

Design Techniques

Ch 2.6-2.12

- 1) What technique can we use for initial design?
- 2) What technique can we use to document a design?

Process

- Early Software Engineering Process Phases:



Software design techniques...

CRC Cards

a Design Technique

CRC Cards

- CRC Cards:...
- It's an index card listing:
 - Class Name
 - Class Responsibilities
Ex: Manage messages
 - Class Collaborators
..
Ex: Message class

Customer

Places orders
Knows name
knows address
Knows customer number
knows order history

Order

Order

Knows placement date
Knows delivery date
Knows total
Knows applicable taxes
Knows order number
Knows order items

Order Item

CRC Cards

- Purpose
 - Support an..
- Physical card support
 - Walk-through a use-case deciding..
 - Lay cards out on table and re-arrange them as needed.
- Small, so limit responsibility of the class
 - No "God" object (knows everything)
 - If too much on a card,..

CRC Process

- 1) For each discovered class, write its name on the top.
 - Look for..
- 2) Left side: Responsibilities
 - Not method names, but..
 - Message class example:
 - Good: manage message content
 - Bad: `getContent()`, `getContentLength()`, `setContent()`
- 3) Right side: Collaborators
 - no particular order; which classes does this one use
 - does not line-up with responsibilities
- 4) Don't list all details; just enough to show..

CRC Example

Mailbox	
<i>manage passcode</i>	MessageQueue
<i>manage greeting</i>	
<i>manage new and saved messages</i>	

MailSystem	
<i>manage mailboxes</i>	Mailbox

CRC Use

- CRC Cards are good for
 - discussions and collaboration
 -
- But they are messy
 - Not good for recording design decisions.
UML Diagrams do this!

In-class exercise: Pledge Tracker Description

- Participants gather pledges from friends and neighbours for completing a charity walk-athon
 - Pledge lists donor's name and billing info.
- App reads pledge data from file (.csv) and:
 - Generates invoices for pledge (.pdf's)
 - Allow entry of payments received (saves to file)
 - Display summary of unpaid pledges (names, \$)
 - Display summary of total pledge amounts:
total \$ pledged, \$ paid, \$ unpaid

