

# CSSE 220 Day 24

## Multithreading

Checkout *Multithreading* project from SVN

# Questions

# The World is Concurrent

» Joe Armstrong,  
*Programming in Erlang*

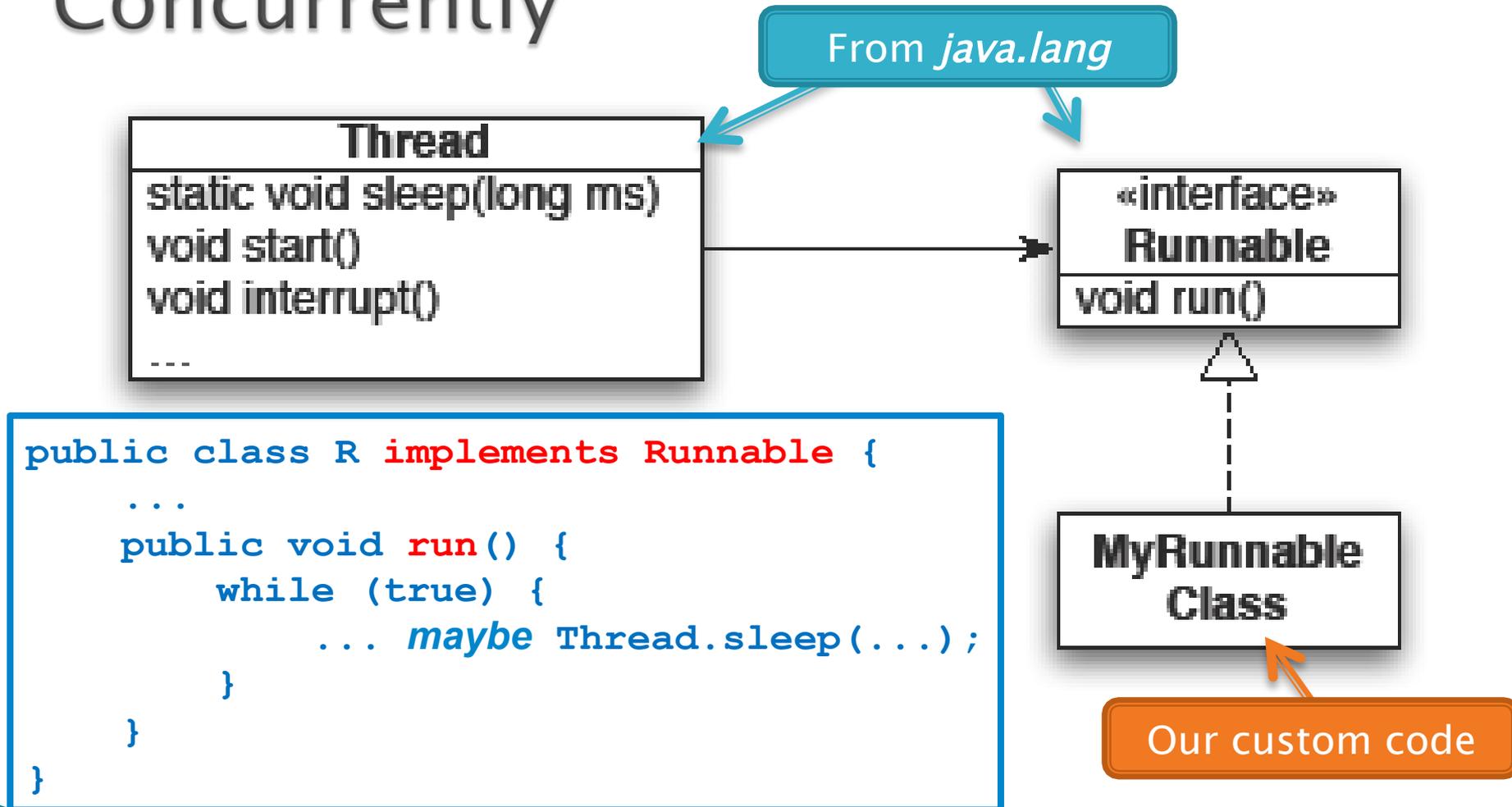
# Multithreading

- ▶ A technique to:
  - Run multiple pieces of code “simultaneously” on a single machine

Time → Slices	1	2	3	4	5	6	7	8	9	10	11	12	13	14
running thread 1	█	█	□	█	□	□	□	█	□	█	□	□	█	█
running thread 2	□	□	█	□	█	█	█	□	█	□	█	█	□	□

- Run different parts of a program on different processor cores

# Running Our Own Code Concurrently



Wherever you want to start the Thread:

```
new Thread(object of type R).start();
```

# Animation with Threads

- ▶ Example 1: A single object
  - “Animate” it with button clicks
  - Animate it with a Timer

```
Timer timer = new Timer(50, animatorButton);  
timer.start();
```

- Animate it by using a thread

```
public class R implements Runnable {  
    ...  
    public void run() {  
        while (true) {  
            ... maybe Thread.sleep(...);  
        }  
    }  
}
```

Wherever you want to start the Thread:

```
new Thread(object of type R).start();
```

# Animation with Threads

- ▶ Example 2: Multiple objects
  - Use separate thread for each object's "brain"
  - Another thread asks Java to update the GUI



# Other Uses for Threads

- ▶ Web servers: many users connecting
- ▶ Desktop applications:
  - layout, spellchecking, auto-save, ...
- ▶ Scientific computing
- ▶ Weather forecasting
- ▶ ...

# Caution!

- ▶ What if one thread is in the middle of performing an action when its time slice ends?
- ▶ What if a second thread's action interferes with the first's action?
- ▶ See bank example in today's project

**Optional:** For a way to fix this, see Big Java Section 20.4

# Team Project



Work time

*Be sure everyone is getting a chance to drive.*