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...

1. CRC Cards
2. UML Class Diagram

CRC Cards
a Design Technique

CRC Cards

- CRC Cards:..
  Class Responsibility &
  Collaborator Cards

- It's an index card listing:
  - Class Name
  - Class Responsibilities
    Ex: Manage messages
  - Class Collaborators
    classes it depends on
    Ex: Message class

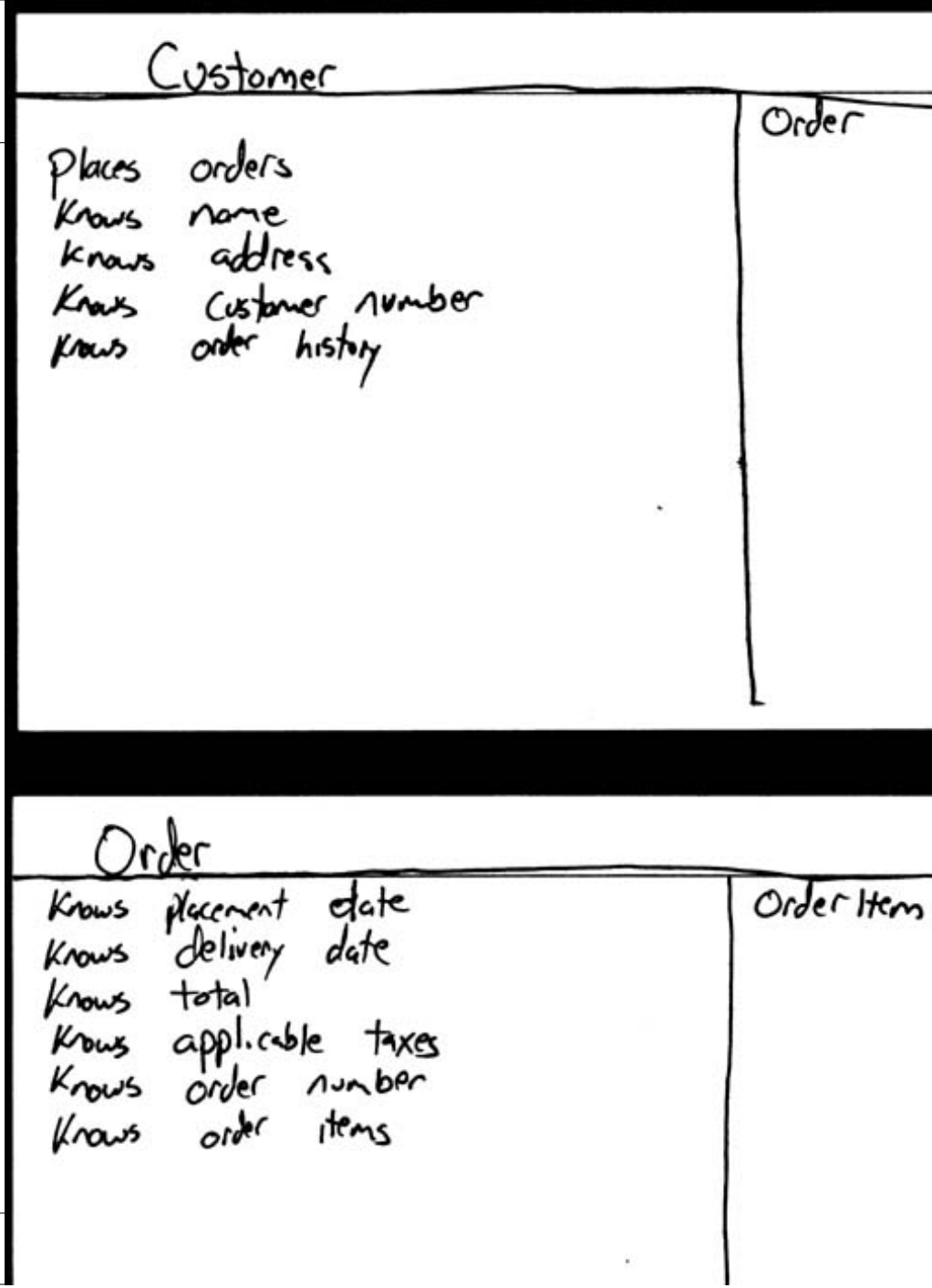


 Image Source: http://www.agilemodeling.com

CRC Cards

- Purpose
  - Support an.. informal design process
- Physical card support
  - Walk-through a use-case deciding..

