

CSSE 374: Interaction Diagrams



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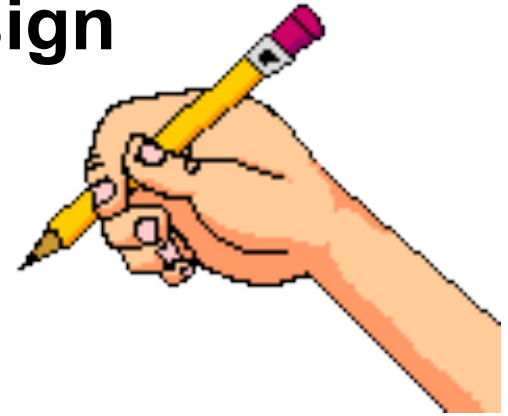
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ROSE-HULMAN
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Prefer Design Skill over UML Skill

- UML is **only a tool** for object design
- The **real skill is the design**,
...NOT the diagramming
- Fundamental object design requires knowledge of:
 - Principles of **responsibility assignment**
 - Design **patterns**



Learning Outcomes: O-O Design

Demonstrate object-oriented design basics like domain models, class diagrams, and interaction (sequence and communication) diagrams.



<http://enterprisegeeks.com/blog/2009/07/>

- **Outline Dynamic/Behavior Design concepts**
- **Introduce Interaction Diagrams**
- **Describe Key Sequence Diagram Concepts**
- **Describe Key Communications Diagram Concepts**



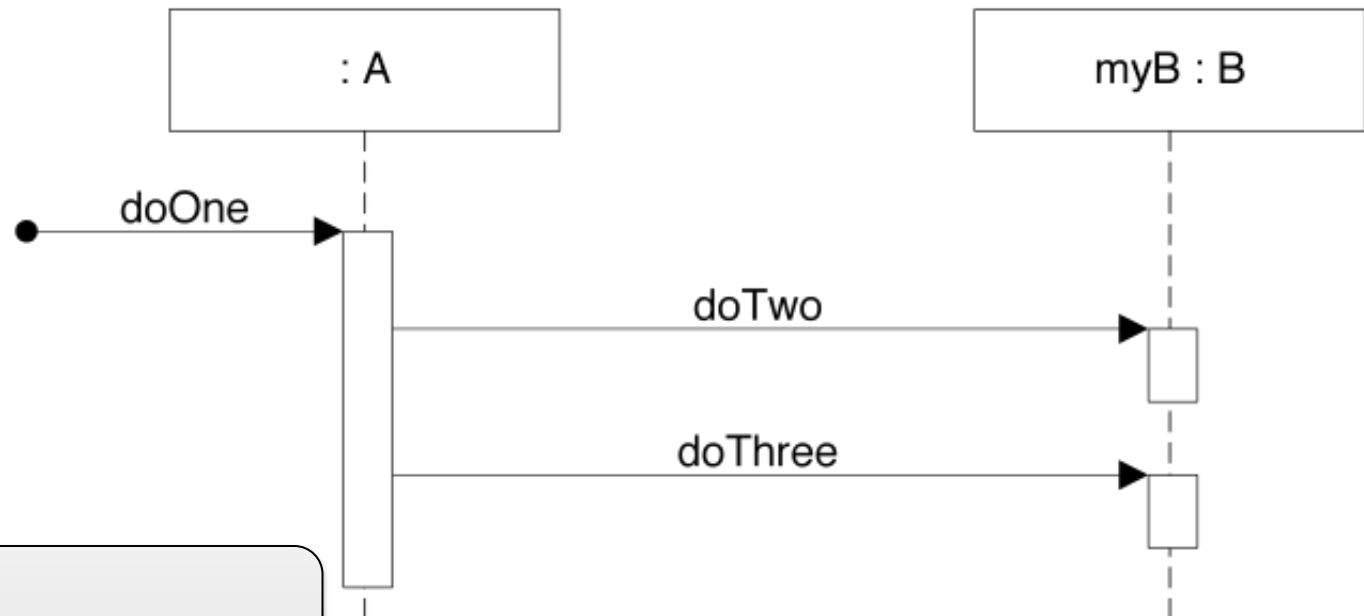
Interaction Diagrams

- **Used for dynamic object modeling**
 - Answer questions about behavior (i.e., events, sequencing)
- **Two common types:**
 - Sequence diagrams
 - Communication diagrams

Don't confuse with System Sequence Diagrams (SSDs), which use a subset of the notation

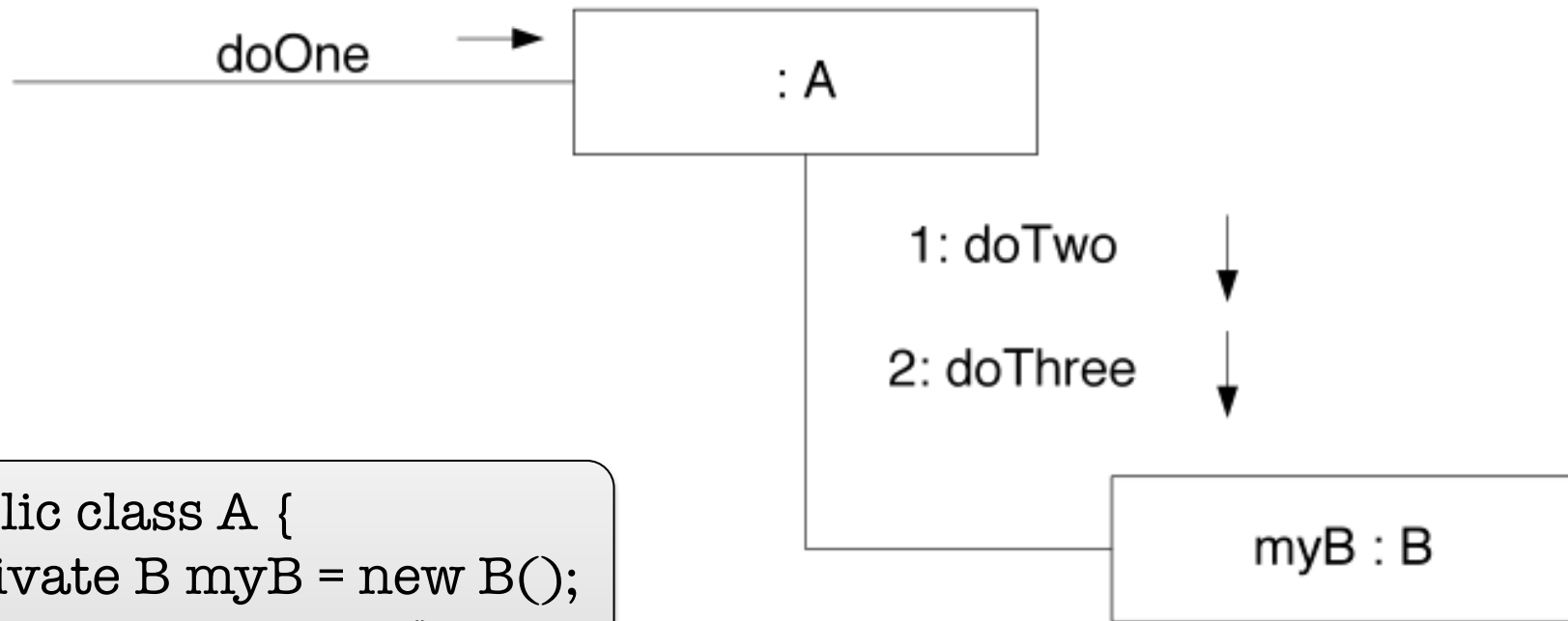
Spend time on interaction diagrams, not just class diagrams

Sequence Diagram Example



```
public class A {
    private B myB = new B();
    public void doOne() {
        myB.doTwo();
        myB.doThree();
    }
}
```

Communication Diagram Example

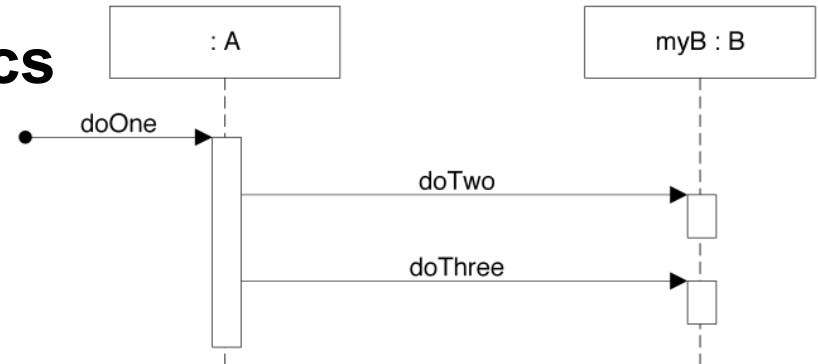


```
public class A {  
    private B myB = new B();  
    public void doOne() {  
        myB.doTwo();  
        myB.doThree();  
    }  
}
```

Relative Strengths

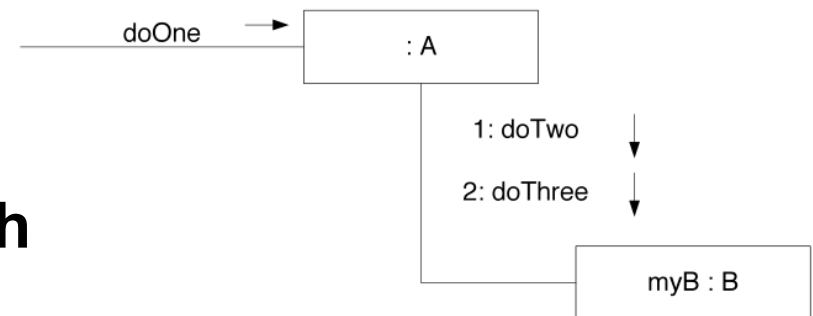
■ Sequence Diagrams (SD)

- Clearer notation & semantics
- Better tool support
- Easier to follow
- Excellent for documents



■ Communication Diagrams (CD)

