Lecture 10a

Collaboration Diagrams

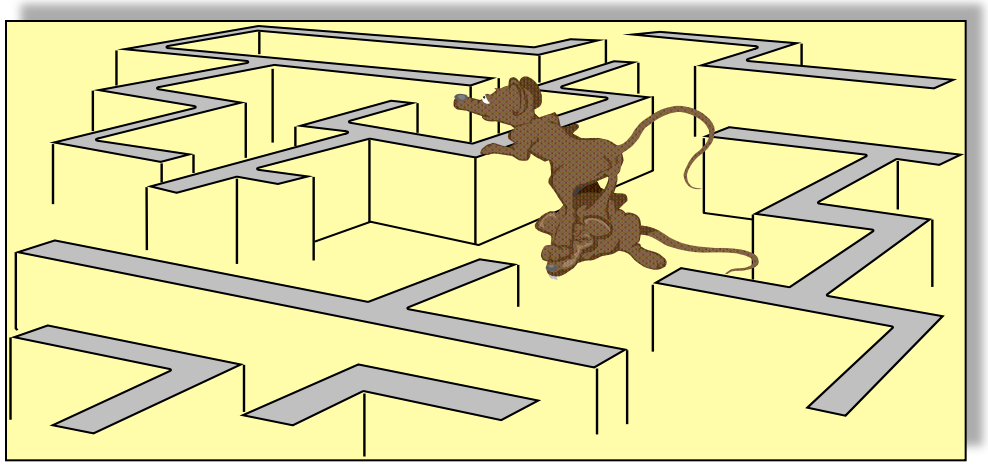
Objectives

- To ensure that students are familiar with Collaboration Diagrams
- To ensure students know the relationship between Sequence Diagrams & Collaboration Diagram
- To enable the students to draw and interpret Collaboration Diagrams

Interaction Diagrams

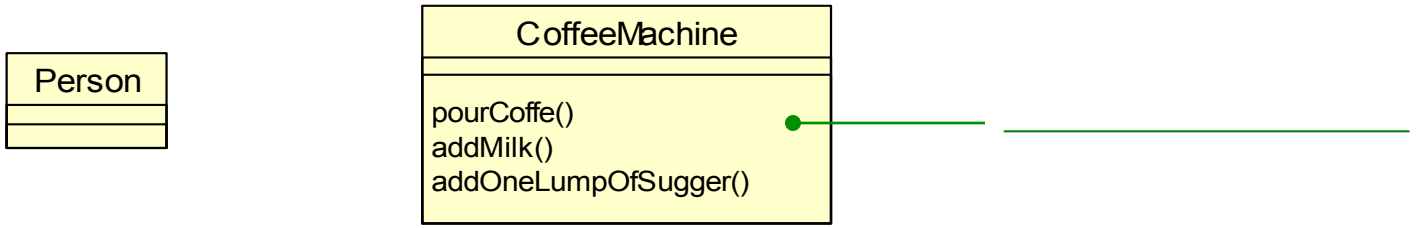
Two types of interaction diagrams:

(1) Sequence Diagrams
(2) Collaboration Diagrams

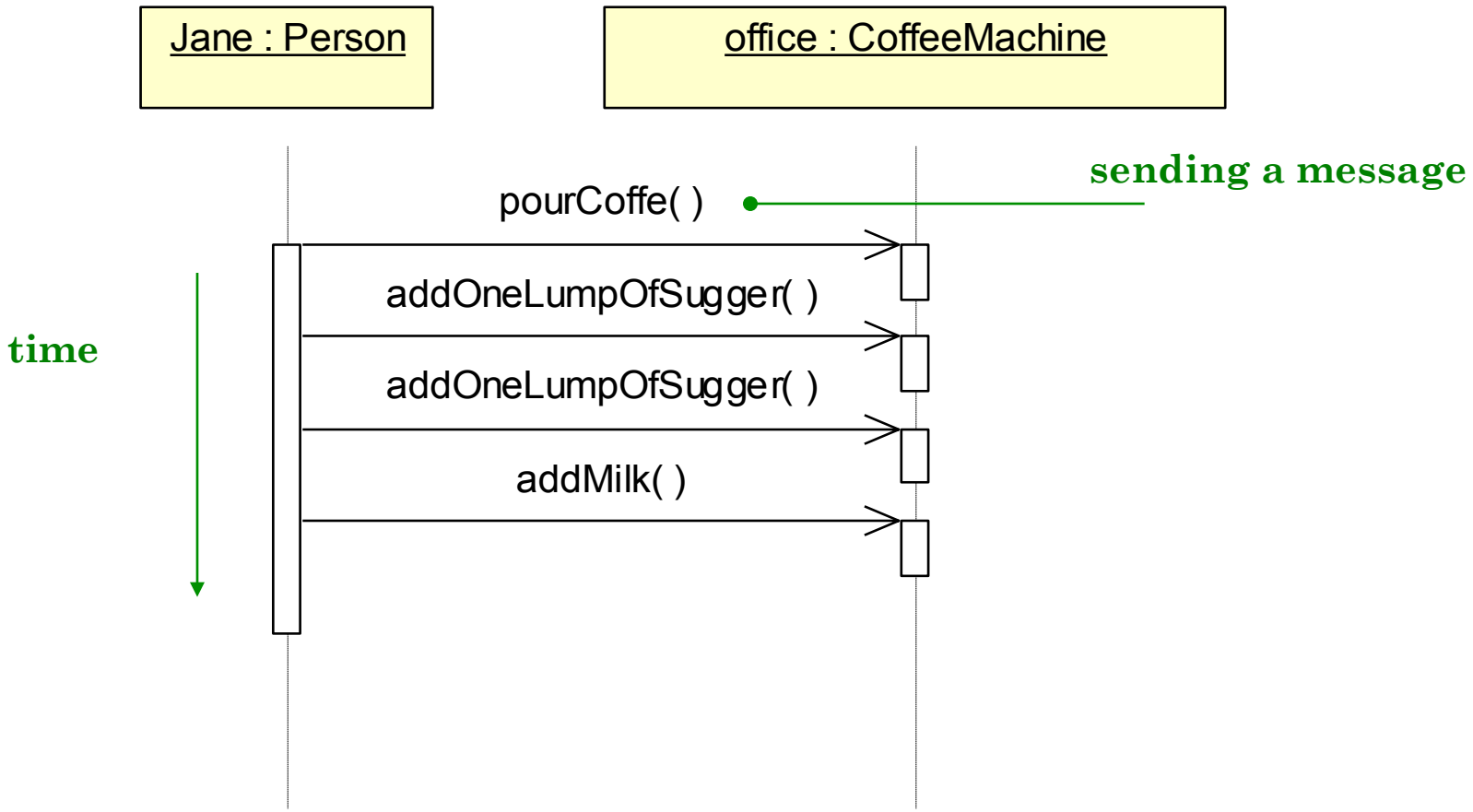


Sequence Diagram

- You are modelling the _____ of an _____ in a Sequence Diagram.
- How do you model the following?
- Jane likes milk and two lumps of sugar in her coffee.