    which classes do which tasks
  - 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,.. split into two classes

CRC Process

1) For each discovered class, write its name on the top.
   - Look for... nouns in the use-cases
2) Left side: Responsibilities
   - Not method names, but... high-level responsibilities
   - 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... it can do its job

CRC Example

Mailbox	
manage passcode	MessageQueue
manage greeting	
manage new and saved messages	

MailSystem	
manage mailboxes	Mailbox

CRC Use

- CRC Cards are good for
  - discussions and collaboration
  - eliciting design ideas and starting design
- But they are messy
  - Not good for recording design decisions.

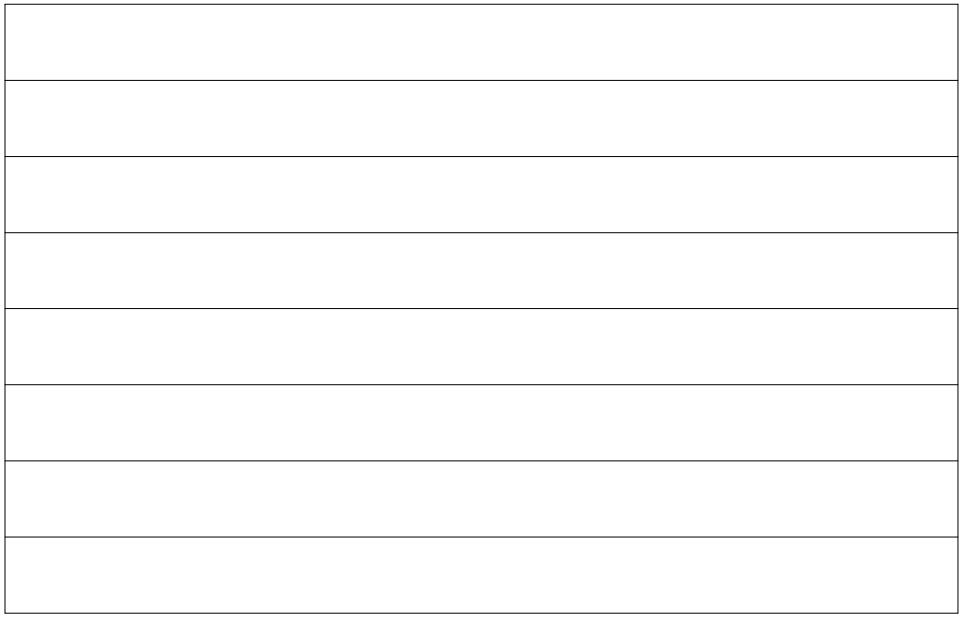
    UML Diagrams do this!

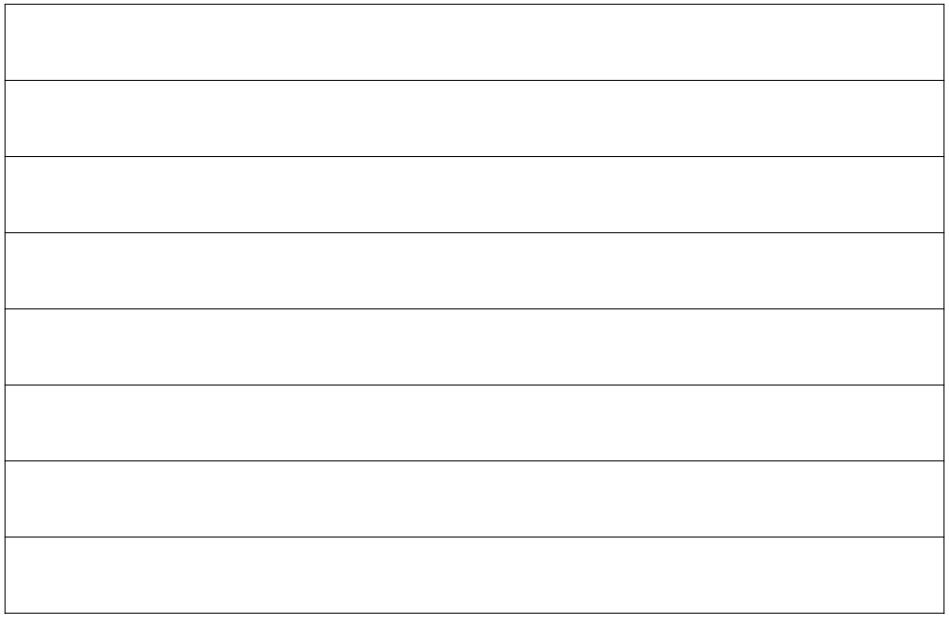
In-class exercise: Pledge Tracker Description