CRC Example

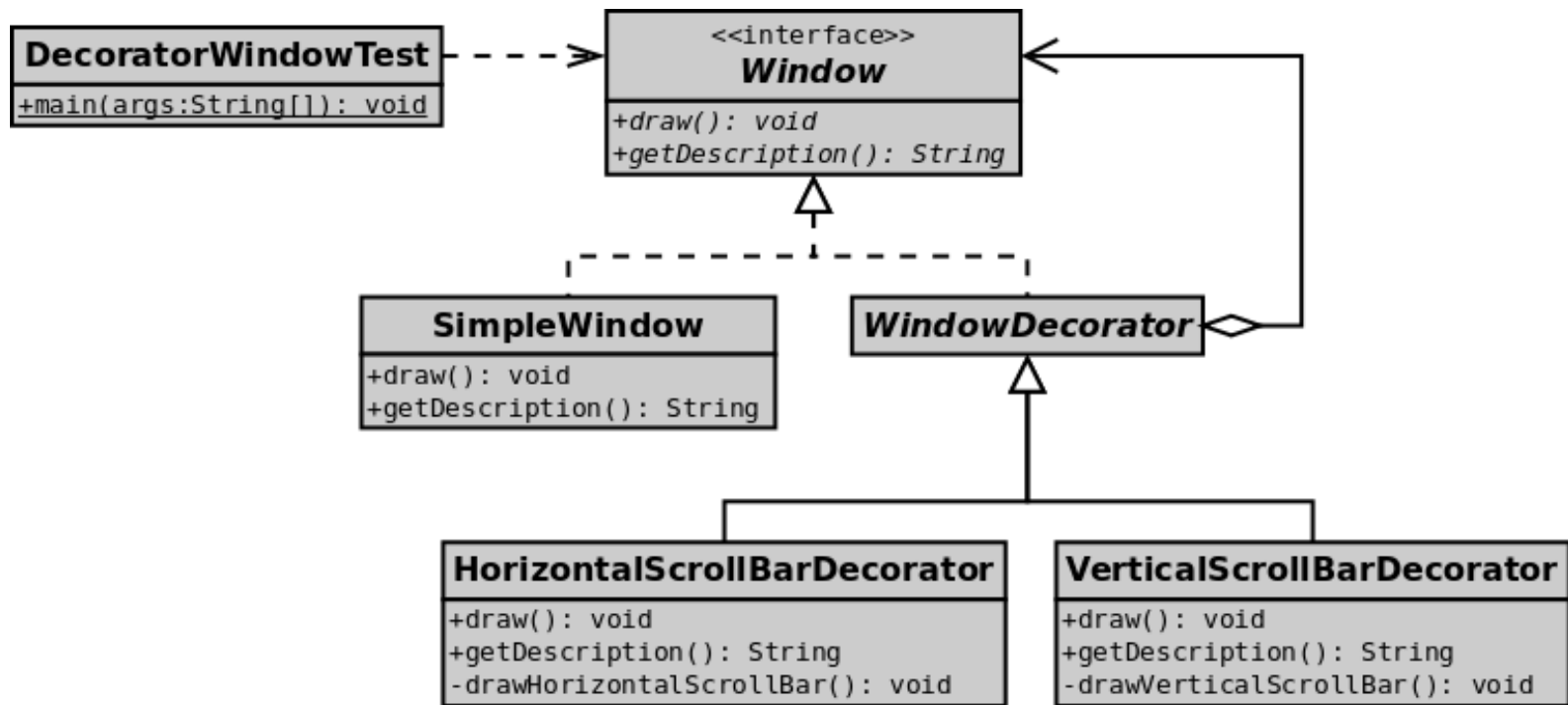
- What classes would be in charity pledge tracker?
- Draw a CRC card for a class or two.

UML Class Diagrams

a Design Communication Technique

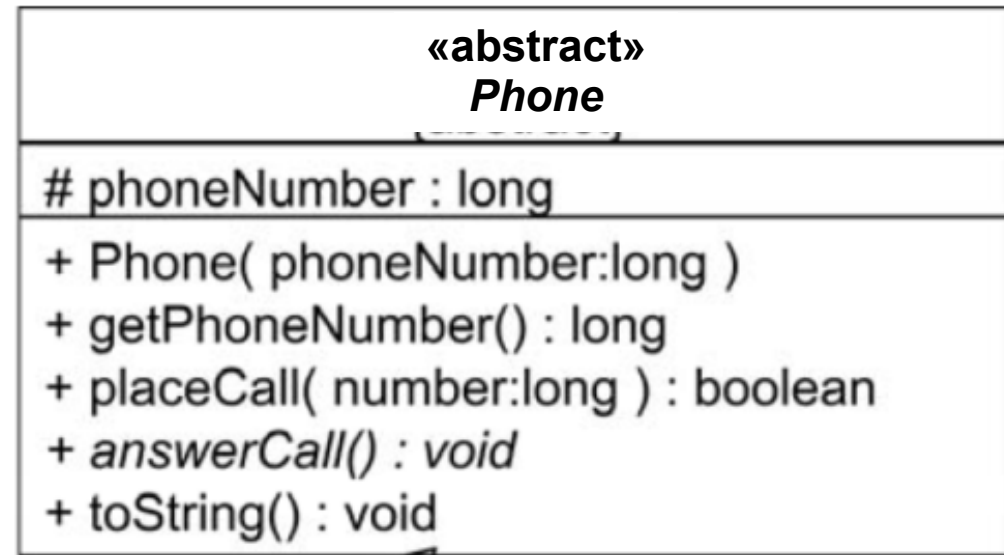
UML Class Diagram

- UML Class Diagram
 - A diagram showing..

