Object Oriented Development with Java

(CT038-3-2 and Version VC1)

Activity Diagram

System Modeling

Topic & Structure of The Lesson

- Activity diagram

Learning outcome

- At the end of this lesson, you will be able to:
  - Model a system using an activity diagram

Key terms you must be able to use

If you have mastered this topic, you should be able to use the following terms correctly in your assessments:

-activity diagram(symbols and connectors)

Activity Diagram

- Activity diagrams show a procedure or workflow
- used in process modeling and analysis during requirements engineering
- show a sequence of activities with alternate paths, and/or parallel paths

Activity Diagram

- Used for:
  - documenting existing process
  - analyzing new Process Concepts
  - finding reengineering opportunities

- The diagrams describe the state of activities by showing the sequence of activities performed
  - they can show activities that are conditional or parallel

Activity Diagram Concepts

- An activity is trigged by one or more events. An activity may result in one or more events that may trigger other activities or processes.

- Events start from start symbol and end with finish marker and have activities in between that are connected by events.

- The activity diagram represents the decisions, iterations and parallel/random behavior of the processing.
  - They capture actions performed.
  - They stress on work performed in operations (methods).

Activity Diagram

- After you have created the Use Cases, you can use Activity Diagrams to graphically show the activities or workflows within the Use Cases
- You can use this to provide a graphical view that compliments the Use Case scenarios
- There is one Activity Diagram for each use case

Activity Diagram

Activity diagrams include the following elements:

- Activities
- Decision
- Split of control
- Merge of control
- Iteration
- Object flow
- Swimlanes

Components

- An *activity* is an ongoing, though interruptible, execution of a step in a workflow (such as an operation or transaction)
  - Represented with a rounded rectangle
  - Text in the activity box should represent an activity (verb phrase in 

Components

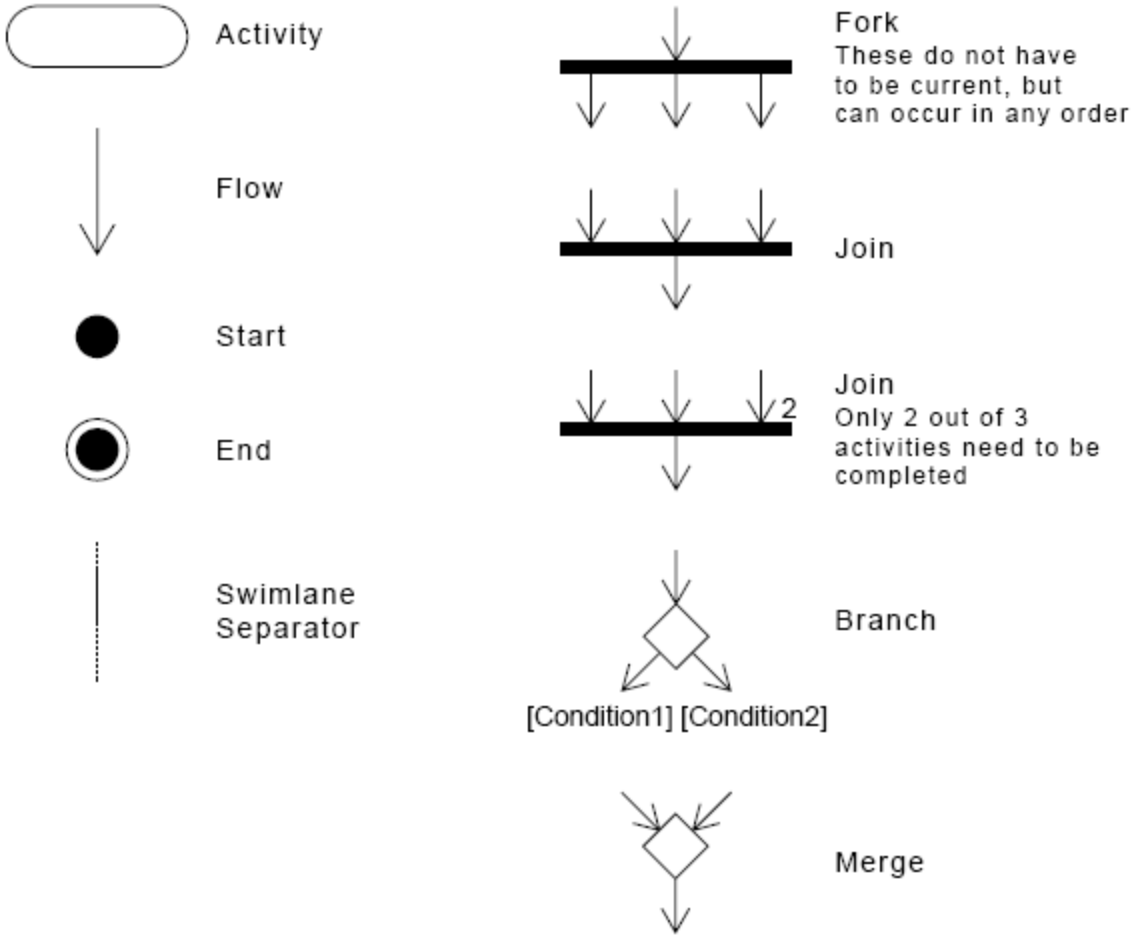
- An *event* is triggered by an activity. It specifies a significant occurrence that has a location in time and space.
  - An instance of an event (trigger) results in the flow from one activity to another.

