Object-Oriented Design

Lecturer: Raman Ramsin

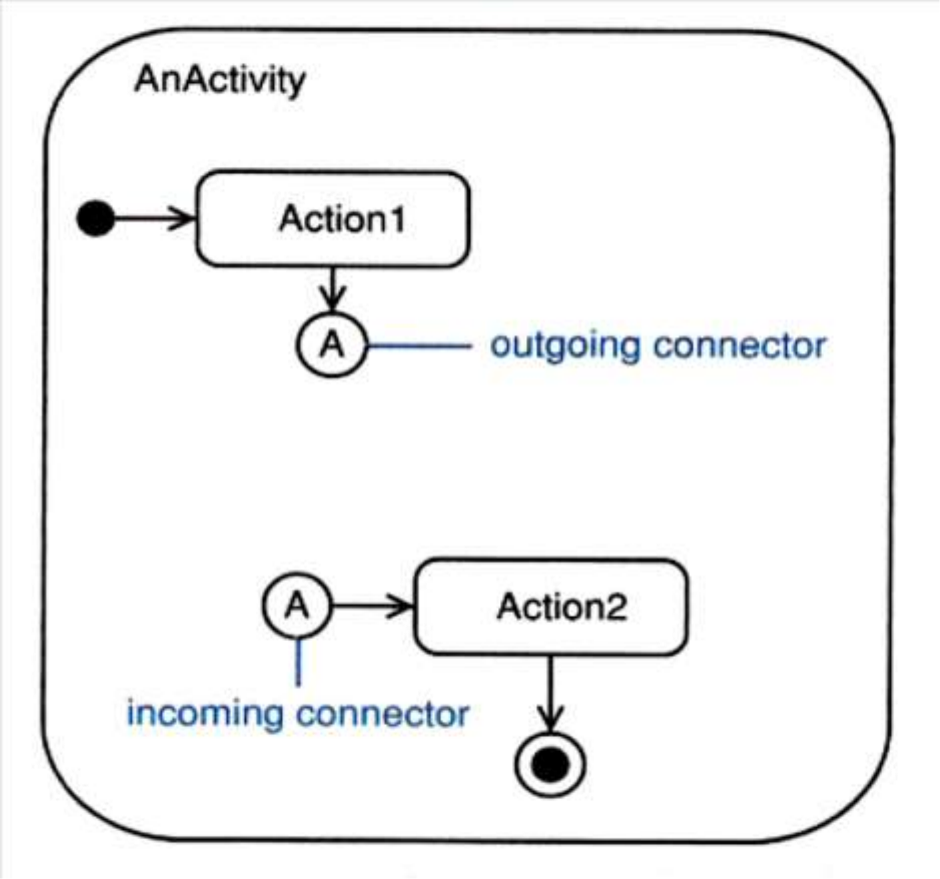
Lecture 12:

Activity Diagrams – Part 2

Analysis Workflow: *Analyze a Use Case*

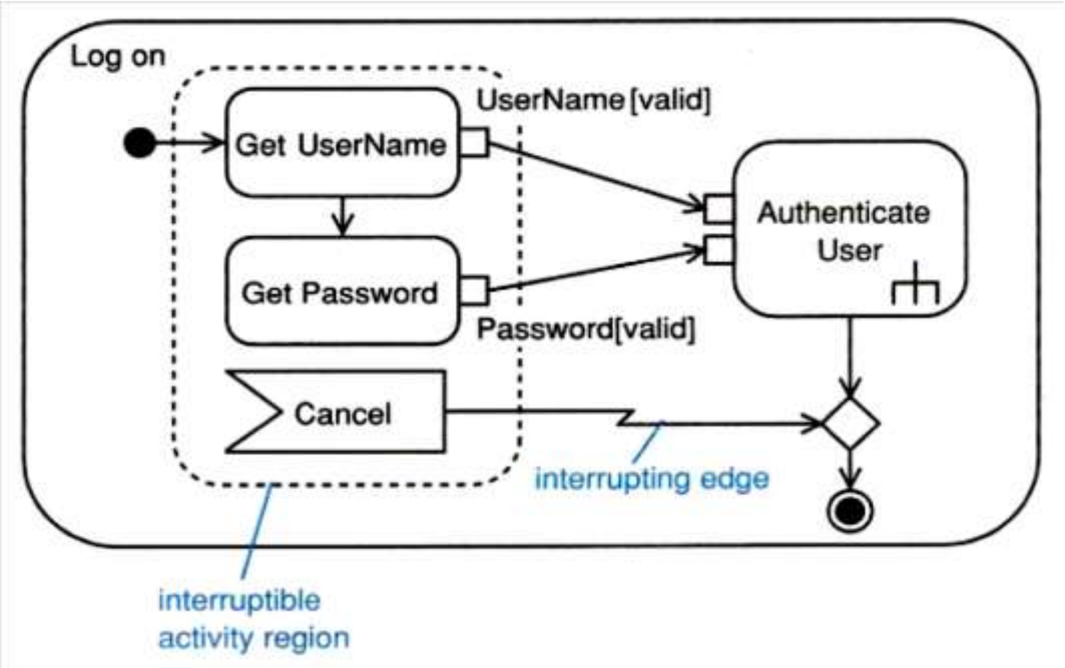
- The *analysis workflow* consists of the following activities:
  - □ Architectural analysis
  - □ **Analyze a use case**
    - **Outputs:**
      - □ **analysis classes**
      - □ **use case realizations**
  - □ Analyze a class
  - □ Analyze a package

