CS324e - Elements of Graphics and Visualization

Java GUIs - Frames and Panels

Intro to Java GUIs

- First, a little history
- Vol Libre. Made by Loren Carpenter in 1979 - 1980.
- http://vimeo.com/5810737
- Shown at SIGGRAPH

Vol Libre

Vol Libre

- Use of fractal (take a shape, split it into subparts, each subpart is the same general shape as the original) to generate things such as mountains, snowflakes, lightning.
  - We will generate a 3d fractal landscape later in the term

Computer Power

- Carpenter reported it took 20 - 40 **minutes** of computer time to generate each frame of movie
- Machine was a VAX-11/780.
  - A mini computer with a speed of about 0.5 MIPS. (millions of instructions per second)
- Ball parking: 2 minutes * 60 sec / minute * 30 frames / sec * 30 minutes / frame =
- 75 days? Seems high. if frame rate were less, say 5 / sec answer is 12.5 days.

Computer Power

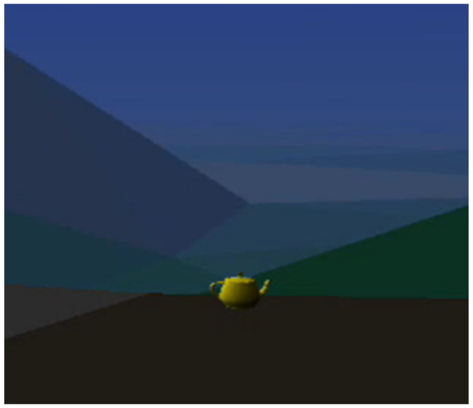
- The Vax 0.5 MIPS
- Intel Core 7 (high end) 177,730 MIPS
- ~350,000 times faster
- 12.5 days / 350,000 = about 3 seconds

Loren Carpenter

- Loren was an engineer at Boeing.
- He went to work at the computer division at Lucas Films.
- The computer division was eventually sold to Steve Jobs and evolved int Pixar
- instrumental in writing the software used to render Pixar movies

The Teapot

- Homage to the "Utah Teapot"
- A lot of early work in computer graphics was done at the University of Utah
- Martin Newell, 1975
  - wanted a model of an ordinary object to test graphics engine / program