Sequence Diagram



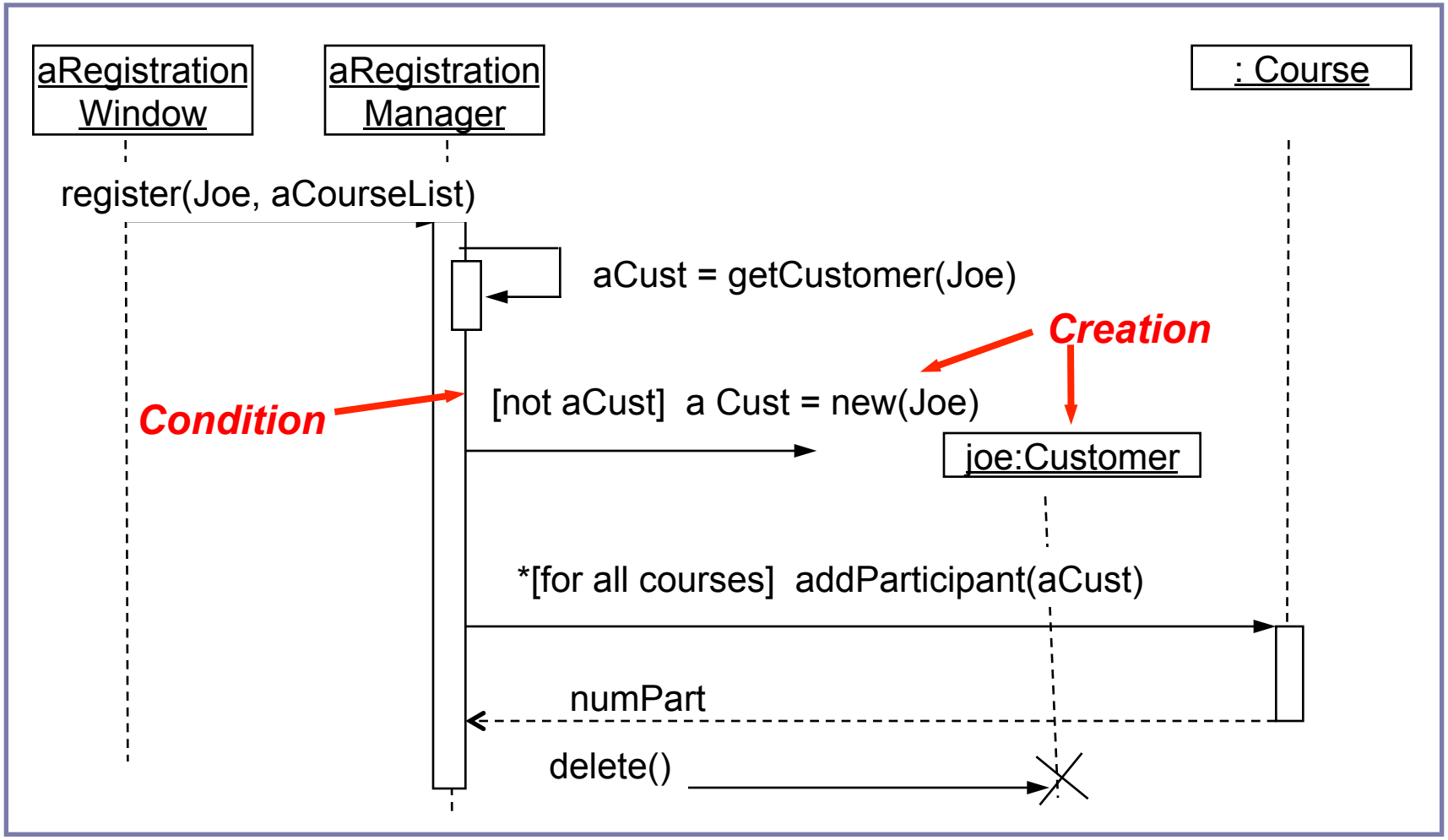
Sequence Diagram

- What does a sequence diagram emphasise? _____

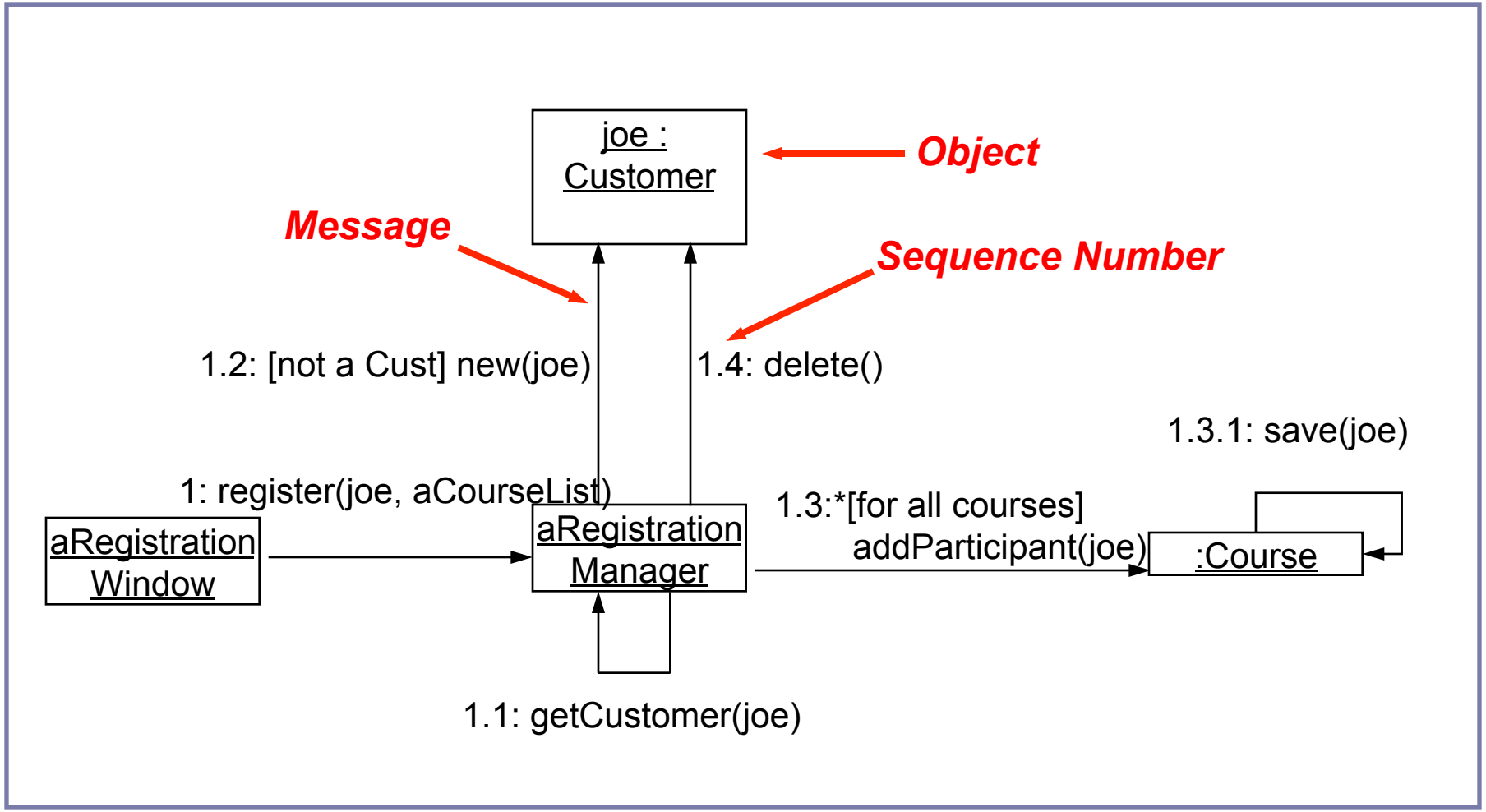
Collaboration Diagrams

- Convey the same information as Sequence Diagrams
- Focus on the messages sent/received by an individual object
- Emphasize the structural aspect of the collaboration.
- Can convert a Sequence Diagram into a Collaboration Diagram using an UML Case Tool.

Sequence Diagram for Registering for a Course



Collaboration Diagram for Registering for a Course



Elements of Collaboration Diagram

- Shows the same sequence as the sequence diagram in the former slide

- Object Naming
- General form for object naming is

  objectName : ClassName

  in which are both underlined.

- Can omit the object name or the class name
- If you omit the object name, you have to **keep the colon** before the class name

- Messages sent
- Same as sequence diagram, sent messages shown with arrows.

Elements of Collaboration Diagram

Sequential Numbering of Messages

The order in which messages are sent is shown by numbering the messages.

Two ways of numbering messages

(1) Sequential Numbering

First message is 1, Second Message = 2 etc.

Easy to follow the sequence of message calling

(2) Decimal Numbers

The top-level message is numbered 1.

Messages sent during the same call have the same decimal prefix but suffixes of 1, 2, etc. depending on when they occur

e.g. 1.1, 1.2

Elements of Collaboration Diagram

Decimal Numbers (cont.)

- Clearer which operation is calling which other operation
- Harder to see the sequence than just following down the time line in a sequence diagram.

Collaboration Diagrams

When do you use Collaboration Diagrams?

- To show the _____ connection between objects
- For more complex scenarios or actions, when a lot of objects involved with few message exchange