- 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.. classes, and relationship between them

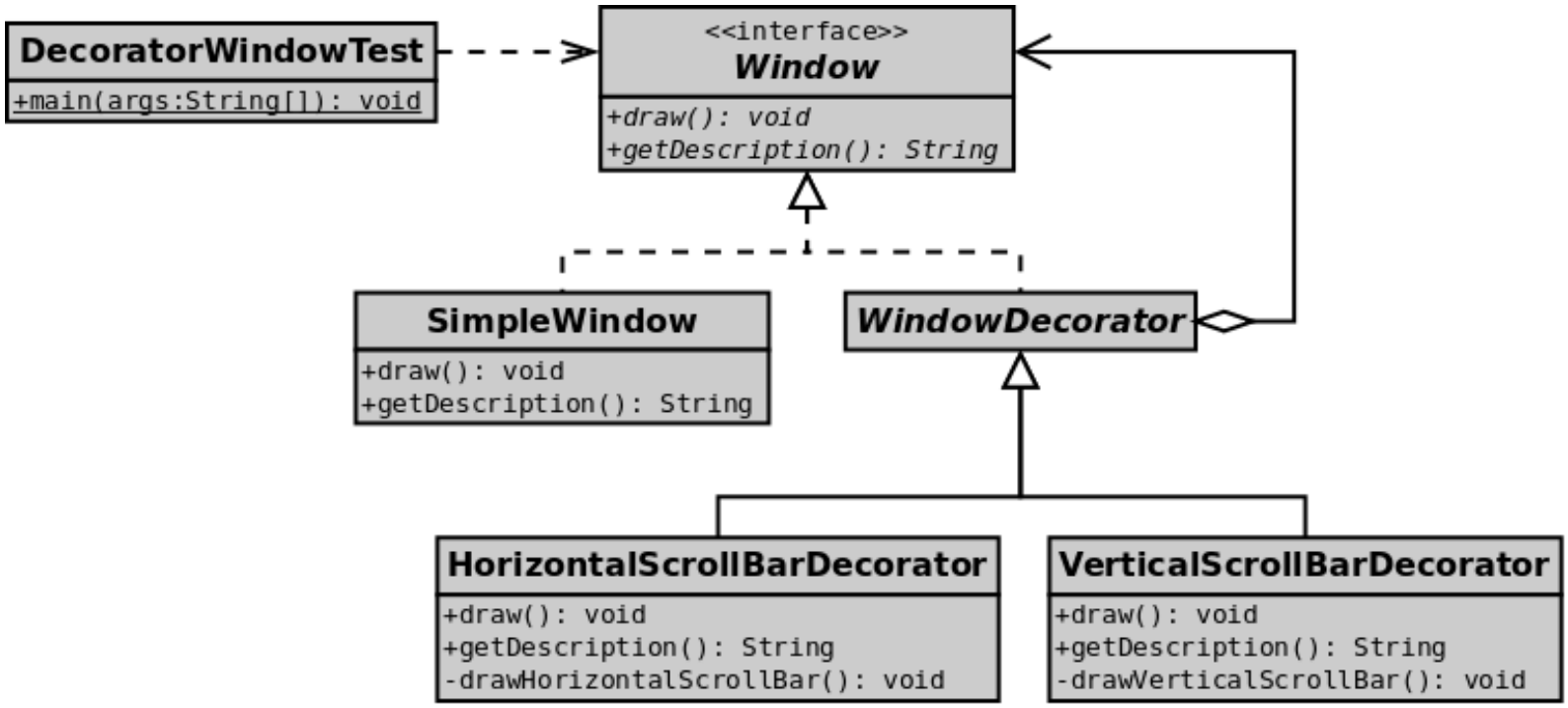
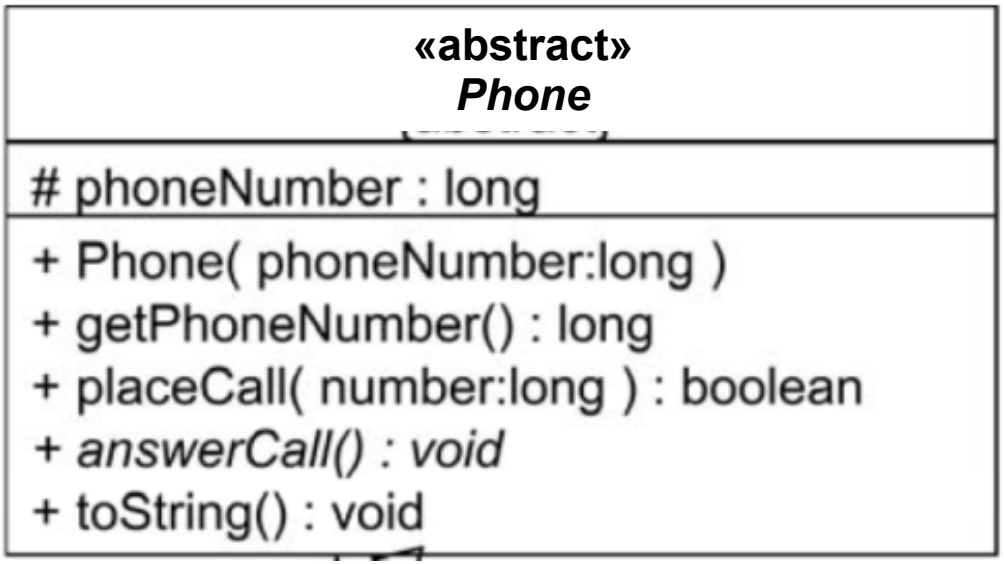