Connectors


AnActivity
Action1
A
outgoing connector
A
Action2
incoming connector

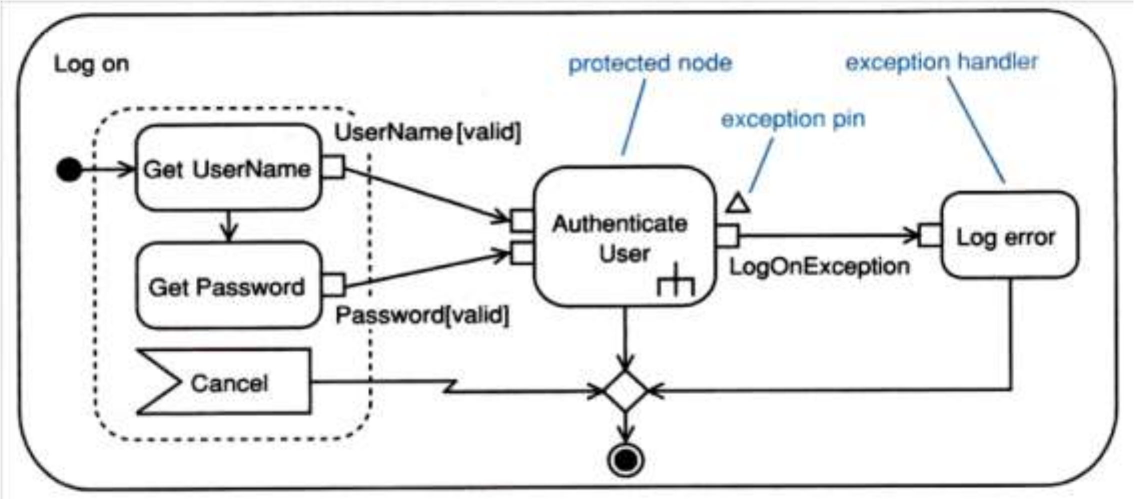
Interruptible Activity Regions

- interrupted when a token traverses an interrupting edge.
- all flows in the region are aborted when it is interrupted.
- interrupting edges are drawn as a zigzag arrow or as a normal arrow with a zigzag icon above it.



Exception Handling

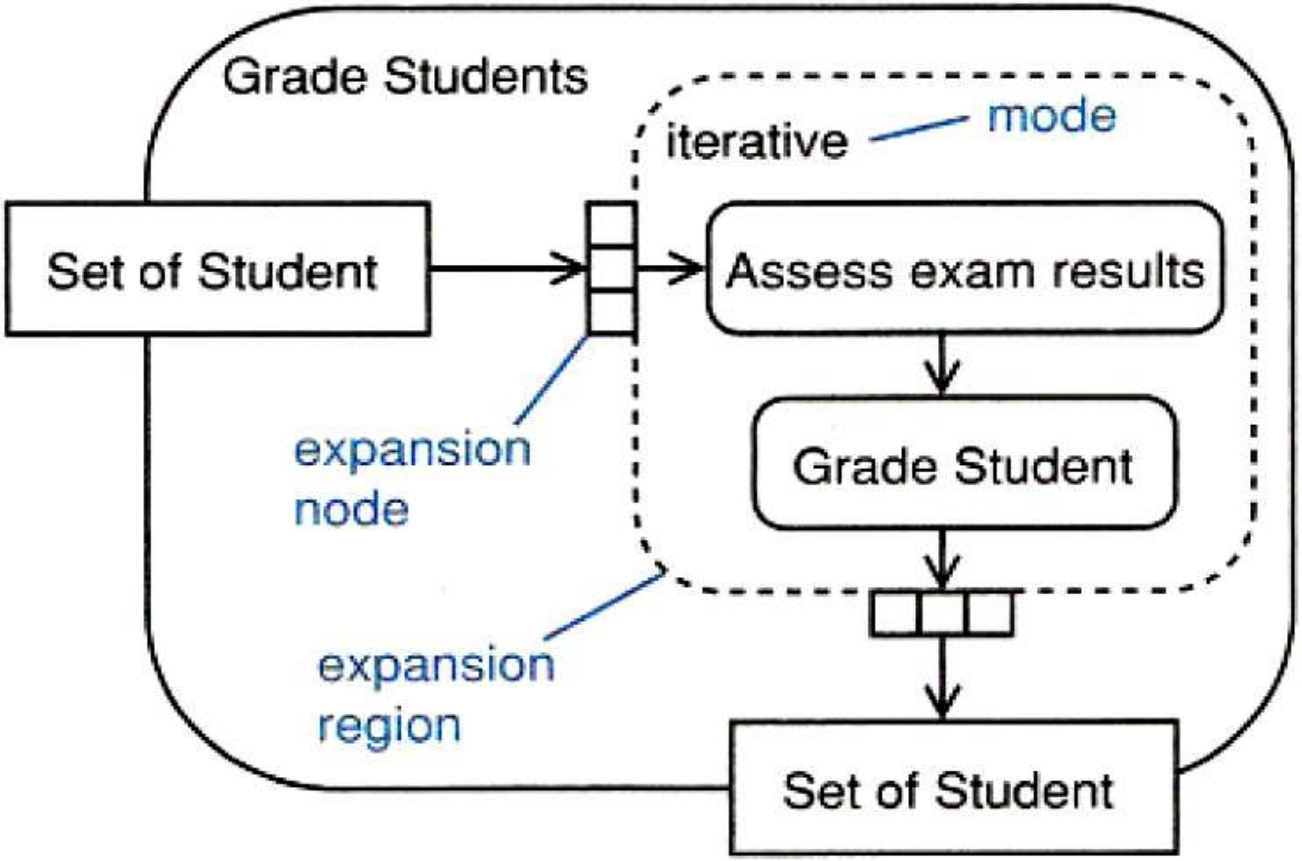
- Exception pins:
  - output an exception object from an action;
  - are indicated with an equilateral triangle.
- Protected nodes:
  - have an interrupting edge leading to an exception handler;
  - abort when an exception of the right type is raised, and flow passes to the exception handler node.



