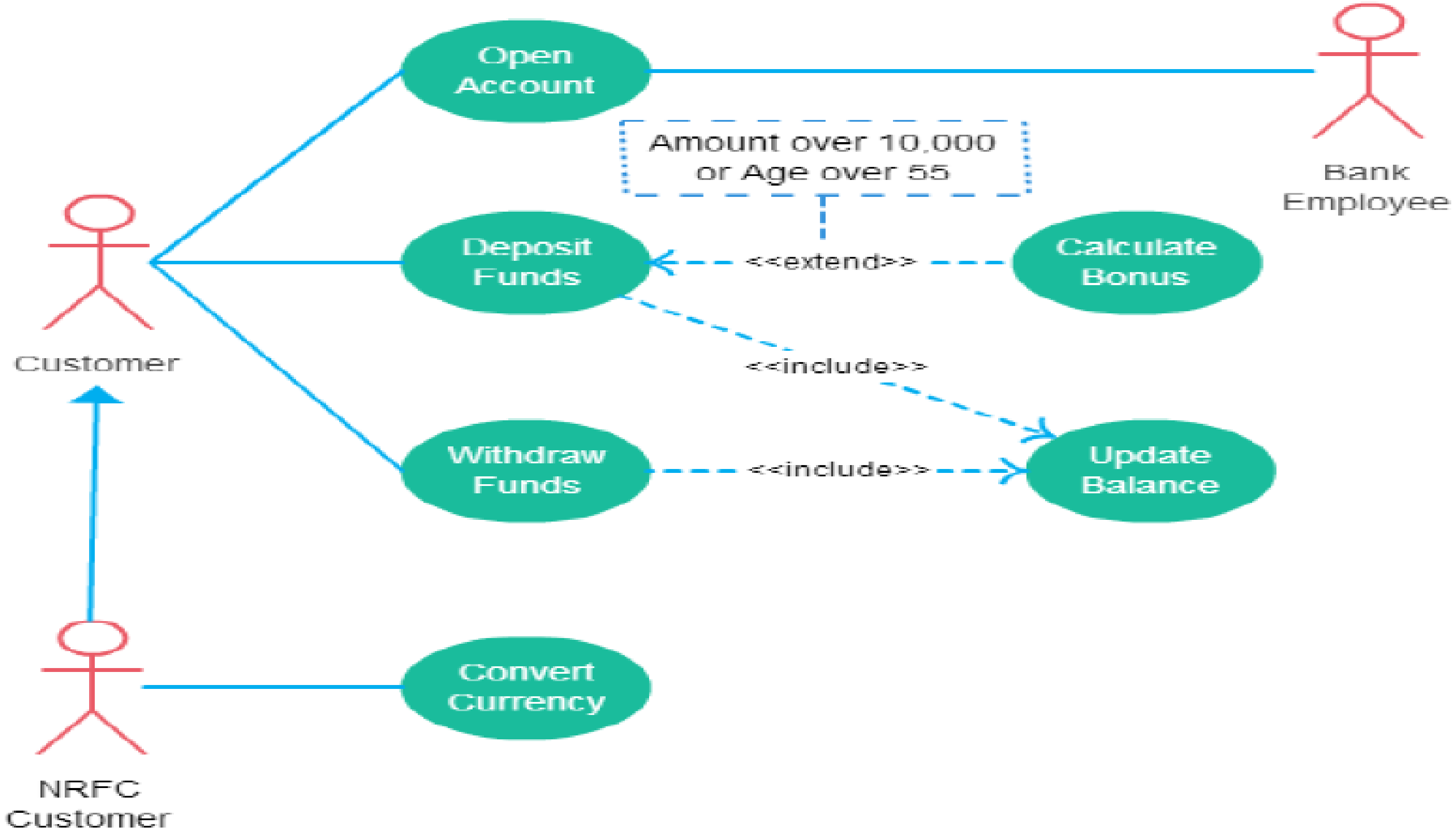
Extend Example



Include & Extend

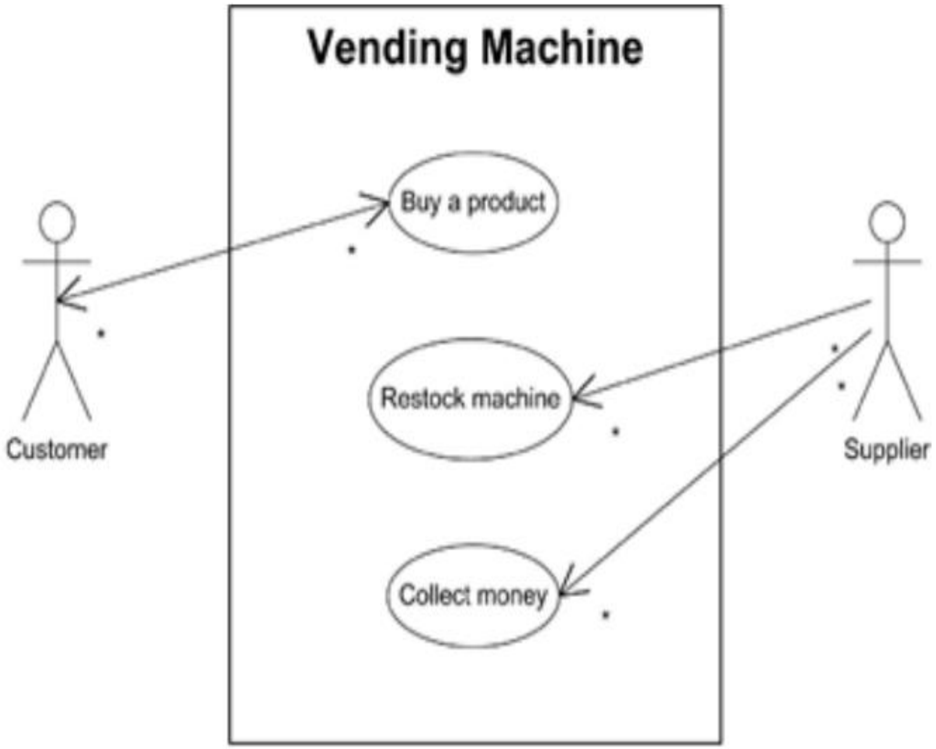


Use-Case Diagram Case Study