Image from Wikipedia: UML2 Decorator Pattern

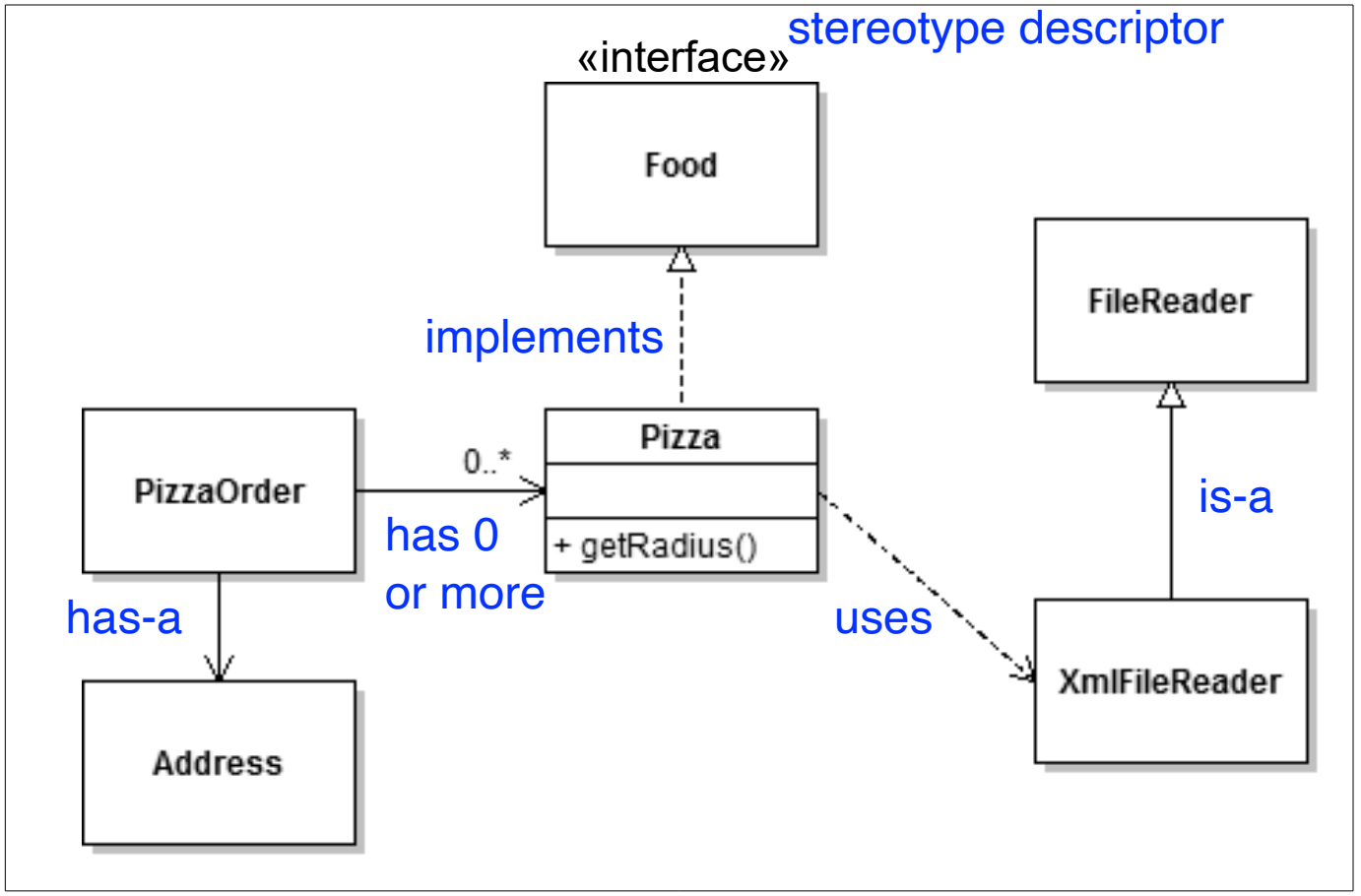
UML Class diagram implementation details