Expansion Nodes

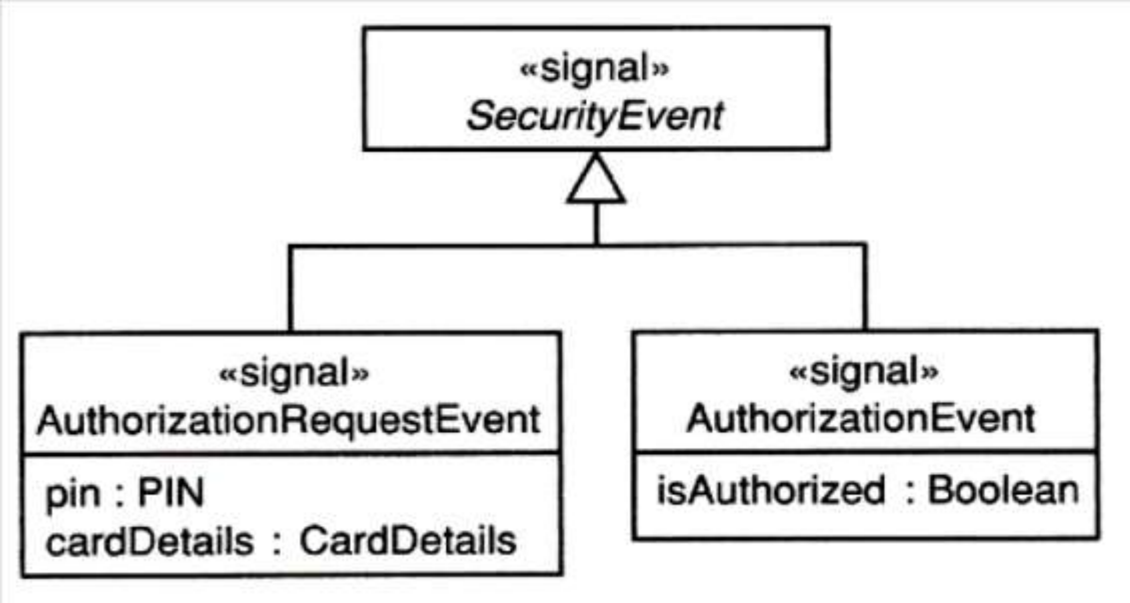
- Represent a collection of objects flowing into or out of an expansion region.
- The region is executed once per input element.
- Constraints:
  - the type of the output collection *must* match the type of the input collection;
  - the type of object held in the input and output collections *must* be the same.
- Modes:
  - **Iterative** - process each element of the input collection sequentially;
  - **Parallel** - process each element of the input collection in parallel;
  - **Stream** - process each element of the input collection as it arrives at the node;
  - there is no default mode.