  - These are represented by directed straight lines emerging from triggering activity and ending at activity to be triggered. Label text for events should represent event but not the data involved.

Components

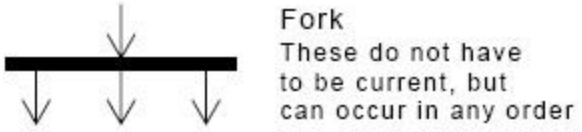
- A *decision* may be shown by labeling multiple output transitions of an activity with different guard conditions.
  - For convenience a stereotype is provided for a decision: the traditional diamond shape, with one or more incoming arrows and with two or more outgoing arrows, each labeled by a distinct guard condition with no event trigger.

Activity Diagram Notation

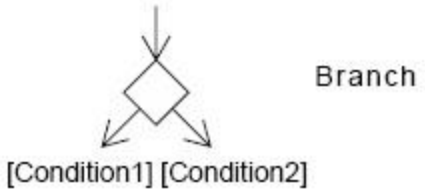


Interpreting an Activity Diagram

- Diagrams are read from top to bottom and have branches and forks to describe conditions and parallel activities.
  - A fork is used when multiple activities occur at the same time.

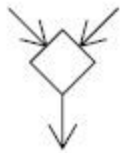


  - A branch describes what activities will take place based on a set of conc



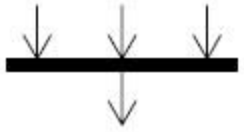
Interpreting an Activity Diagram

- Diagrams are read from top to bottom and have branches and forks to describe conditions and parallel activities.
  - All branches at some point are followed by a merge to indicate the end of the conditional behaviour started by tha

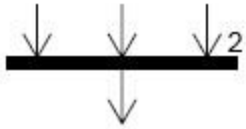


Merge

  - After the merge all of the parallel activities must be combined by a join before transitioning into the final activity state.