- Much more space efficient
- Easier to modify quickly
- Excellent for UML as sketch

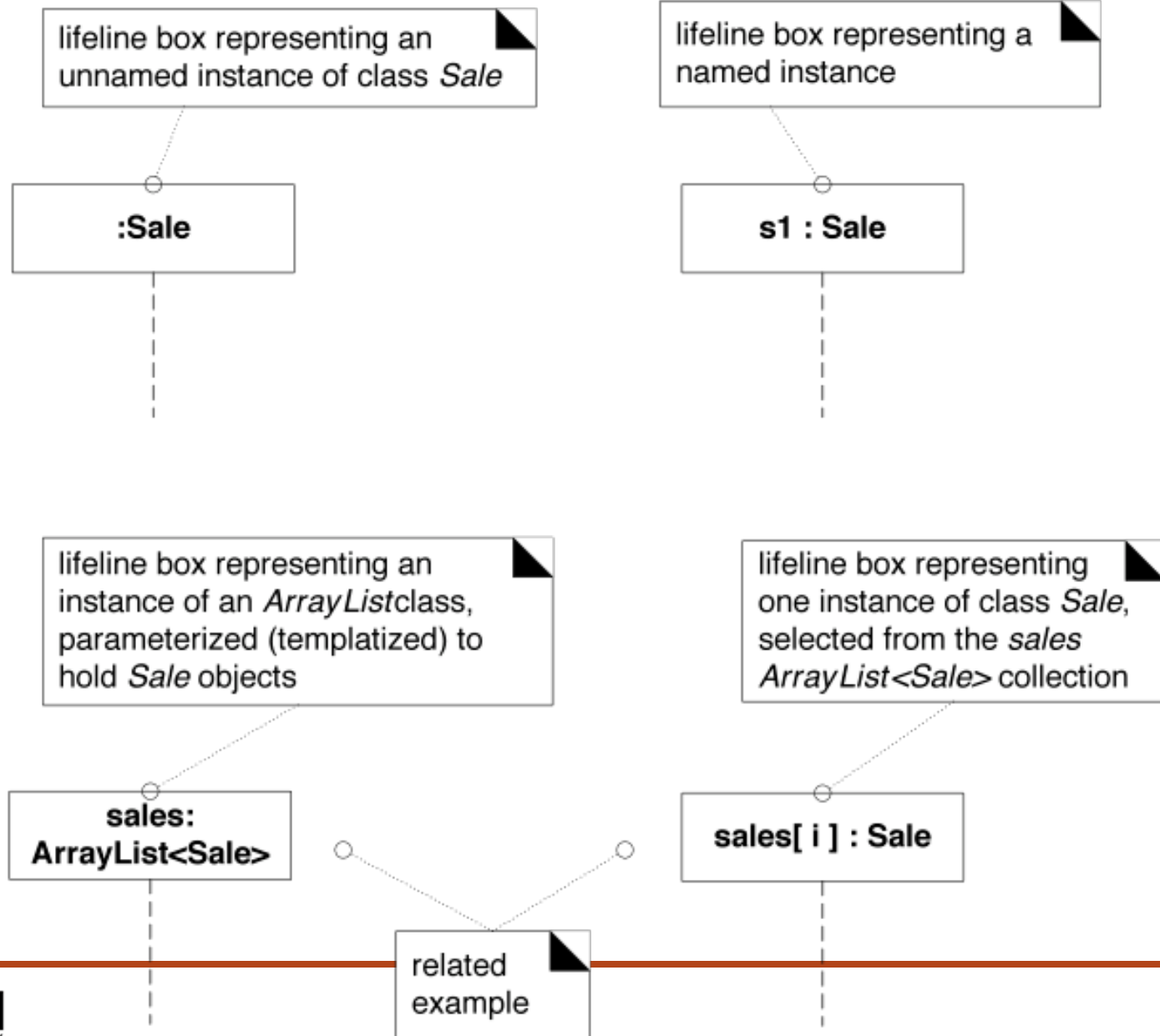




Common Notation



Lifeline Boxes





Basic Message Expression Syntax

id = message (parameter : parameterType) : returnType



Much is optional, for example:

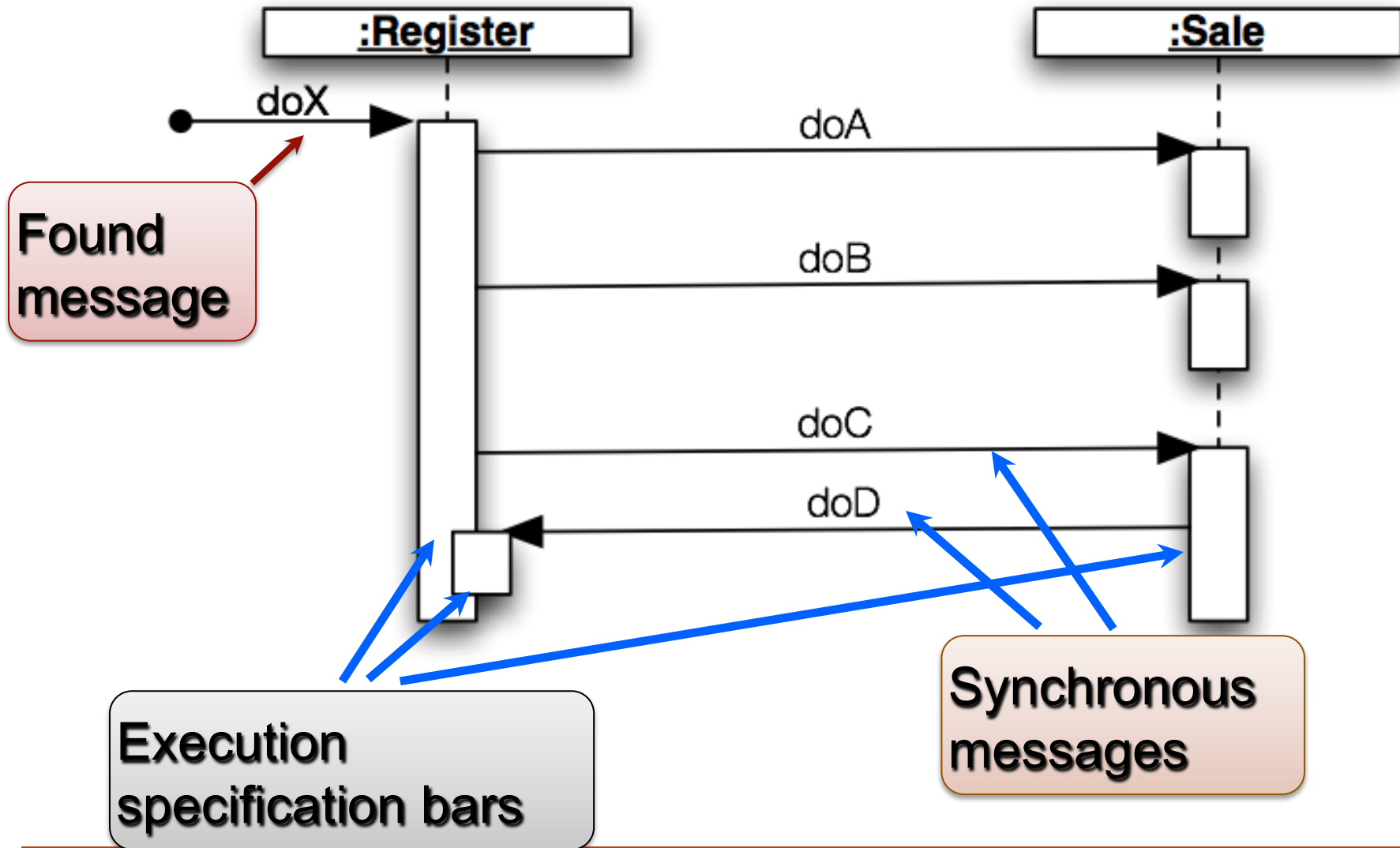
- **initialize(register)**
- **initialize**
- **d = getProductDescription(id)**
- **d = getProductDescription(id:ItemID)**
- **d = getProductDescription(id:ItemID) : ProductDesc**

Sequence Diagrams (SD)

(when order is key)