Expansion Nodes: Example



Sending Signals and Accepting Events

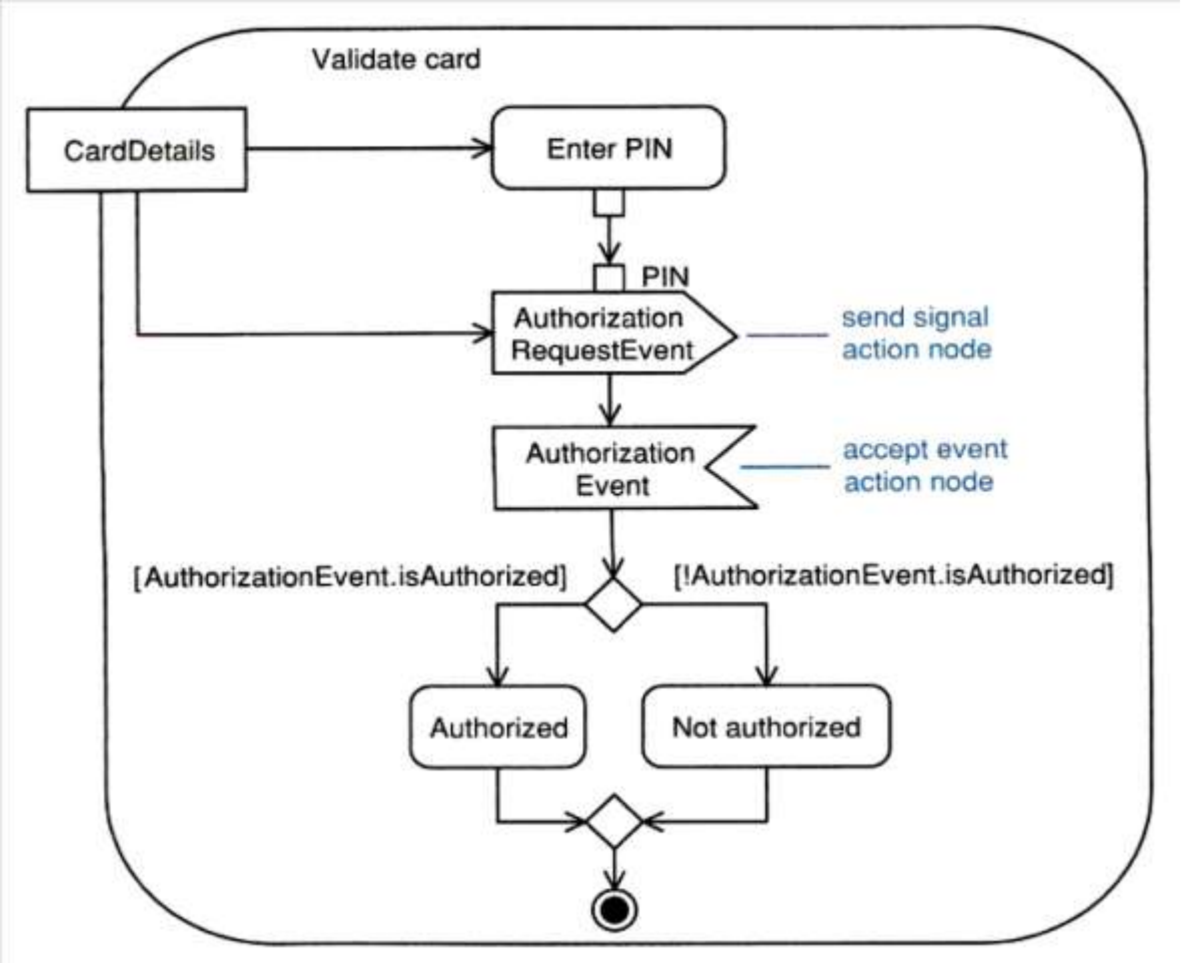
- Signals:
  - information that is passed asynchronously between objects;
  - class stereotyped «signal»;
  - the information is held in the attributes.

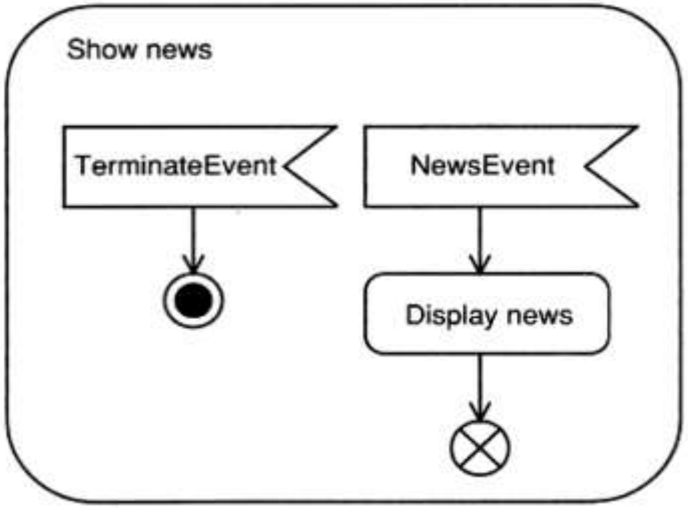


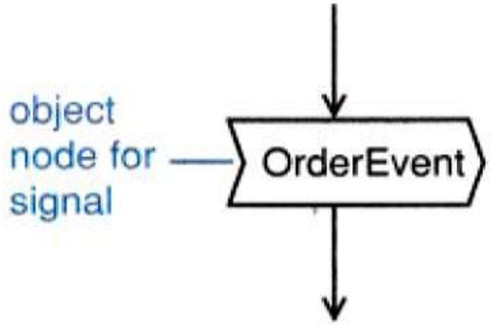
Sending Signals and Accepting Events: Action Nodes

- **Send Signal** action node:
  - starts when there is a token on all input pins;
  - executes - a signal object is constructed and sent;
  - then ends and offers control tokens on its output edges.
- **Accept Event** action node:
  - started by an incoming control edge *or* if no incoming edge, when its owning activity starts;
  - waits for an event of the specified type:
  - outputs a token that describes the event;
  - continues to accept events while the owning activity executes;
  - for a signal event, the output token is a signal.