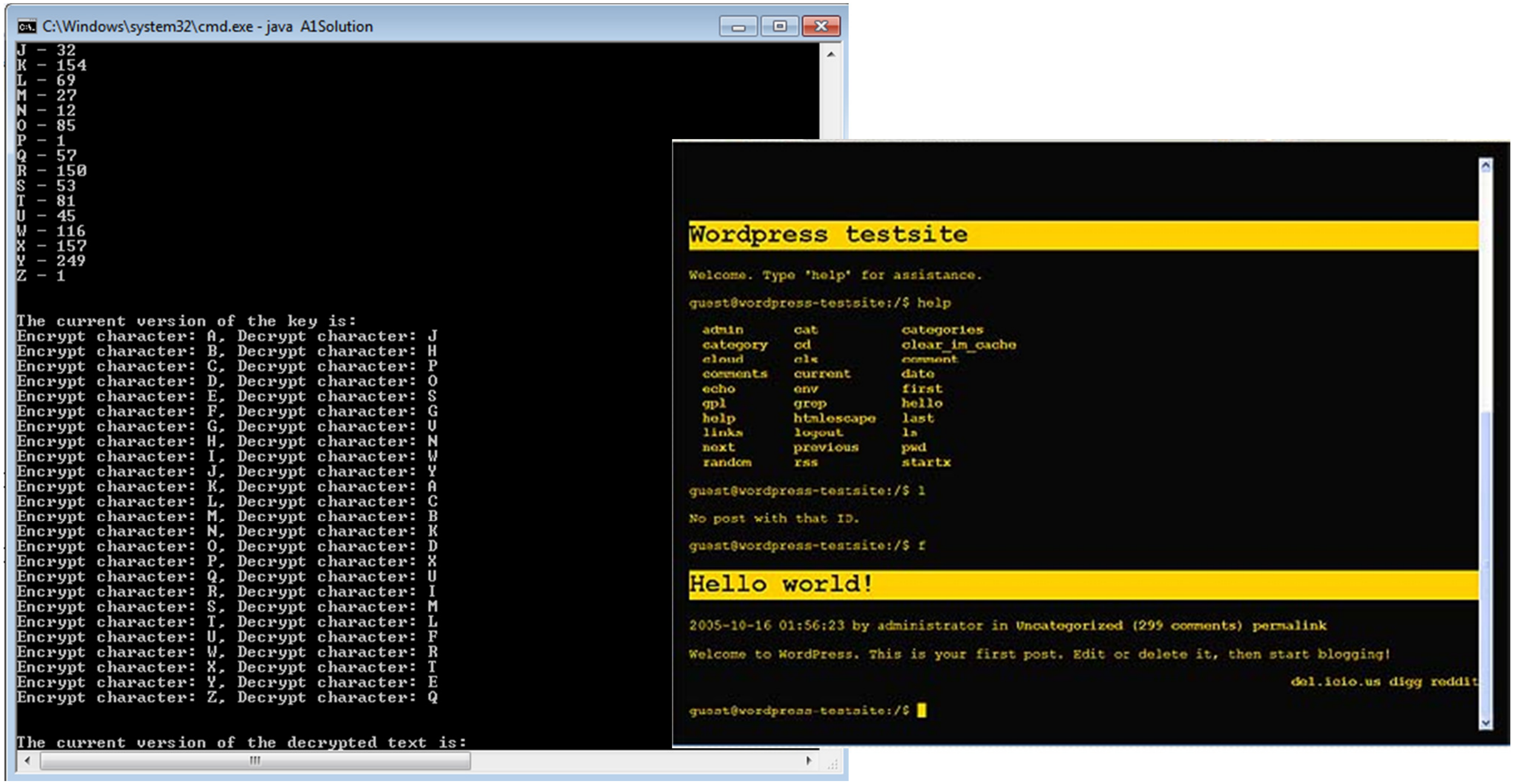


Java GUIs

- Java has huge library of built in classes
  - The API
- works with files, networking, databases, xml, cryptography, graphics, …
- AWT (Abstract Windowing Toolkit) and Swing

Sidetrack GUIs

- In the beginning, was the command line

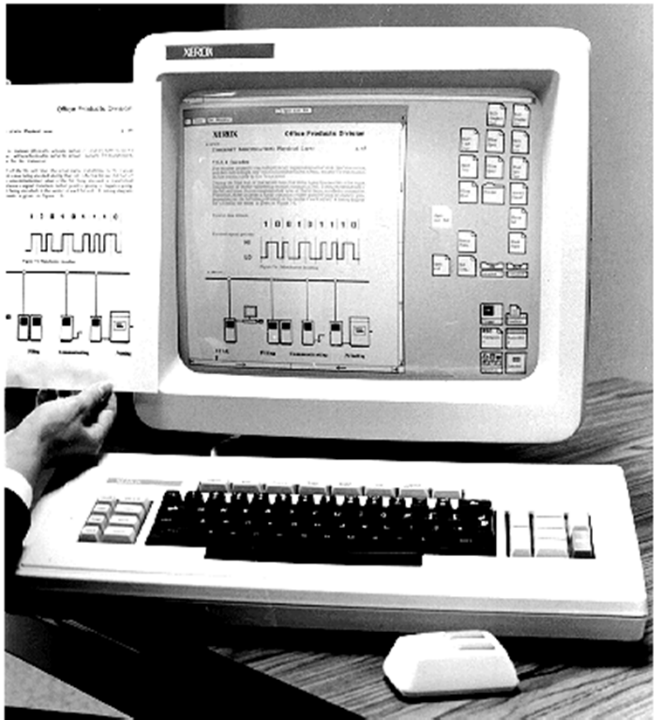


```
J - 32
K - 154
L - 69
M - 27
N - 12
O - 85
P - 1
Q - 57
R - 150
S - 53
T - 81
U - 45
W - 116
X - 157
Y - 249
Z - 1


The current version of the key is:
Encrypt character: A, Decrypt character: J
Encrypt character: B, Decrypt character: H
Encrypt character: C, Decrypt character: P
Encrypt character: D, Decrypt character: O
Encrypt character: E, Decrypt character: S
Encrypt character: F, Decrypt character: G
Encrypt character: G, Decrypt character: V
Encrypt character: H, Decrypt character: N
Encrypt character: I, Decrypt character: W
Encrypt character: J, Decrypt character: Y
Encrypt character: K, Decrypt character: A
Encrypt character: L, Decrypt character: C
Encrypt character: M, Decrypt character: B
Encrypt character: N, Decrypt character: K
Encrypt character: O, Decrypt character: D
Encrypt character: P, Decrypt character: X
Encrypt character: Q, Decrypt character: U
Encrypt character: R, Decrypt character: I
Encrypt character: S, Decrypt character: M
Encrypt character: T, Decrypt character: L
Encrypt character: U, Decrypt character: F
Encrypt character: W, Decrypt character: R
Encrypt character: X, Decrypt character: T
Encrypt character: Y, Decrypt character: E
Encrypt character: Z, Decrypt character: Q


The current version of the decrypted text is:
```

```
Wordpress testsite

Welcome. Type 'help' for assistance.

guest@wordpress-testsite:/$ help

  admin      cat          categories
  category   cd           clear_im_cache
  cloud      cls          comment
  comments   current      date
  echo       env          first
  gpl        grep         hello
  help       htmlescape   last
  links      logout       ls
  next       previous     pwd
  random     rss          startx

guest@wordpress-testsite:/$ l

No post with that ID.

guest@wordpress-testsite:/$ f

Hello world!

2005-10-16 01:56:23 by administrator in Uncategorized (299 comments) permalink

Welcome to WordPress. This is your first post. Edit or delete it, then start blogging!

                                                               del.icio.us digg reddit

guest@wordpress-testsite:/$ █
```

