AMSS Lecture 9: UML Design – Additional Diagram Types

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Agenda

Interaction Diagrams

- Communication Diagrams
- Interaction Overview Diagrams
- Timing Diagrams

Structure Diagrams

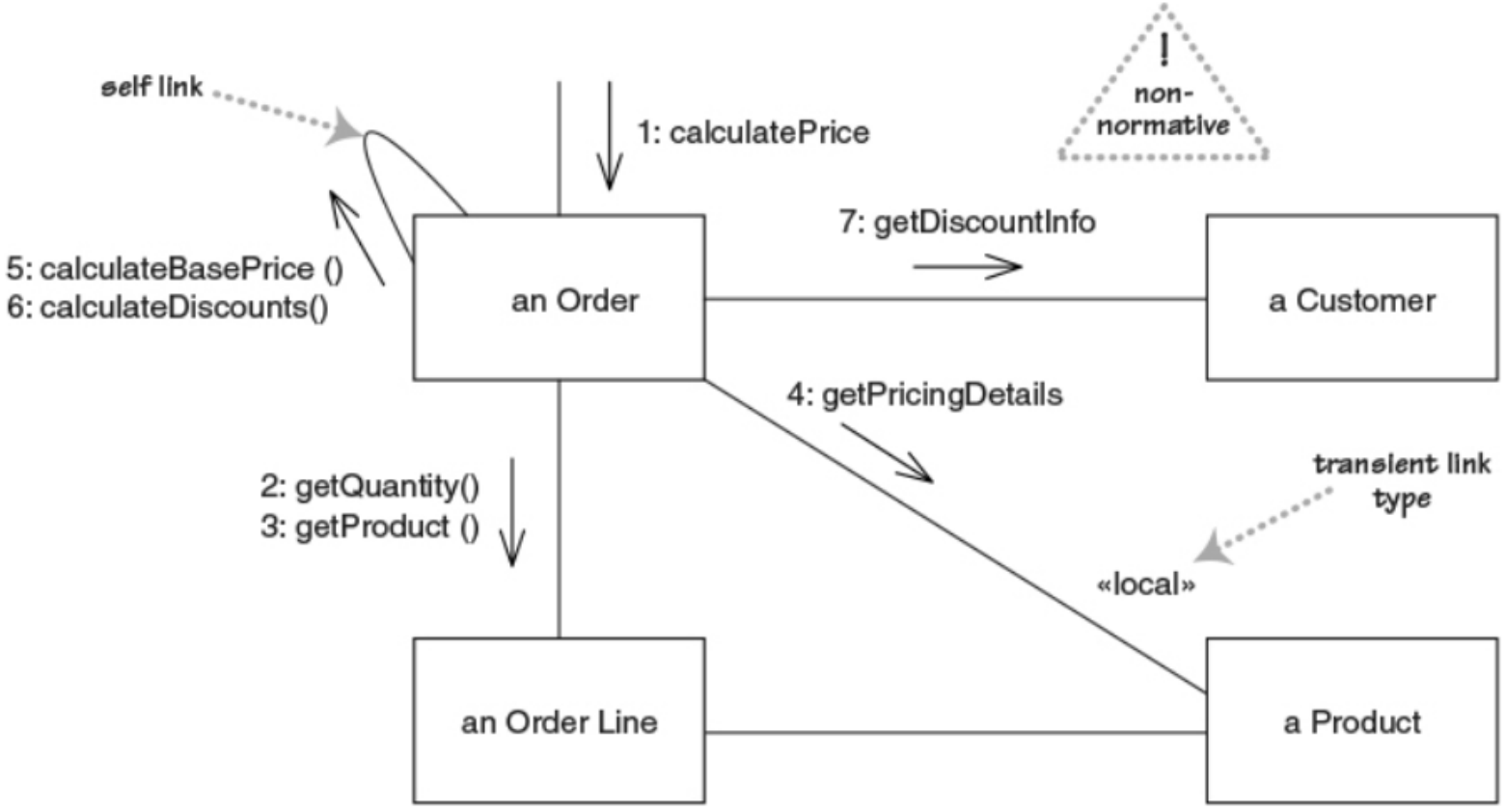
- Composite Structure Diagrams
- Profile Diagrams