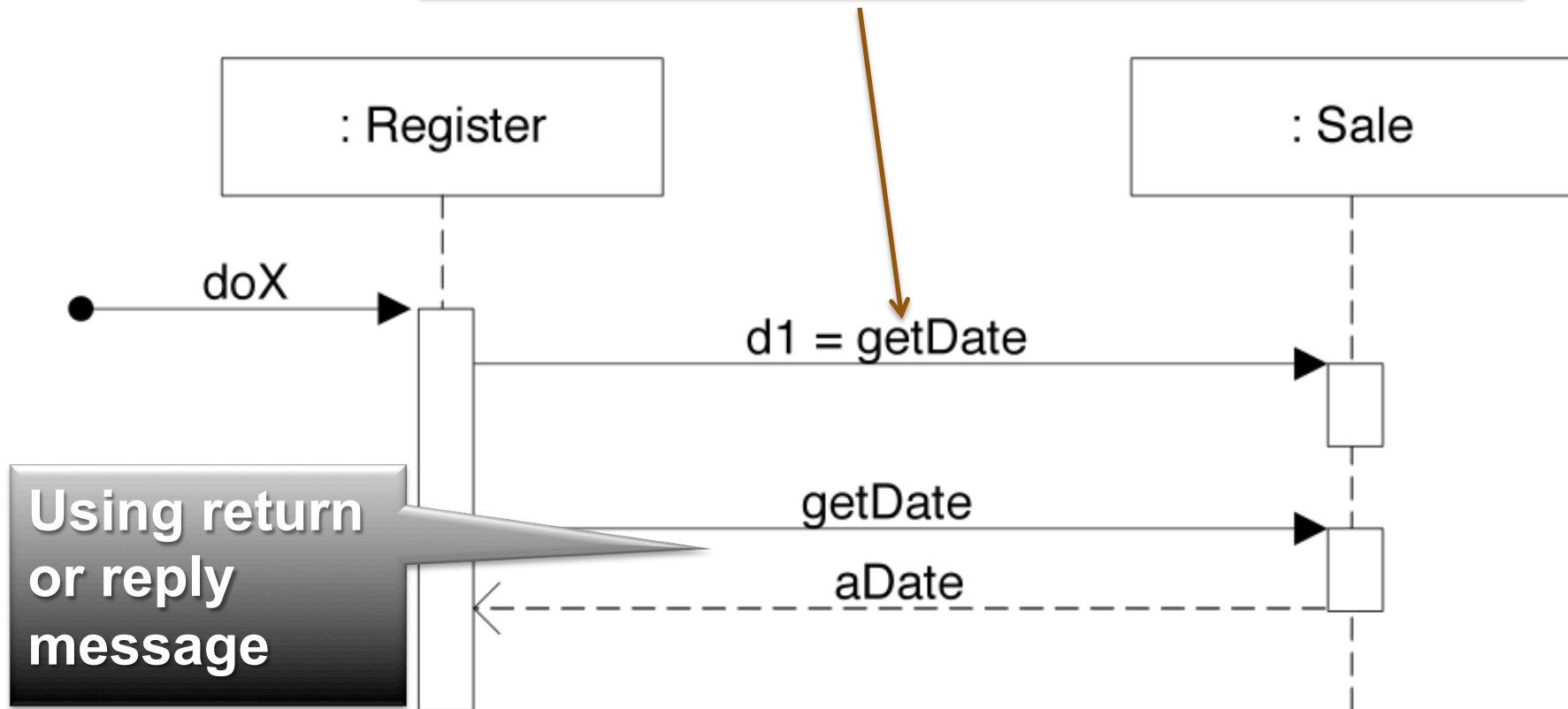


Basic SD Terminology



Two Ways of Illustrating Return Values

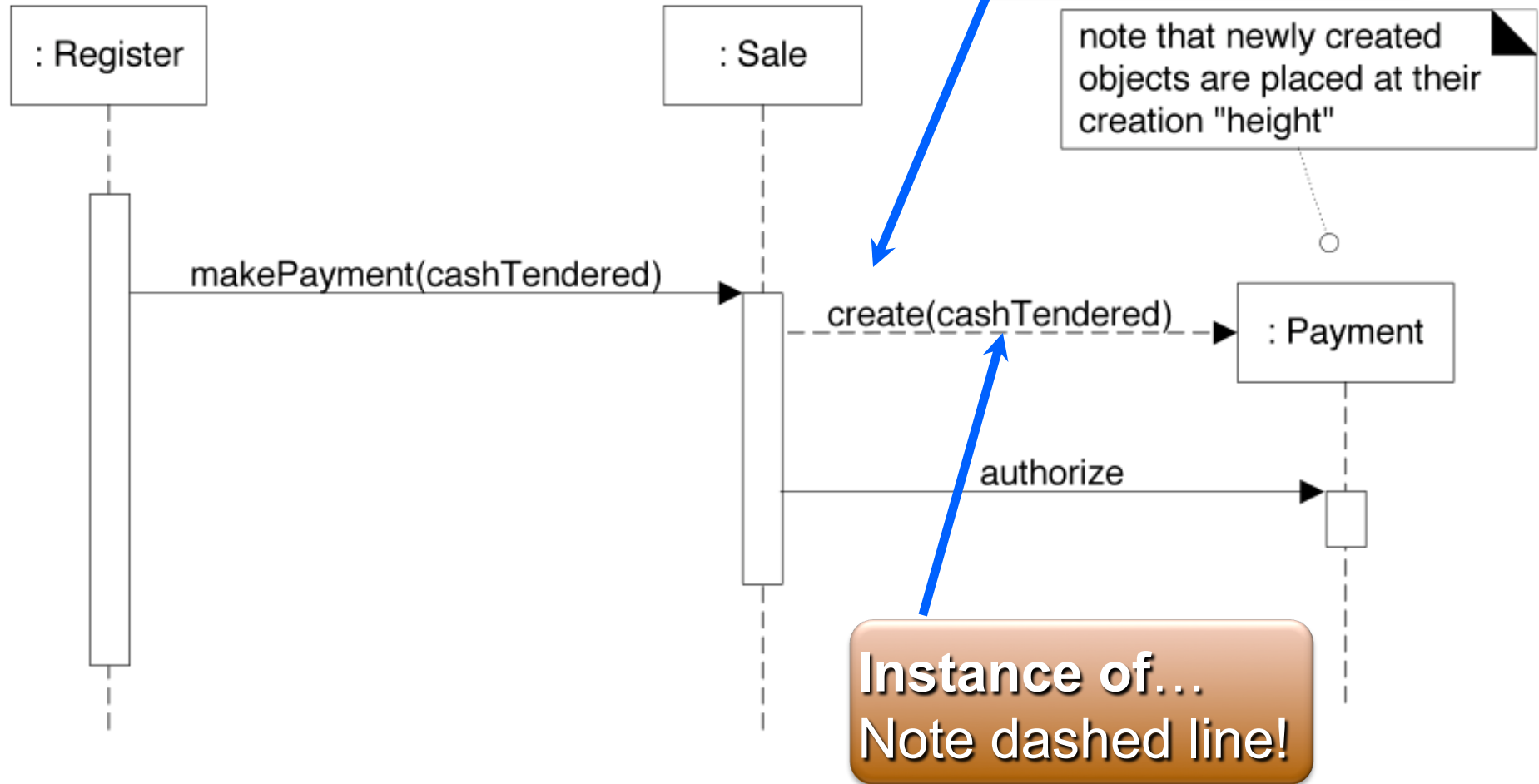
```
returnVar = message(parameter)
```



Instance Creation

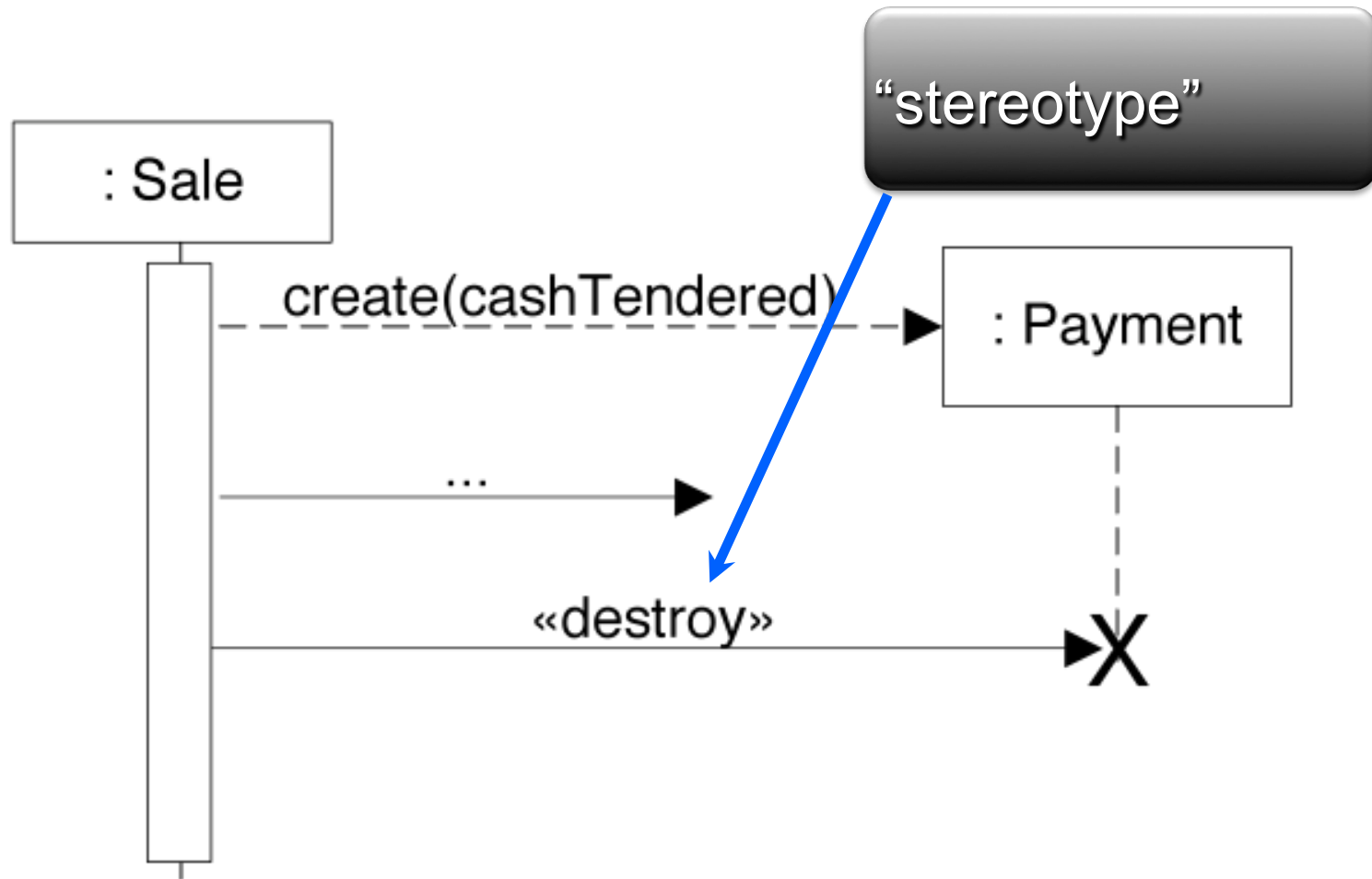
Conventional message name

note that newly created objects are placed at their creation "height"