Fun Example
Objects

:Cat

:Policeman

:Person

:RSPCA Inspector

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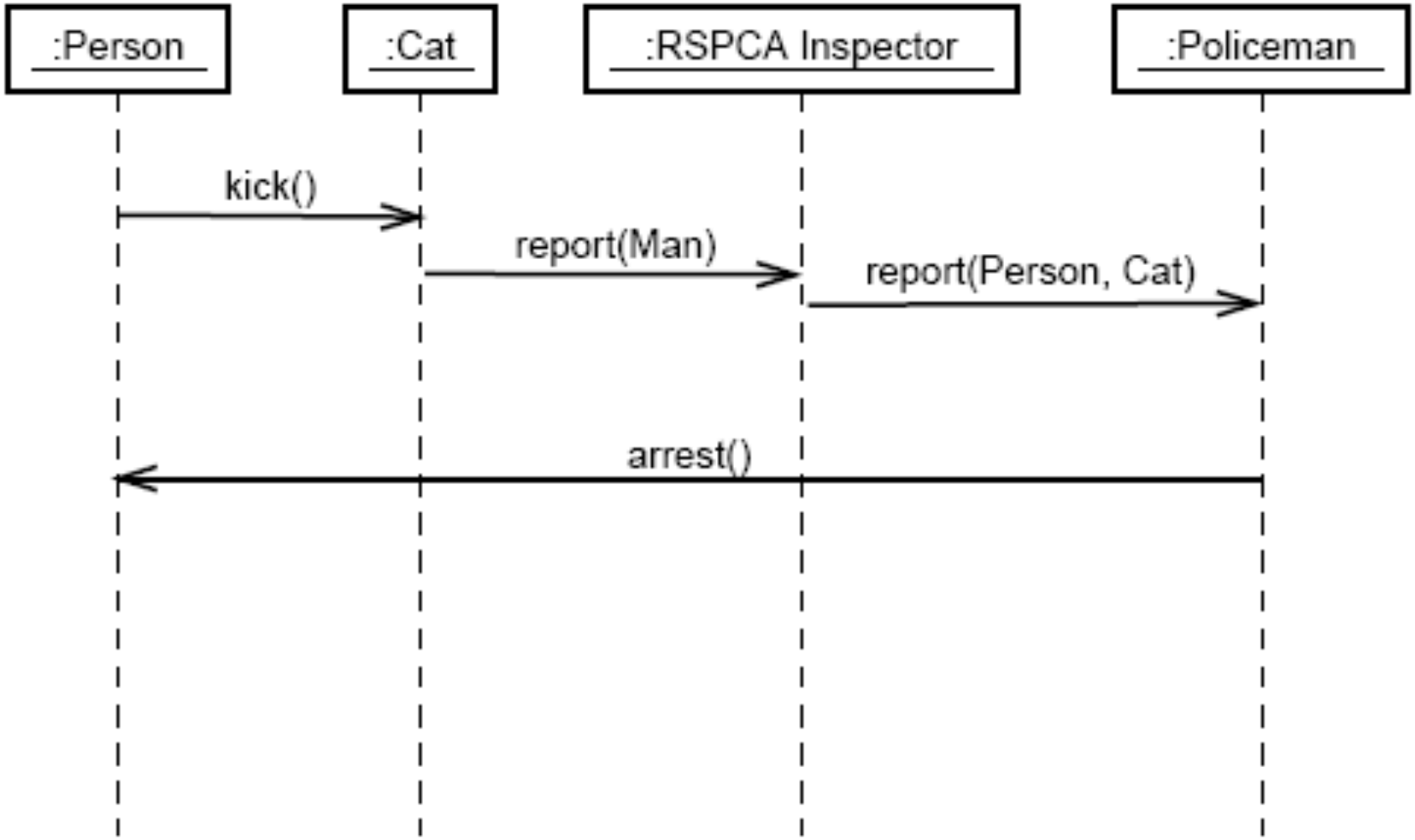
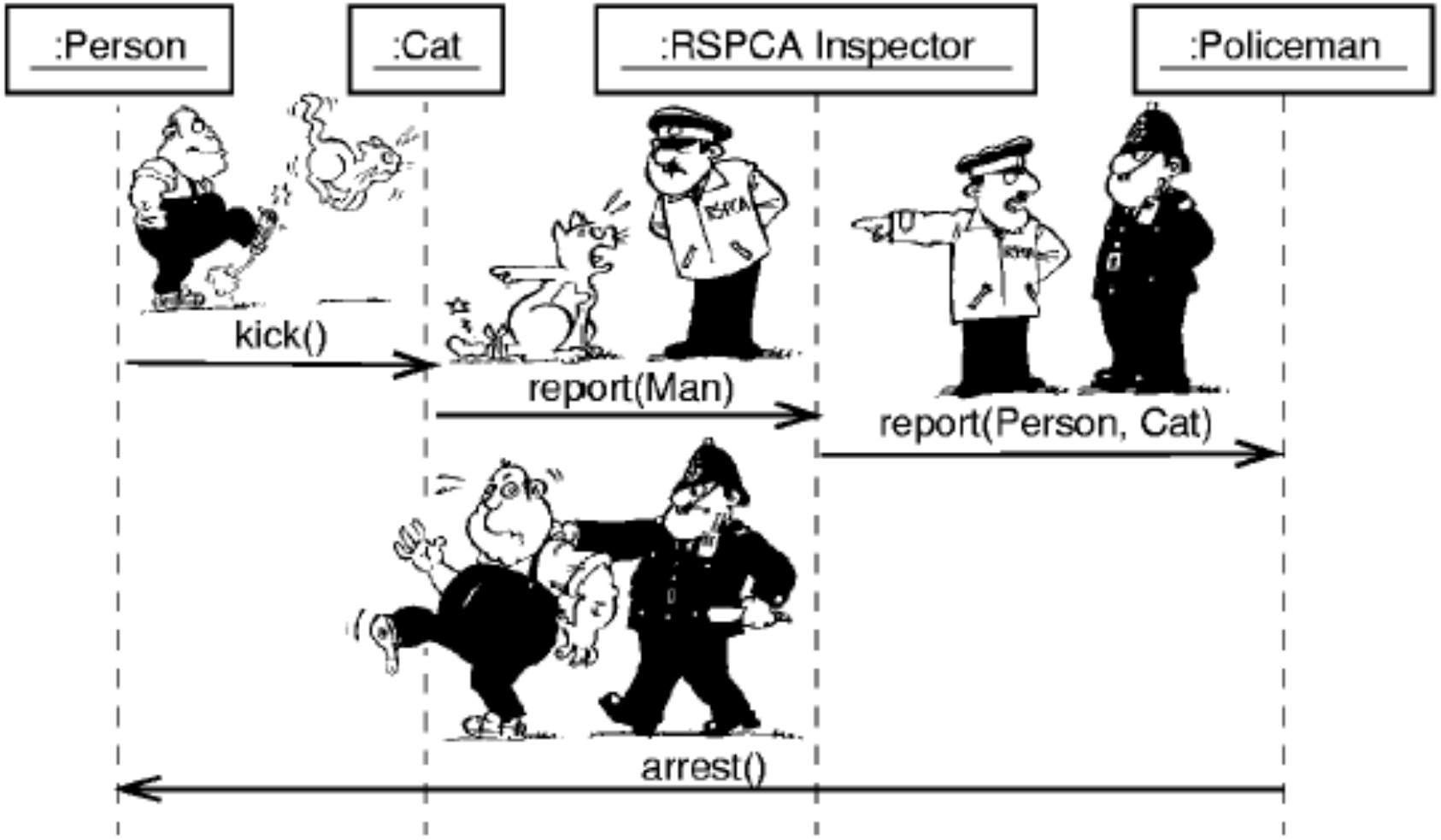
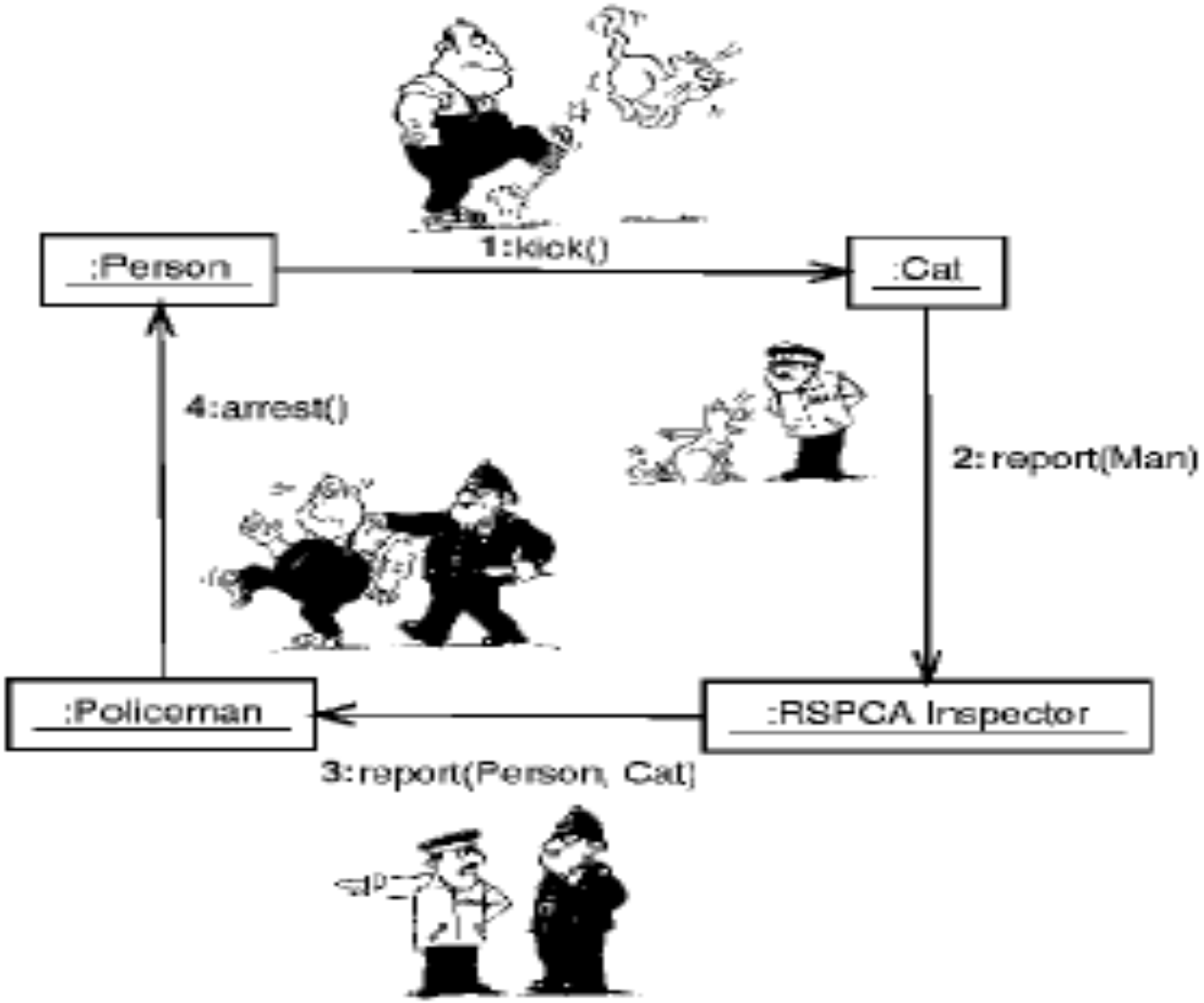
Fun Example
Sequence diagram