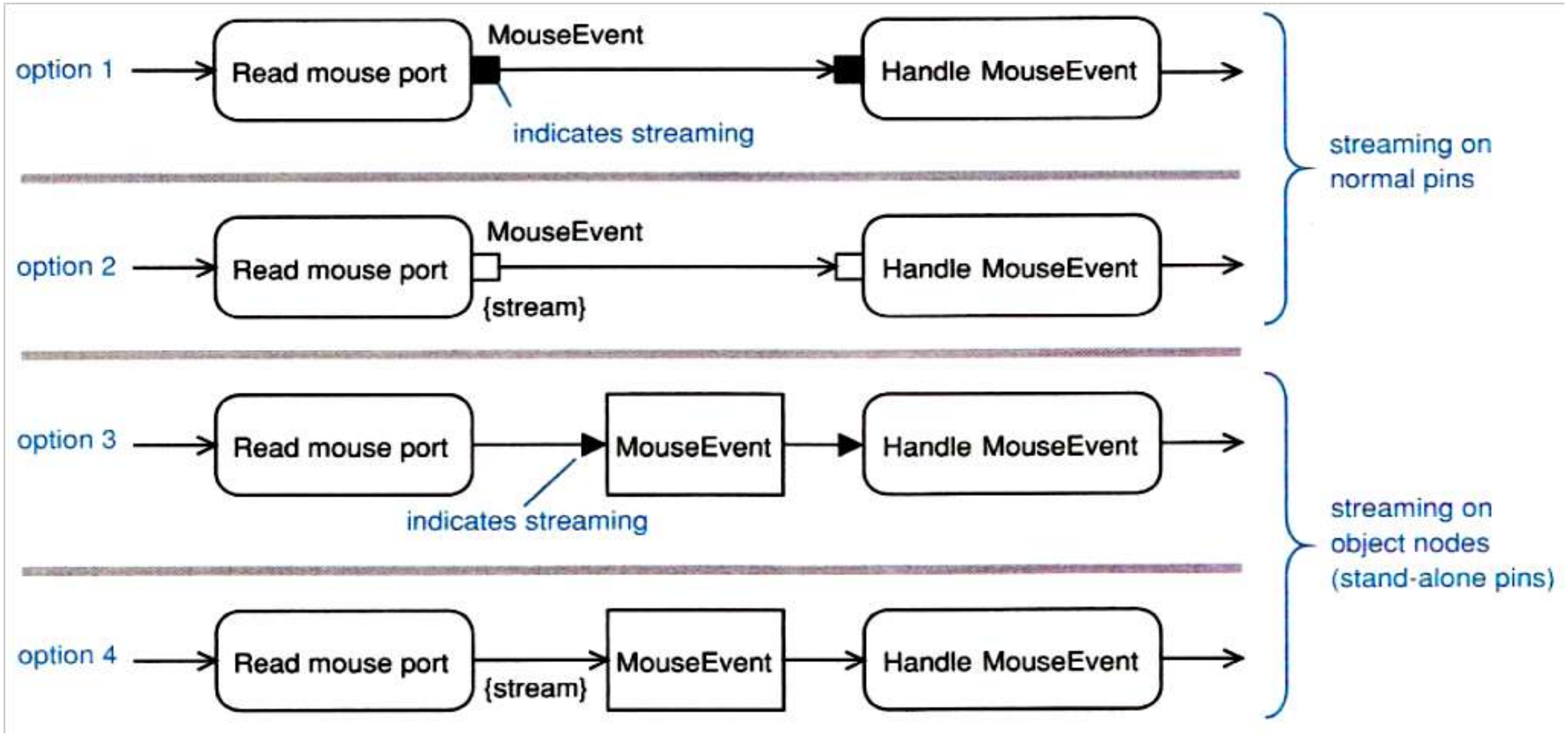
Sending Signals and Accepting Events: Examples