- 3 Sections
  - Class name
  - Attributes (fields)
  - Operations (methods)
- Types (Optional)
  - fieldName: type
  - methodName() : returnType
- Visibility: Can preceded attributes and methods
  - \+ for. public
  - \# for. protected
  - \- for. private



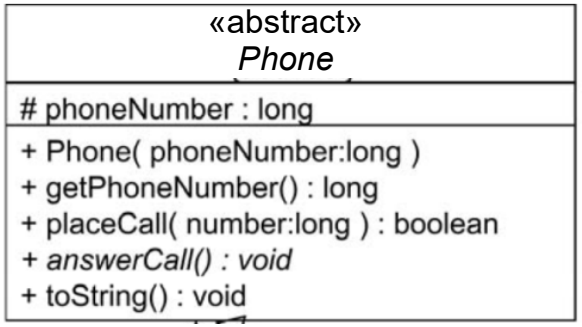
Class Connections

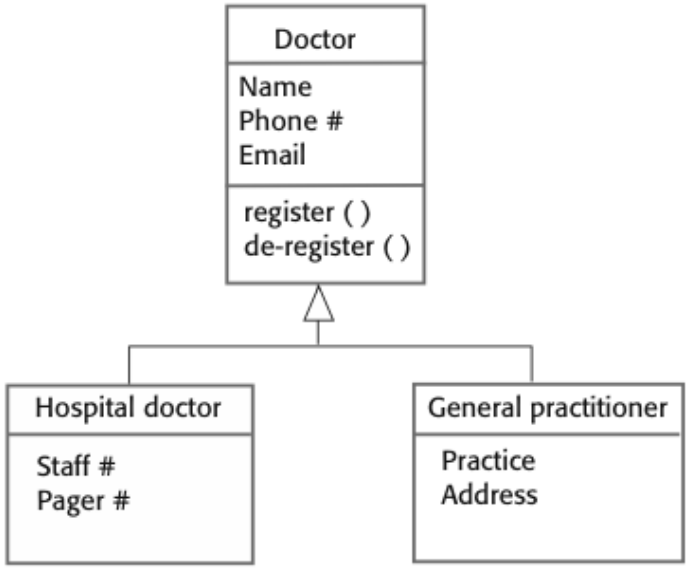
watch this part again! Mon Feb 5 (the end)



