

# CS1007: Object Oriented Design and Programming in Java

Lecture #21

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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

```
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

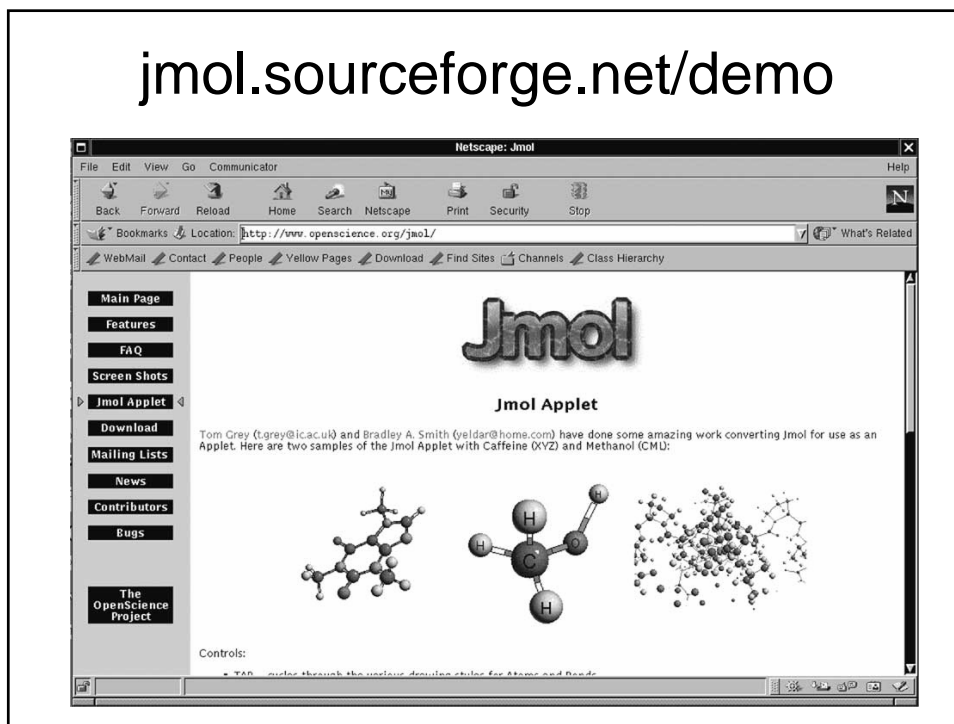
```
import javax.swing.JApplet;
import java.awt.Graphics;

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

# jmol.sourceforge.net/demo



## 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 build 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
  
- Hmm, it was returning an array of signers
  
- Double hmm 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

## Lets 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