CS1007: Object Oriented Design and Programming in Java

Lecture #6
Feb 2

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Outline

- Feedback
- Wrap up last time stuff
- Actual Code
- More Background material
  - Some Theory
  - Encapsulation
  - Inheritance
  - Interface
- Class design

- Reading
  - Chapter 2.5-end, 3.1

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Feedback

- Interface questions
  - We will cover code examples today
  - What if you choose a random class to implement mouseListener
- If something is confusing…see me after class or next office hours…each lecture builds on the last
- Voicemail VS other example
  - Limited time for class
  - Want to make sure everyone understands the book, this will come into play when we do code review

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Feedback

- Explanation of what we did last time (and today) for UML + voice system
- Please TELL me if you need more time to copy down something….you might not be the only one
- Software engineering in general is abstract, so we cover it on theory, doc, code levels

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Feedback

- UML design requirements on the HWs?
  - Will be told which docs you need to generate
- How many diagrams /use cases necessary?
  - Usually we will do specific ones on hw
- Java inheritance, Javadoc
  - Will cover today
- Interface/Extend class

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Announcement

- For the homework, you should be adding methods and/or constructors as you see fit….the assignment is just bare minimum
- Q: Don't know where to begin…..
- Q: Need programming help….
- A: OH = Office Hours

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From last time

- We covered basic UML building blocks
- Started to sketch out UML/CRC of a voice mail system
  - Result in a few basic pieces and relationship
  - Will now look at charts
  - If you don't follow a step, please stop me and ask

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UML Class Diagram for Mail System

- CRC collaborators yield dependencies
- `Mailbox` depends on `MessageQueue`
- `Message` doesn't depends on `Mailbox`
- `Connection` depends on `Telephone, MailSystem, Message, Mailbox`
- `Telephone` depends on `Connection`

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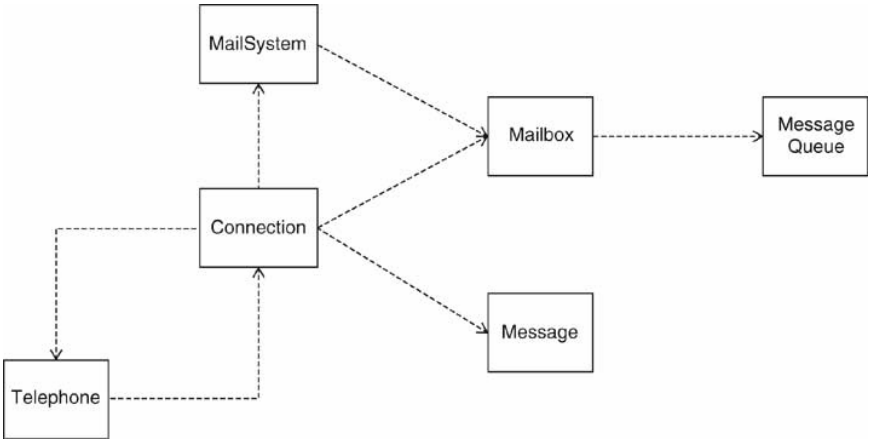
Dependency Relationships



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Aggregation Relationships

- A mail system has mailboxes
- A mailbox has two message queues
- A message queue has some number of messages
- A connection has a current mailbox.
- A connection has references to a mailsystem and a telephone

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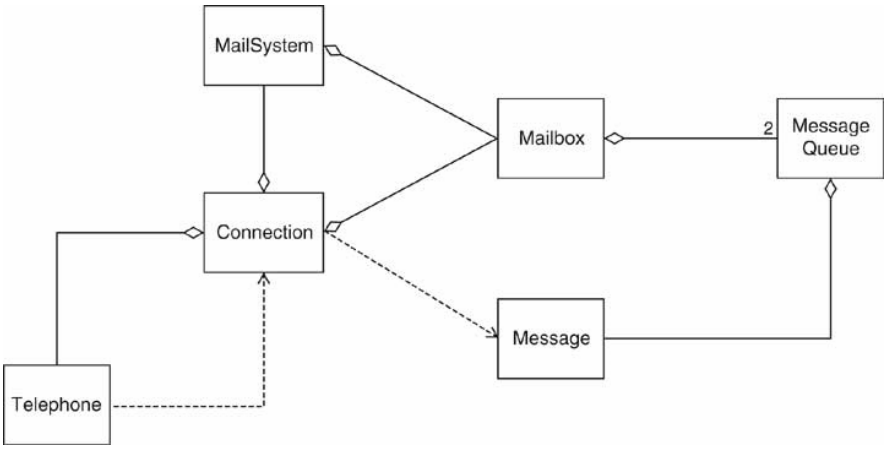
UML Class Diagram for Voice Mail System



