Object Oriented Analysis and Design with Java

Dr. Kamatchi Priya L
Department of Computer Science and Engineering

Acknowledgements: Significant portions of the information in the slide sets presented through the course in the class, are extracted from the prescribed text books, information from the Internet. Since these are only intended for presentation for teaching within PESU, there was no explicit permission solicited. We would like to sincerely thank and acknowledge that the credit/rights remain with the original authors/creators only

Object Oriented Analysis and Design with Java

Activity Modelling: UML Activity Diagrams, Modelling and Guidelines

Dr. Kamatchi Priya L

Department of Computer Science and Engineering

Interaction Modeling

The interaction model describes how objects interact to produce useful results. It is a holistic view of behavior across many objects

Interactions can be modeled at different levels of abstraction.

- Use Case Model
- Sequence Model
- Activity Model

Interaction Modeling

Use Case Model:

At a high level, use cases describe how a system interacts with outside actors. Each use case represents a piece of functionality that a system provides to its users. Use cases are helpful for capturing informal requirements.

Sequence Model:

Sequence diagrams provide more detail and show the messages exchanged among a set of objects over time. Messages include both asynchronous signals and procedure calls. Sequence diagrams depicts the behavior sequences seen by users of a system.

Interaction Modeling

Activity Model:

- Activity diagrams provide further detail and show the flow of control among the steps of a computation.
- Activity diagrams can show data flows as well as control flows.
- Activity diagrams document the steps necessary to implement an operation or a business process referenced in a sequence diagram.

Activity Diagram

- An activity diagram visually presents a series of actions or flow of control in a system similar to a flowchart or a data flow diagram.
- Activity diagrams are often used in business process modeling. They can also describe the steps in a use case diagram.
- Activities modeled can be sequential and concurrent.
- In both cases an activity diagram will have a beginning (an initial state) and an end (a final state).

Activity Diagram: Notations and Symbols

Initial State or Start Point

A small filled circle followed by an arrow represents the initial action state or the start point for any activity diagram. For activity diagram using swimlanes, make sure the start point is placed in the top left corner of the first column.

Start Point/Initial State

Activity Diagram: Notations and Symbols

Activity or Action State

An action state represents the non-interruptible action of objects. A rectangle with rounded corners represent an activity or an action state.

Activity

Activity Diagram: Notations and Symbols

Action Flow:

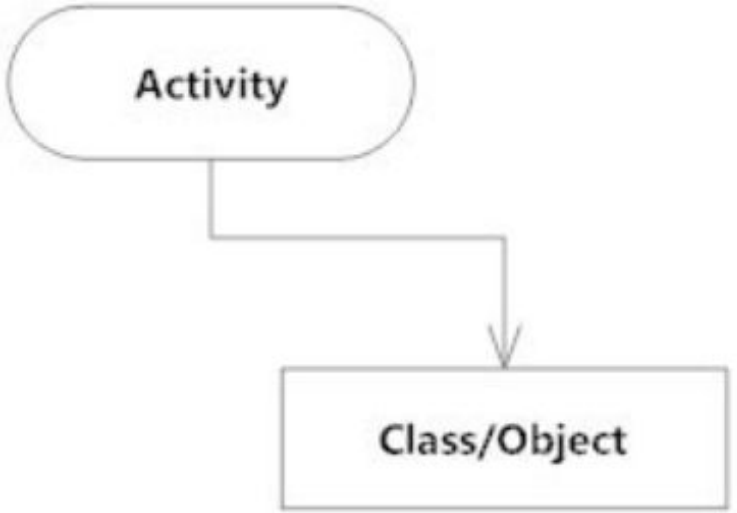
Action flows, also called edges and paths, illustrate the transitions from one action state to another. They are usually drawn with an arrowed line.