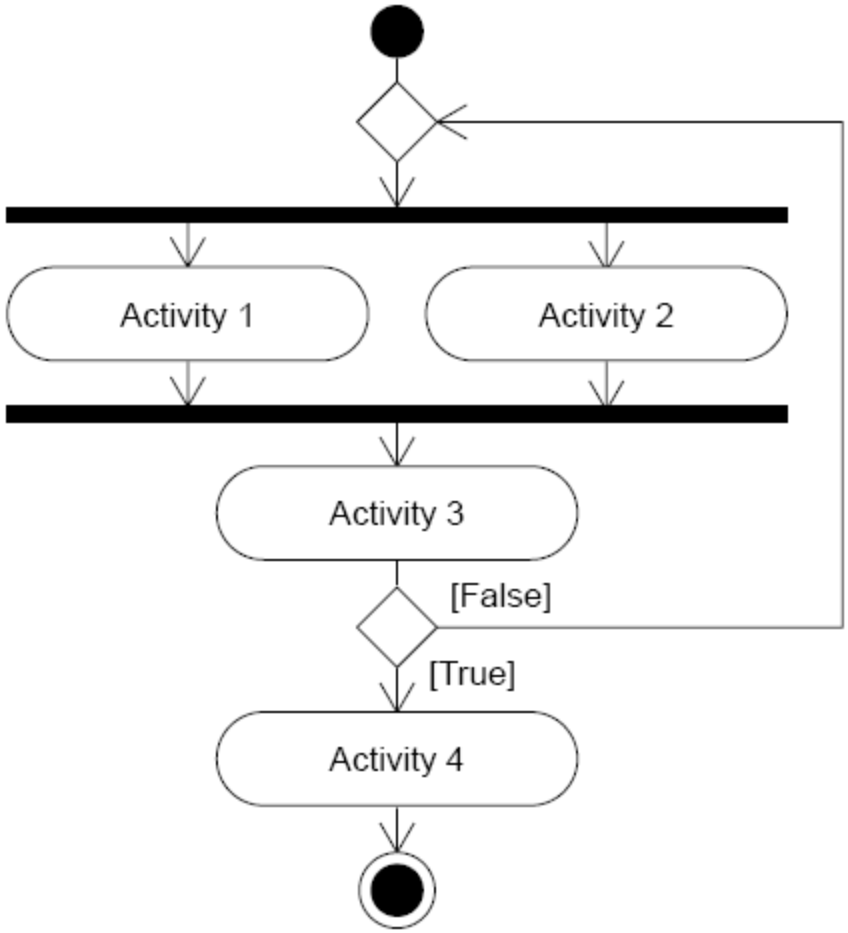


Join

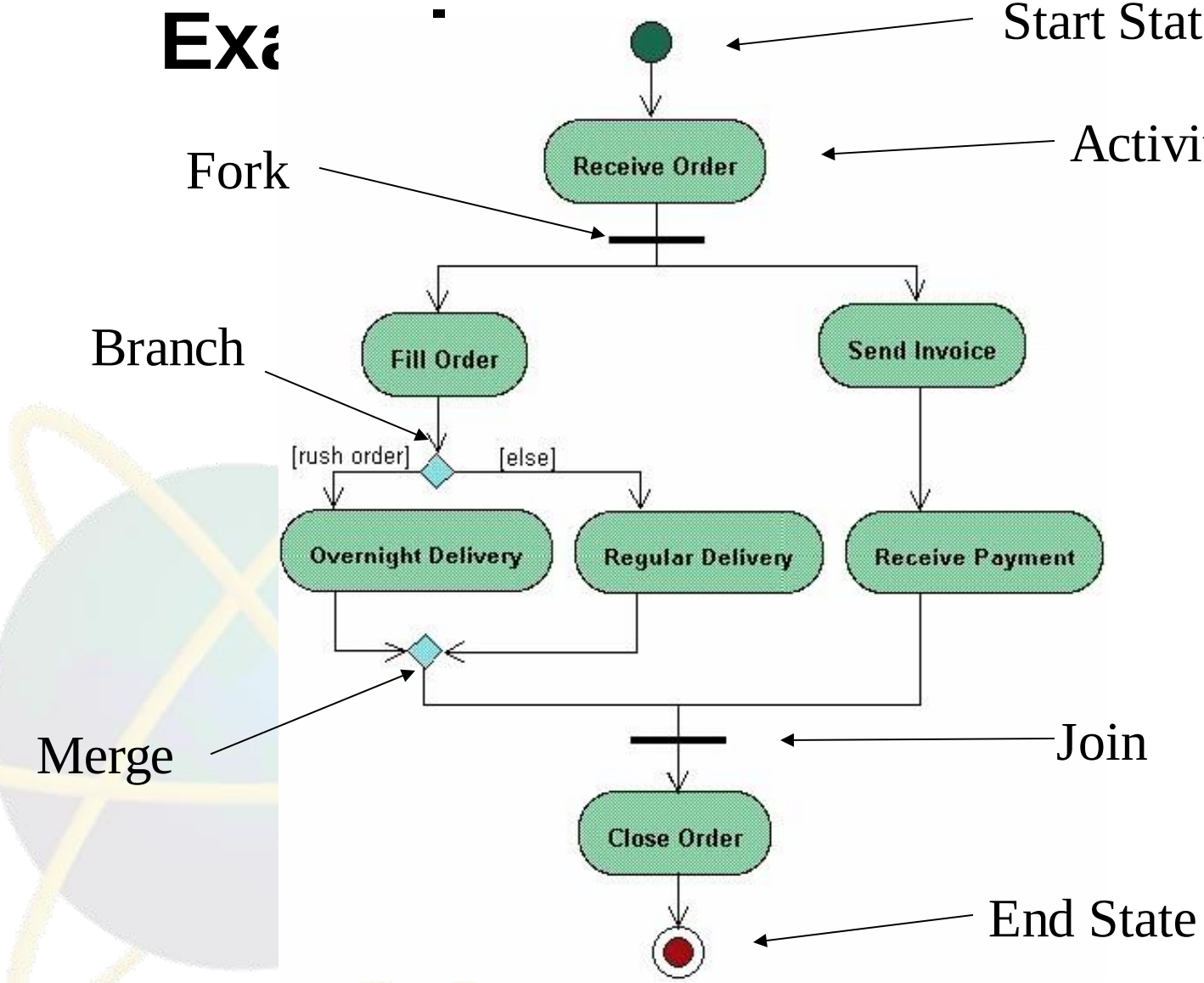


Join
Only 2 out of 3 activities need to be completed

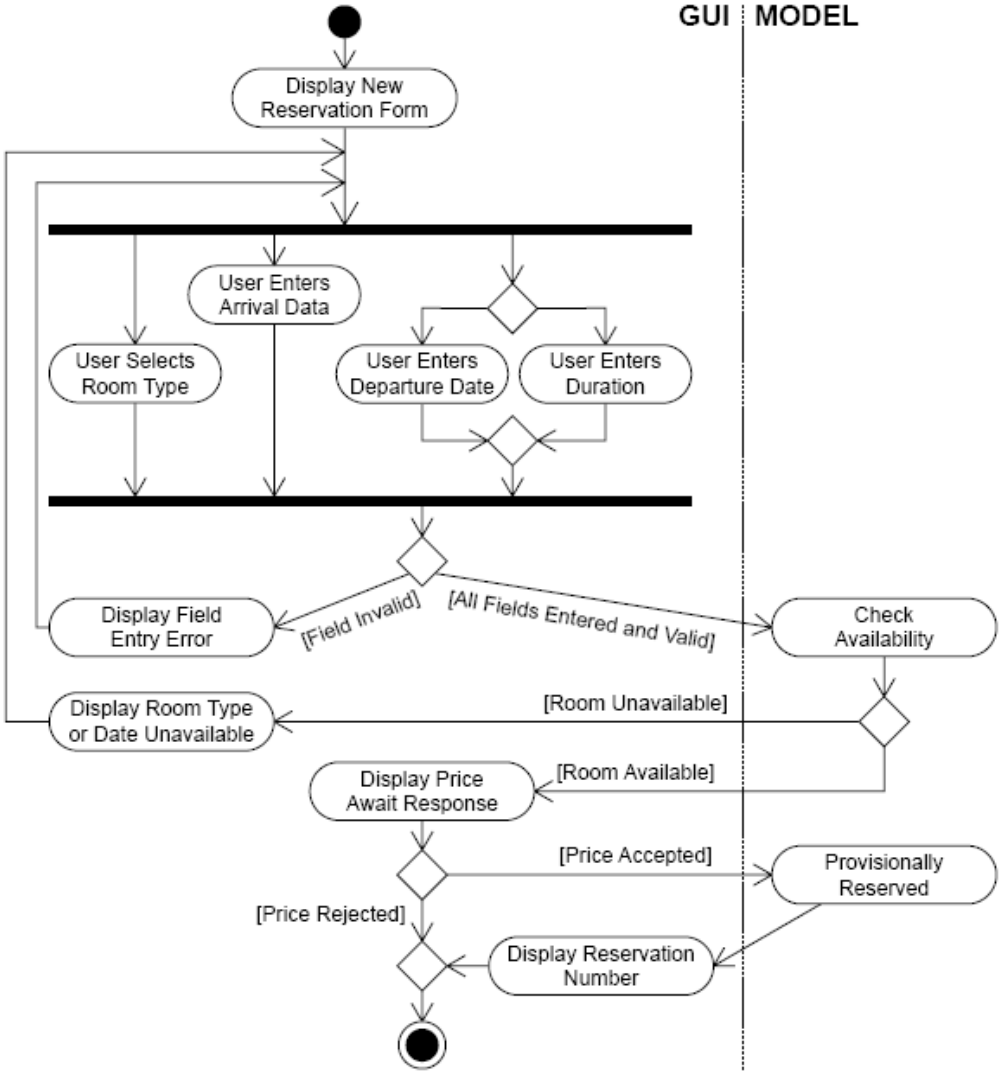