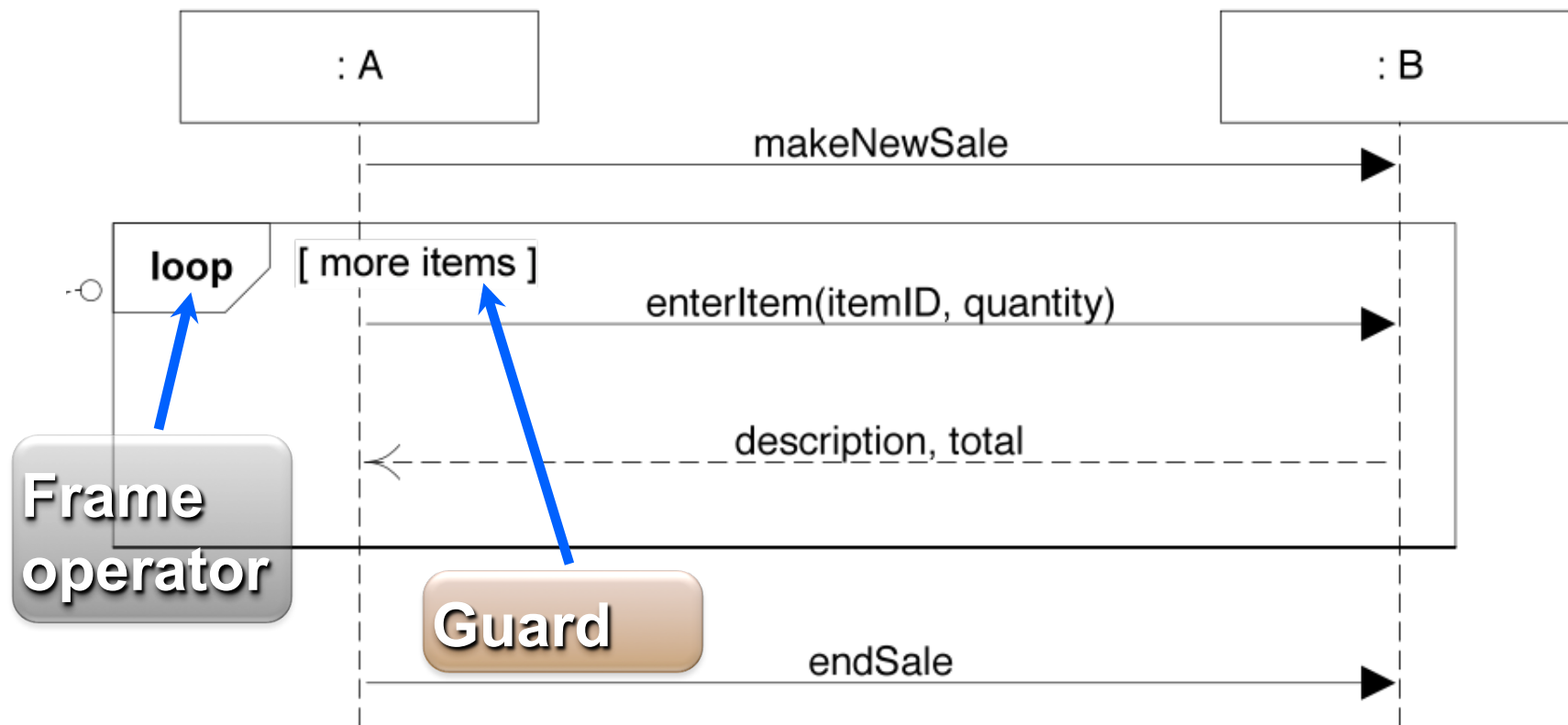


Instance Destruction



Speaking of Sales...

Recall Interaction Frames

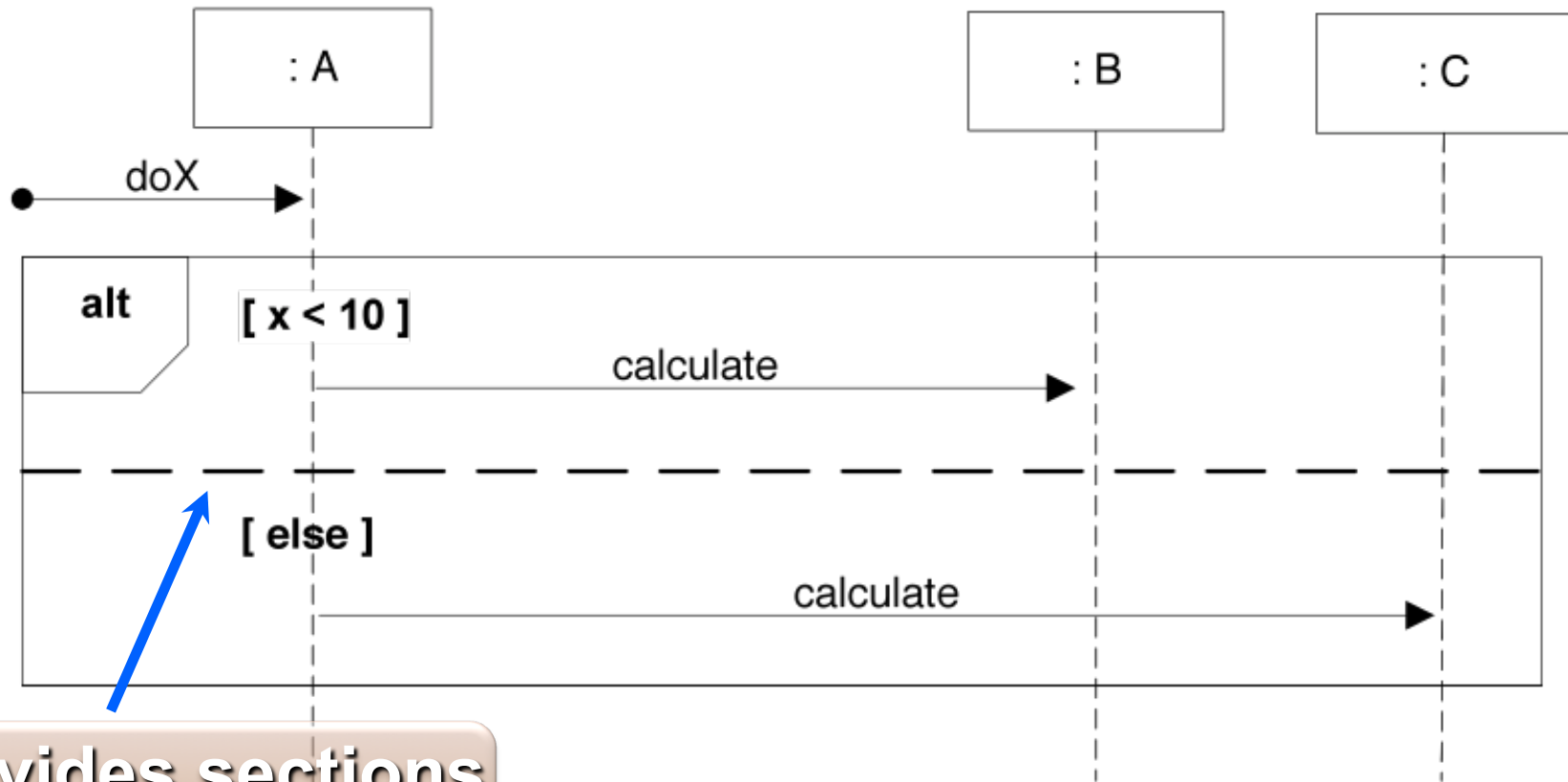




Common Frame Operators

Operator	Meaning
alt	✓ “alternative”, if-then-else or switch
loop	✓ loop while guard is true, or <i>loop(n)</i> times
opt	✓ optional fragment executes if guard is true
par	✓ parallel fragments
region	✓ critical region (single threaded)
ref	✓ a “call” to another sequence diagram
sd	✓ a sequence diagram that can be “called”