Action Flow

Activity Diagram: Notations and Symbols

Object Flow:

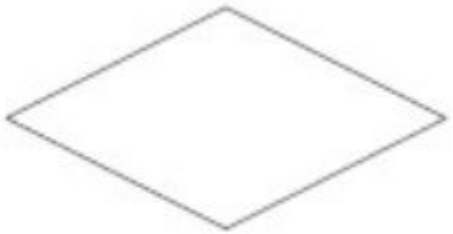
- Object flow refers to the creation and modification of objects by activities.
- An object flow arrow from an action to an object means that the action creates or influences the object.
- An object flow arrow from an object to an action indicates that the action state uses the object.



Activity Diagram: Notations and Symbols

Decisions and Branching:

A diamond represents a decision with alternate paths. When an activity requires a decision prior to moving on to the next activity, add a diamond between the two activities. The outgoing alternates should be labeled with a condition or guard expression. One of the paths can be labeled as "else“.

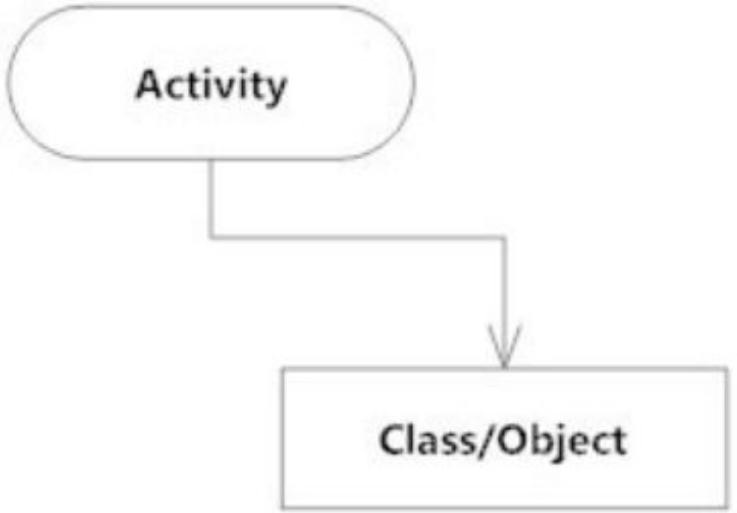


Decision Symbol

Activity Diagram: Notations and Symbols

Object Flow:

Object flow refers to the creation and modification of objects by activities. An object flow arrow from an action to an object means that the action creates or influences the object. An object flow arrow from an object to an action indicates that the action state uses the object.

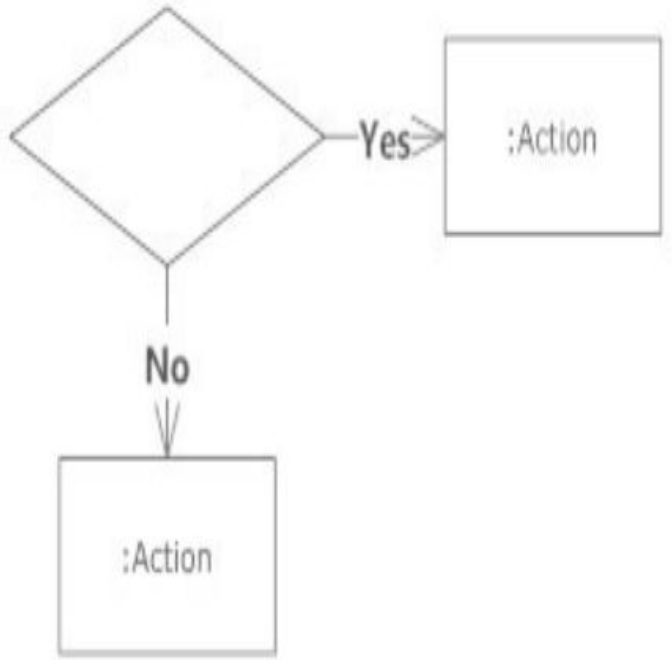


Object Flow

Activity Diagram: Notations and Symbols

Guards:

In UML, guards are a statement written next to a decision diamond that must be true before moving next to the next activity.
These are not essential, but are useful when a specific answer, such as "Yes, three labels are printed," is needed before moving forward.