GUIs

- As Computer use grew (rapidly) ease of use became an issue
- HCI, Human Computer Interaction
- GUIs
- Xerox Alto from PARC and Xerox Star
  - Macintosh
  - Windows

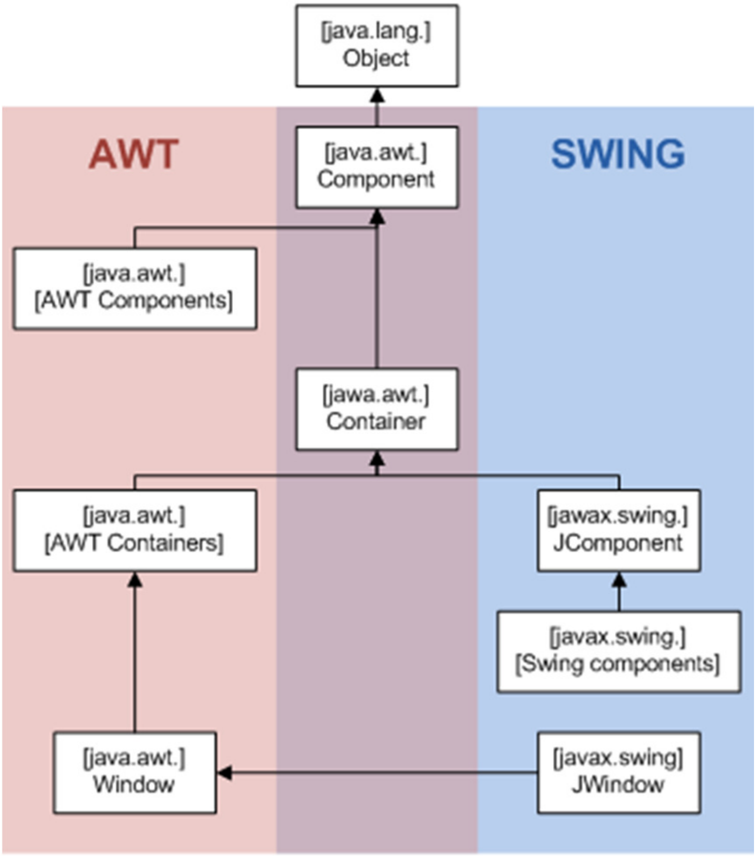


Back to Java GUIs - AWT

- early 90s, AWT was first attempt to provide ability to have graphics and GUIs in Java
- Approach was to have very little code in Java and instead map to components provided by host machine
  - use a Max button or a Windows button
- Java "Write Once, Run Everywhere"
  - "write once, debug everywhere"