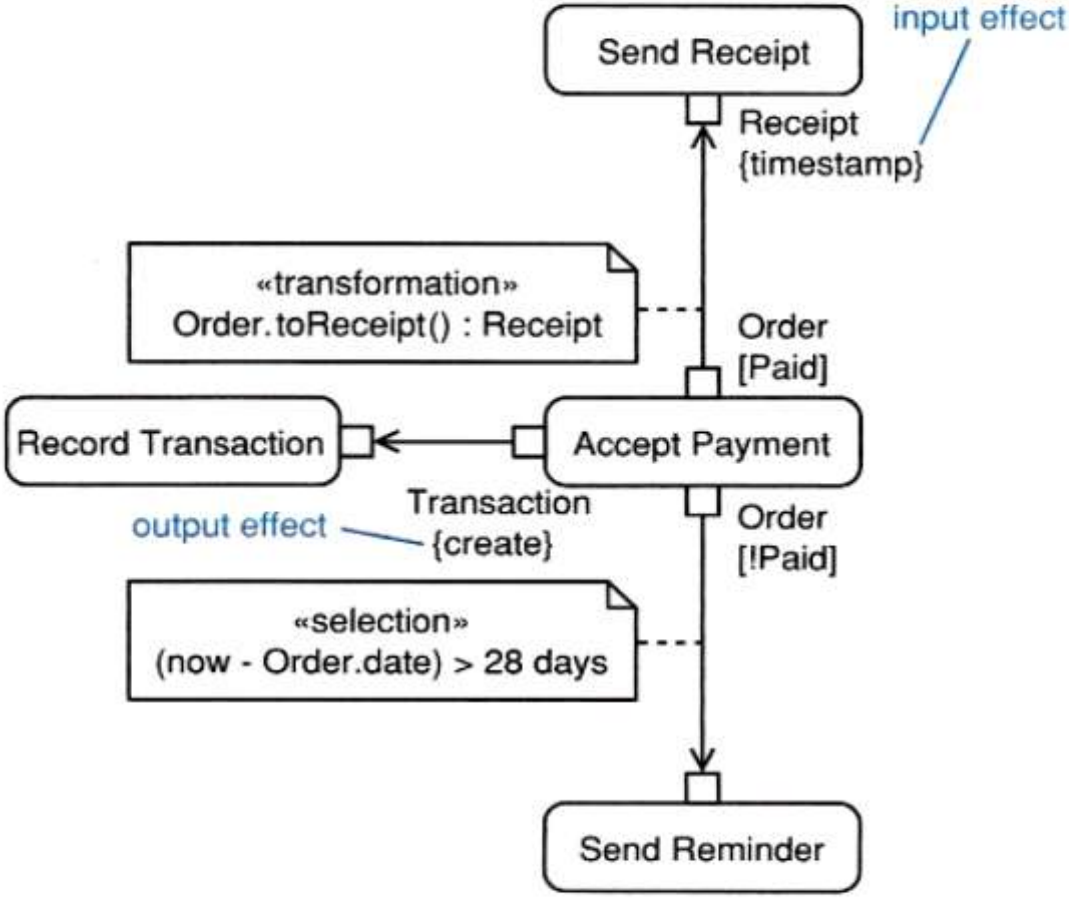
Streaming


option 1
Read mouse port
MouseEvent
Handle MouseEvent
indicates streaming
streaming on
normal pins
option 2
Read mouse port
MouseEvent
{stream}
Handle MouseEvent
option 3
Read mouse port
MouseEvent
Handle MouseEvent
indicates streaming
streaming on
object nodes
(stand-alone pins)
option 4
Read mouse port
{stream}
MouseEvent
Handle MouseEvent

Advanced Object Flows

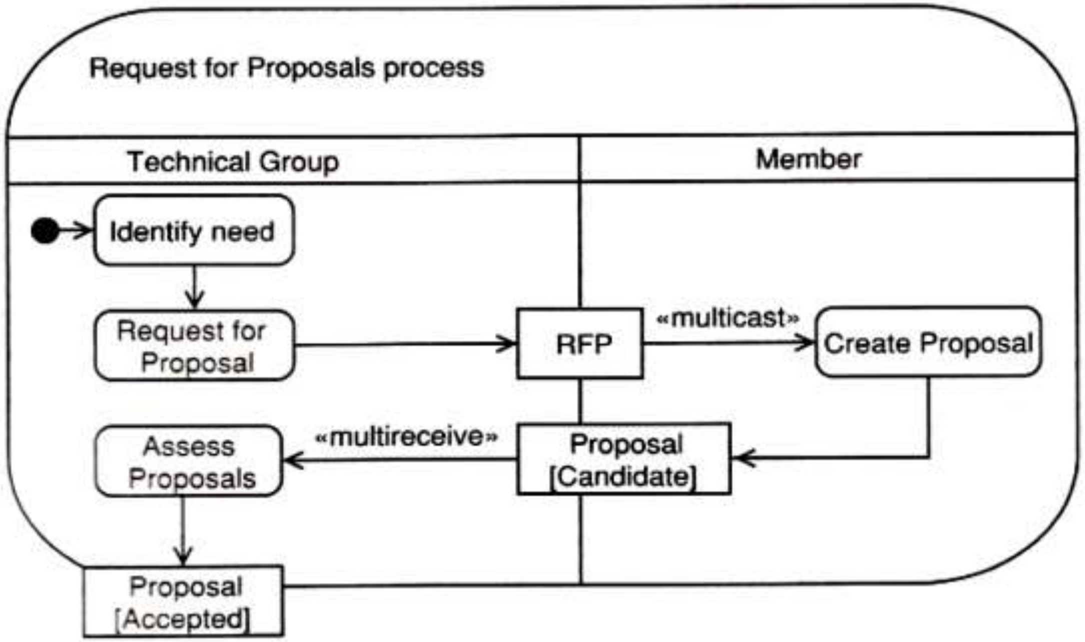
- input and output effects show the effects an action has on its input and output objects:
  - write the effect in braces close to the pin;
- selection - a condition on an object flow that causes it to accept only those objects that satisfy the condition:
  - put the selection condition in a note stereotyped «selection» attached to the object flow;
- transformation - transforms objects in an object flow to a different type:
  - put the transformation expression in a note stereotyped «transformation» attached to the object flow.