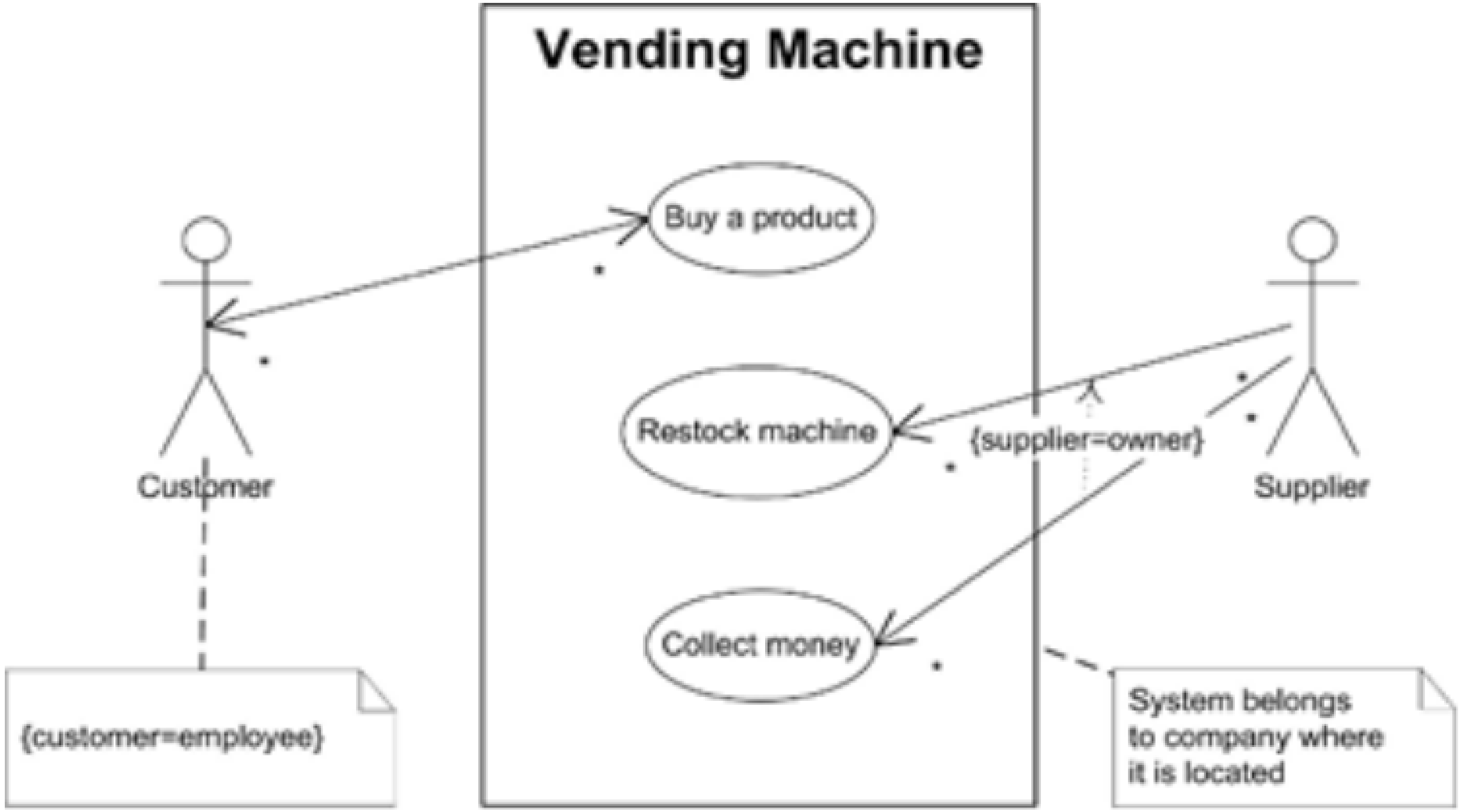
Vending Machine

After client interview the following system scenarios were identified:

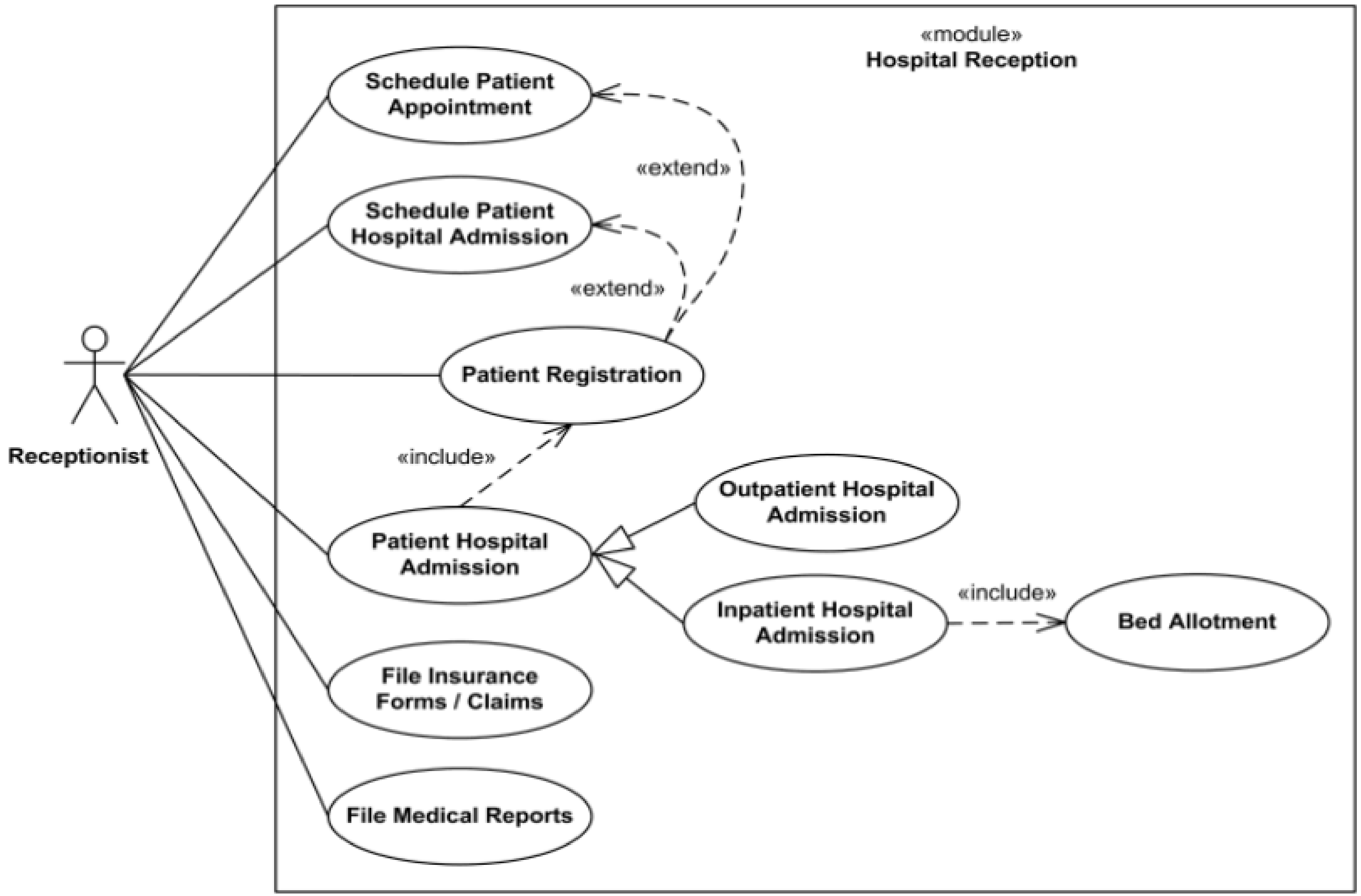
- A customer buys a product
- The supplier restocks the machine
- The supplier collects money from the machine
  - On the basis of these scenarios, the following three actors can be identified:
  - Customer; Supplier; Collector (in this case Collector=Supplier)



Introducing annotations (notes) and constraints.



Hospital Reception


«module»
Hospital Reception
Receptionist
Schedule Patient Appointment
Schedule Patient Hospital Admission
«extend»
«extend»
Patient Registration
«include»
Patient Hospital Admission
Outpatient Hospital Admission
Inpatient Hospital Admission
«include»
Bed Allotment
File Insurance Forms / Claims
File Medical Reports

END

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