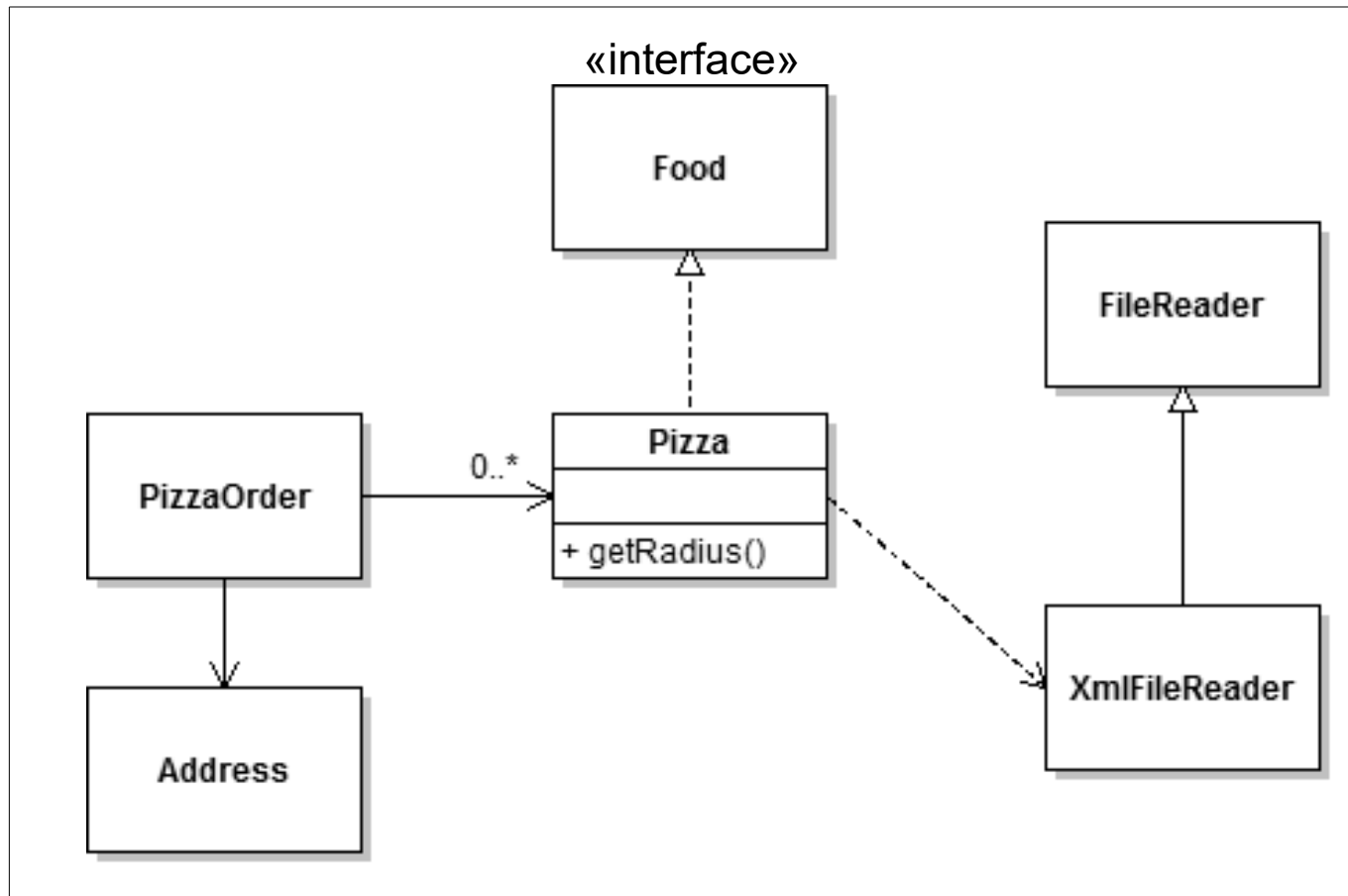


UML Class diagram implementation details

- 3 Sections
 - Class name
 - Attributes (fields)
 - Operations (methods)
- Types (Optional)
 -
 - methodName() : returnType
- Visibility: Can precede attributes and methods
 - + for..
 - # for..
 - for..