Input and Output Effects



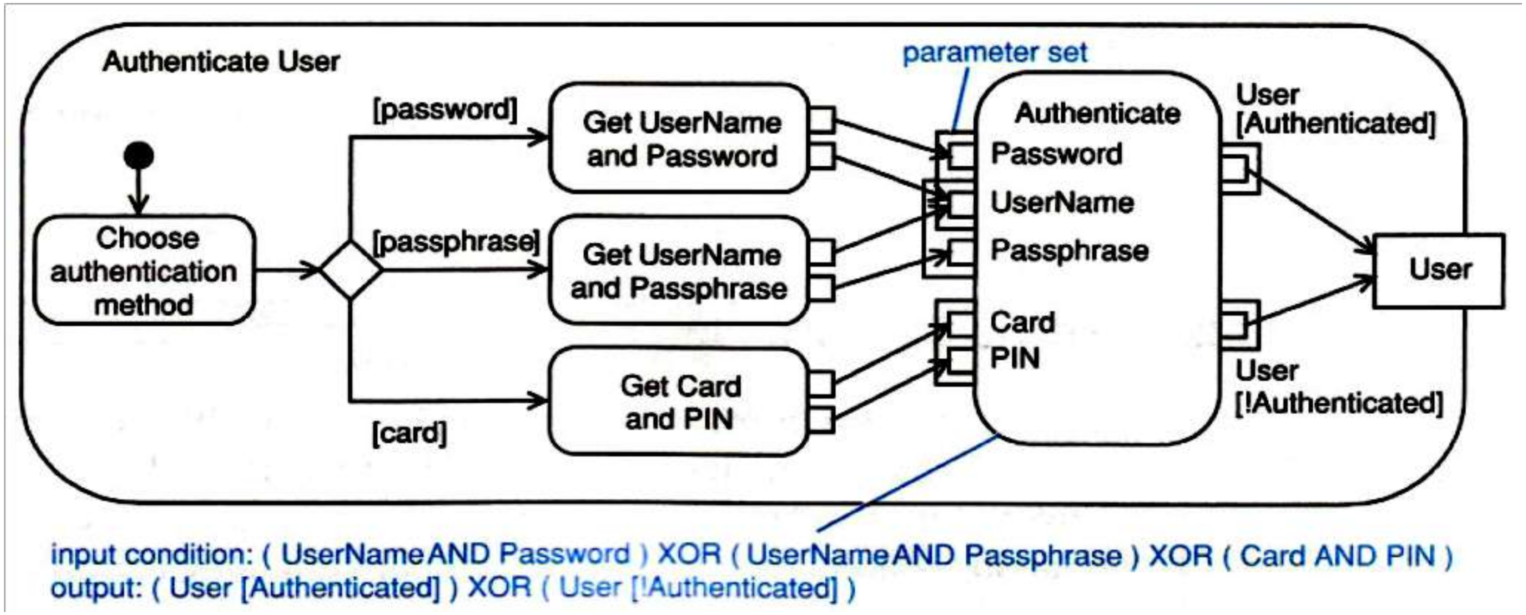
Multicast and Multireceive

- Multicast sends an object to many receivers:
  - □ stereotype the object flow «multicast».
- Multireceive receives objects from many senders:
  - □ stereotype the object flow «multireceive».



Parameter Sets

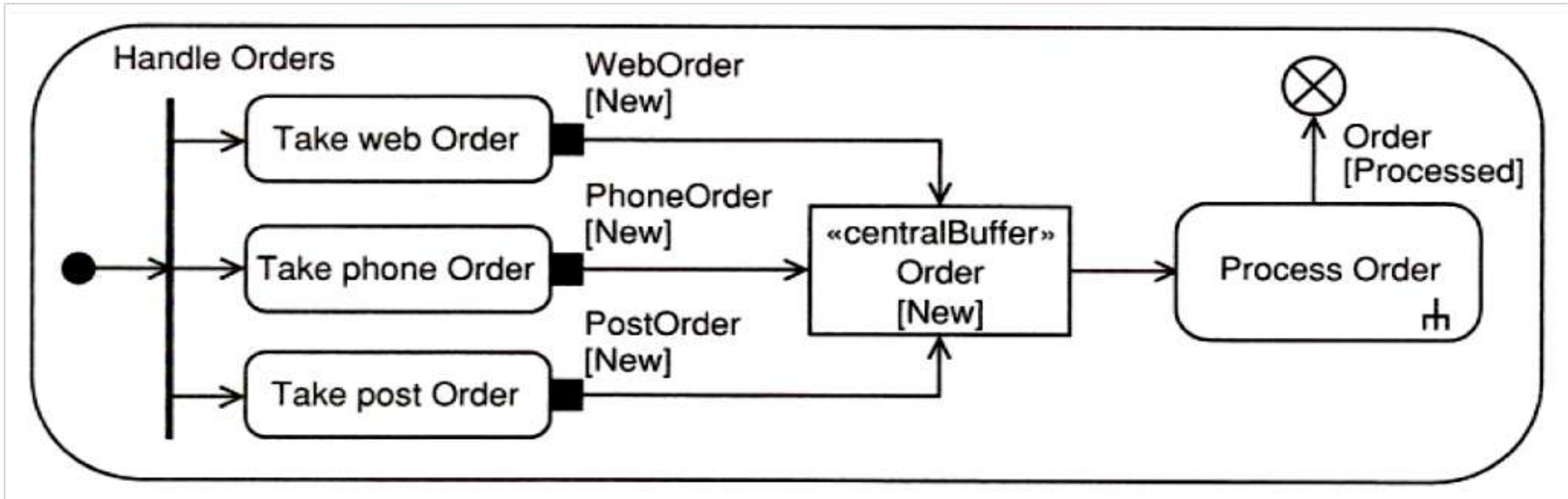
- Parameter sets allow an action to have alternative sets of input and output pins:
  - input parameter sets contain input pins;
  - output parameter sets contain output pins;
  - only one input parameter set and one output parameter set may be used per execution of the action.