Swing

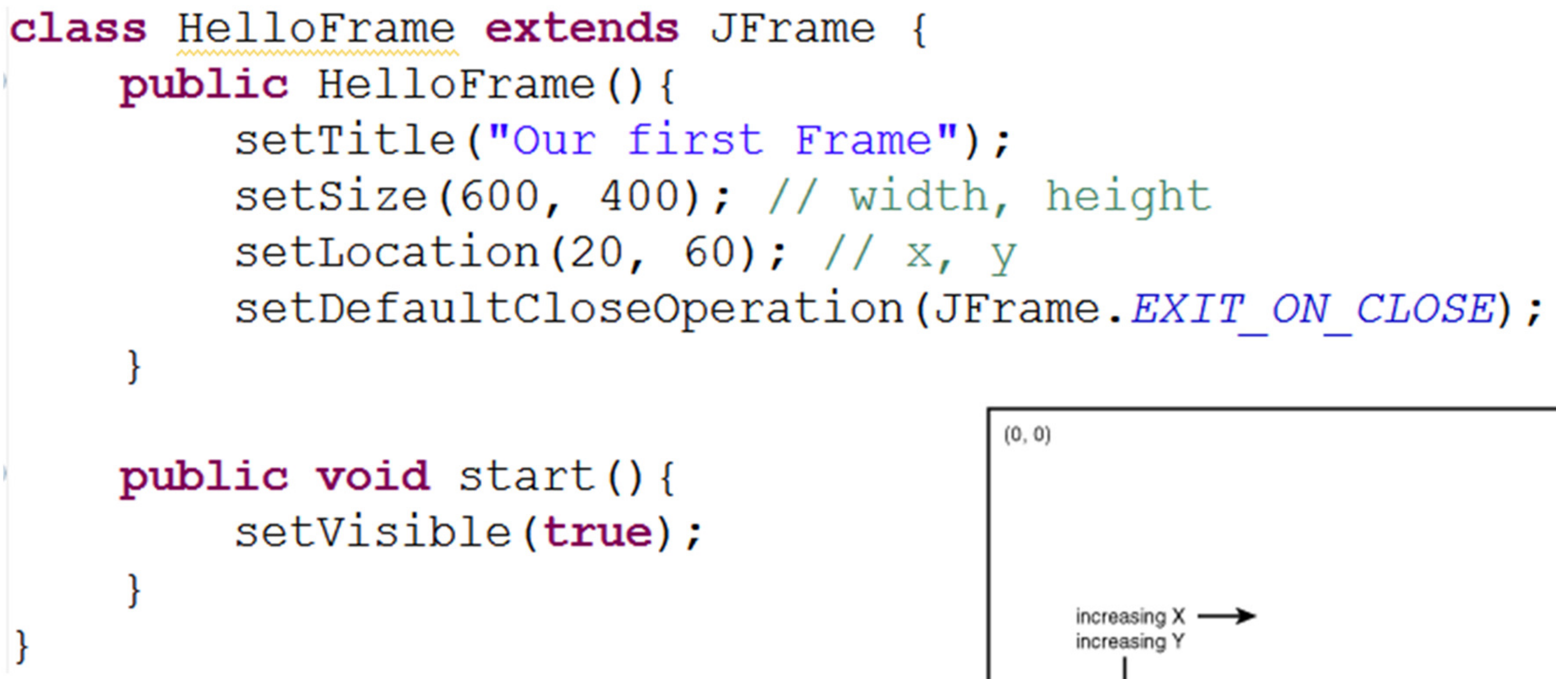
- Sun and Java developers borrowed IFC (Internet Foundation Classes) from Netscape
- Everything written in Java, so not as platform dependent as AWT
  - still use parts of AWT for GUI programming



