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Abstract Windowing Toolkit

Swing (IBM)
GUI Programming

1. Command line won't cut
   it for most users

2. Event-driven programming
bw = new BoardWindow();

Component

$$\text{paint(Graphics g)}$$

displays

Class BoardWindow extends Frame

$2 \times 2$
Wiring

 configuring which components want which events

 click mouse button
How do I create a program w/out creating 1000 classes?

(Anonymous) inner classes

A class defined inside another class
Graphics vs Graphics 2

public void paint(Graphics g)

1. add new method
   public void paint(Graphics g)

? replace paint
public void draw(Graphics g)
{
    Graphics2 g2 = (Graphics2) g;
    g2.____
    g2.____
    g2.____
Frame handling of mouse events

1. draw blue dot where mouse is
2. play sound & flash screen
3. draw a red dot
Old Way

```java
class BlueDotFrame extends Frame {
}

class EvilFrame extends Frame {
}

class RedDotFrame extends Frame {
}
Frame f1 = new BloodedFrame();
Frame f2 = new EvilFrame();
Frame f3 = new Rod DotFrame();
Instead with mouse listeners

```java
class BDML extends MouseListeners
{
}

class EML extends MouseListeners
{
}

class RDML extends MouseListeners
{
}
```
Frame f1, f2, f3 = new Frame();

f1. add MouseListener (new BDML());

f2. add MouseListener (new EML());

f3. add MouseListener (new RPMC());

MouseListener m = new RPMC();

f1. add MouseListener (m);
Say f1 gets a mouse click:

```java
Vector v = f1.getMouseListeners();
for (MouseListener m : v) {
    m.handleEvent(e);
}
```
Big Deal! Instead of creating 3 frame classes, I now create 3 ML classes.
```java
fl.addMouseLister(new MouseListener

            public void mouseClicked(MouseEvent e)

            { // draw dot .... what vers are in score here?

            }

            public void mouseMoved(MouseEvent e)

            { answer:

            }

            public void mouseEntered(MouseEvent e)

            { everything in surrounding class

            }

            public void mouseExited(MouseEvent e)
```