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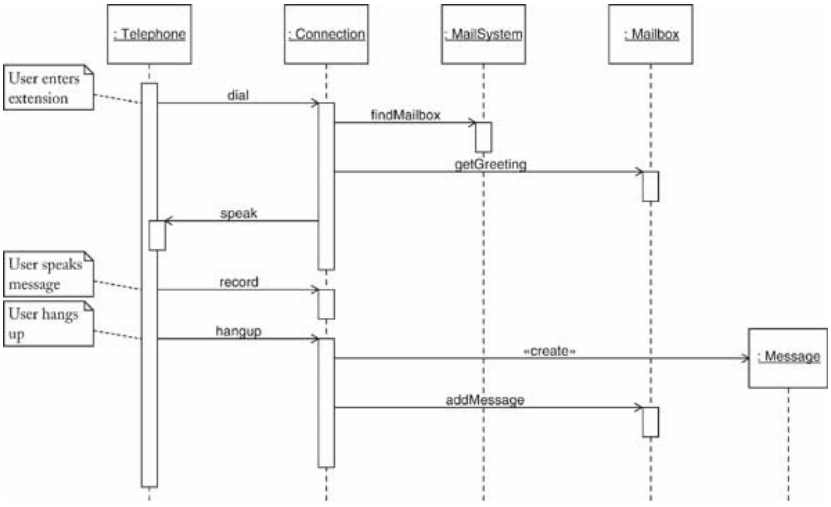
Sequence Diagram for Use Case: Leave a message



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Interpreting this Sequence Diagram

- Each key press results in separate call to dial, but only one is shown
- Connection wants to get greeting to play
- Each mailbox knows its greeting
- Connection must find mailbox object:

Call findMailbox on MailSystem object

- Parameters are not displayed (e.g. mailbox number)
- Return values are not displayed (e.g. found mailbox)
- Note that connection holds on to that mailbox over multiple calls

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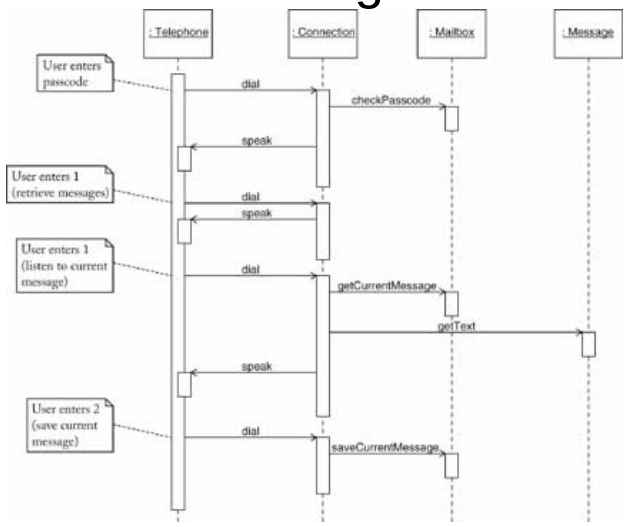
Sequence Diagram: Retrieve messages



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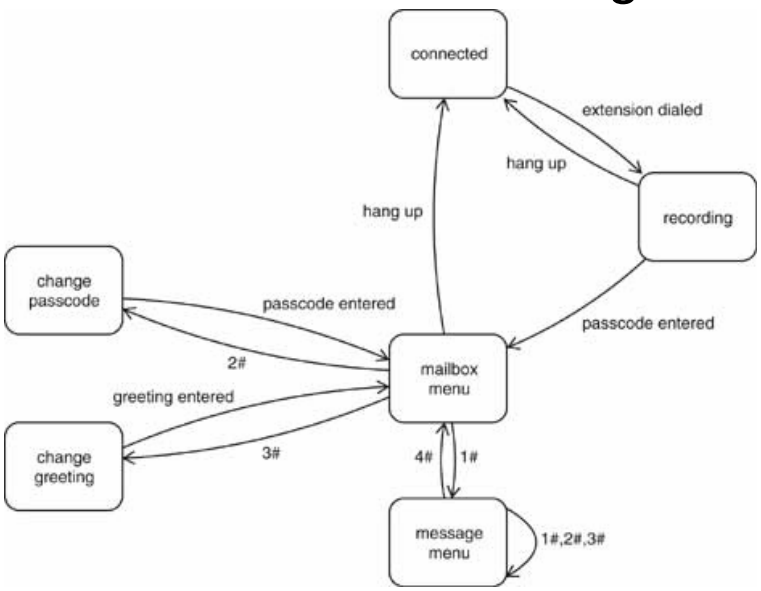
Connection State Diagram



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More javadoc

- For javadoc to work the javadoc style comments
  1. Immediately precede
     - Public class
     - Public method
     - Public item
  2. /** */

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Tags

- **`@param ParamName describtion`**
- **`@return describtion of return value`**
- **`@throws ExceptionType explanation`**

- `@author yourname`
- `@version version info`
- `@see Package.Class`

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Running javadoc

- javadoc –d doc_dir package_name
- Near the classes
- Can run on single class
  - Javadoc something.java
- Javadoc -?