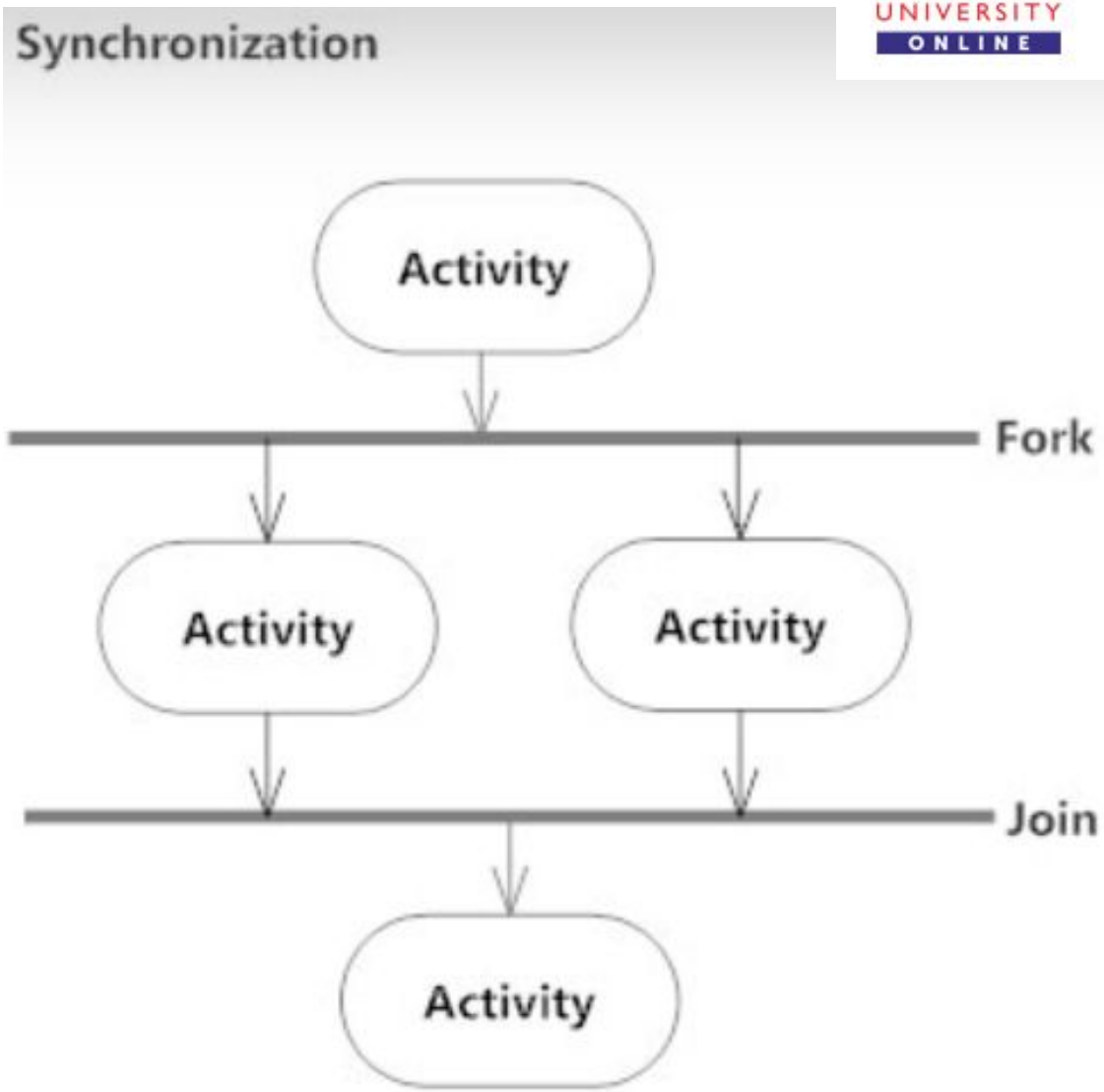


Guard Symbols

Activity Diagram: Notations and Symbols

Synchronization :

- A **fork** is used to split a single incoming flow into multiple concurrent flows. It is represented as a straight, slightly thicker line in an activity diagram.
- A **join** is used to join multiple concurrent flows back into a single outgoing flow.
- A fork and join mode used together are often referred to as synchronization. It helps to show parallel occurrence of activities.



