Computer Science 340

Software Design & Testing

UML Sequence Diagrams

Behavioral Modeling in UML

- Class Diagrams are used to model the static structure of a system
  - The things in the system and the connections between them
- In addition to static structure, a system also has dynamic behavior
  - The system must DO something to be useful
  - How the objects in the system interact at runtime
    - When and by whom are the various objects created?
    - What is the message flow between the various objects?
  - What are the Algorithms?

Sequence Diagrams

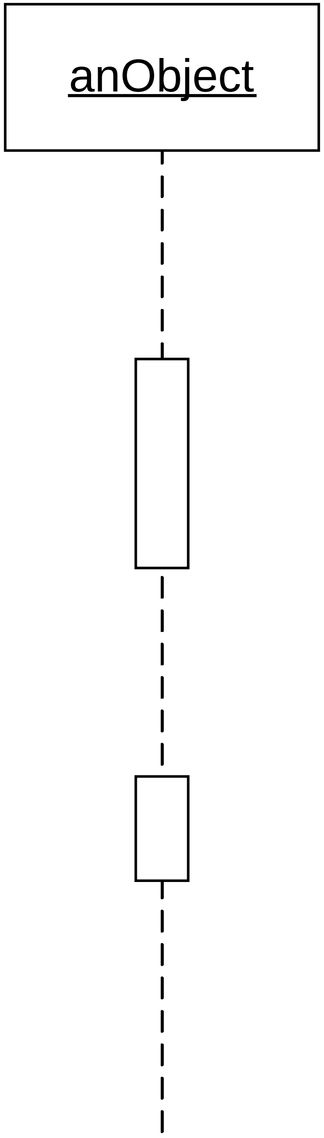
- Sequence Diagrams are used to show how messages flow between objects

- They provide one possible representation for algorithmic behavior
  - Pseudo code is another

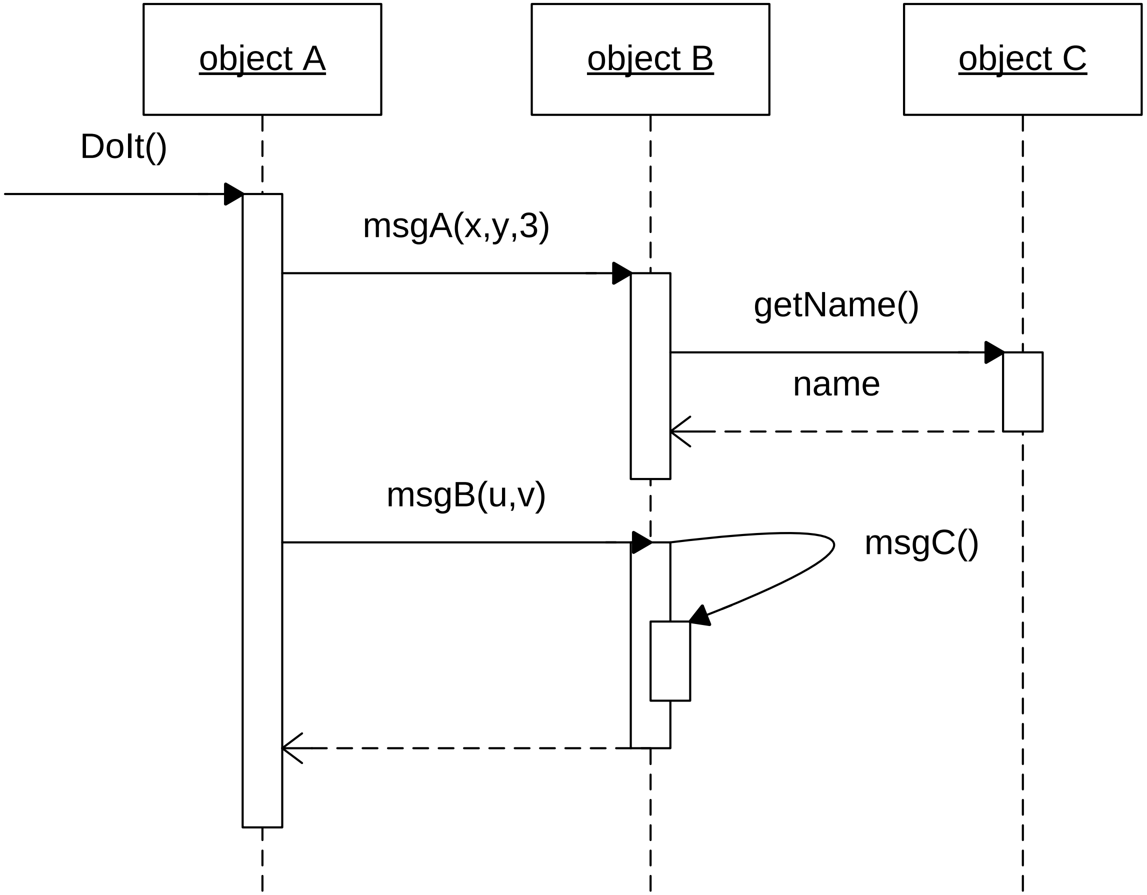
- Sequence Diagrams contain:
  - Objects (instances)
  - Lifelines
  - Messages