Interaction Diagrams

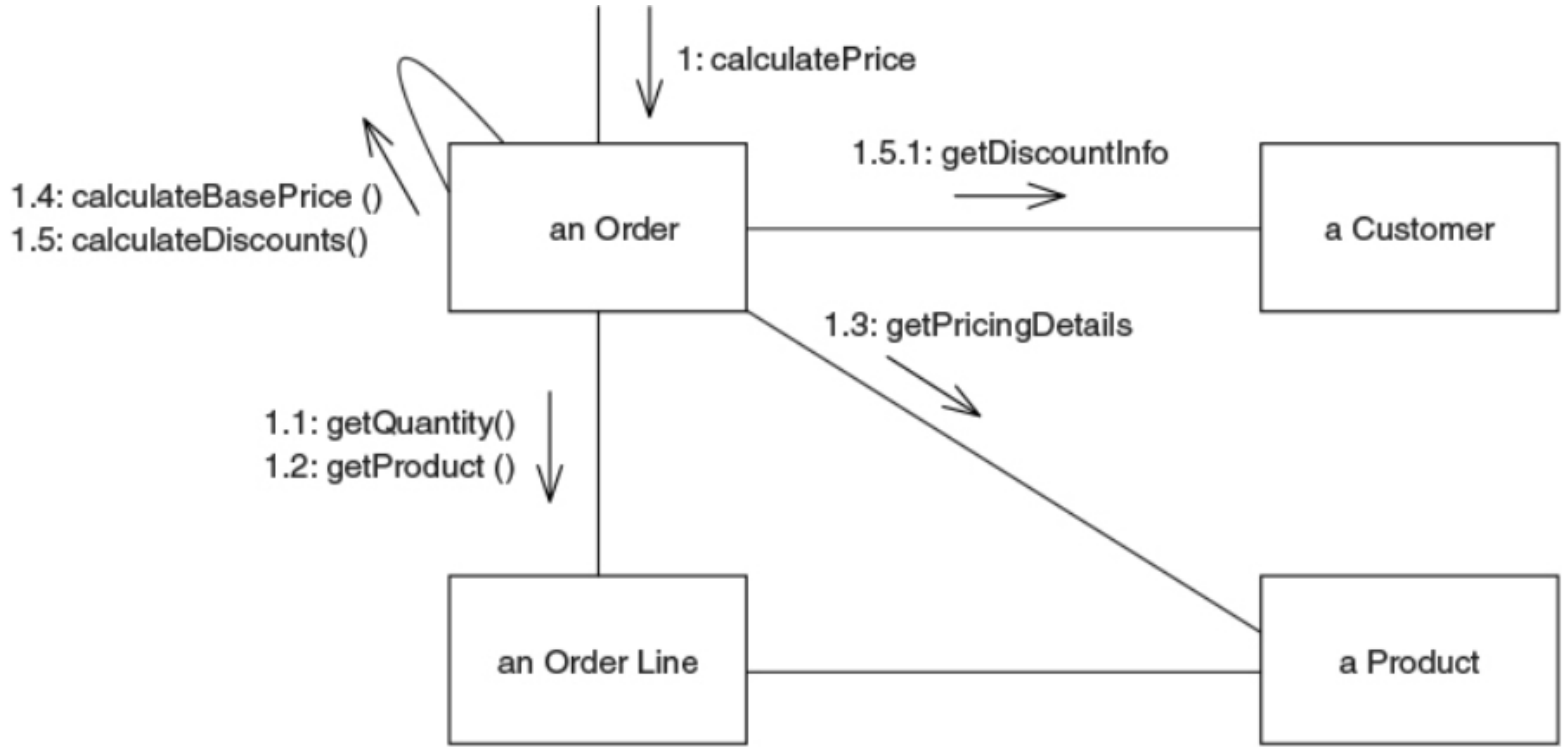
1. Communication Diagrams

Emphasize data links between participants in the interaction.

