

SYSTEM MODELLING

BY DR. RUBEENA DOOMUN

LEARNING OBJECTIVES



- LO1: Understand how graphical models can be used to represent software systems;
- LO2: Understand why different types of model are required and the fundamental system modeling perspectives of context, interaction, structure, and behavior;
- LO3: Introduce to some of the diagram types in the Unified Modeling Language (UML) and how these diagrams may be used in system modeling;

WHAT IS UML?

- Unified Modeling Language (UML) is a standardised modelling language.
- Use to specify, visualize, construct, and document software systems.
- Provide a standard way to create blueprints for system design.
- UML diagrams describe how the system works, how it is structured, and the interactions between its parts.

Use Case Diagram

Use Case Diagram

Class Diagram

TYPES OF UML

Sequence Diagram

Activity Diagram

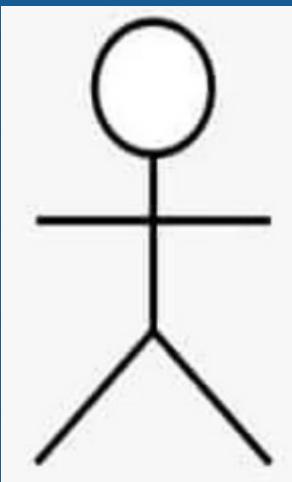
USE CASE DIAGRAM OVERVIEW

- A use case diagram represents the interactions between users (actors) and a system.
- It focuses on the functionality of a system from a user's perspective.
- Use cases represent goals, and actors represent roles or users interacting with the system.
- Relationships between actors and use cases describe the system's intended behavior.

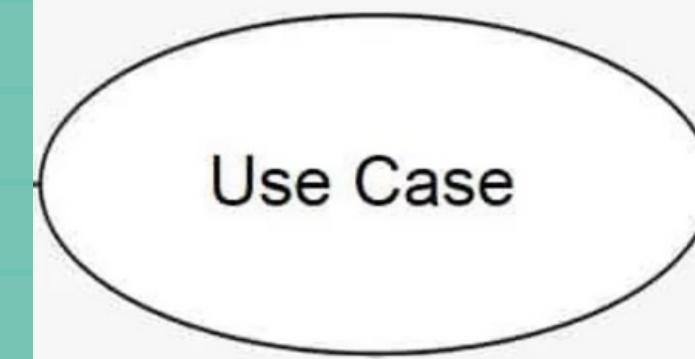


MAIN ELEMENTS OF A USE CASE DIAGRAM

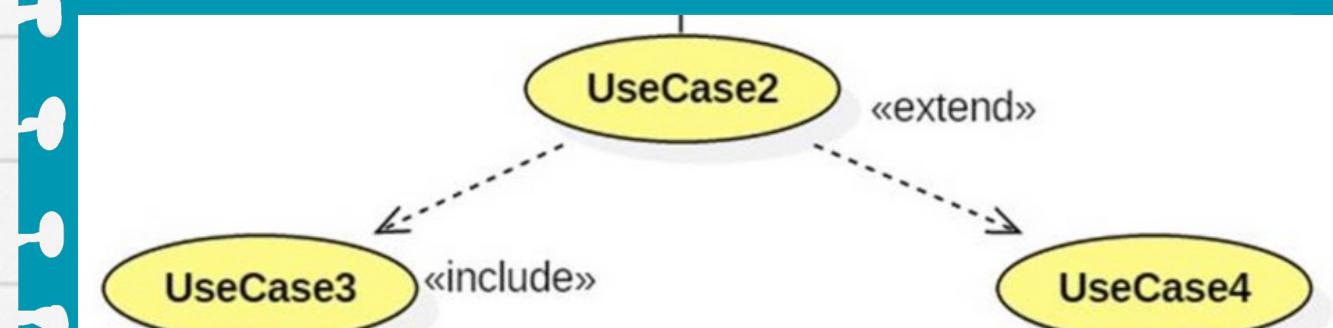
ACTORS



USE CASE



SYSTEM BOUNDARIES & ASSOCIATIONS



ACTORS

These are the figures that depict external users (people or systems) that interact with the system.