Example of a generic Activity Diagram



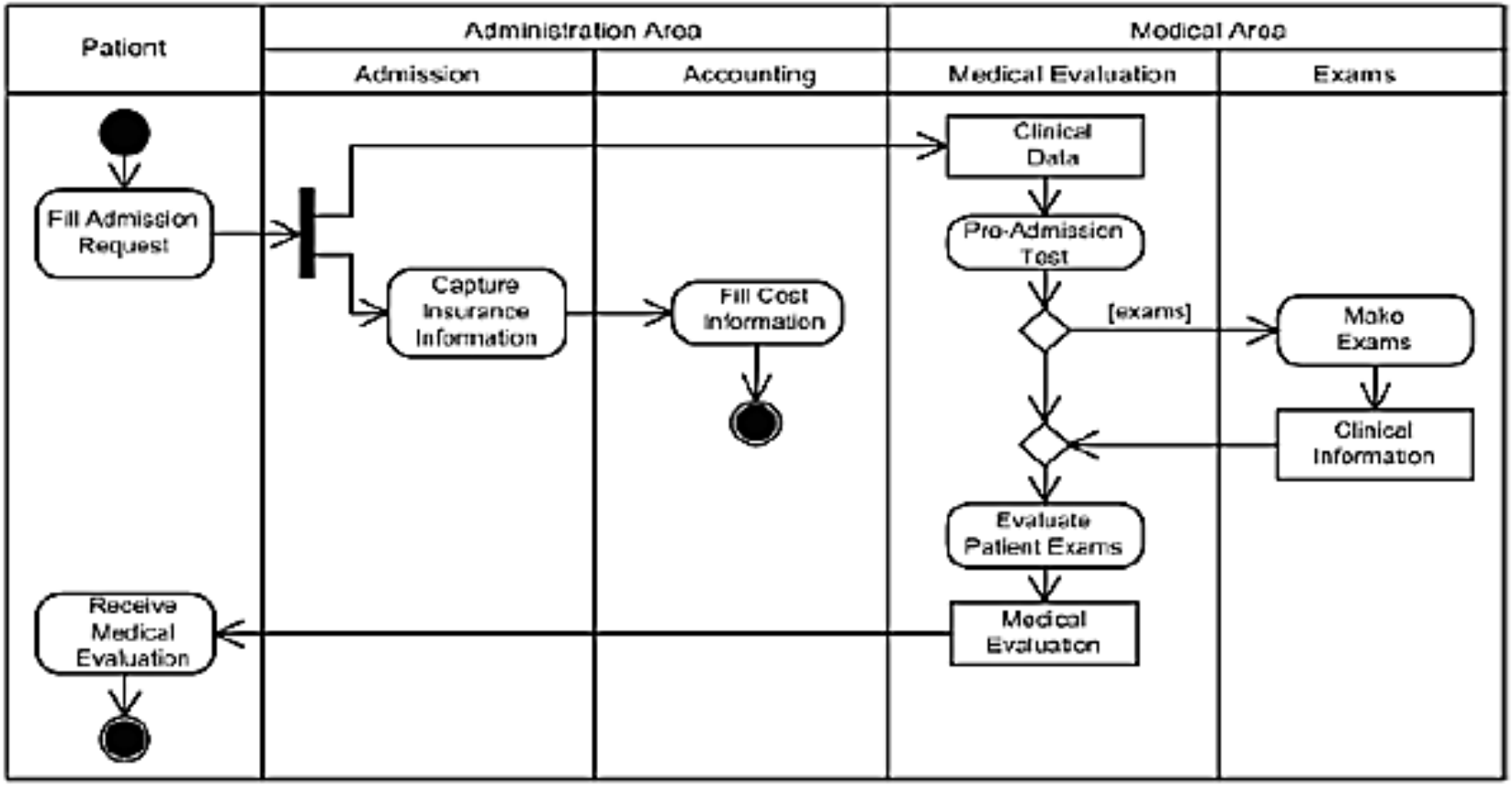
Activity Diagram Exa



Activity Diagram for a New Reservation Use Case



Activity Diagram for Admission of Patients



Steps to Create an Activity Diagram

1. Select a use case
2. Add activities to the diagram
3. Add flows
4. Add conditions, if necessary
5. Add synchronization bars, if necessary