- free placement of participants
- draw links to show how participant connect
- use numbering to show message sequence

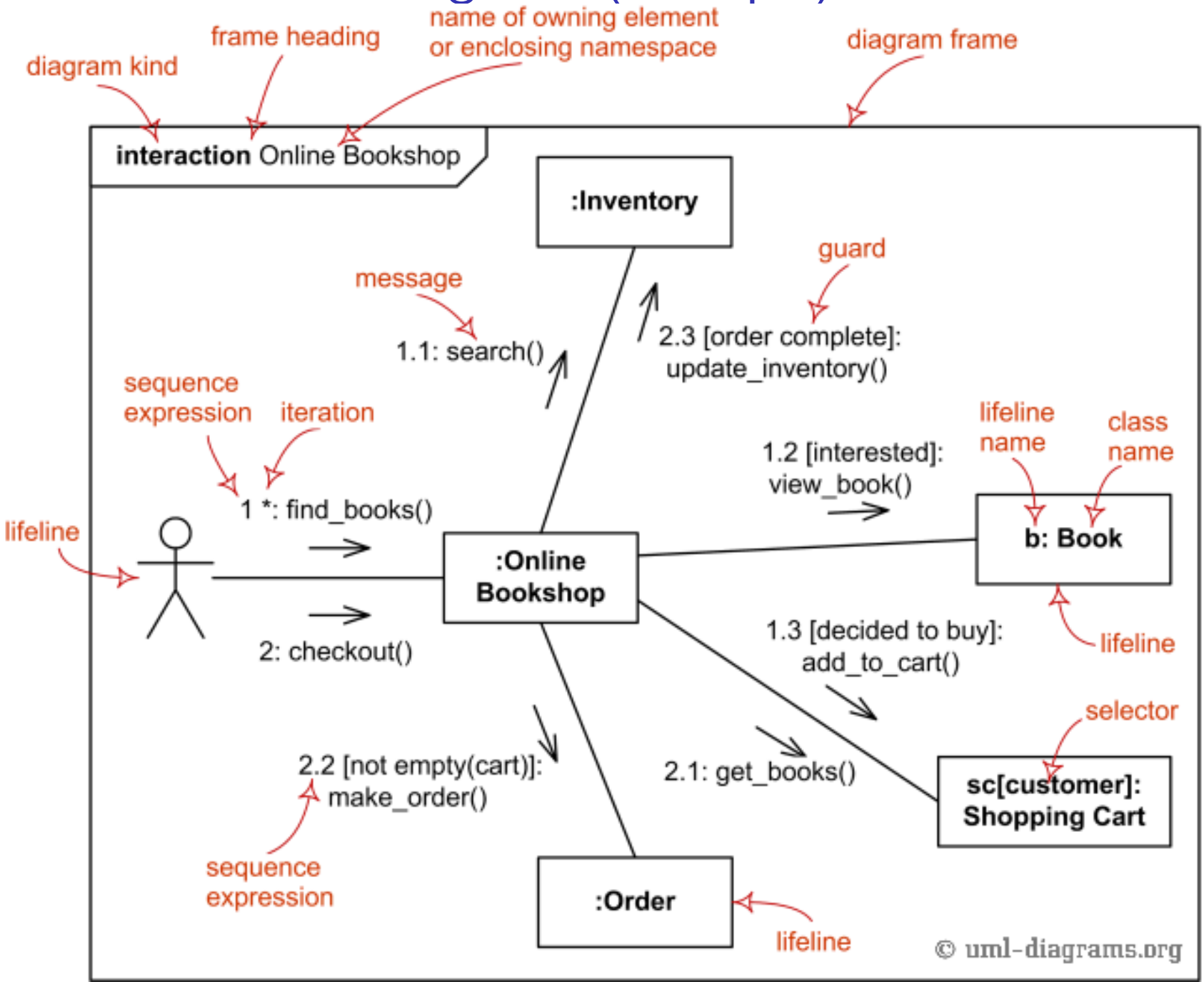


1. Communication Diagrams (nested numbering)



- Can use letters to indicate different threads
  - e.g., 1a1 and 1b1 indicate two threads within message 1
- Nested numbers can get hard to follow (e.g., 1.1.1.2.1.1.)
  - Some people prefer using flat numbers as on previous slide
- Don't have precise notation for control logic

1. Communication Diagrams (example)



1. Communication Diagrams vs. Sequence Diagrams

- **Sequence diagrams** highlight temporal sequencing.
- **Communication diagrams** highlight structural organization