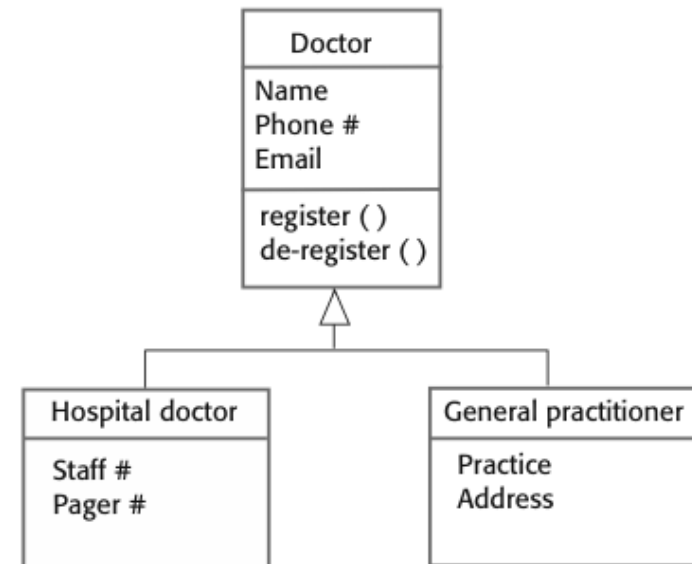
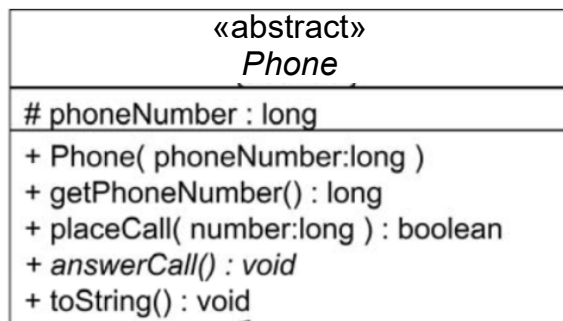
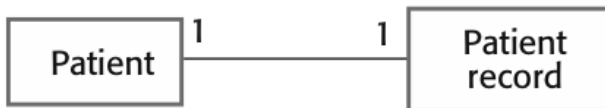


Class Connections



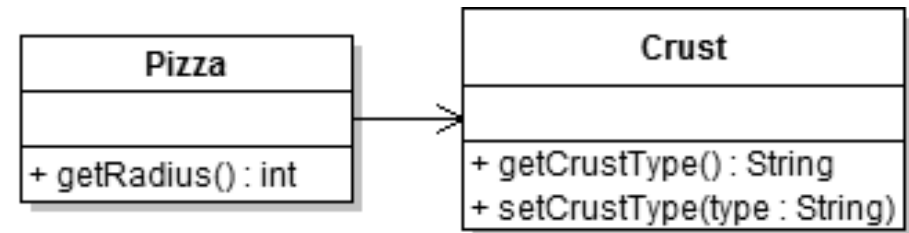
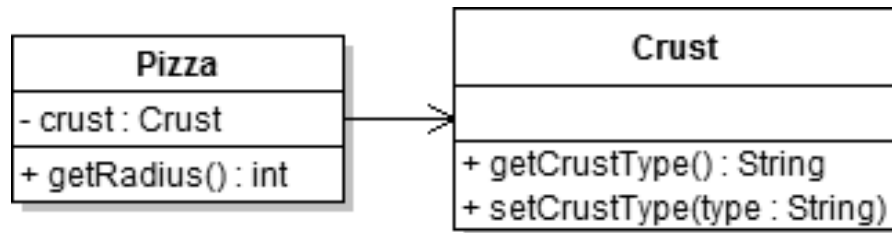
Level of Detail

- Choose required level of detail
 - What are you trying to show in your diagram?
 - Who is the..
- Some Options
 - Classes & relationships.
 - Attributes and methods.
 - Types, arguments, visibility (+, -, #).