Activity Diagrams in the Design Phase

- Activity diagrams are not used often in the Design phase. They tend to be used when they can highlight features that the other dynamic view cannot show
- As the name suggests, they are useful for:
  - Emphasizing activities
  - Showing parallel behavior

Activity Diagrams in the Design Phase

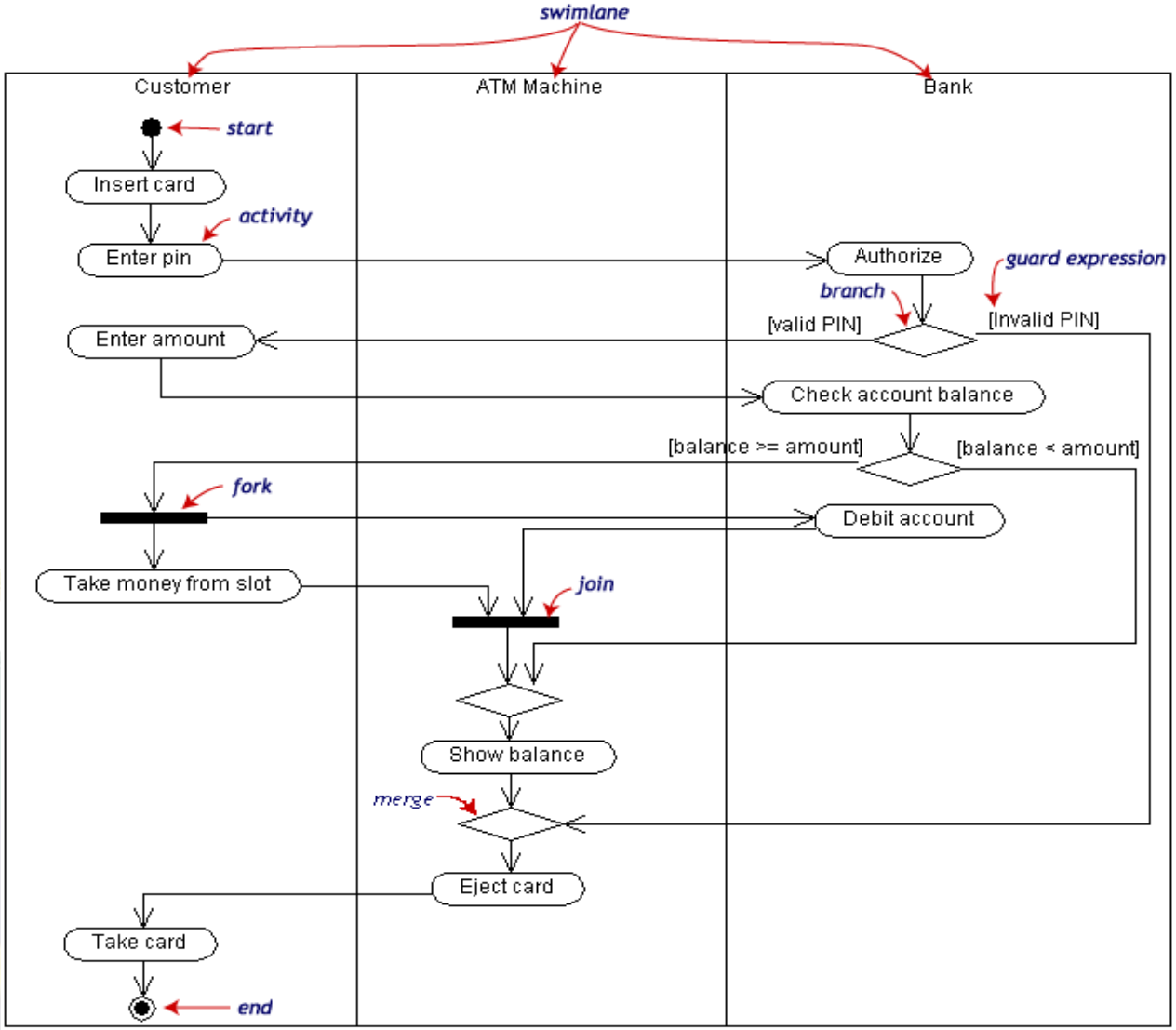
- Activity diagrams can be drawn or redrawn if needed to support activities that are new or changed by the impact of design
- You can add detail, add, or change swimlanes
- For example, you could put the GUI, event handlers, and data persistence objects into a swimlane