Aspect	Sequence Diagram	Communication Diagram
Focus	Flow of messages	Structural relationships among objects
Emphasis	*When* messages occur	*Which* objects interact
Layout	Vertical lifelines; message flow top-to-bottom	Graph layout; objects linked by message paths
Best For	message order, concurrency, timing	Collaboration structure and object roles
Mesage Order	Vertical position	Explicit sequence numbers (1, 1.1, 2...)
Use Case	Complex logic, workflows, time-dependent behavior	High-level interaction patterns object relationships

Interactive Exercise (5 minutes)

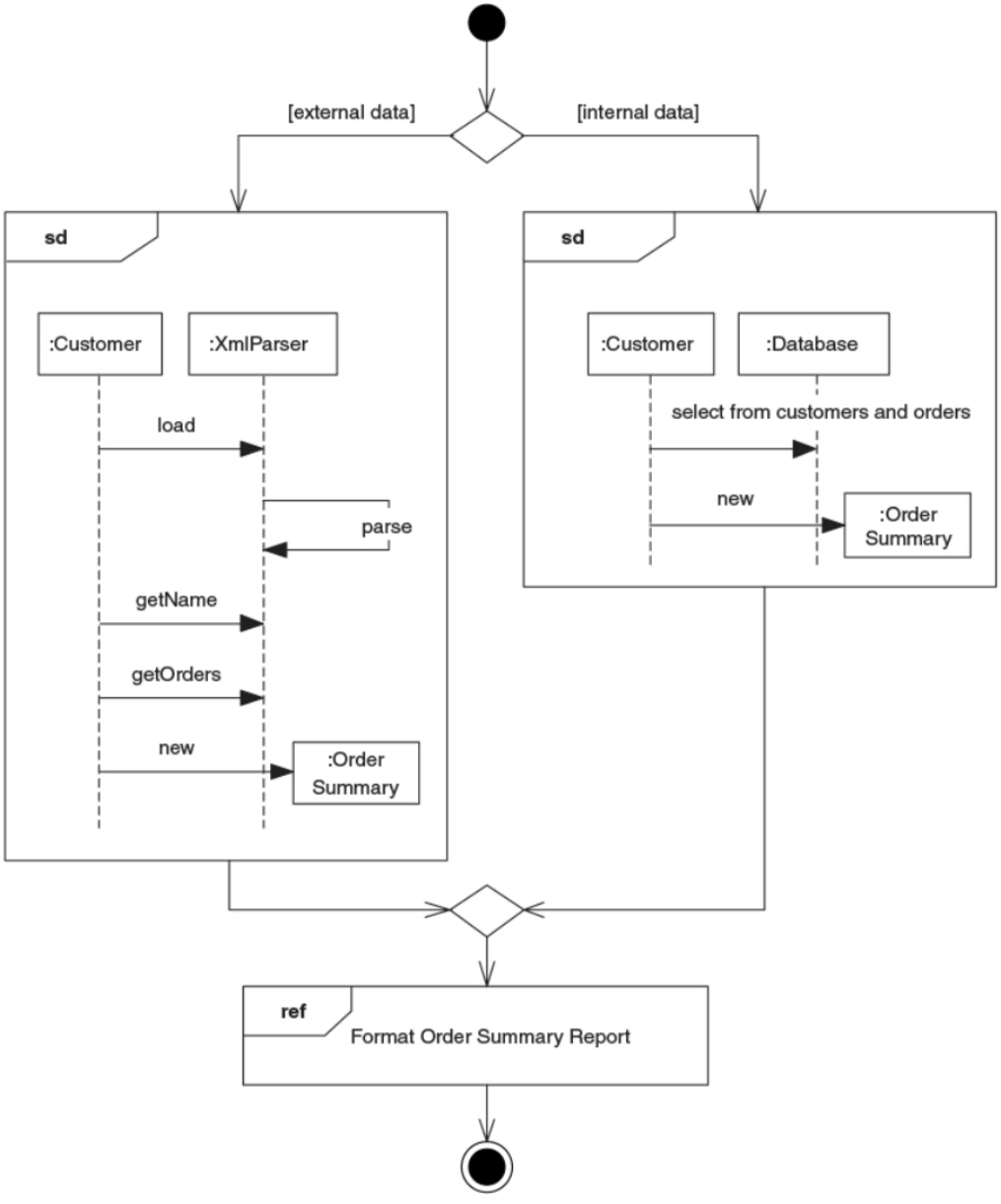
Task

Model the basic interactions within an online ordering system when a customer places a food order online.