Fun Example
Sequence diagram



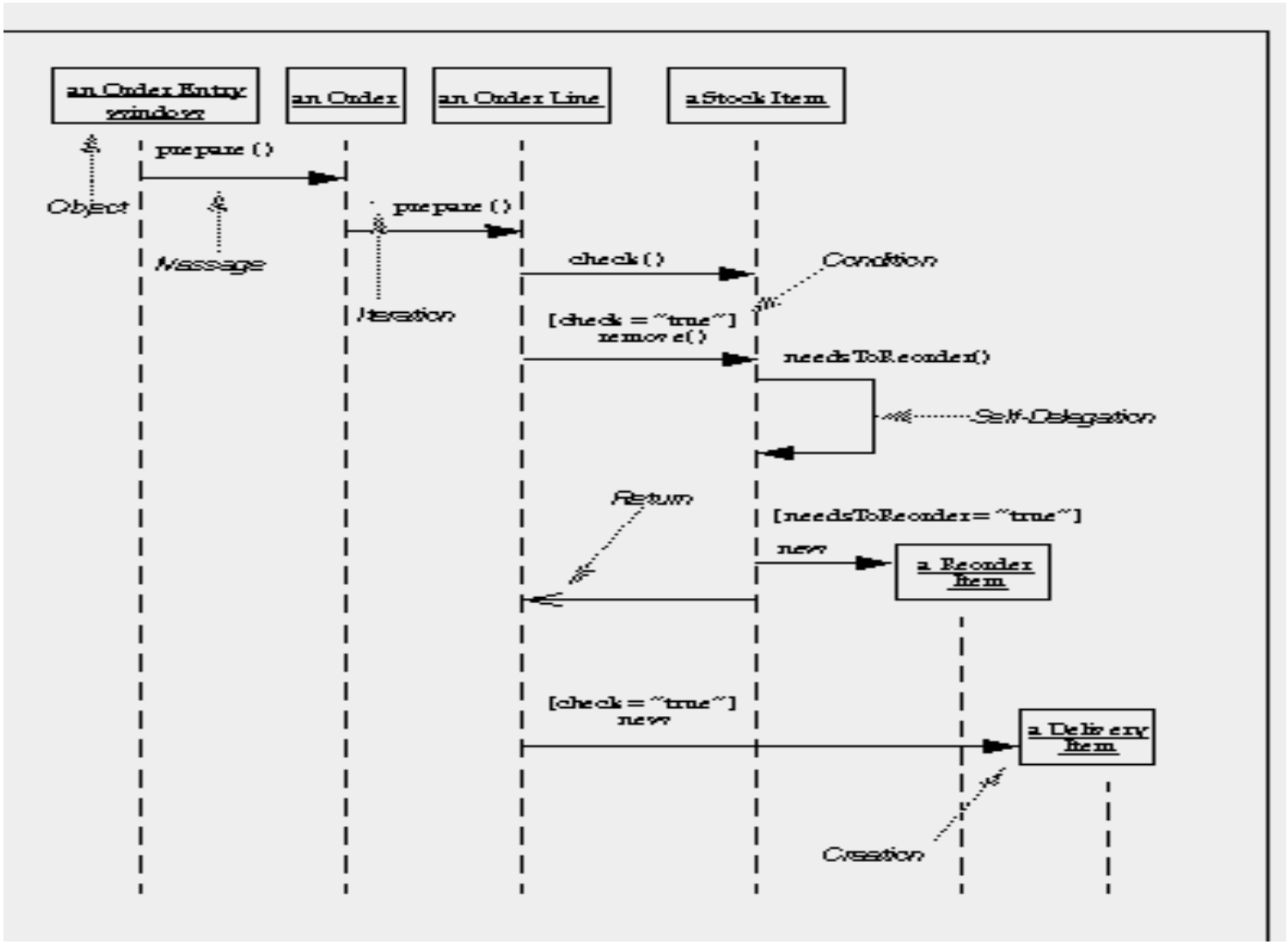
Fun Example
Collaboration diagram



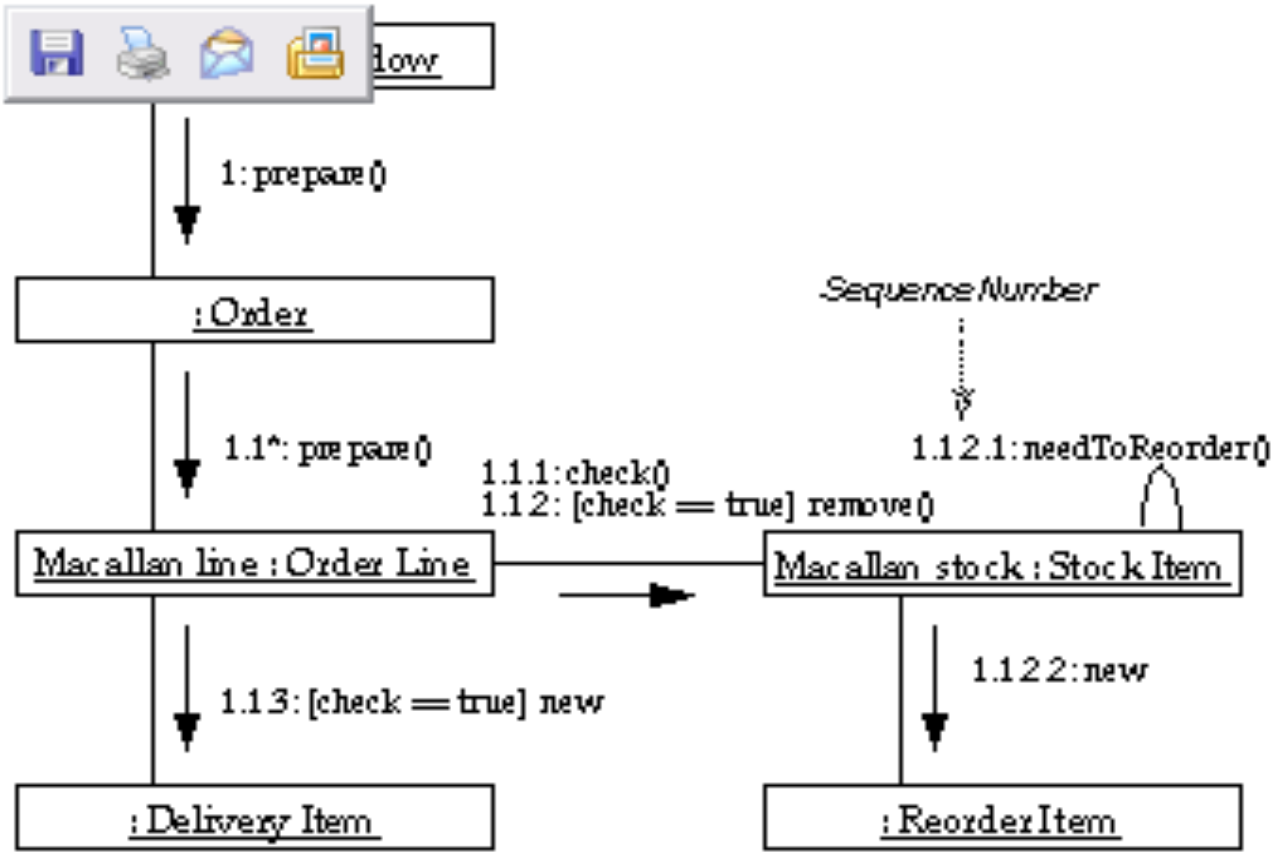
Order Entry Example

- The Order Entry window sends a "prepare" message to an Order.
- The Order then sends "prepare" to each Order Line on the Order.
- Each Order Line checks the given Stock Item.
- If this check returns "true," the Order Line removes the appropriate quantity of Stock Item from stock.
- Otherwise, the quantity of Stock Item has fallen below the reorder level, and the Stock Item requests a new delivery.

Order Entry – Sequence Diagram



Order Entry – Collaboration Diagram



Hotel Reservation

- **ReservationWindow** object initiates the sequence of messages
- It sends a ***makeReservation() message*** to a **HotelChain**.
- **HotelChain** then sends a ***makeReservation()*** message to a **Hotel**.
- If the **Hotel** has available rooms, then it makes a **Reservation** and a **Confirmation**.
- **Hotel** issues a **self call** to determine if a room is available.
- If so, then the **Hotel** creates a **Reservation** and a **Confirmation**.
- Asterisk on the **self call** means **iteration** (to make sure there is available room for each day of the stay in the hotel).
- Expression in square brackets, [ ], is a **condition**.
- Diagram has a clarifying **note**
- The object is **deleted** – shown with **X**