Activity Diagram: Notations and Symbols

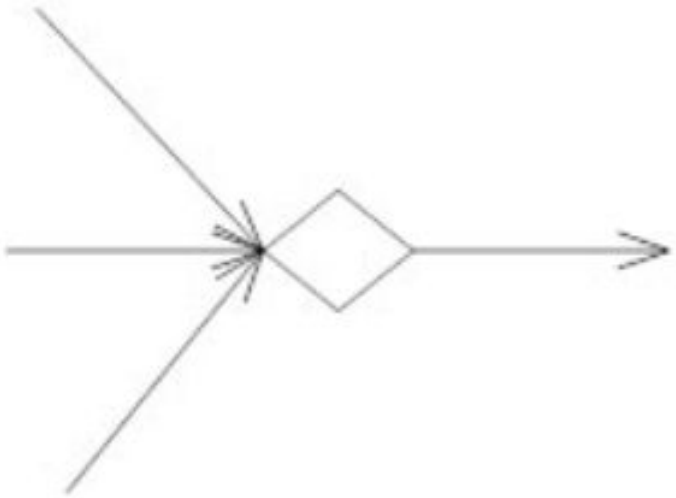
Time Event:

- This refers to an event that stops the flow for a time
- An hourglass depicts it.

Activity Diagram: Notations and Symbols

Merge Event:

A merge event brings together multiple flows that are not concurrent.



Merge

Activity Diagram: Notations and Symbols

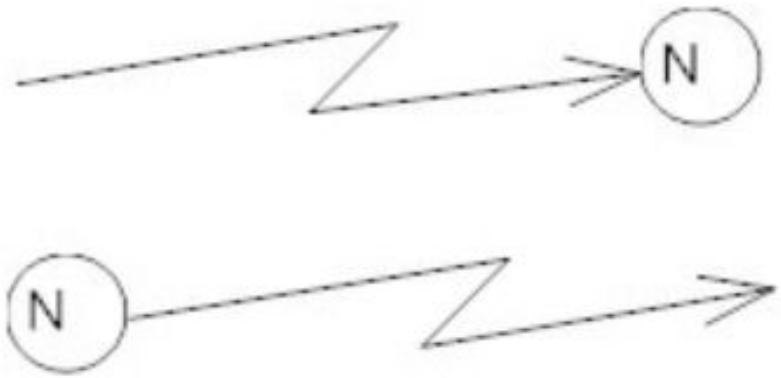
Sent and Received Signals

- Signals represent how activities can be modified from outside the system
- They usually appear in pairs of sent and received signals, because the state can't change until a response is received
- For example, an authorization of payment is needed before an order can be completed

Activity Diagram: Notations and Symbols

Interrupting Edge:

An event, such as a cancellation, that interrupts the flow denoted with a lightning bolt.