When to Use Activity Diagrams

- The main reason to use activity diagrams is to model the workflow behind the system being designed
- Activity Diagrams are also useful for:
  - analyzing a use case by describing what actions need to take place and when they should occur
  - describing a complicated sequential algorithm
  - modeling applications with parallel processes
- Activity Diagrams should not take the place of interaction diagrams and state diagrams
- Activity diagrams do not give detail about how objects behave or how objects collaborate

Use Case

- Withdraw money from a bank account through an ATM


swimlane
Customer
ATM Machine
Bank
start
Insert card
activity
Enter pin
Authorize
guard expression
branch
[valid PIN]
[Invalid PIN]
Enter amount
Check account balance
[balance >= amount]
[balance < amount]
fork
Debit account
Take money from slot
join
Show balance
merge
Eject card
Take card
end

Disadvantage

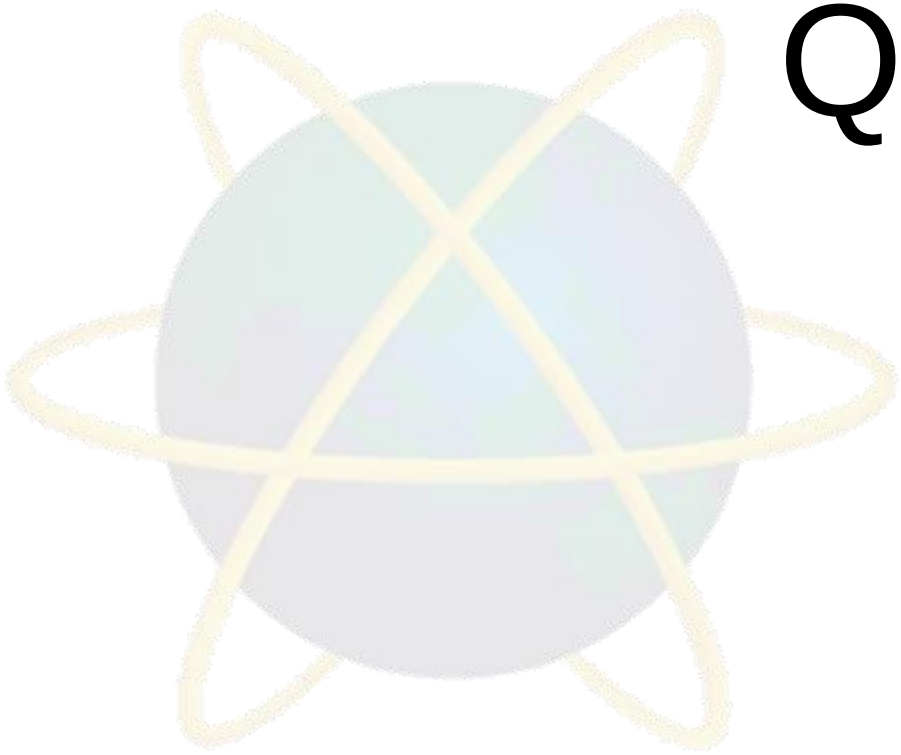
- A disadvantage of activity diagrams is that they do not explicitly present which objects execute which activities, and the way that the messaging works between them
  - Labeling of each activity with the responsible object can be done
  - It is useful to draw an activity diagram early in the modeling of a process, to help understand the overall process
- Then interaction diagrams can be used to help you allocate activities to classes.

Quick Review Questions

- What is an activity diagram?
- What are the components of an activity diagram?
- Draw the activity diagram for borrowing a book from the library

Summary of Main Teaching Points

-Activity diagram and its components



Q & A