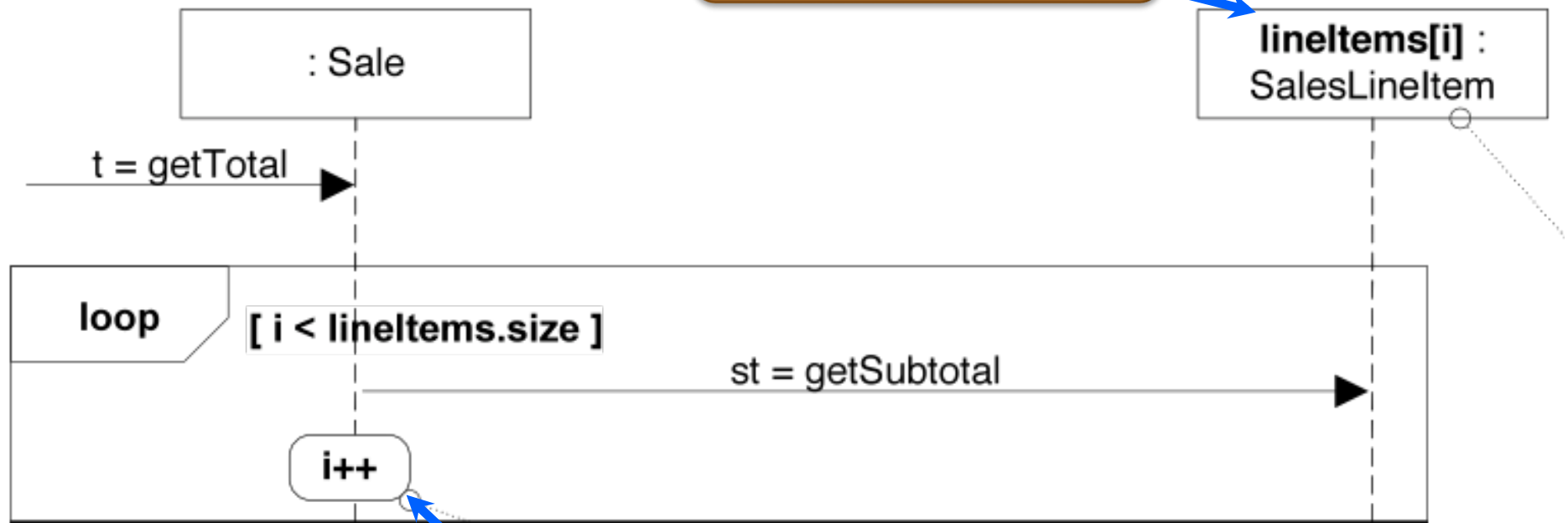
Mutual Exclusion “alt” Frame



Divides sections of frame

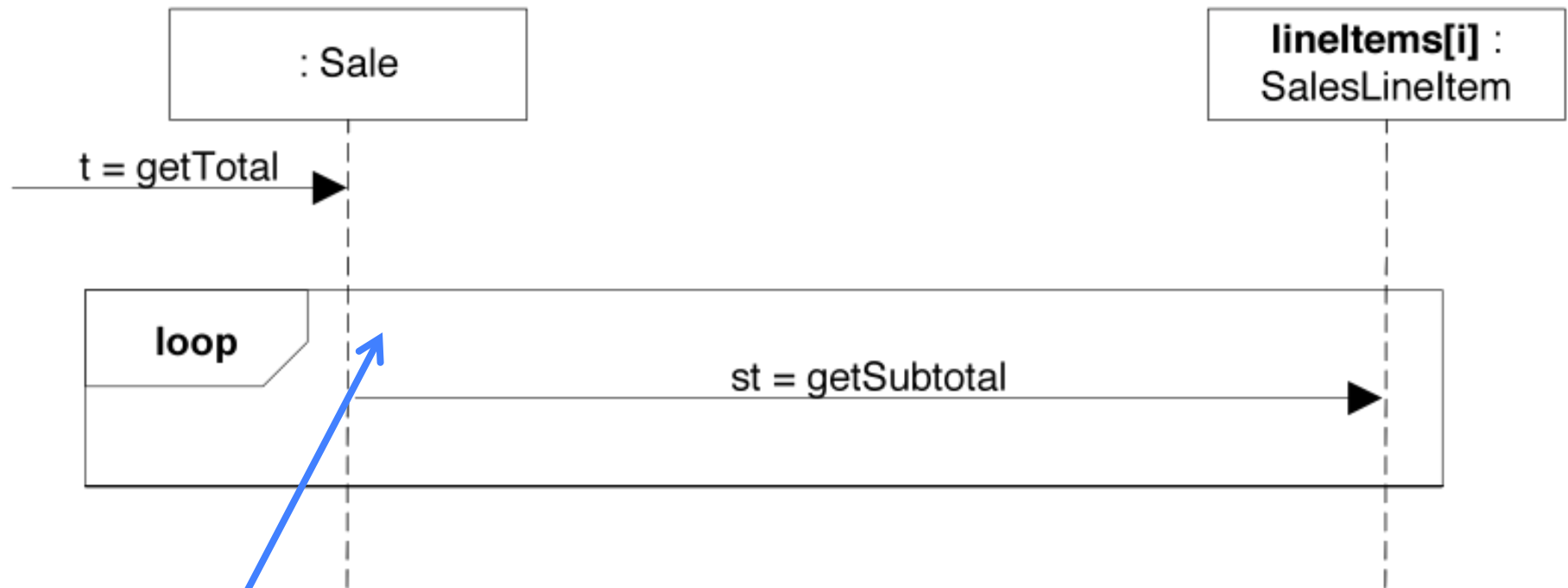
Iterating Over a Collection—Version 1

One instance from a collection



Action box contains arbitrary statements from implementation language – increment i

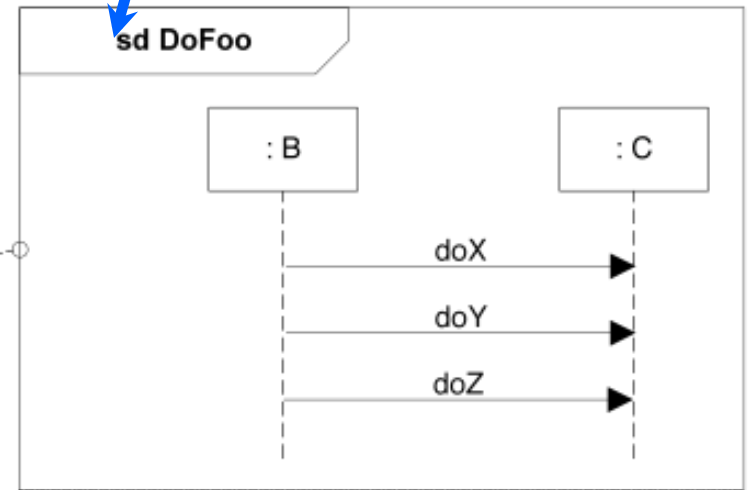
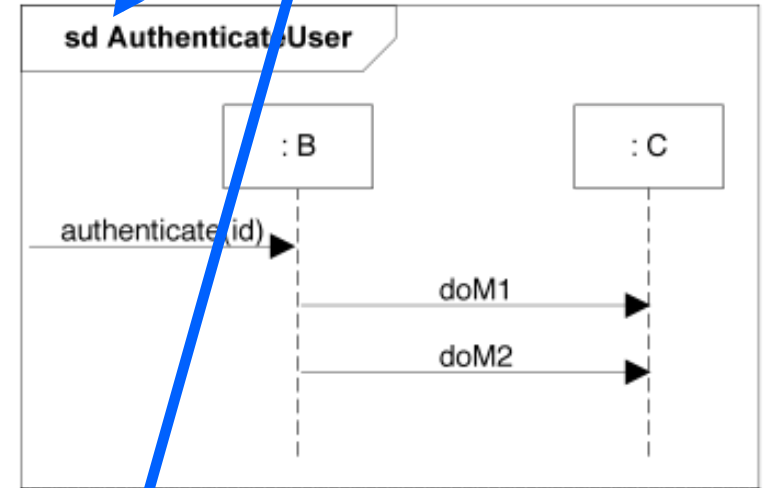
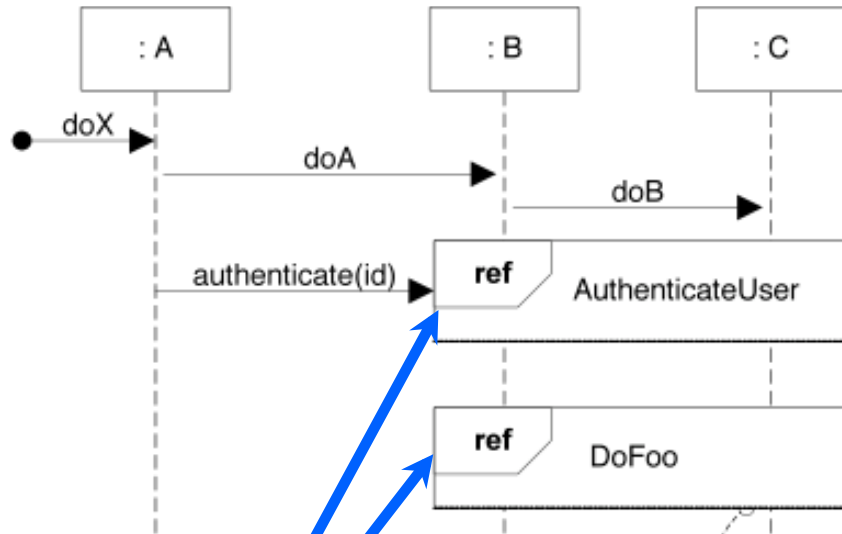
Iterating Over a Collection—Version 2



Leaves the loop implicit.

Abstracting Interaction

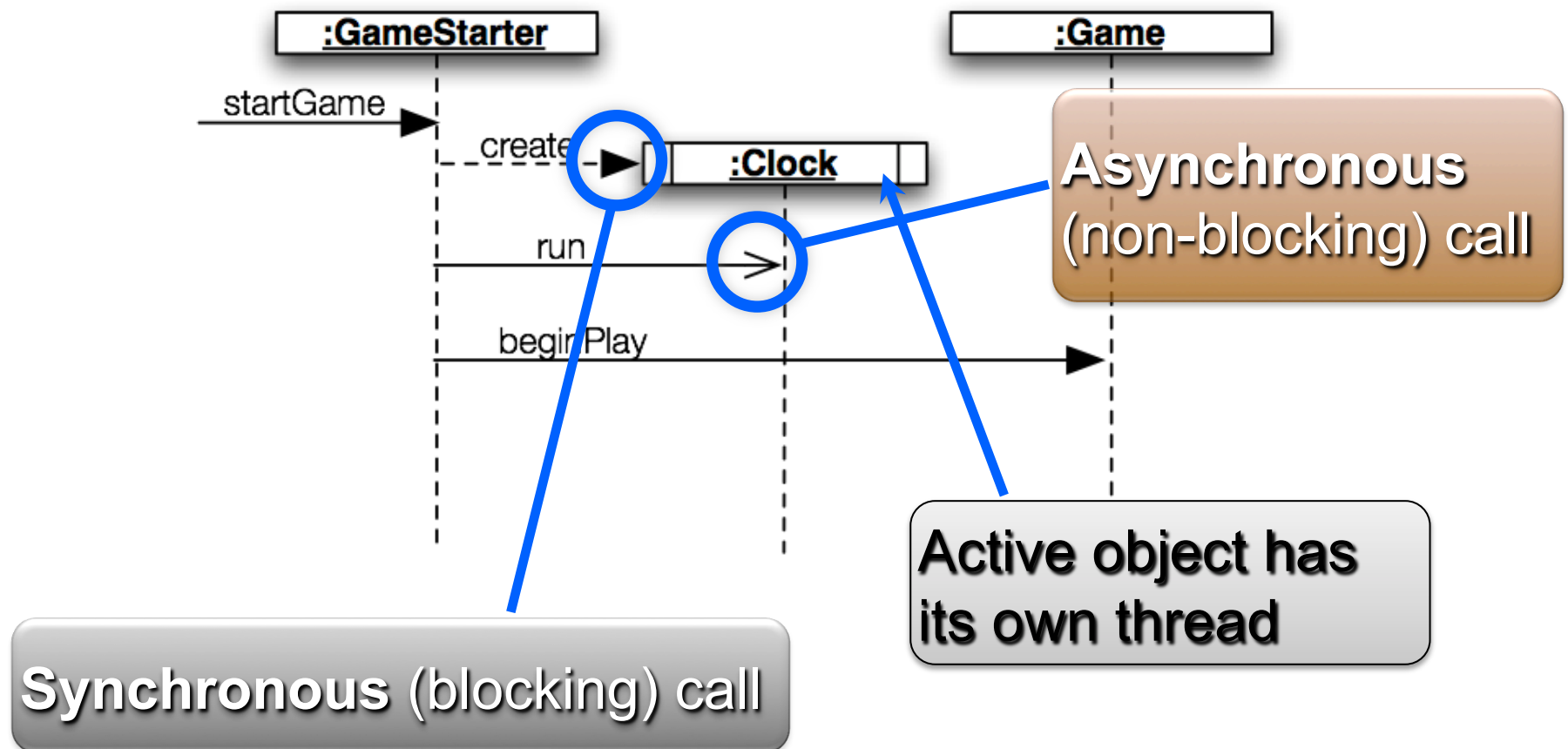
sd frames



Interaction occurrence
 ref frames

interaction occurrence
 lifelines
 note that the sd frame it relates to
 has the same lifelines: B and C