Guidelines

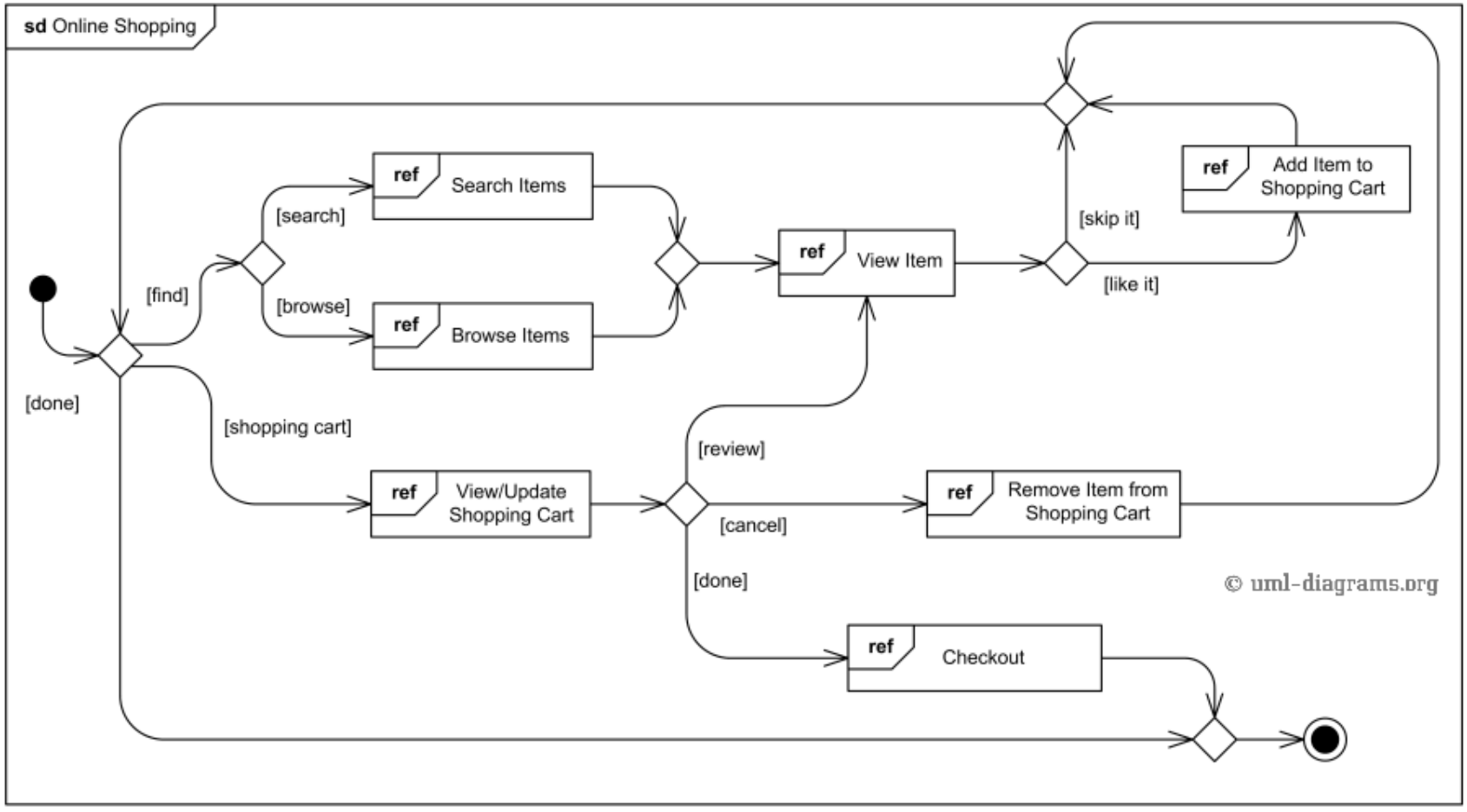
- Use at least 4 objects (CustomerApp, OrderService, RestaurantSystem, PaymentService).
- Number your messages.
- model possible failures.