Object Lifelines

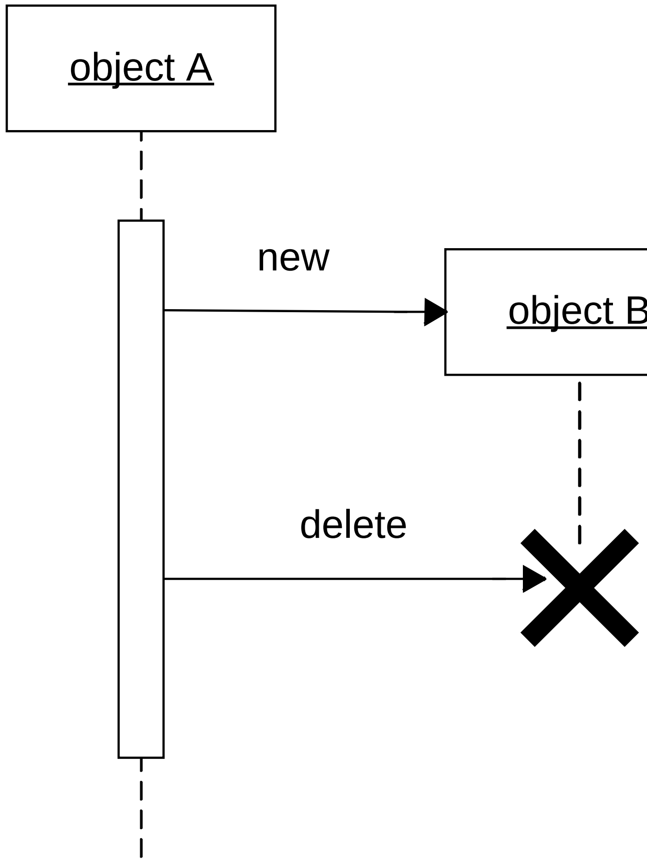
- Time proceeds from top to bottom
- Dashed line represents the lifetime of the object (the time during which the object exists)
- Activation boxes show when the object is active (i.e., executing an operation)