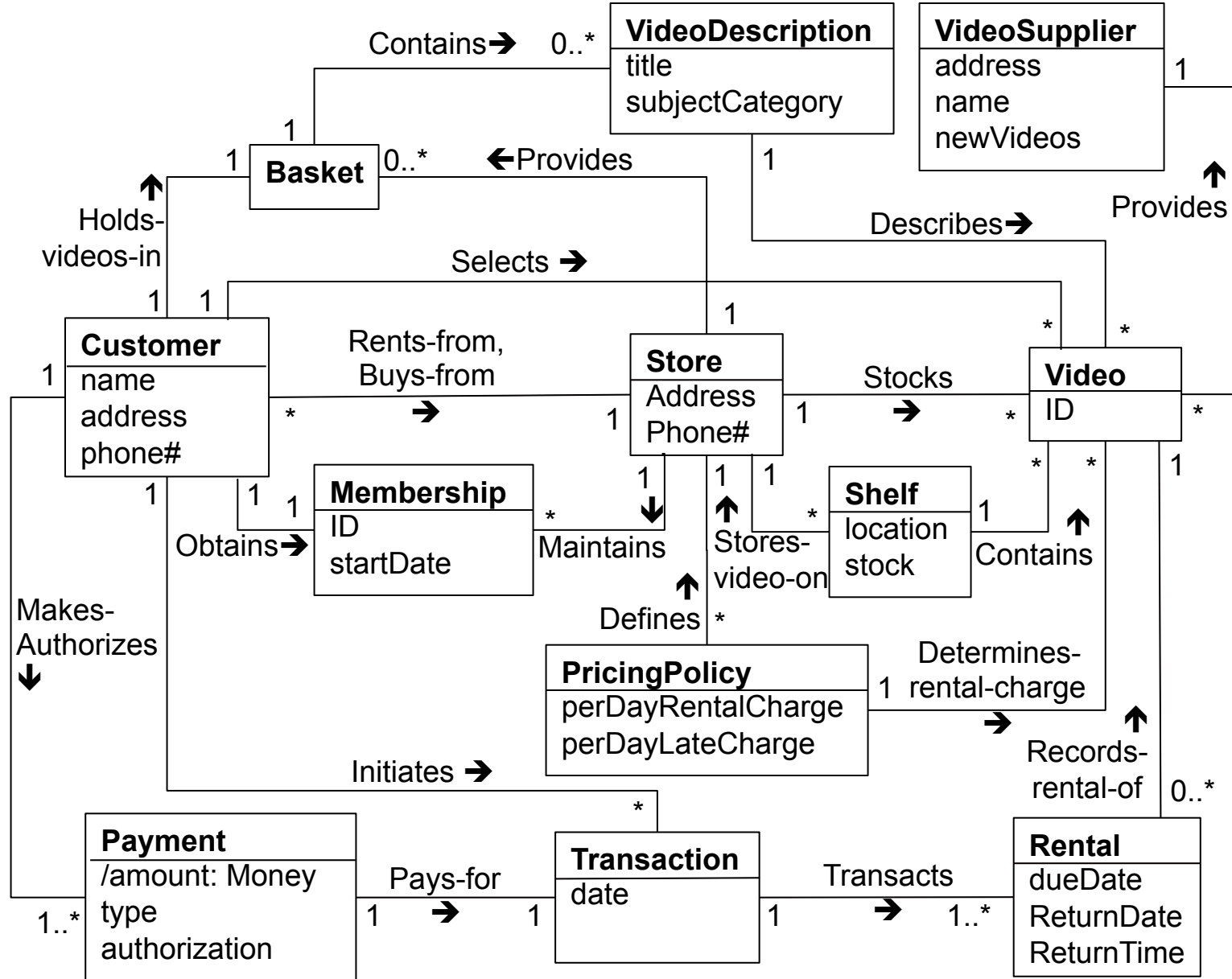
Asynchronous Calls



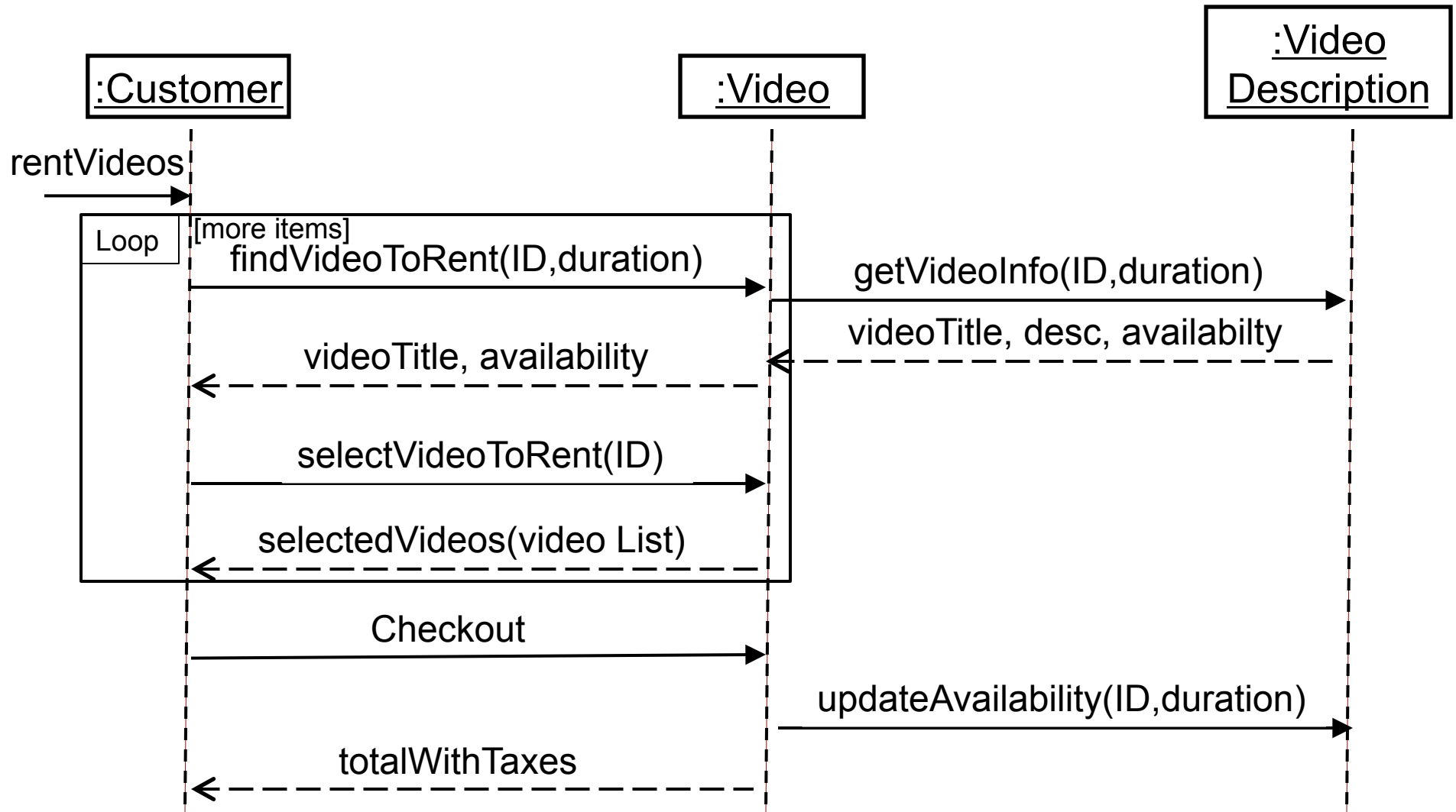
Exercise on Sequence Diagrams

- Break up into your project teams
- Given the following:
 - Select a number of videos in preparation to purchase and put them in a list (cart)
 - Involve Classes/Lifeline Boxes: Customer, Video, and Video Description
- Draw an SD for Rent Video example





An SD Solution for Rent Video Example



Communi- cation Diagrams (CD)