2. Interaction Overview Diagrams

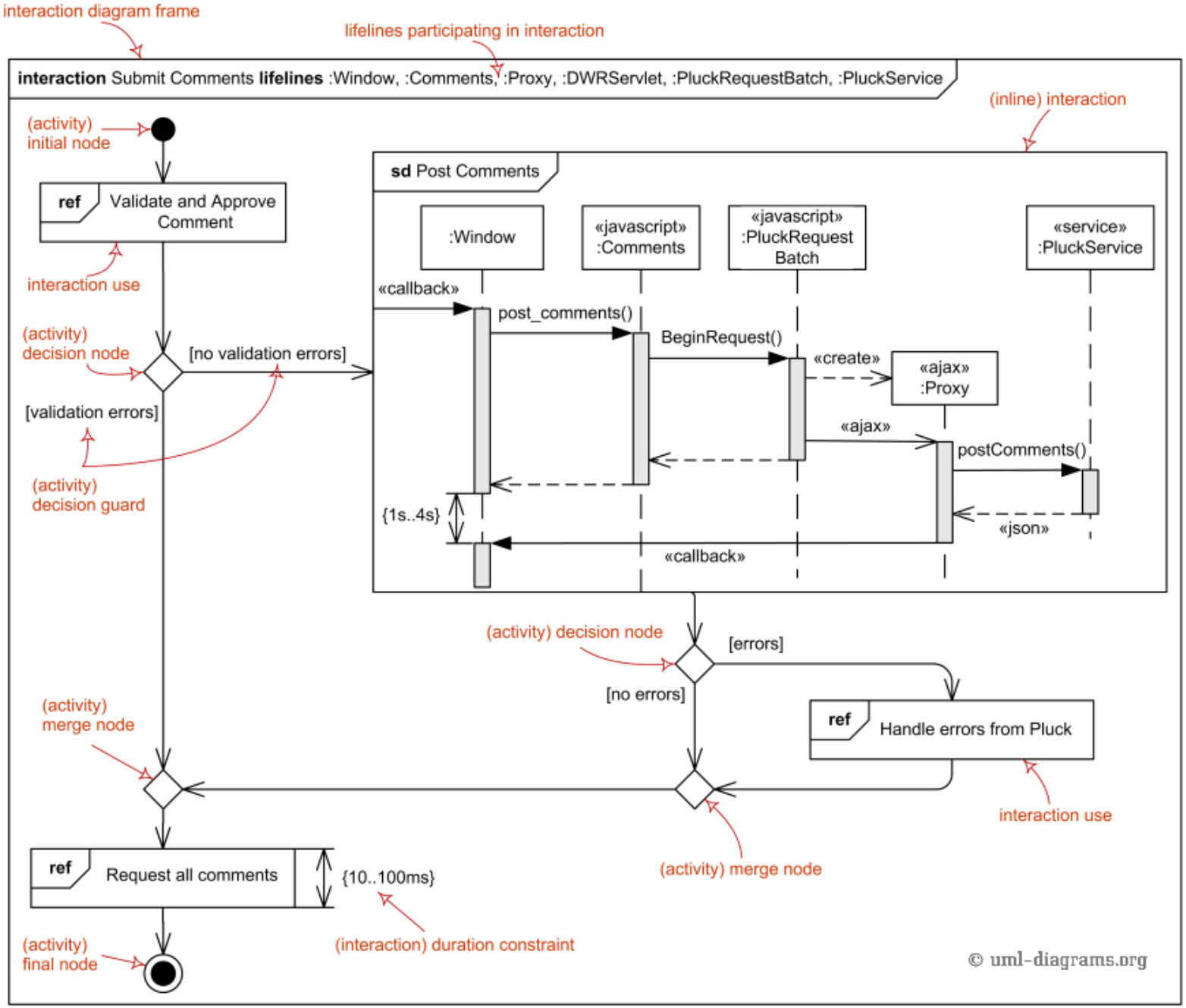


- Activity diagrams where actions are Interaction Diagrams (or references).
- High-level control flow combining multiple interactions.

