CS1007: Object Oriented Design and Programming in Java

Lecture #21
Apr 06
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Outline

• Applet programming
• Networking

• Reading : 8.2, 9-9.2
Feedback

• Graphic problems
  – I’m getting emails about specific problems doing X in graphics…please office hours/email contact if you need help
  – Check the API
  – Check the web by describing what you want

  – Learn to debug…in eclipse or similar IDE

Framework

• A set of cooperating Objects that make up a reusable design for something specific
Software Framework

• Set of classes and interfaces that structure some underlying mechanism for a specific task

Example

• SWING
Web page programming

• HTML is a text document describing some data
• Browser takes the text and renders a view
• Would like to add a running program to an HTML webpage
• Solution:
  – Application framework to get this done
  – Applet: Java program that runs in a web browser

Applet

• Programmer forms subclass of Applet or JApplet
• Override
  – init/destroy
  – start/stop
  – paint
methods

- Init
  - Called when first loaded
- Start
  - Called when first loaded and when restore webpage
- Stop
  - When user leaves window and when terminates
- Destroy
  - When terminate
- Paint
  - When repainting

Example 1

```java
import javax.swing.JApplet;
import java.awt.Graphics;

public class HelloWorld extends JApplet {
    public void paint(Graphics g) {
        g.drawRect(0, 0,
                    getSize().width - 1,
                    getSize().height - 1);
        g.drawString("Hello world!", 5, 15);
    }
}
```
Example 2

```java
import javax.swing.JApplet;
import java.awt.Graphics;

public class HelloWorld extends JApplet {
    public void paint(Graphics g) {
        g.drawRect(0, 0,
                   getSize().width - 1,
                   getSize().height - 1);
        g.drawString("" + new Date(System.currentTimeMillis()), 5, 15);
    }
}
```

Basic

- So can run most of your programs in a browser environment
- We can also interact with ambient browser
  - `getParameter`
  - `showDocument`
  - HTML page contains applet tag and parameters
Web advertisements

• Can anyone name a really annoying web advertisement tactic ??

• Anyone know which was the earliest ones ?

• BANNERS!
Applets

<applet code="BannerApplet.class"
width="300" height="100">
  <param name="message"
value="Hello, World!"/>
  <param name="fontname"
value="Serif"/>
  <param name="fontsize"
value="64"/>
  <param name="delay" value="10"/>
</applet>

Example

• Shows scrolling banner
• init reads parameters
• start/stop start and stop timer
• paint paints the applet surface
Ch8/applet/BannerApplet.java
Complicated example

http://rintintin.colorado.edu/~epperson/Java/TicTacToe.html

Advantages

• Can create some code
• Have users user (through webpage) dynamically load the code
• Run the code locally

• So what happens when code needs updating?
Problems

• When running remote code locally
  – Do we know anything about what the code does?
  – Can we trust it?
  – Is it safe?

Approach

• Java security model
• Sandbox approach
  – Byte code level
  – Loader level
  – Security manager
• Main idea: allow you to run UNTRUSTED code on your local machine
Byte code

- Verification that the byte code is legal
- Want to figure out if a valid Java compiler created the byte code
- Checks for object usage
- Checks for method usage

Applet class loader

- Checks to see how this program is instantiating the objects it will use
- Make sure that the main framework is not being violated
  - i.e. check that built-in base classes are correct for the browser
Security manager

• Run time check on methods
• Code in library asks manager for permission
• Security manager has veto power
  – Security Exception
• Have a list of what is allowed by whom

ActiveX approach

• Microsoft
• Idea: allow your code to do anything
• Trust the user to only run trusted code
• By signing the code through digital signatures
Question

• If applets are so restricted….how do you get it to do anything useful outside of the browser ??

Solution

• Security restrictions through code signing specific level of operations
Security hole (Java 1.1)

- `Class.getsigners()`
- Return a list of trusted signers

- Hmmmm, it was returning an array of signers

- Double hmmm it was returning shallow copy!

Be careful

- You can write a perfectly working applet which will run on your own system

- Wont run remotely due to security restrictions

- Need to sign
Let's talk about your computer

- Anyone use a computer??

- How many CPU?

Quick question

- If only one CPU

- How do you run more than one application at a time??

- CHEAT!!
multitasking

• No what you do instead of listening to class 😊

• Method by which processes share a common resource
  – Only one process is running at a time
  – Scheduling algorithm decides who runs when
  – Context switch between processes

Schedule algorithms

• Any ideas how to schedule 2 processes on a single resource ??
Something to think about

- 5 philosophers around a table
- 5 forks
- Need 2 forks to eat
- Sometimes thinking…sometimes eating

- Problem with starvation

Some algorithms

- Shortest jobs first
- Round robbin
- Priority scheduling
- Multiple level queues
- Inheritance
- Random
For next time

- Read 9-9.2
- Do homework