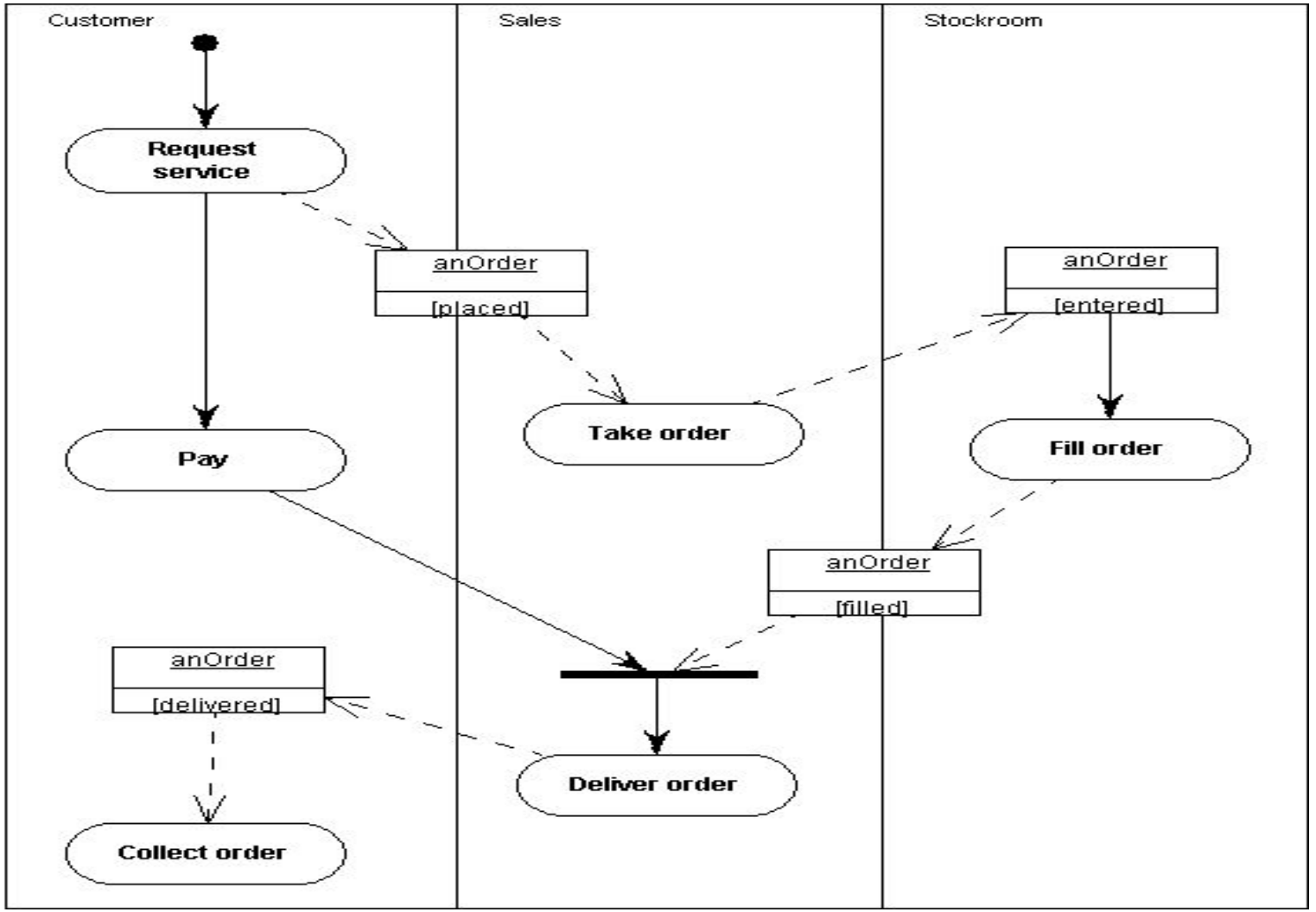


Interrupting Edge Symbols

Activity Diagram: Notations and Symbols

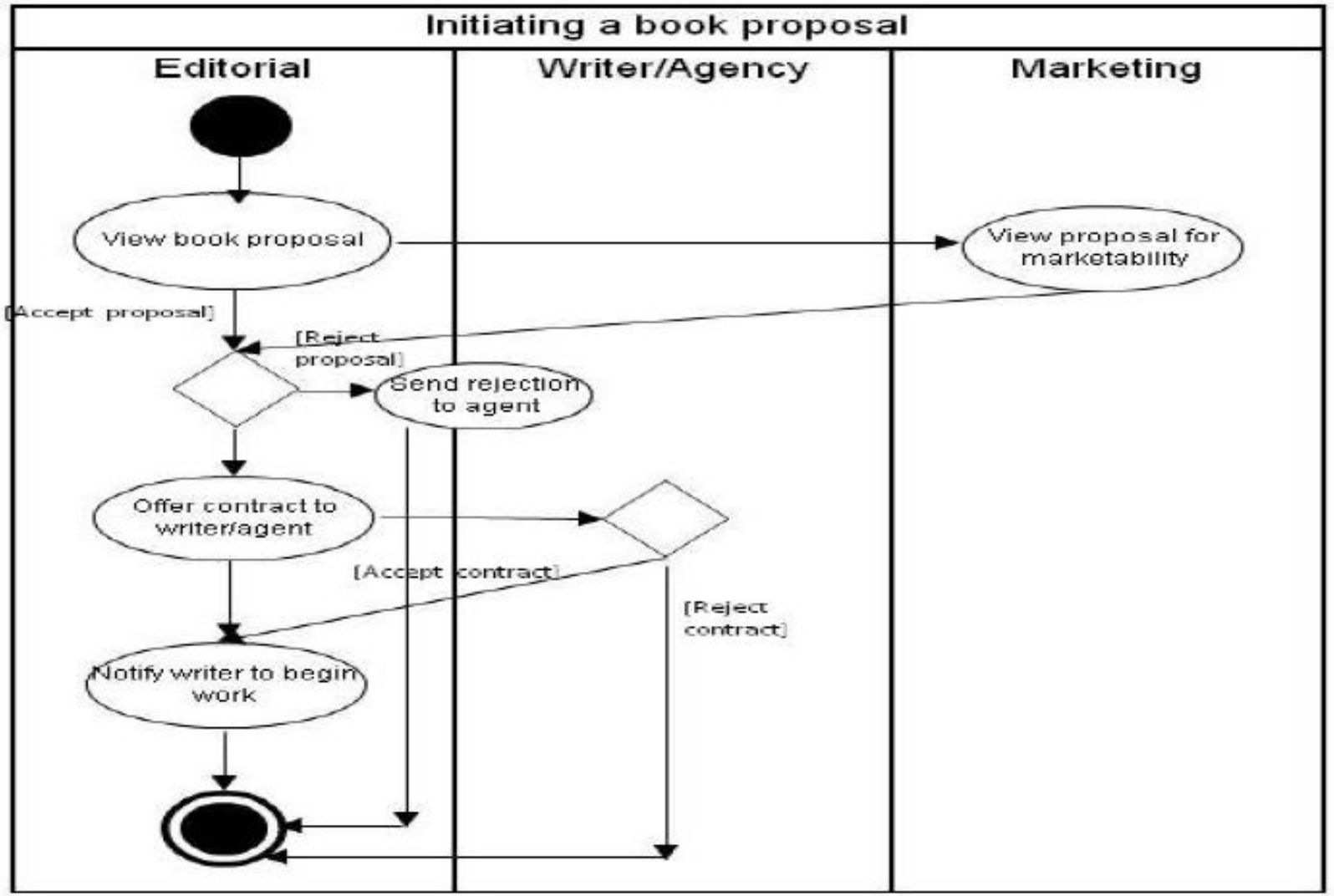
Swimlanes:

Swimlanes group related activities into one column



Activity Diagram: Notations and Symbols

Swimlanes:



Activity Diagram: Notations and Symbols

Final State or End Point

An arrow pointing to a filled circle nested inside another circle represents the final action state.

End Point Symbol

Steps to Construct an Activity Diagram

Step 1: Figure out the action steps from the use case

Here you need to identify the various activities and actions your business process or system is made up of.

Step 2: Identify the actors who are involved

If you already have figured out who the actors are, then it's easier to discern each action they are responsible for.