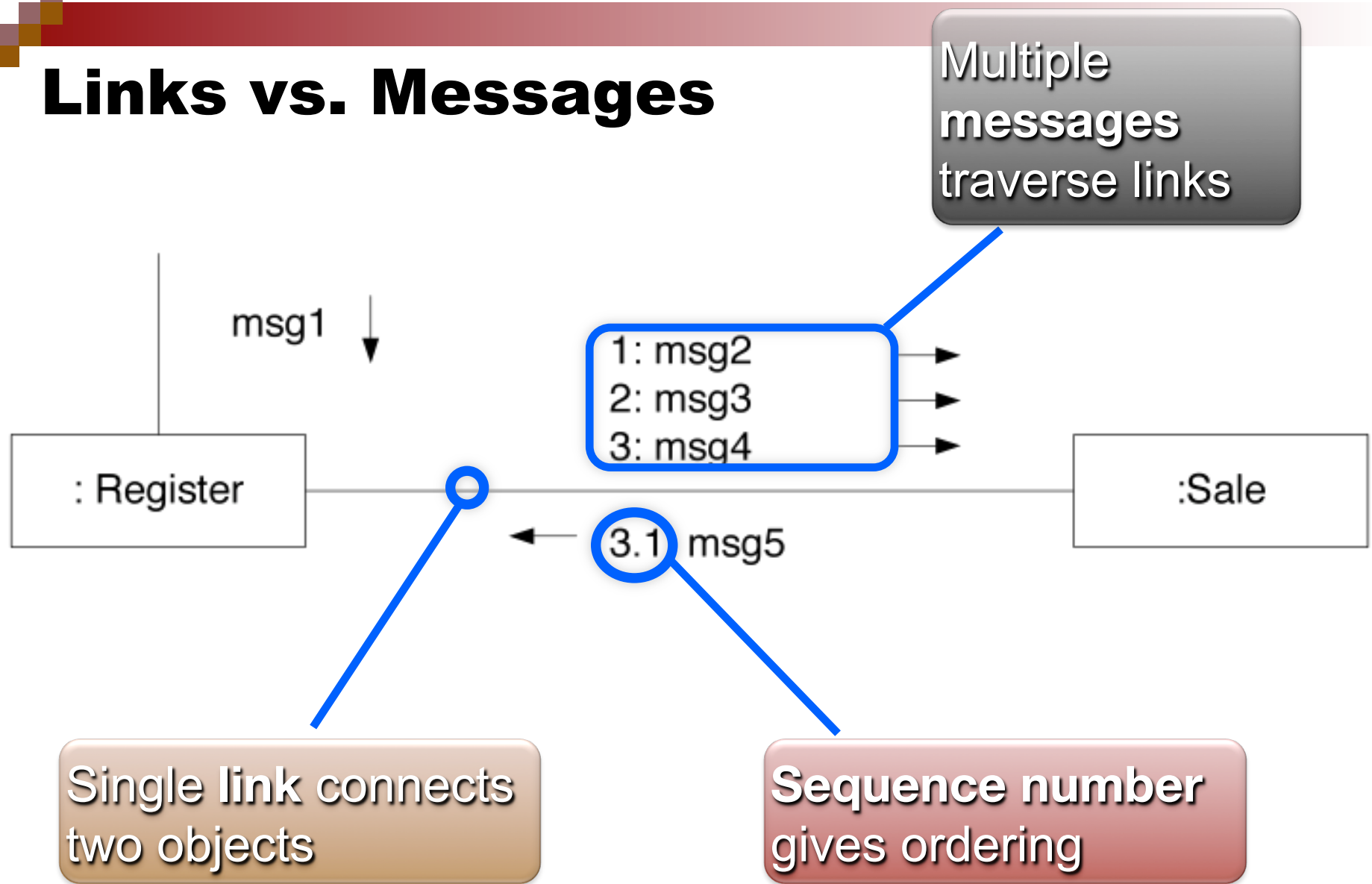
TURING TEST EXTRA CREDIT:
CONVINCE THE EXAMINER
THAT HE'S A COMPUTER.

YOU KNOW, YOU MAKE
SOME REALLY GOOD POINTS.

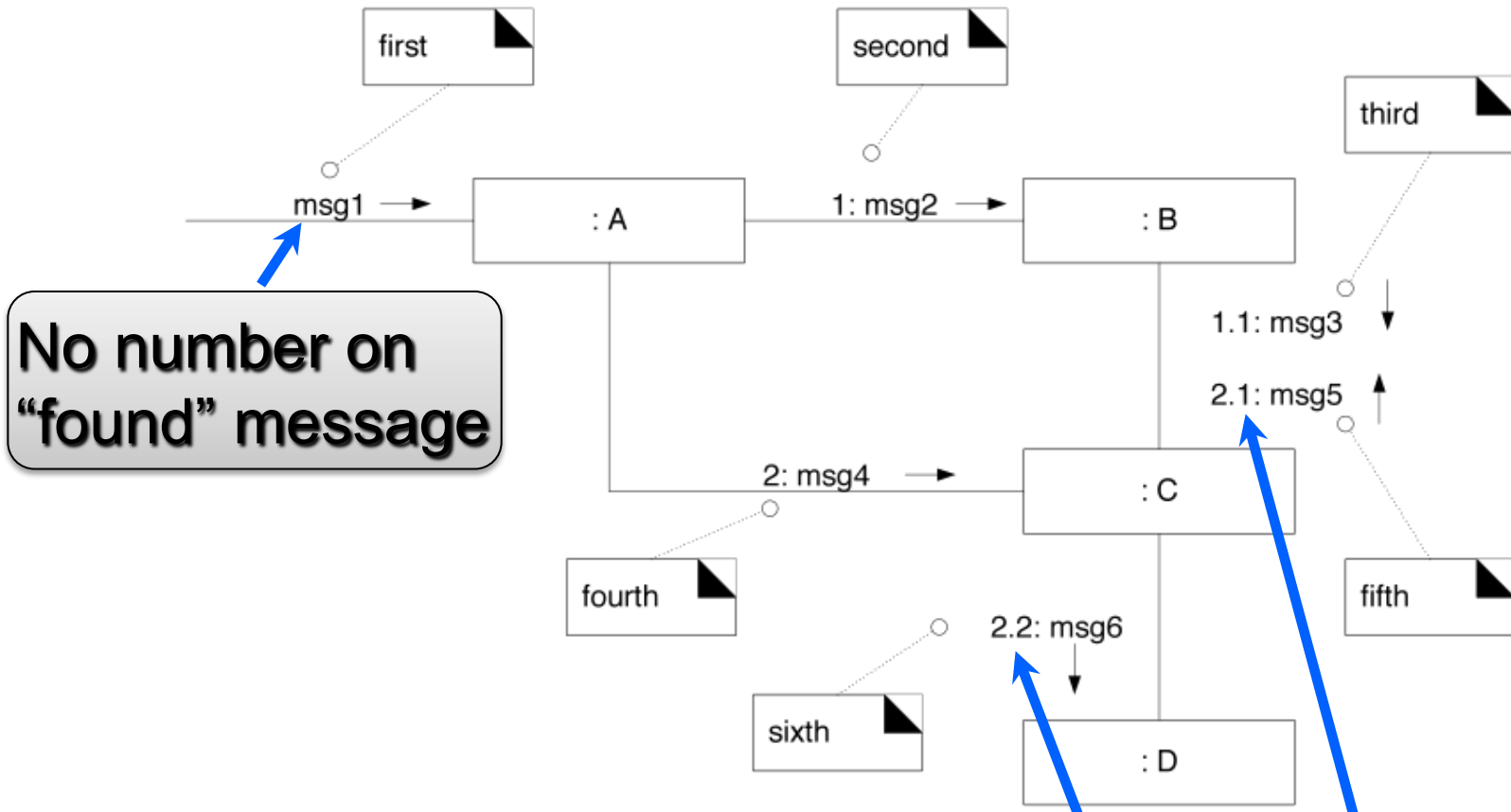
I'M ... NOT EVEN SURE
WHO I AM ANYMORE.