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Code

- Will look at all the components of the code in chapter 2.

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Java Example

```
01: /**
02:    A message left by the caller.
03: */
04: public class Message
05: {
06:    /**
07:       Construct a Message object.
08:       @param messageText the message text
09:    */
10:    public Message(String messageText)
11:    {
12:       text = messageText;
13:    }
14:
15:    /**
16:       Get the message text.
17:       @return message text
18:    */
19:    public String getText()
20:    {
21:       return text;
22:    }
23:
24:    private String text;
25: }
```

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For MessageQueue

```
36:    /**
37:       Get the total number of messages in the queue.
38:       @return the total number of messages in the queue
39:    */
40:    public int size()
41:    {
42:       return queue.size();
43:    }
44:
45:    /**
46:       Get message at head.
47:       @return message that is at the head of the queue, or null
48:       if the queue is empty
49:    */
50:    public Message peek()
51:    {
52:       if (queue.size() == 0) return null;
53:       else return queue.get(0);
54:    }
55:
56:    private ArrayList<Message> queue;
57: }
```

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Tester

```
01: import java.util.Scanner;
02:
03: /**
04:    This program tests the mail system. A single phone
05:    communicates with the program through
   System.in/System.out.
06: */
07: public class MailSystemTester
08: {
09:    public static void main(String[] args)
10:    {
11:       MailSystem system = new MailSystem(MAILBOX_COUNT);
12:       Scanner console = new Scanner(System.in);
13:       Telephone p = new Telephone(console);
14:       Connection c = new Connection(system, p);
15:       p.run(c);
16:    }
17:
18:    private static final int MAILBOX_COUNT = 20;
19: }
```

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Violet

- Simple UML system
- Will demo
- Be sure to download and play with it before hw2

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Background

- Interface
- Theory
- Class hierarchies

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Interface in Java

- Just like a class is a type so it an interface
- Used to define a behavior
- Can not create an instance
- A class can choose to implement an interface thus in a sense instantiating the interface
- Idea of something…..

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Example

- Music player control
- What would we expect to see supported?
- What does it mean in context?

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Interface definition

- Generally set public access
- Contains method signatures
  - `public boolean isActive();`
  - `public void startCount(int count);`
- Can also contain defined constants
  - `public static final int START = 0;`

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```
public interface musicControl {

   /**
    * Will rewind the player n moves
    * @param n number of moves to move back
    */
   public void setRewind(int n);

   public void fastForward();

   public void play();

   public void pause();

   public void jumpShuffle();

   public void jumpForward();

   public void jumpBackward();
}
```

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```
public interface musicControl {

   public static int SHUFFLE =0;
   public static int FORWARD = 1;
   public static int BACKWARD = 2;
   /**
    * Will rewind the player n moves
    * @param n number of moves to move back
    */
   public void setRewind(int n);

   public void fastForward();

   public void play();

   public void pause();

   public void jump(int n);
}
```

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How to use the interface

- Class says “implements ..”
  - `public class cheapIPOD implements musicPlayer {`
- If more than one, use commas to seperate
- Must define all interface methods
- Interface is a type, so that if the class implements it, I can pass it to a method which expects the interface type

```
public void calculate(musicPlayer x)
```

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```
public class cheapIpod impliments
  musicPlayer{
  ….
  public void jump(int j) {

  if( j == musicPlayer.SHUFFLE) { …}
  else if(j == musicPlayer.FORWARD){..}
  else if(j == musicPlayer.BACKWARD){..}
  else { throw new
  illigalCommandException(…) }
  }
```

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Chaining interfaces

- Can derive one interface from another

```
public interface basicMail {…}
public interface blackberryMail
  extends basicMail {..}
```

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WARNING

- Java couldn't care less about what the interface methods are supposed to do
- Who's job is it?
- How can it be accomplished?

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Designing Objects

- Secret of OOD is to balance **Abstraction** and **Encapsulation**

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Next Time

- Do homework assignment
- Read chapter 3-3.3

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