USE CASE

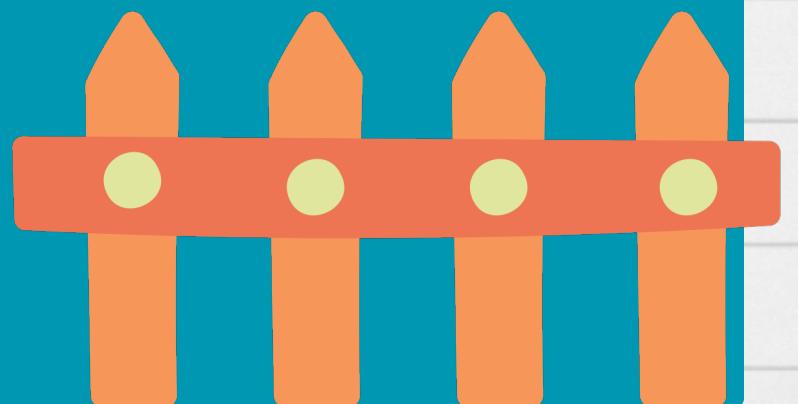
Usually drawn with ovals, use cases represent different interaction scenarios that actors might have with the system (log in, make a purchase...)



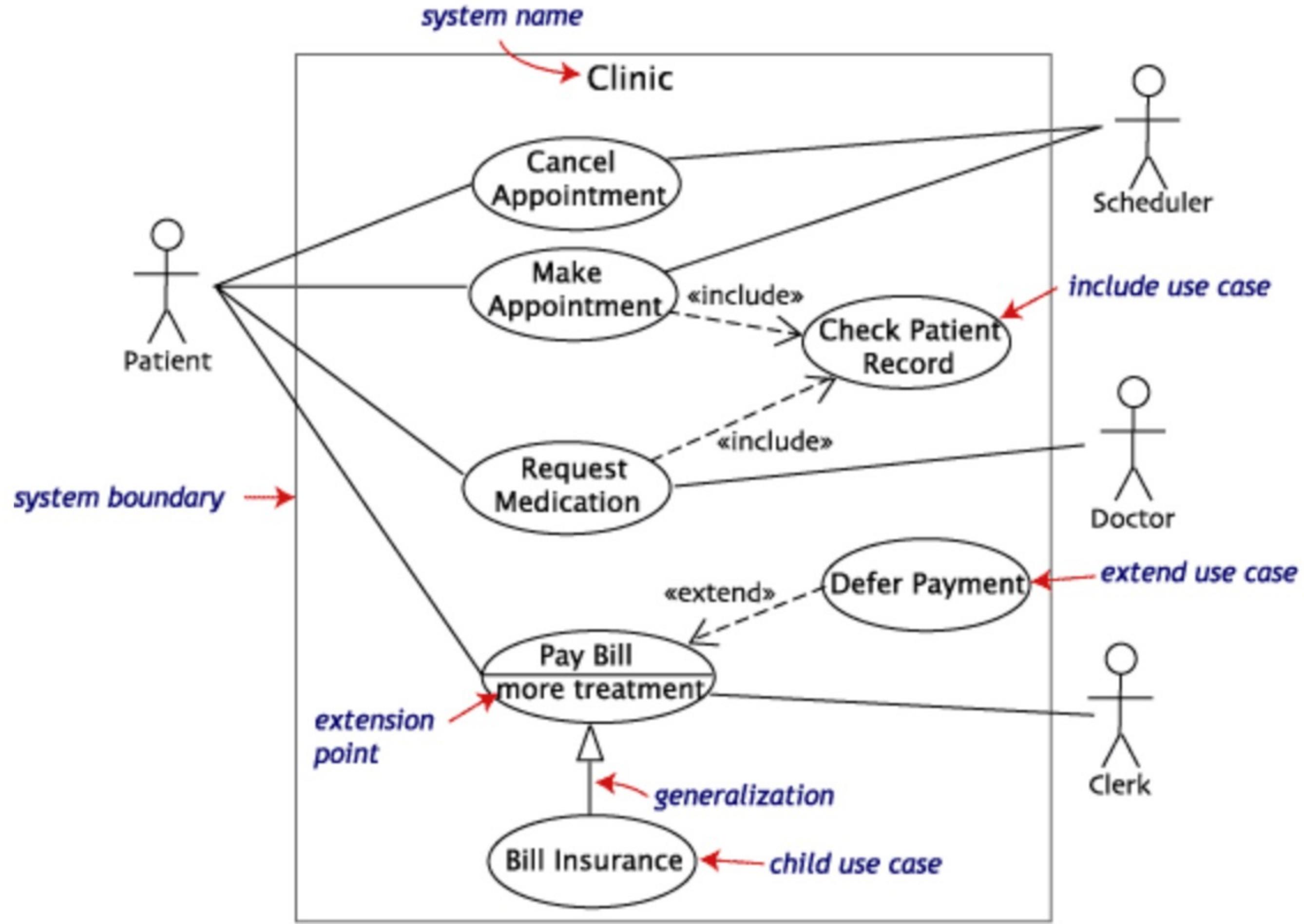
SYSTEM BOUNDARIES

Boundaries are outlined by the box that groups various use cases in a system.

Associations are drawn with lines showing different types of relationships between actors and use cases.



EXAMPLE OF A USE CASE DIAGRAM





EXPLANATION OF THE USE CASE DIAGRAM [1]

- A use case generalization shows that one use case is simply a special kind of another.
- Pay Bill is a parent use case and Bill Insurance is the child.
- A child can be substituted for its parent whenever necessary.
- Generalization appears as a line with a triangular arrow head toward the parent use case.



EXPLANATION OF THE USE CASE DIAGRAM [2]

- Includes are especially helpful when the same use case can be factored out of two different use cases.