Level of Detail

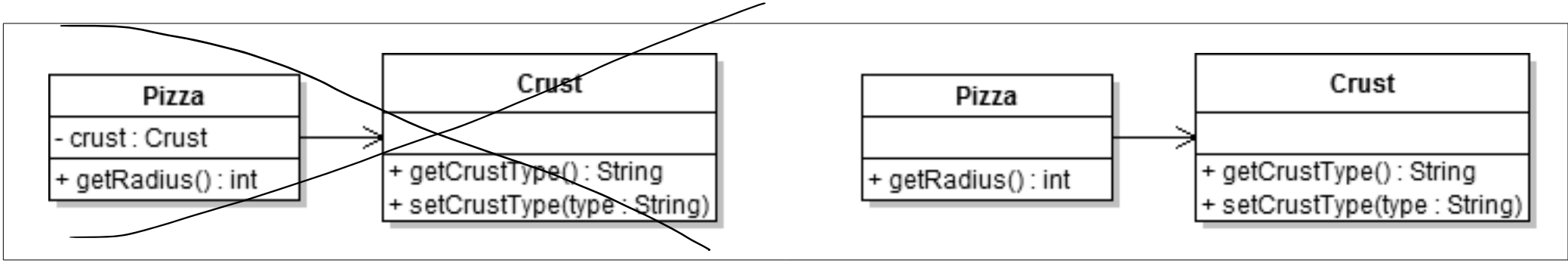
- Choose required level of detail
  - What are you trying to show in your diagram?
  - Who is the... intended audience: customer or devs?
- Some Options
  - Classes & relationships.
  - Attributes and methods.
  - Types, arguments, visibility (+, -, #).



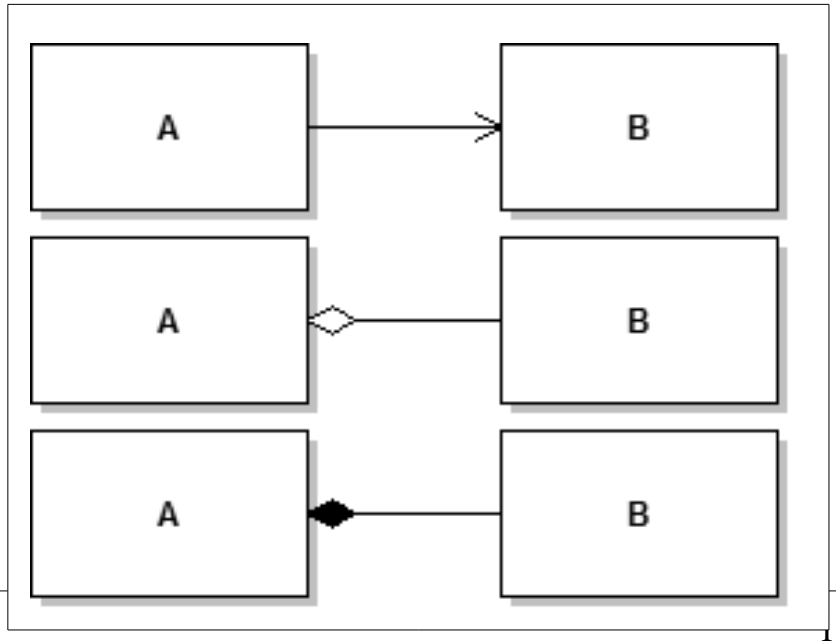


Class Diagram Notes

- If Pizza “has-a” Crust, don't.list it as a field as well

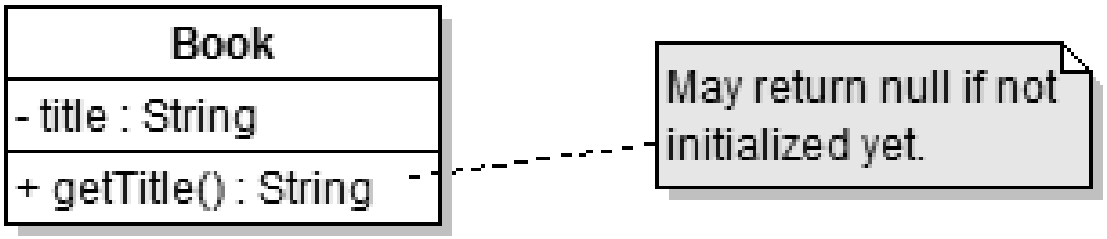


- A “has-a” B can be shown as any of the following:
  - Directed association (we'll use this; simplest)
  - Aggregation
  - Composition

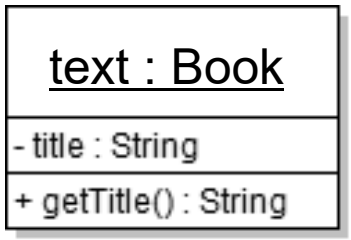


More Notation

- add comments:



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



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.