2. Interaction Overview example (all references)



2. Interaction Overview example



2. Interaction Overview exercise (Library Book Borrowing)

Task

Create an Interaction Overview Diagram (IOD) that shows the control flow of a user borrowing a book through an online library portal.

Guidelines

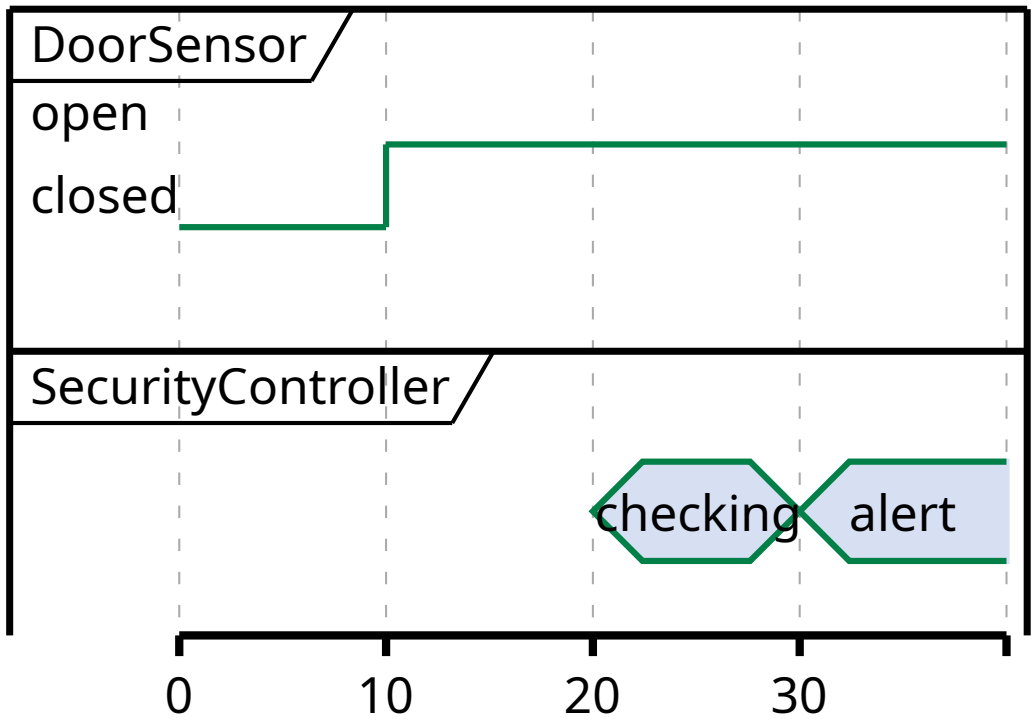
The diagram must include at least one interaction sub-diagram, such as a short sequence diagram or communication diagram.
The system consists of:

- UserPortal
- SearchService
- CatalogService
- LoanService
- NotificationService

3. Timing Diagrams (15 minutes)

Show the *change of state over time*.

Example



Interactive Exercise (5 minutes)

Task

Create a timing diagram showing:

- TemperatureSensor reading changes from 18°C $\rightarrow$ 20°C $\rightarrow$ 19°C
- HeatingController turns *on* only when below 19°C