First Component

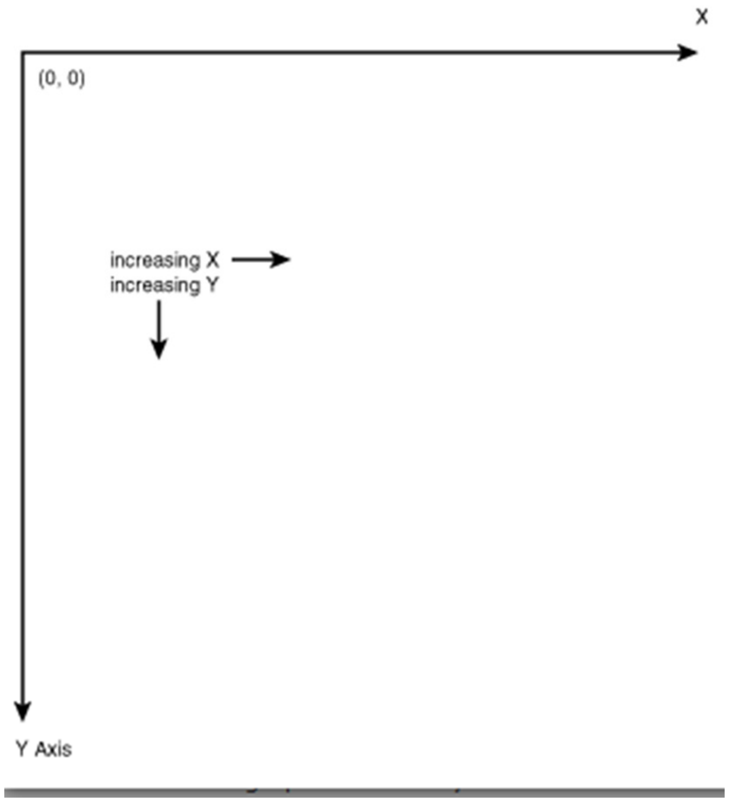
- use JFrame class
  - frames hold things
- main class to do "other stuff"
- creates a frame
- Inheritance sidetrack
  - creating a new data type based on a preexisting data type
  - get all of the existing methods!
  - inheritance in Java

HelloFrame



```
class HelloFrame extends JFrame {
    public HelloFrame(){
        setTitle("Our first Frame");
        setSize(600, 400); // width, height
        setLocation(20, 60); // x, y
        setDefaultCloseOperation(JFrame.EXIT_ON_CLOSE);
    }

    public void start(){
        setVisible(true);
    }
}
```

- Graphics Coordinate Systems

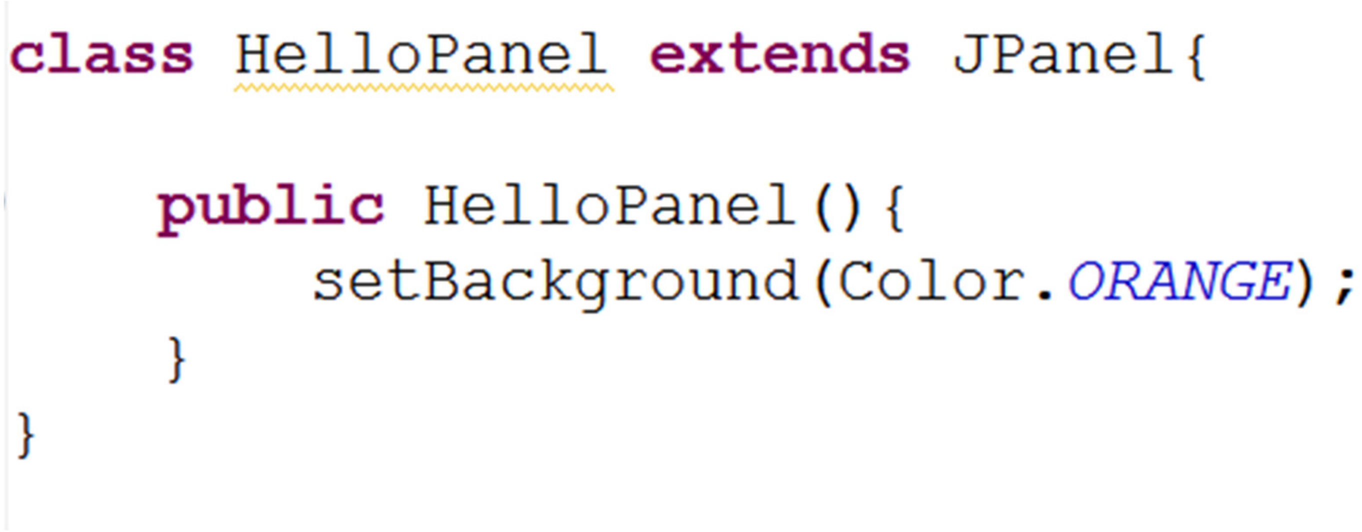


JPanel

- Frames holds things
- We will use panels as out canvas to draw (paint stuff)
  - painting metaphor very useful in Java graphics
- panel is like a frame and a canvas
- Panels can hold other things, but can we can also paint on them