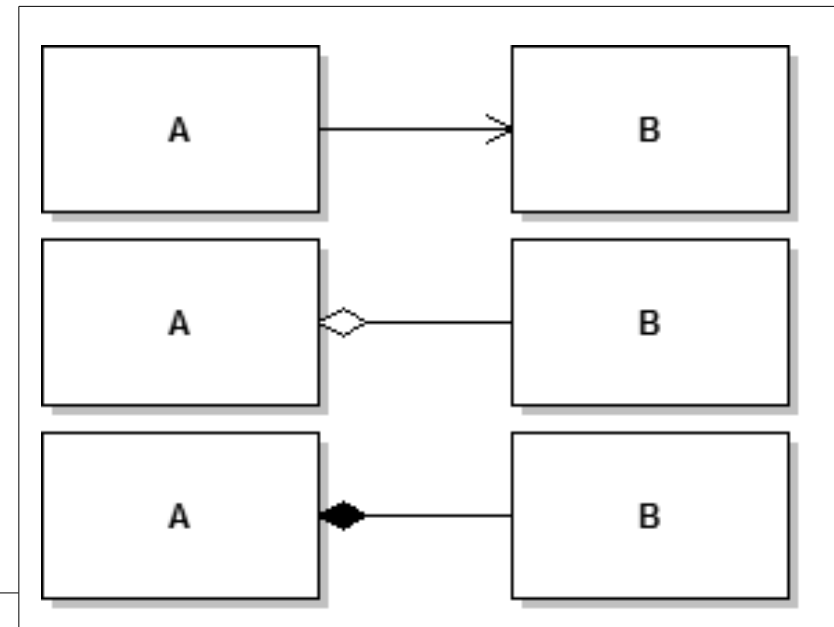


Class Diagram Notes

- If Pizza “has-a” Crust, don't..

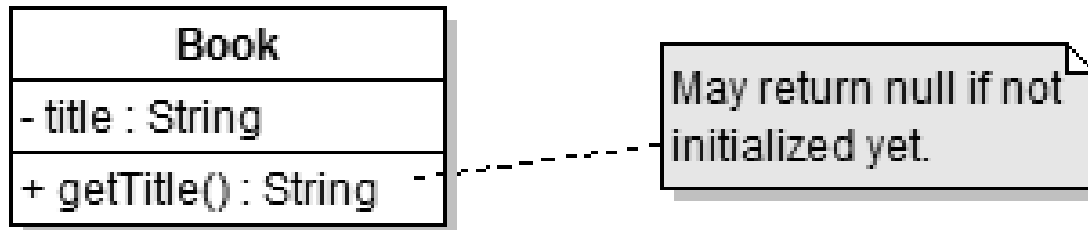


- A “has-a” B can be shown as any of the following:
 - Directed association (we'll use this; simplest)
 - Aggregation
 - Composition



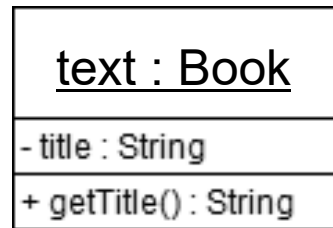
More Notation

- add comments:



- Show objects:
A class but with a ':' (and underlined)

..



UML Class Diagram Example

- Draw a UML class diagram for the classes from the CRC cards for the pledge tracker.
 - Show just class names and relationships.

Summary

- CRC: Early design process.
 - Index card listing class name, responsibilities, and collaborators.
 - High-level and informal description.
- UML Class Diagrams: Formalize design.
 - Draw classes and class relationships.