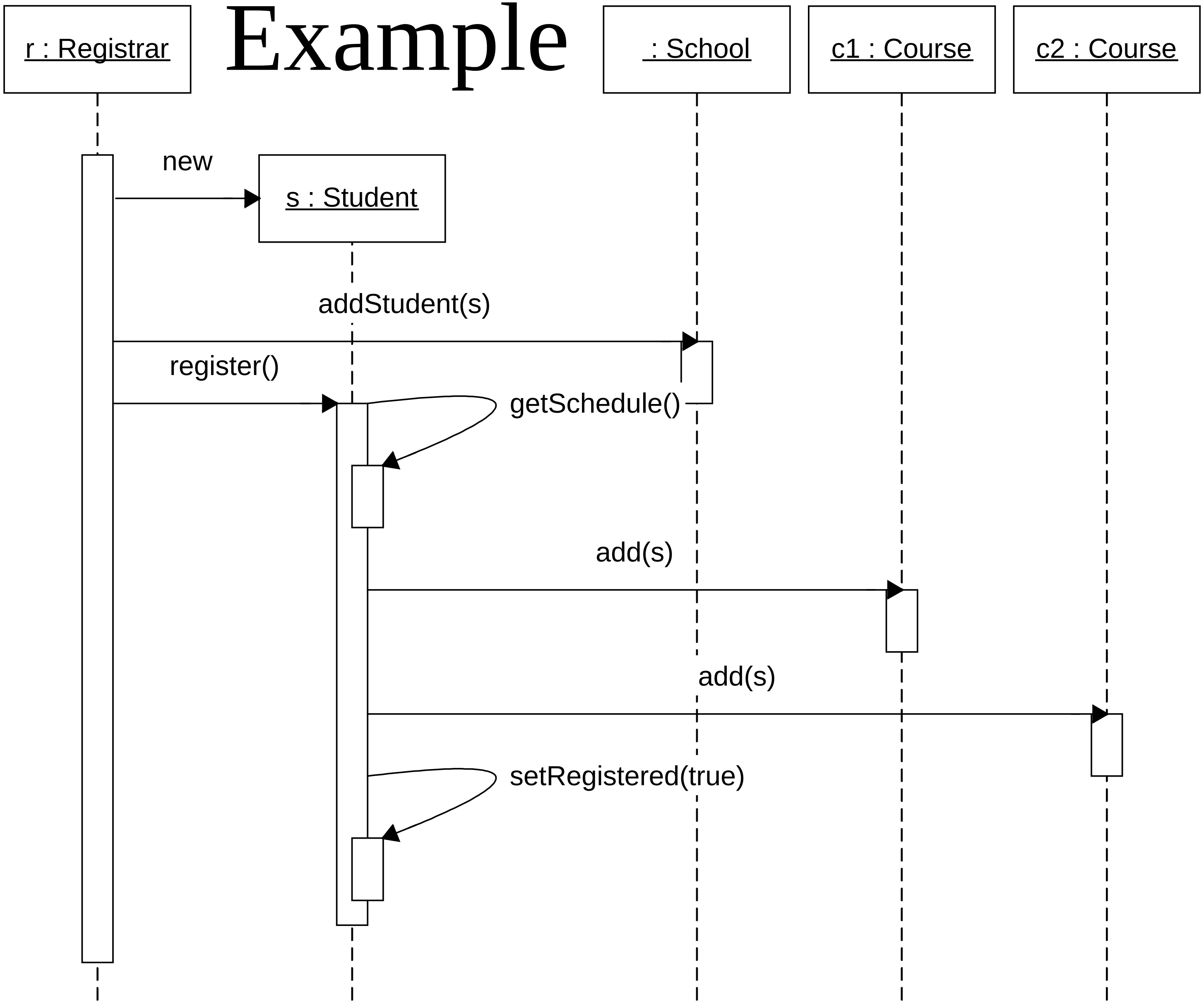
Message Passing



Creating/Deleting Objects

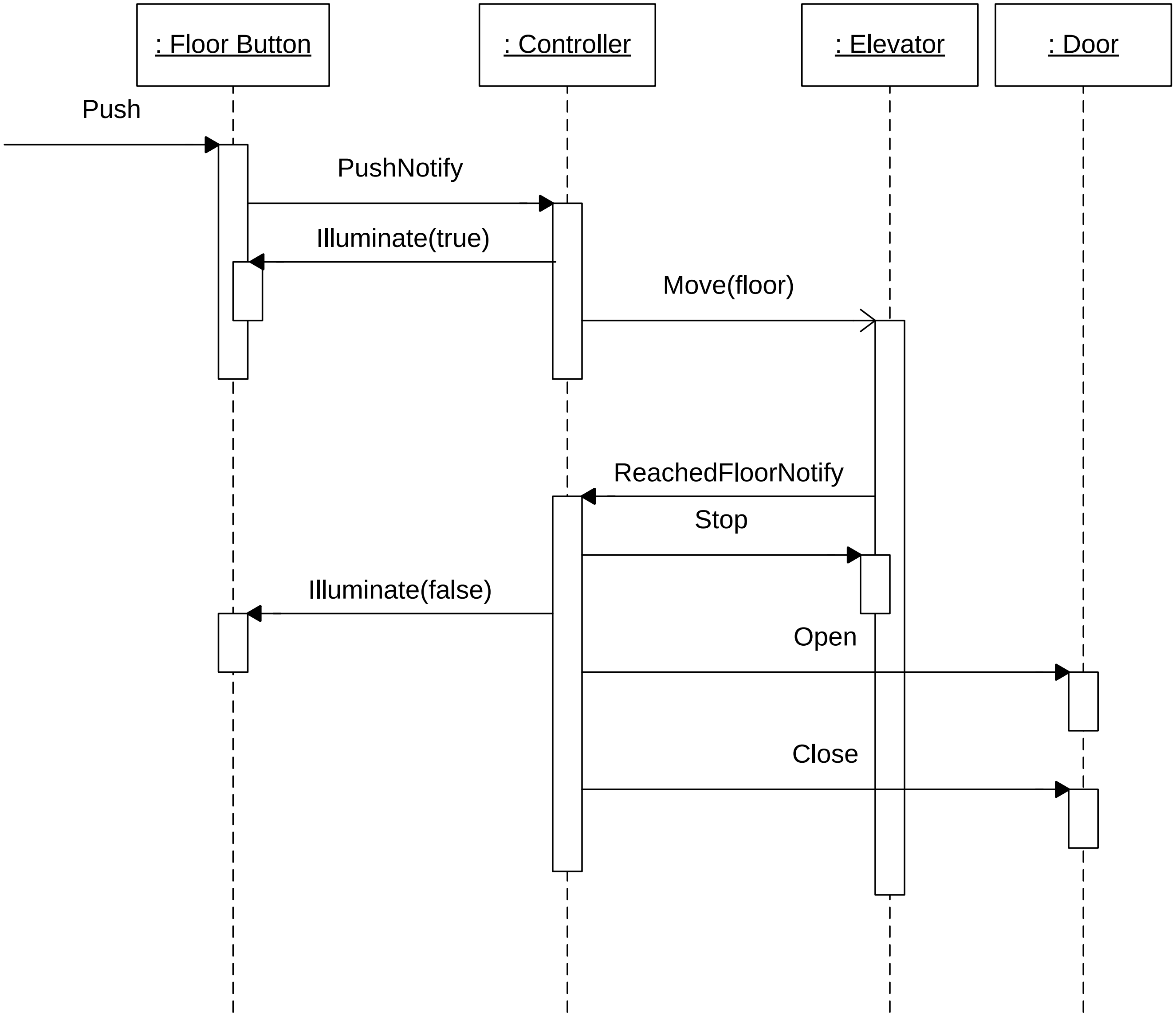


Example

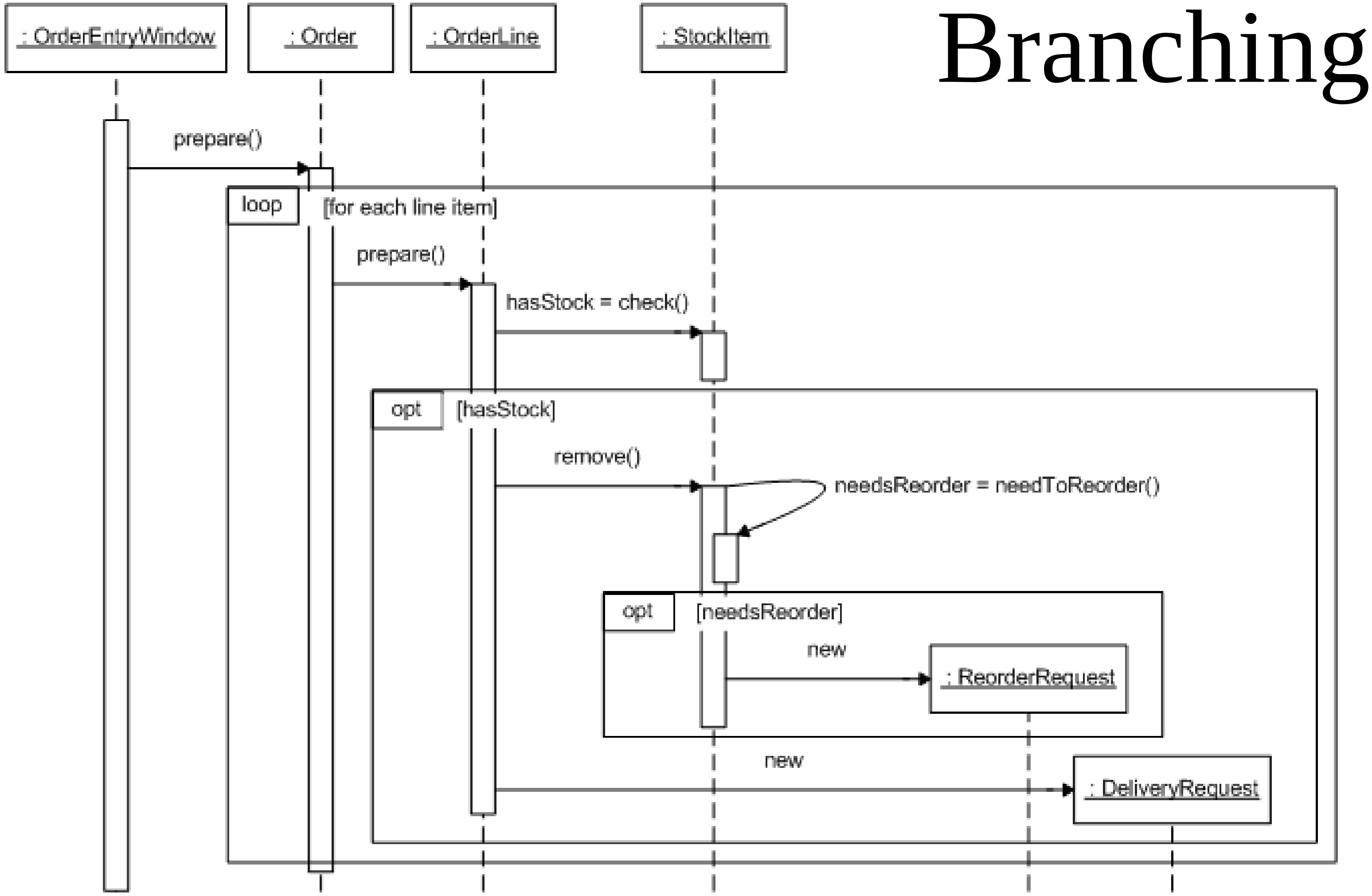


Source: Booch et. al., The UML User Guide

Example


: Floor Button
: Controller
: Elevator
: Door
Push
PushNotify
Illuminate(true)
Move(floor)
ReachedFloorNotify
Stop
Illuminate(false)
Open
Close

Iteration and Branching



Source: Fowler, UML Distilled

Pseudo Code

```
Create new student

Add new student to school

For each course in student's schedule
      Add student to course

Mark student as "registered"
```

Pseudo Code

```
For each line item in the order

      If item is in stock

            Decrement quantity of item in stock

            If item needs to be reordered
                  Create re-order request

            Create delivery request
```

Sequence Diagrams vs. Pseudo Code

- Sequence diagrams are good at showing how multiple objects work together to achieve a task
  - Algorithms are frequently distributed across multiple classes
  - Sequence diagrams excel at showing the message flow across participating objects
- Sequence diagrams are not good at showing complex logic
  - Complex logic = Lots of iteration and branching
  - If complex logic is needed, you can create a separate diagram for each major path, thus keeping each diagram as linear as possible
  - Pseudo code can be a better representation for complex algorithms