- Both Make Appointment and Request Medication include Check Patient Record as a subtask.
- Include notation is a dotted line beginning at base use case ending with an arrows pointing to the include use case. The dotted line is labeled <<include>>



EXPLANATION OF THE USE CASE DIAGRAM [3]

- An extend relationship indicates that one use case is a variation of another.
- Extend notation is a dotted line, labeled **<<extend>>**, and with an arrow toward the base case.
- The extension point, which determines when the extended case is appropriate, is written inside the base case.



UML TOOLS

- Lucidchart
- Draw.io
- StarUML
- Visual Paradigm
- etc...

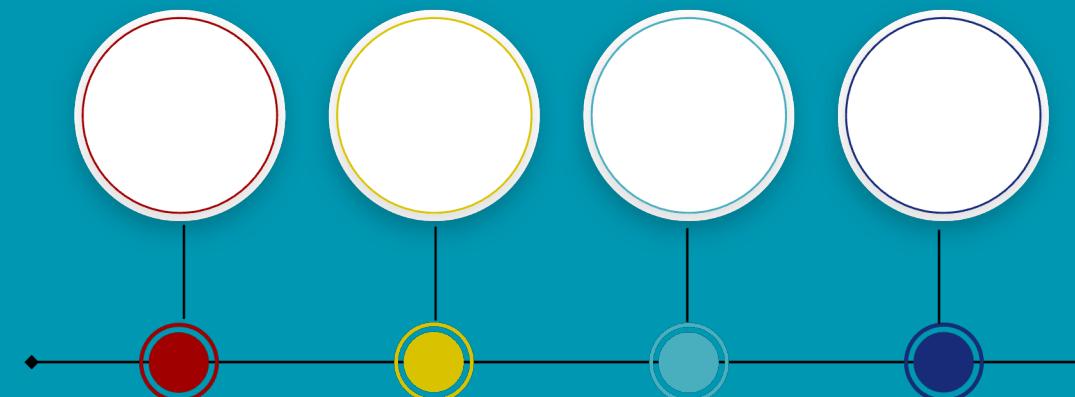


ACTIVITY TIME



CLASS DIAGRAM OVERVIEW

- A class diagram is a structural diagram used in UML that describes the structure of a system.
- It shows the system's classes, their attributes, operations, and the relationships among objects.
- Visualises the static aspect of an application and provides a blueprint for building an object-oriented system.