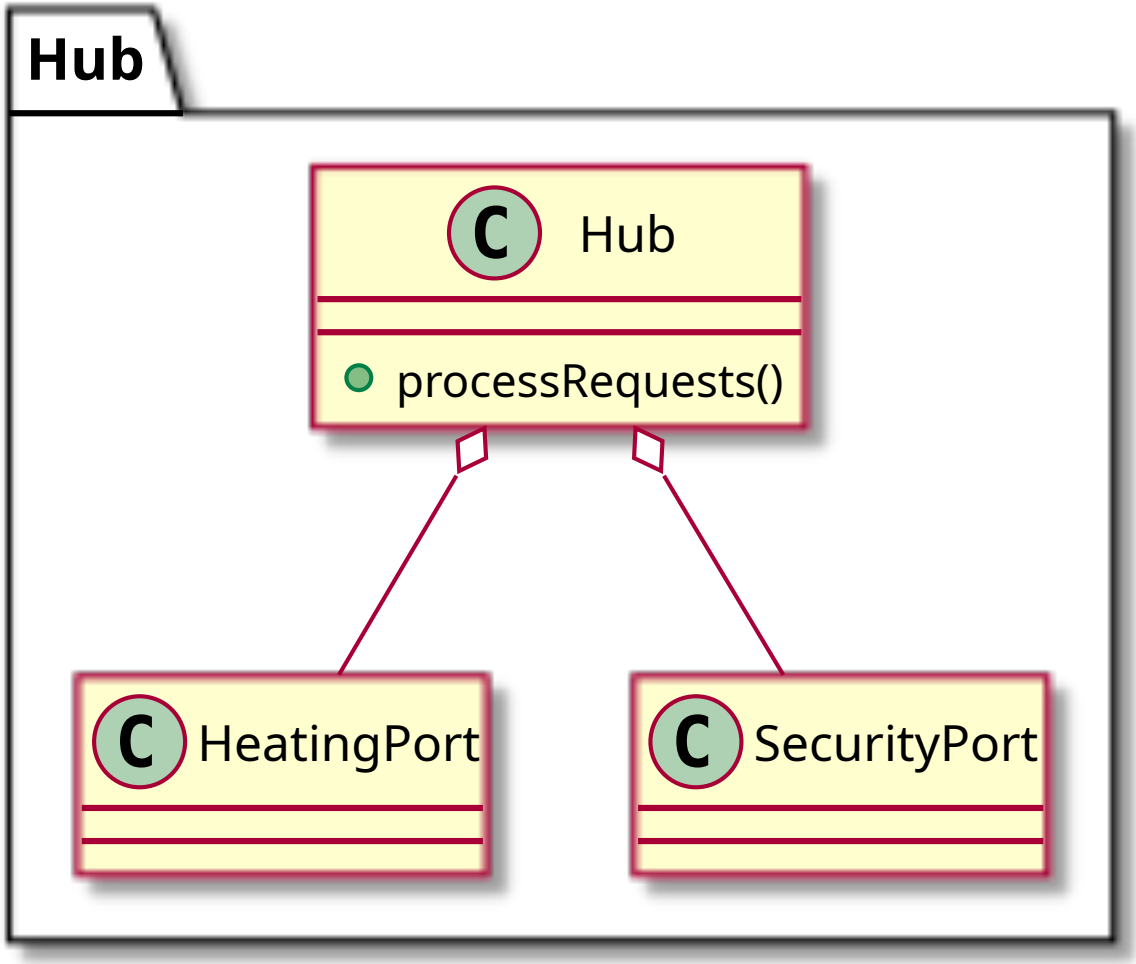
Session 2 (50 minutes): Structure Diagrams

4. Composite Structure Diagrams (20 minutes)

Purpose

Show the *internal structure* of a class or component.

Example



Interactive Exercise (10 minutes)

Task

Model the *HeatingController* internal structure.

Include:

- A sensor input port
- An actuator output port
- A processing unit

5. Profile Diagrams (20 minutes)

Purpose

Define UML extensions for domain-specific modeling.

Example

```
@startuml
profile SmartHomeProfile {
  stereotype Sensor
  stereotype Actuator
}

class TemperatureSensor <<Sensor>>
class HeatingController <<Actuator>>
@enduml
```

Interactive Exercise (10 minutes)

Task

Create a simple **SmartLightingProfile** with:

- Stereotype `LightDevice`
- Stereotype `Dimmable`

Apply your stereotypes to:

- LightSensor
- LightController

Wrap-Up

Summary Table

Diagram Type	Purpose	Example
Communication	Object message exchange	Heating activation
Interaction Overview	High-level flow	Morning routine
Timing	Time-based behavior	Door sensor alert
Composite Structure	Internal architecture	Hub subsystem
Profile	Domain extensions	SmartHome stereotyp

Closing Task

Pick one Smart Home subsystem (Heating, Security, Lighting) and:

- Create *one* interaction diagram
- Create *one* structure diagram
- Apply at least *one* stereotype from a custom profile