HelloPanel

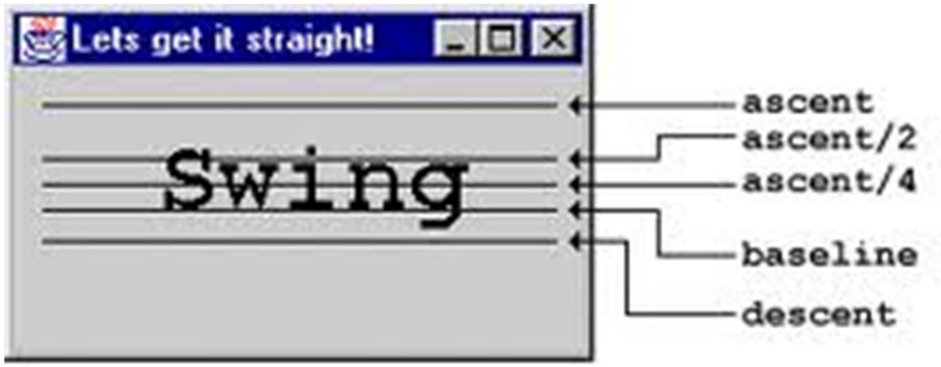
- Initial Version:



```
class HelloPanel extends JPanel{

    public HelloPanel(){
        setBackground(Color.ORANGE);
    }
}
```

Try Drawing on Panel

- Naïve attempt:
  - get graphics object for panel
  - drawString method
  - x, y are of baseline of String
  - in constructor?
  - in start()?
  - what happens when frame resized?

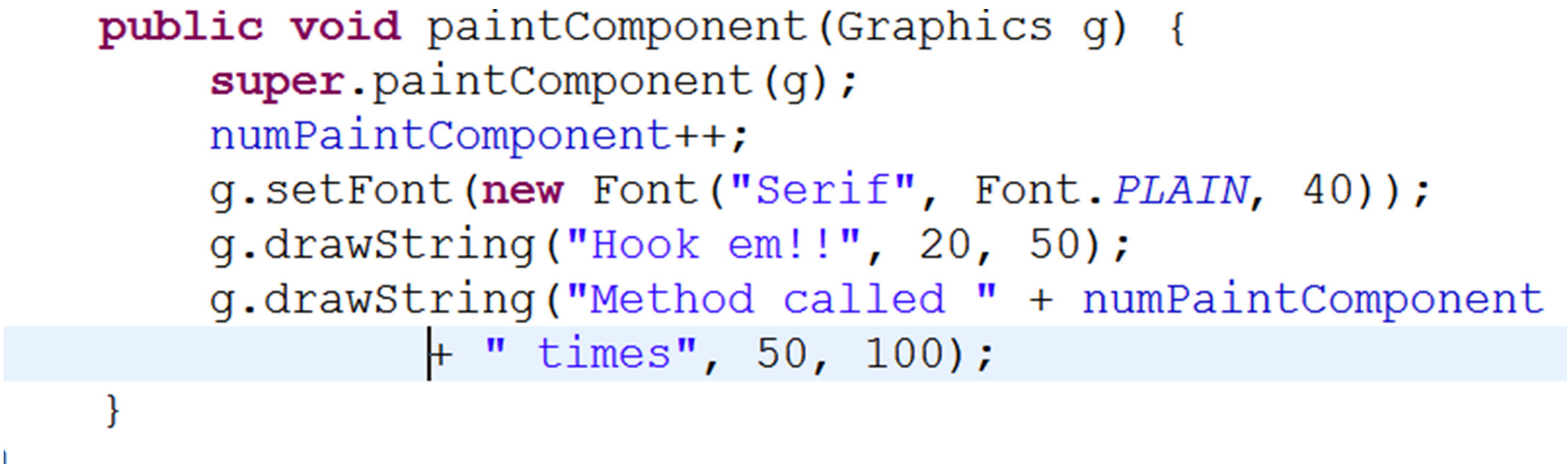


Swing Rendering

- "Something" generates a paint request
  - such as resizing the frame
- A component, such as the frame will eventually have its paintComponent method called
- The component's children will also have their paintComponent method called
- back to front painting

Override paintComponent

- in HelloPanel



```java
public void paintComponent(Graphics g) {
    super.paintComponent(g);
    numPaintComponent++;
    g.setFont(new Font("Serif", Font.PLAIN, 40));
    g.drawString("Hook em!!", 20, 50);
    g.drawString("Method called " + numPaintComponent
            + " times", 50, 100);
}
```

- what happens if don't call super.paintComponent?
- what happens when resized?