input condition: (UserName AND Password) XOR (UserName AND Passphrase) XOR (Card AND PIN)
output: (User [Authenticated]) XOR (User [!Authenticated])

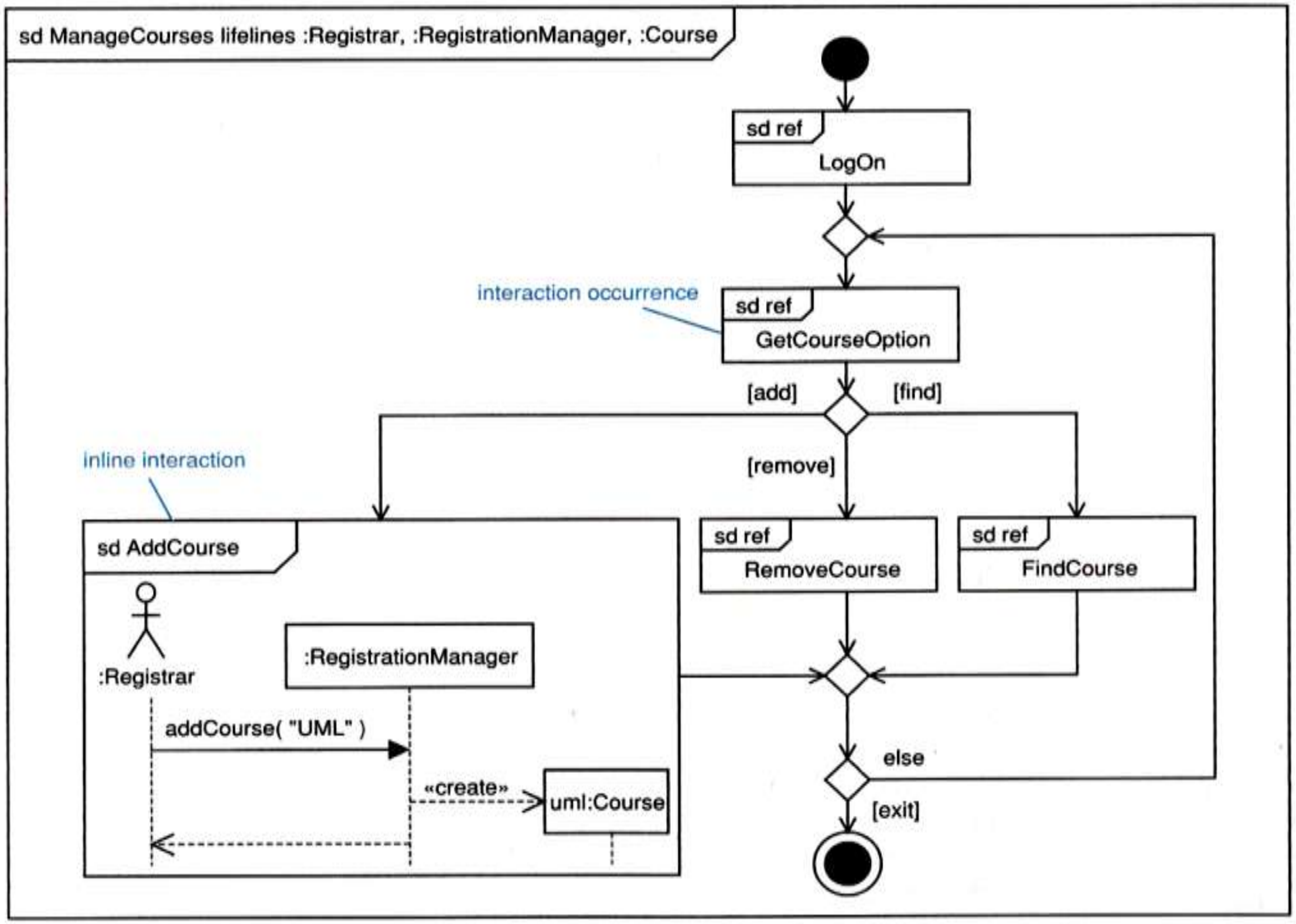
Central Buffer Nodes

- Central buffer node - object nodes that are used specifically as buffers:
  - stereotype the object node «centralBuffer».



Interaction Overview Diagrams

- Interaction overview diagrams show flow between interactions and interaction occurrences



Reference

- Arlow, J., Neustadt, I., *UML 2 and the Unified Process: Practical Object-Oriented Analysis and Design*, 2nd Ed. Addison-Wesley, 2005.