CLASS DIAGRAM NOTATIONS

Classes:
Class name
Attributes
Methods

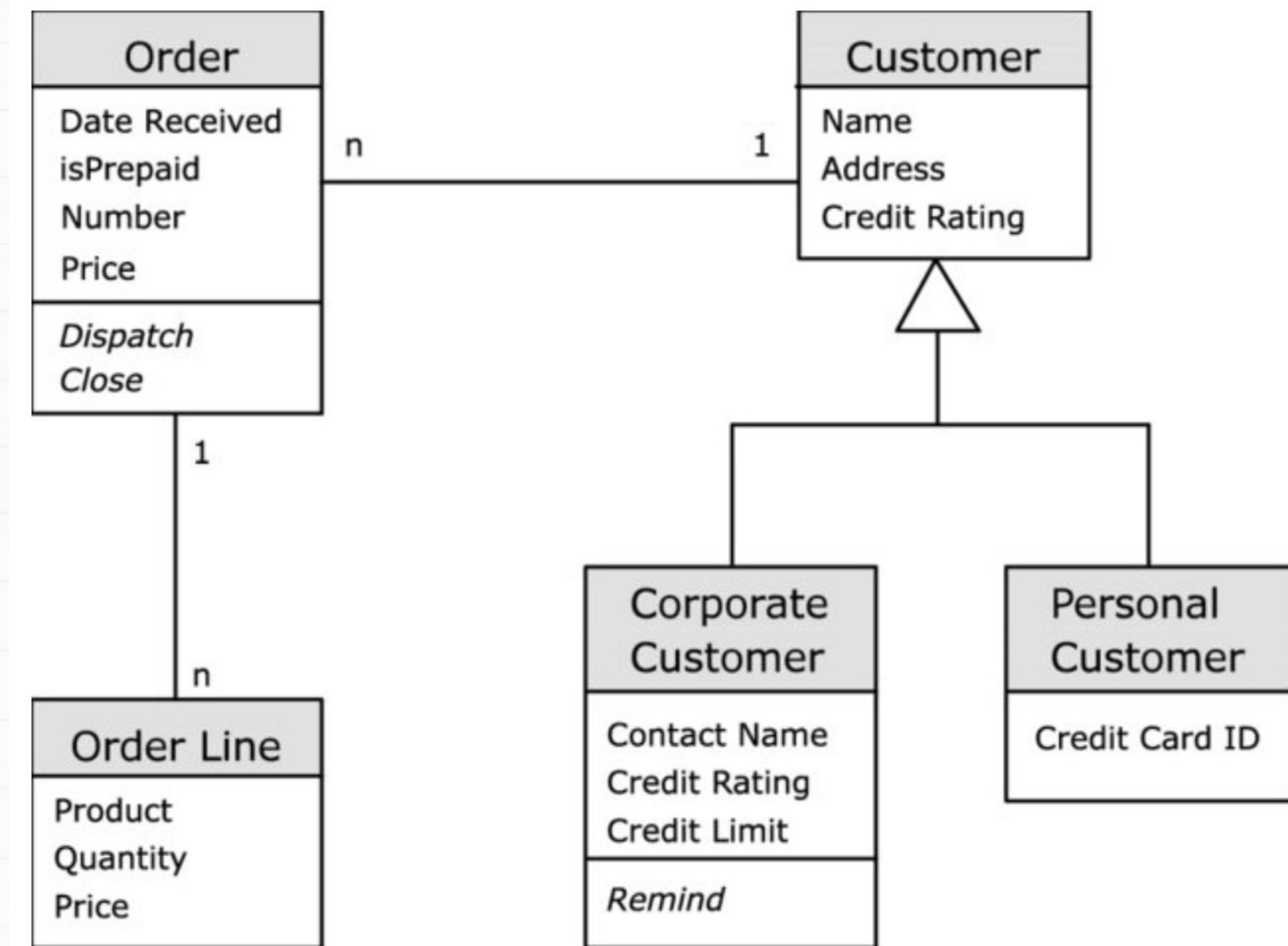
Association:
A connection
between two
classes

Inheritance:
Represents ‘is-a’
relationship
between classes

Aggregation:
Represents
‘whole-part’
relationship

Multiplicity:
Defines how many
instances of a
class can relate
to another

EXAMPLE OF A CLASS DIAGRAM



ACTIVITY TIME



SEQUENCE DIAGRAM OVERVIEW

- A sequence diagram is a type of interaction diagram that shows how objects interact in a particular sequence.
- It illustrates how and in what order messages are exchanged between objects.
- Model the dynamic behaviour of a system.