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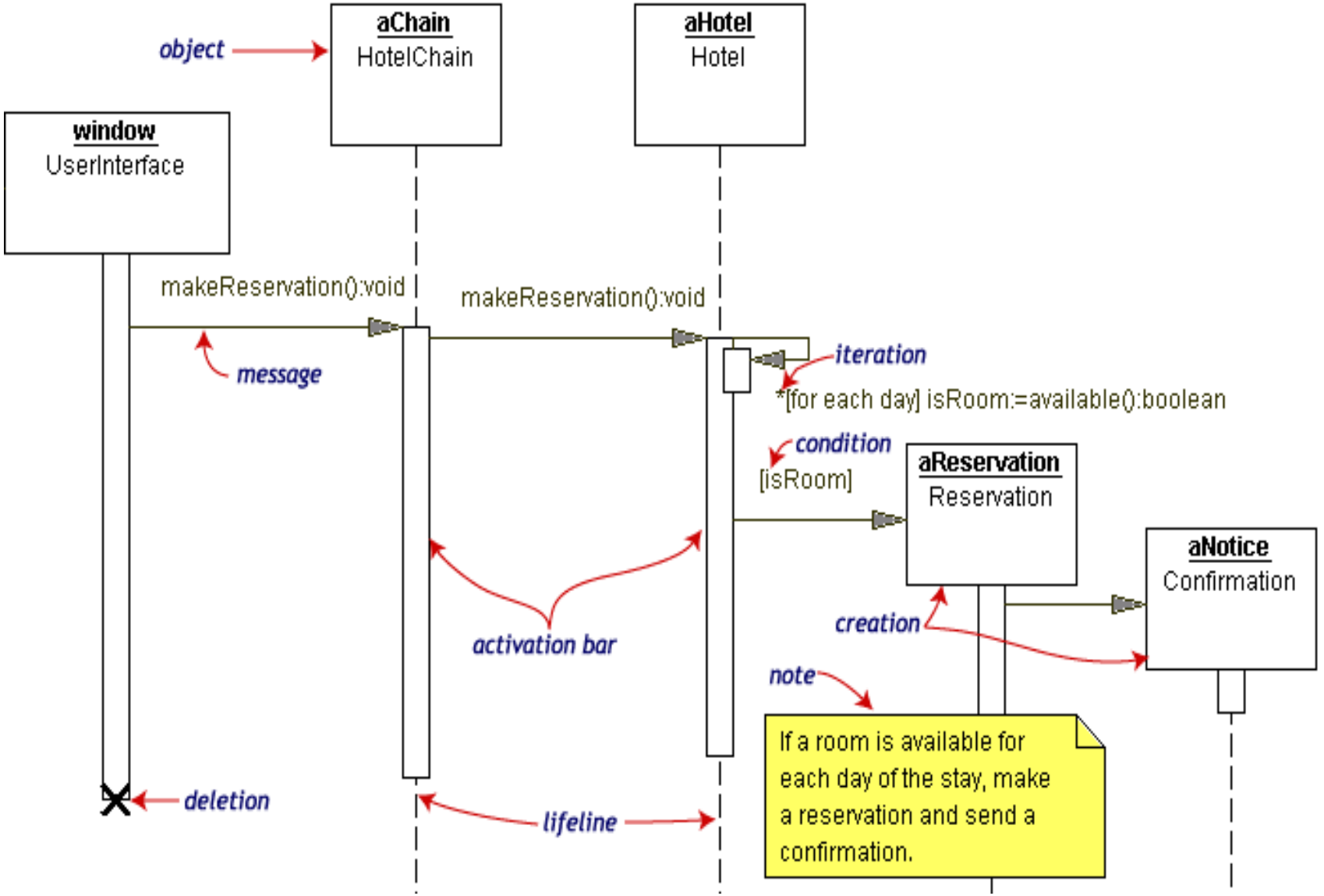
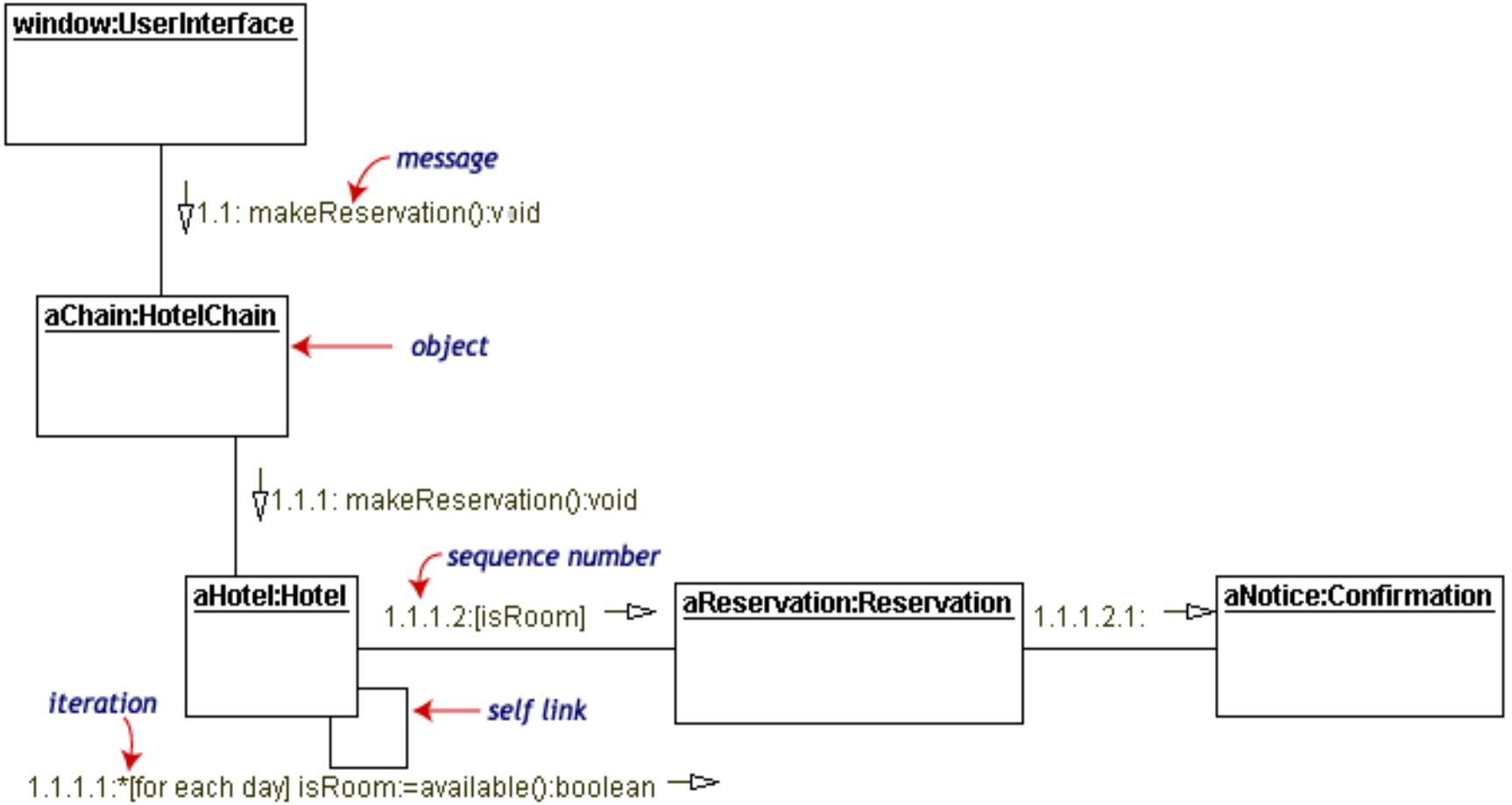
Hotel Reservation – Sequence Diagram



Hotel Reservation Collaboration Diagram



Comparing Diagrams
Sequence V Collaboration

- Which to use ?
  - You like to show sequences ?
    - Use _____
  - You like to show object connections ?
    - Use _____

- There is not a clear response to this question; it depends on what you want to _____ - and which you _____.

Sequence V Collaboration

- I prefer the sequence diagrams over the collaboration, because I usually want to emphasize sequences - and sequence diagrams do this very well.

- Interaction diagrams can also be used in the a_____, d_____ and i_____ phases of a project.

Exercise 1

- Draw a labeled collaboration diagram to show the following:
  - ObjectA sends Message1 to ObjectB.
  - ObjectB sends Message2 to ObjectC.
  - ObjectC sends Message3 to ObjectD.
  - ObjectD sends Message4 to ObjectA.

Exercise 2

- Draw a labeled collaboration diagram to show the following:

1. The Teacher object sends the LoadClass() message to Class object

1.1 The Class object sends the LoadStudents() message to the FileSystem object.

1.2 The Class object sends the LoadClassInfo() message to the FileSystem object.

1.3 The Class object sends the LoadRoom() message to the FileSystem object.

2. The Teacher object sends the AddStudent() message to the Student object.

Exercise 3

Draw a **sequence diagram** & collaboration diagram of the following process.

- When a user returns an item to the library, the library clerk updates the database and records the date when the item was returned.
- If the item is overdue, the clerk collects a fine calculated as DaysLate * €1.
- The clerk also records the fine collected in the database.
- In addition, the clerk checks if the returned item is damaged, and if so, records the information in the database again.