Links vs. Messages



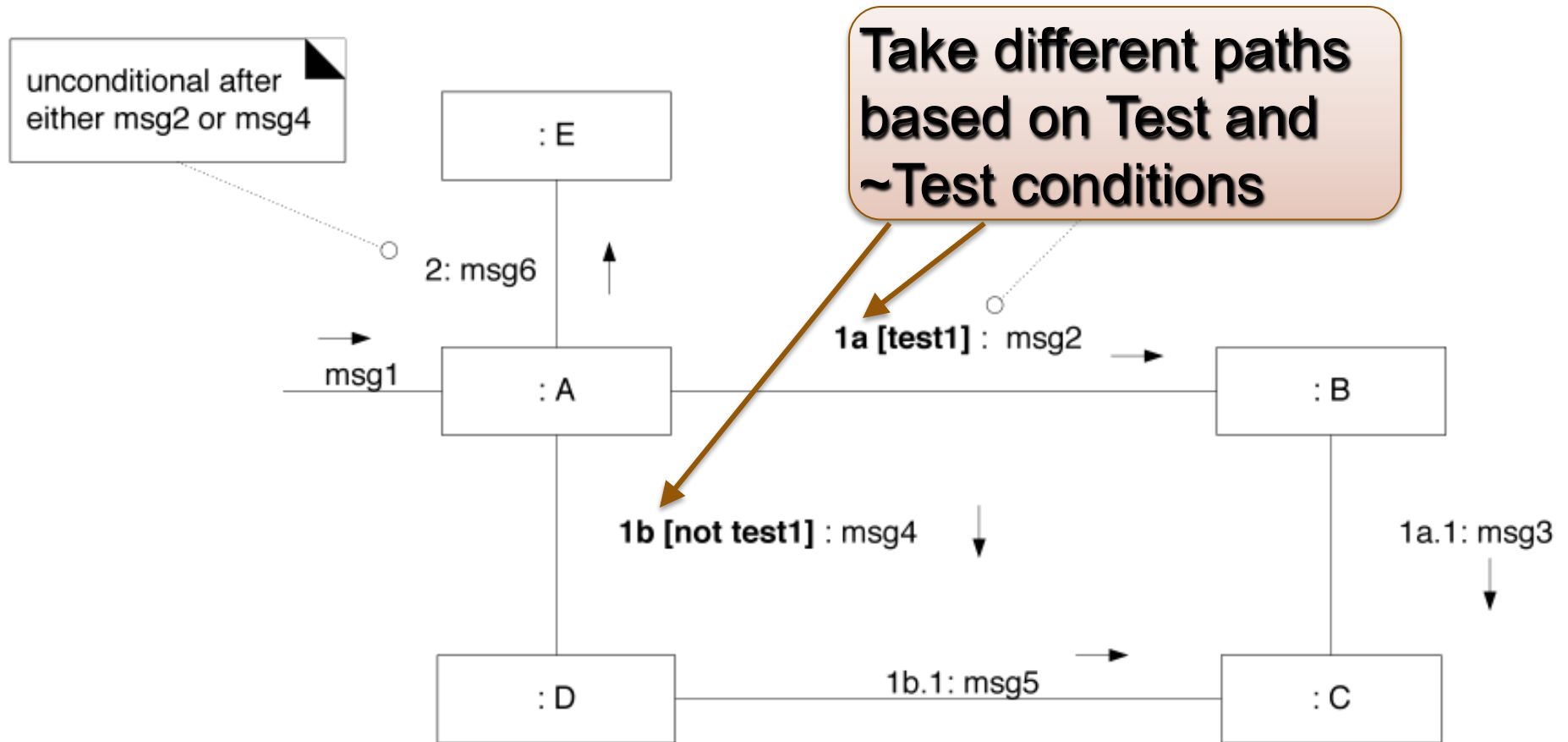
Sequence Numbering – Following Flow



No number on "found" message

Nested messages use "legal" style

Conditional Messages Use Guards

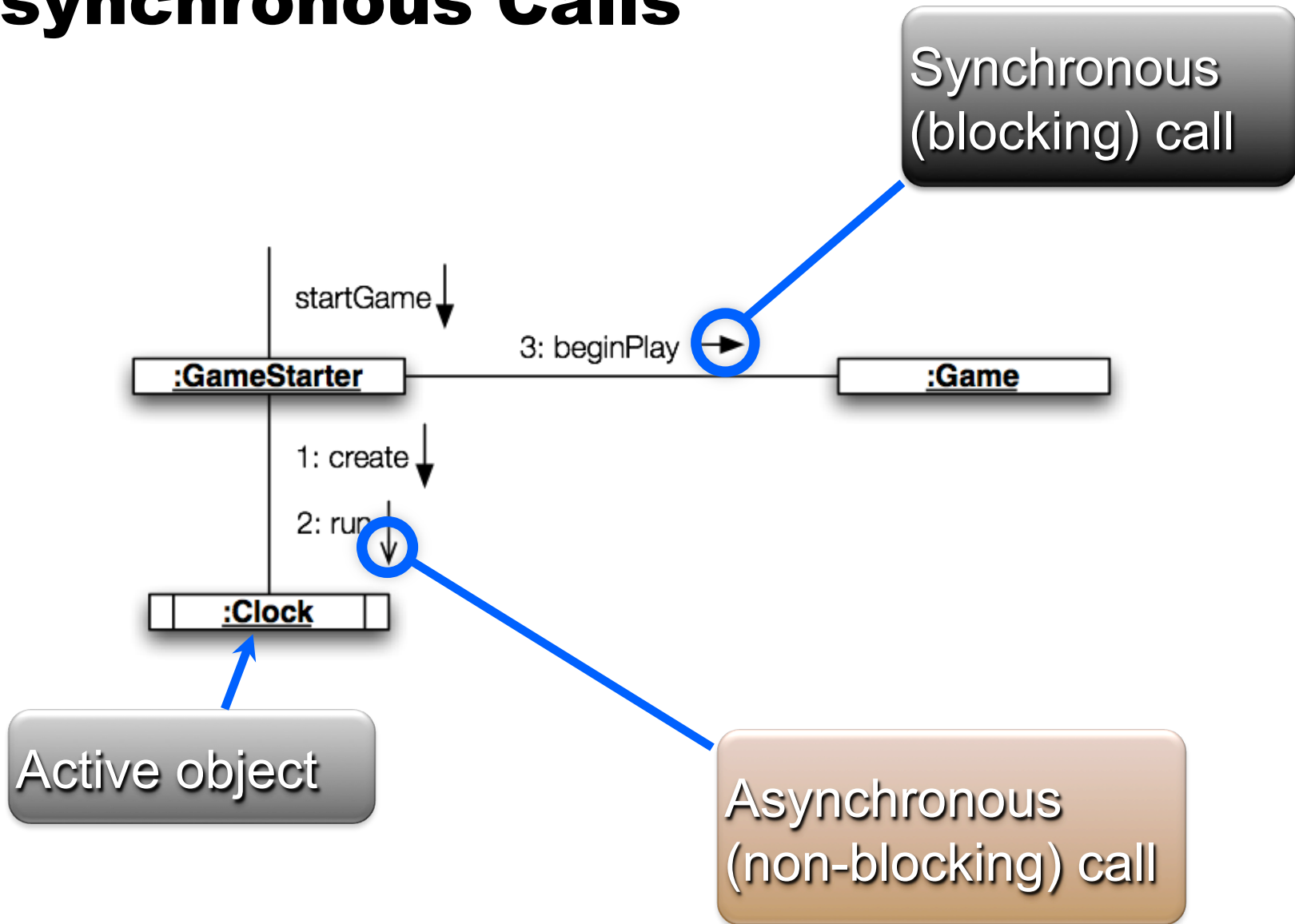


Iteration Uses Stars (splats ☺ ***)



Iteration is indicated with “*”
Note: 1 * [i=1..n]: st = getSubtotal

Asynchronous Calls

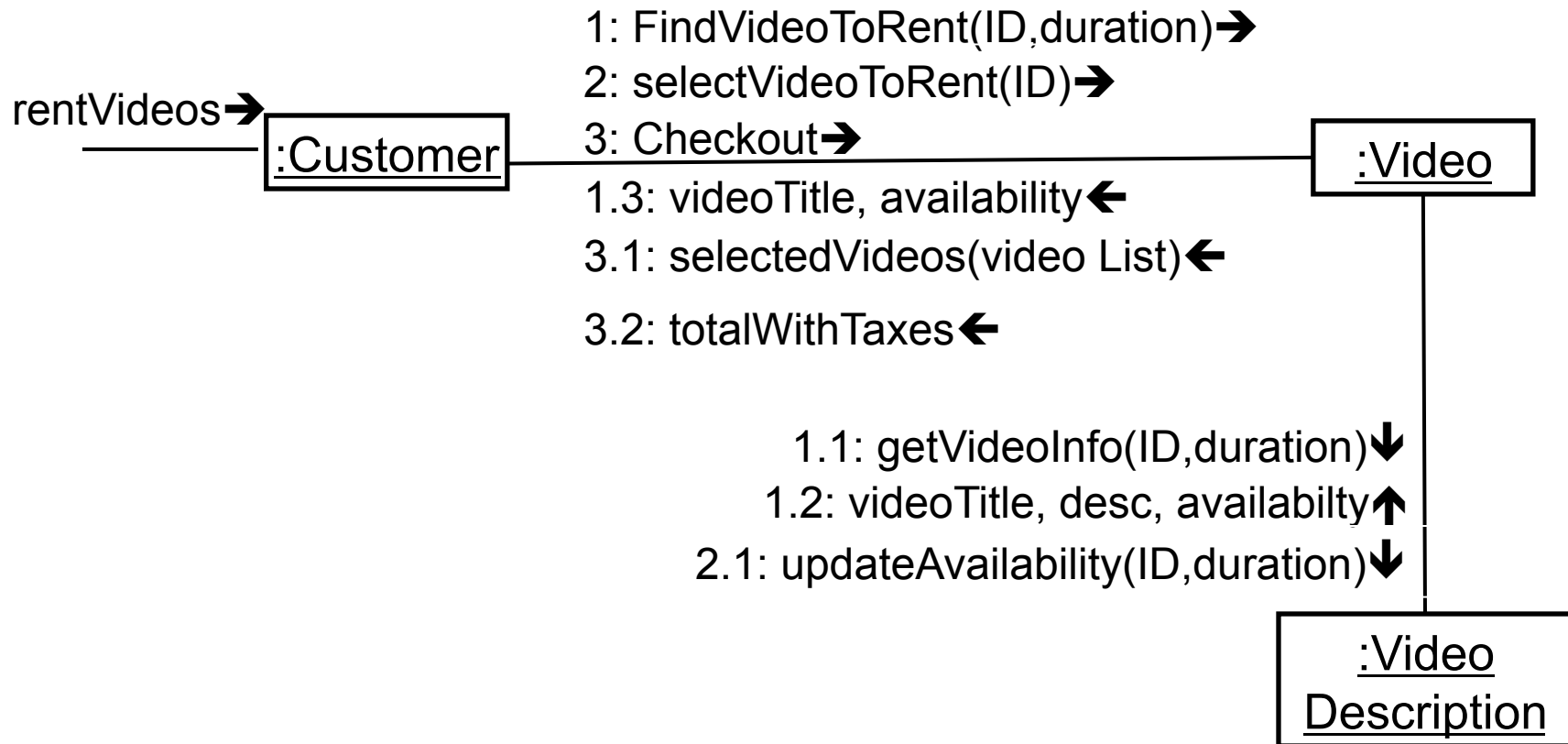


Exercise on Communications Diagrams

- Break up into your project teams
- Given the following:
 - Select a number of videos in preparation to purchase and put them in a list (cart)
 - Involve Classes/Lifeline Boxes: Customer, Video, and Video Description
- Draw an CD for Rent Video example



A CD Solution for Rent Video Example





Homework and Milestone Reminders

- Read Chapter 16 on Design Class Diagrams
- Homework 2 – BBVS SSDs & Ops Contracts
 - Due by 5:00pm on Today, December 14th, 2010
- Homework 3 – BBVS Logical Architecture and Preliminary Design
 - Due by 5:00pm on Tuesday, January 4th, 2011
- Milestone 3 – Junior Project SSDs, OCs, and Logical Architecture
 - Due by 11:59pm on Friday, January 7th, 2010
- 5% extra credit on Milestone 3 and Homework3 if you finish by 11:59pm, Friday before break!

Cartoon of the Day

MY HOBBY:

EMBEDDING NP-COMPLETE PROBLEMS IN RESTAURANT ORDERS

CHOTCHKIES RESTAURANT

~ APPETIZERS ~

MIXED FRUIT	2.15
FRENCH FRIES	2.75
SIDE SALAD	3.35
HOT WINGS	3.55
MOZZARELLA STICKS	4.20
SAMPLER PLATE	5.80

~ SANDWICHES ~

BARBECUE	6.55
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