SEQUENCE DIAGRAM NOTATIONS

Lifeline:
Represents the timeline of an object or actor

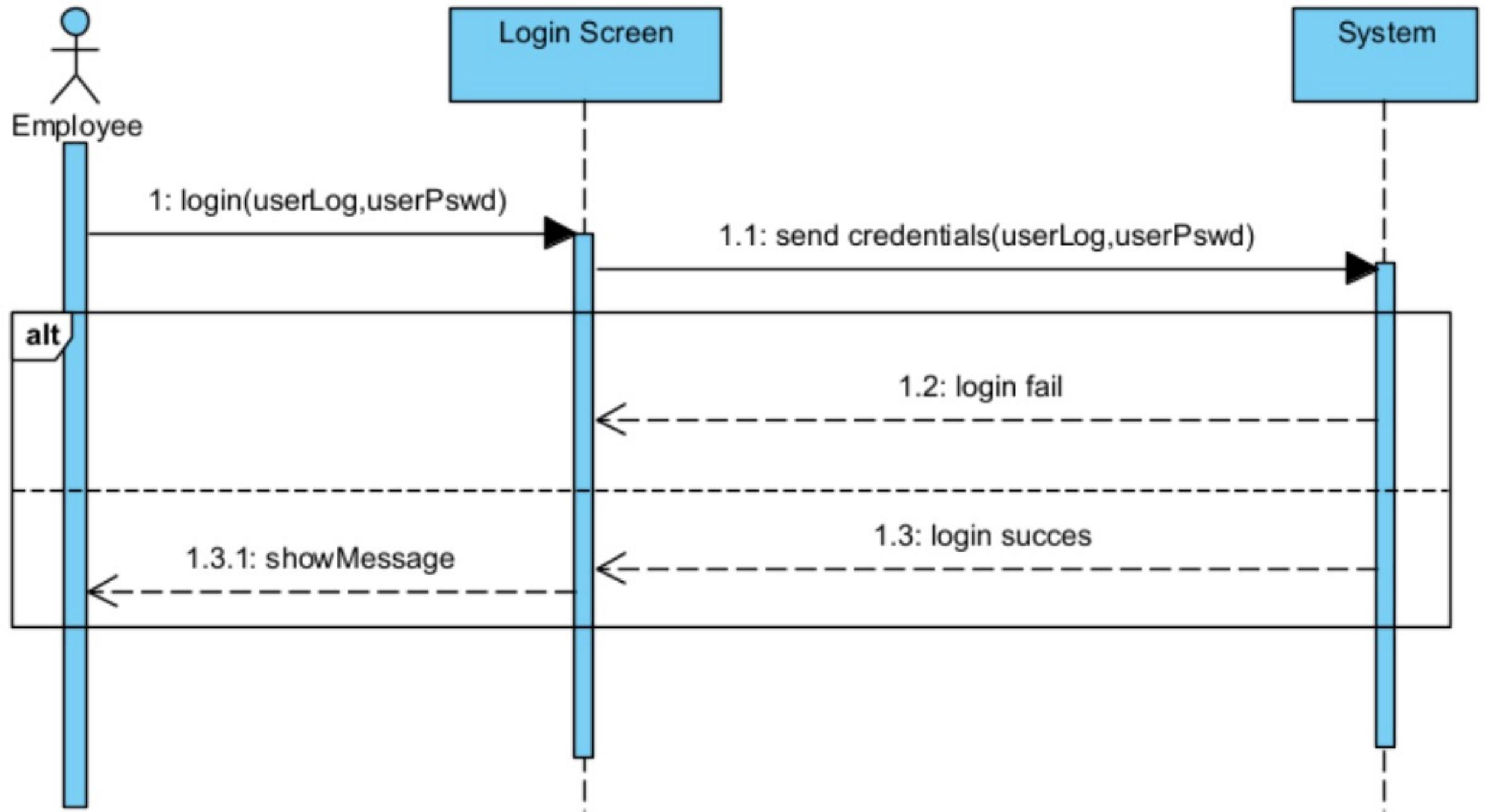
Message:
Arrows showing communication between objects

Activation Bar:
Represents the period an object is active

Synchronous & Asynchronous Messages:
Indicate the type of message communication

Object Creation/Destruction:
Show when objects are created or destroyed in a sequence

EXAMPLE OF A SEQUENCE DIAGRAM



ACTIVITY DIAGRAM OVERVIEW

- Activity Diagrams are used to illustrate the flow of control in a system and refer to the steps involved in the execution of a use case.
- Can depict both sequential processing and concurrent processing of activities using an activity diagram i.e an activity diagram focuses on the condition of flow and the sequence in which it happens.



