CSSE 220 Day 19

Multithreading

Checkout *Multithreading* project from SVN

Questions

The World is Concurrent

>> Joe Armstrong,
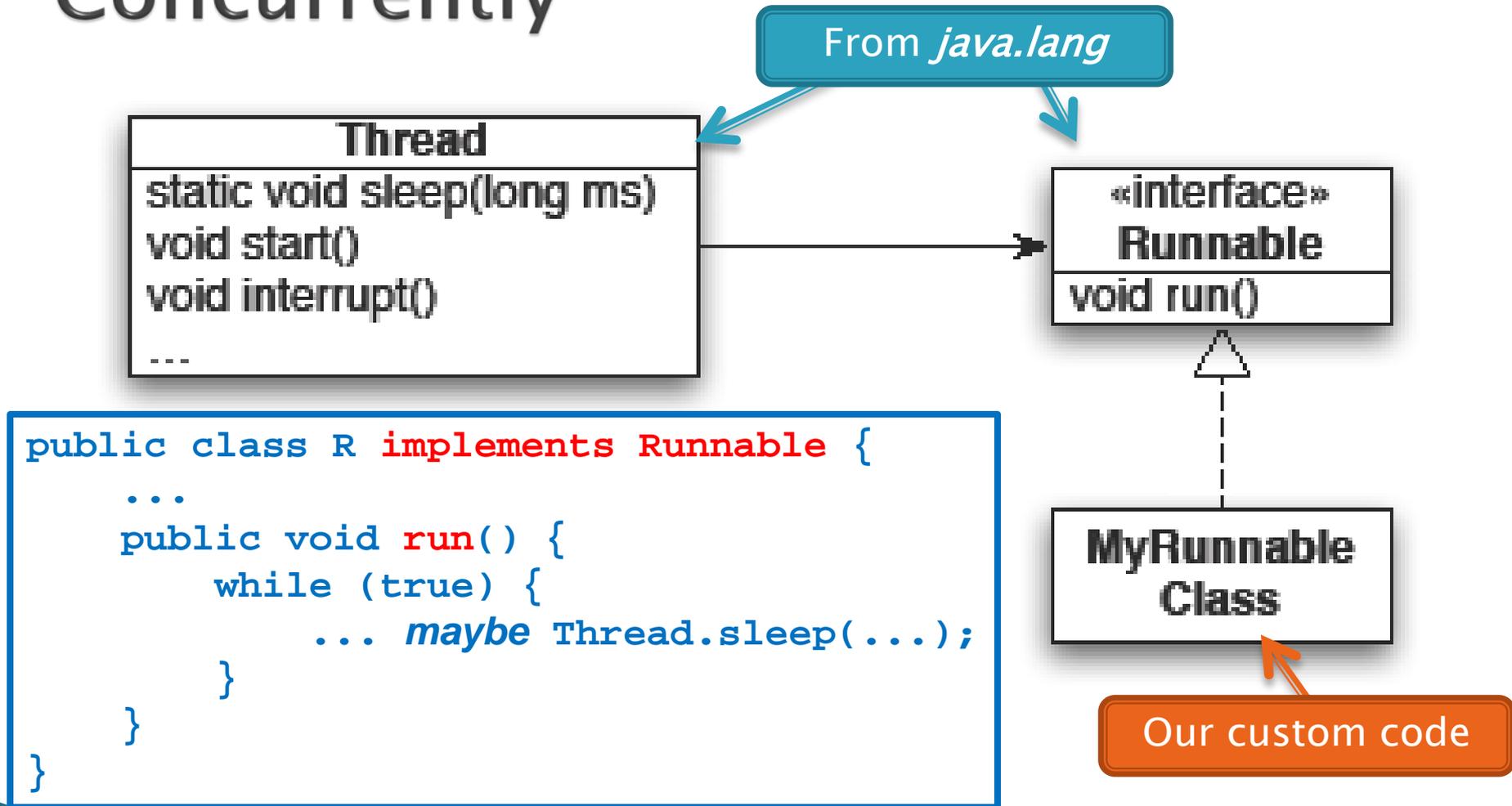*Programming in Erlang*

Q1

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

Q2

Running Our Own Code Concurrently

From *java.lang*

Thread
- static void sleep(long ms)
- void start()
- void interrupt()
- ...

«interface»
Runnable
- void run()

MyRunnable Class

Our custom code

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

Wherever you want to start the Thread:
```java
new Thread(object of type R).start();
```

Q3

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

http://www.roadsideamerica.com/story/8543

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

Q4

Team Project

>> Work time

Be sure everyone is getting a chance to drive.

Q5–6