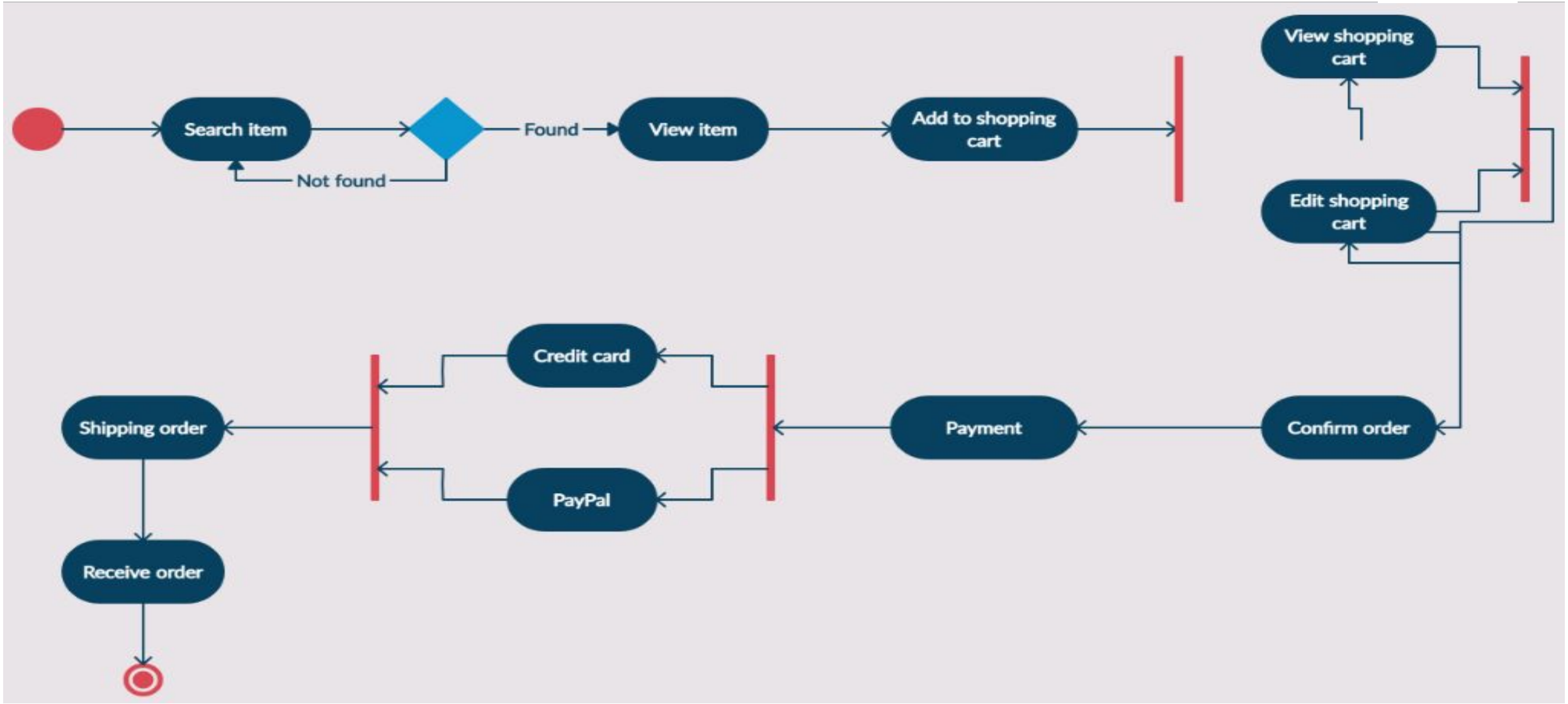
Step 3: Find a flow among the activities

Figure out in which order the actions are processed. Mark down the conditions that have to be met in order to carry out certain processes (which actions occur at the same time, whether you need to add any branches in the diagram, do you have to complete some actions before you can proceed to others?).

Step 4: Add swimlanes

Figure out who is responsible for each action. And assign them to a swimlanes by grouping each action the objects are responsible for, under them.

Online Shopping System



THANK YOU

Dr. Kamatchi Priya L

Department of Computer Science and Engineering

priyal@pes.edu