ACTIVITY DIAGRAM NOTATIONS

Activity: To represent a set of actions

Action: A task to be performed

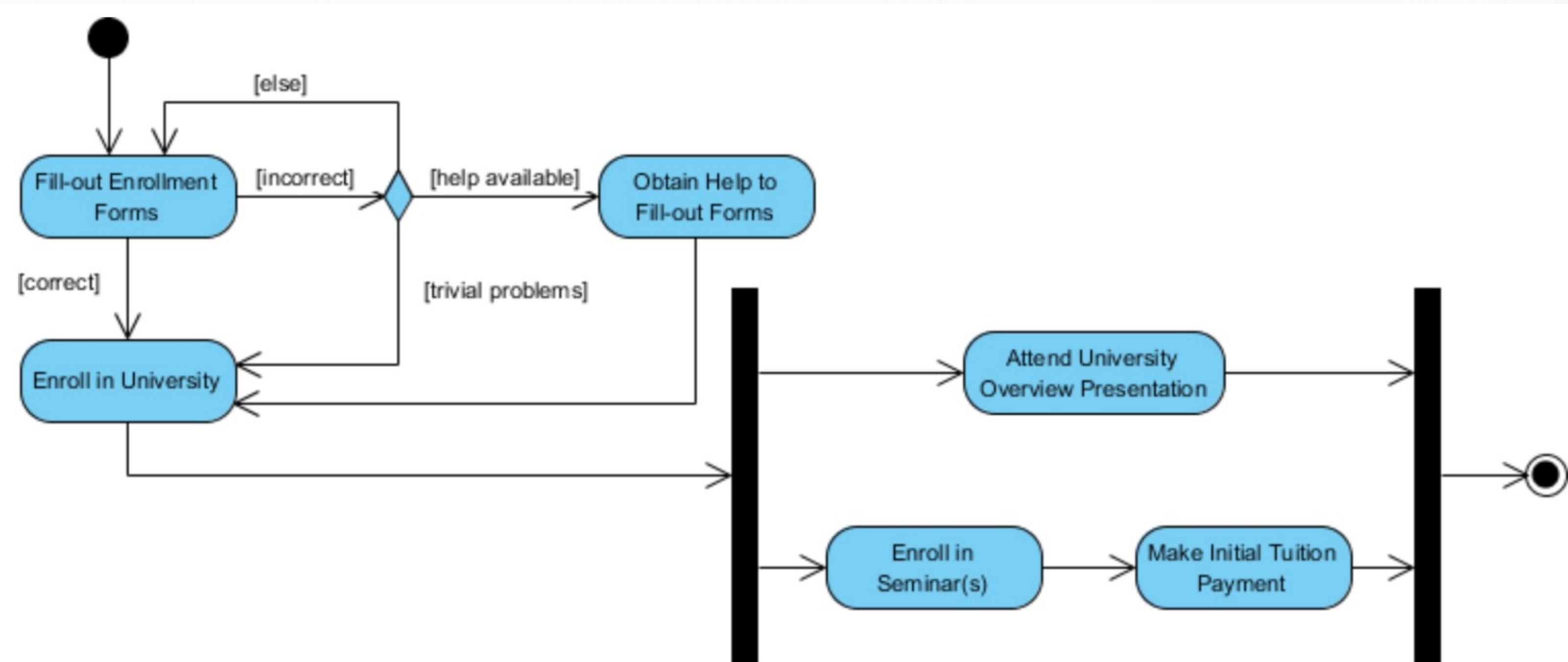
Control/Object flow: Show the sequence of execution

Initial node: the beginning of a set of actions or activities

Final node: Stop all control flows and object flows in an activity

Object node: Represent an object that is connected to a set of Object Flows

EXAMPLE OF AN ACTIVITY DIAGRAM





RECAP ACTIVITY



THANK YOU!

