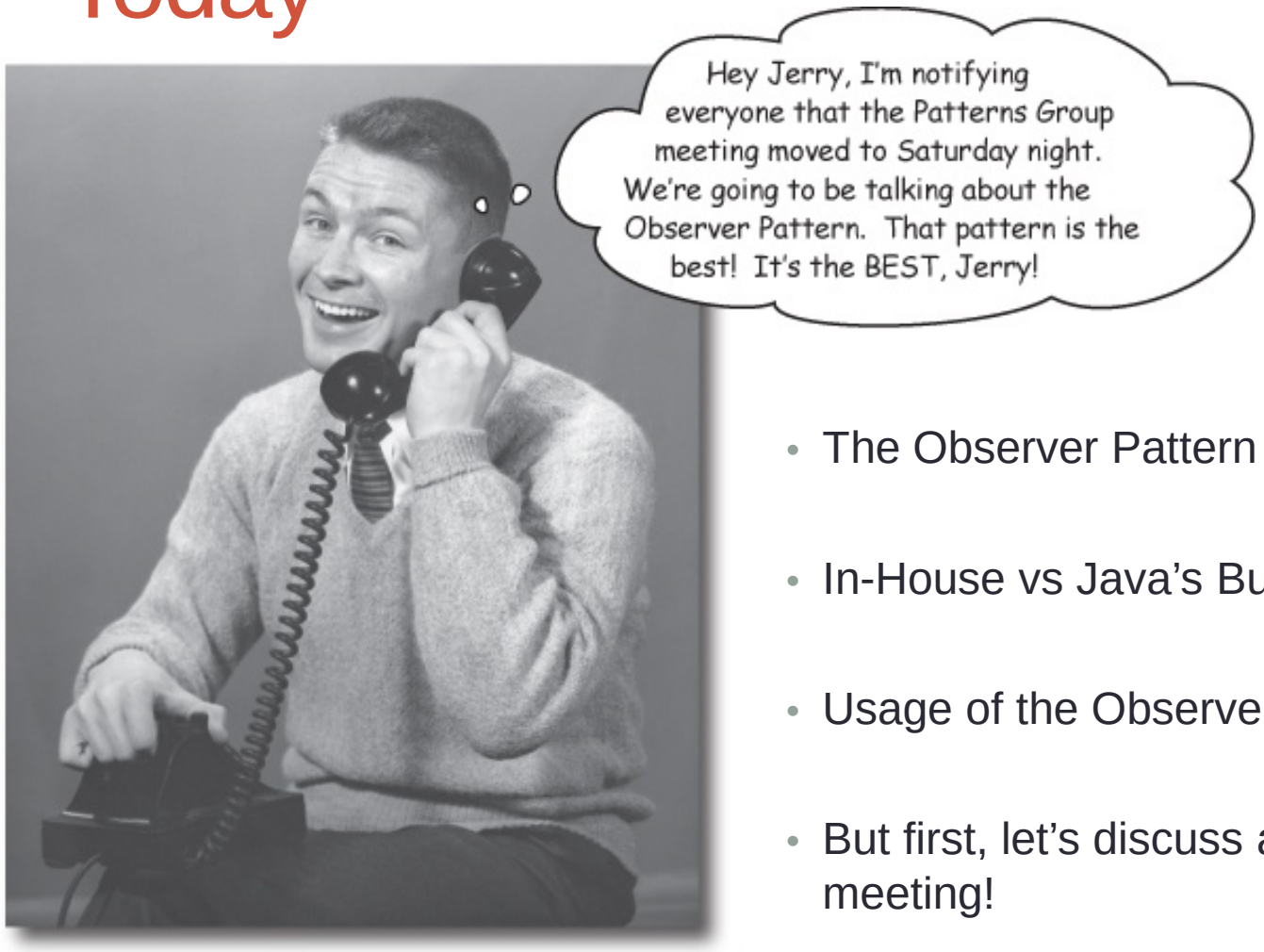
THE OBSERVER PATTERN

Chandan R. Rupakheti

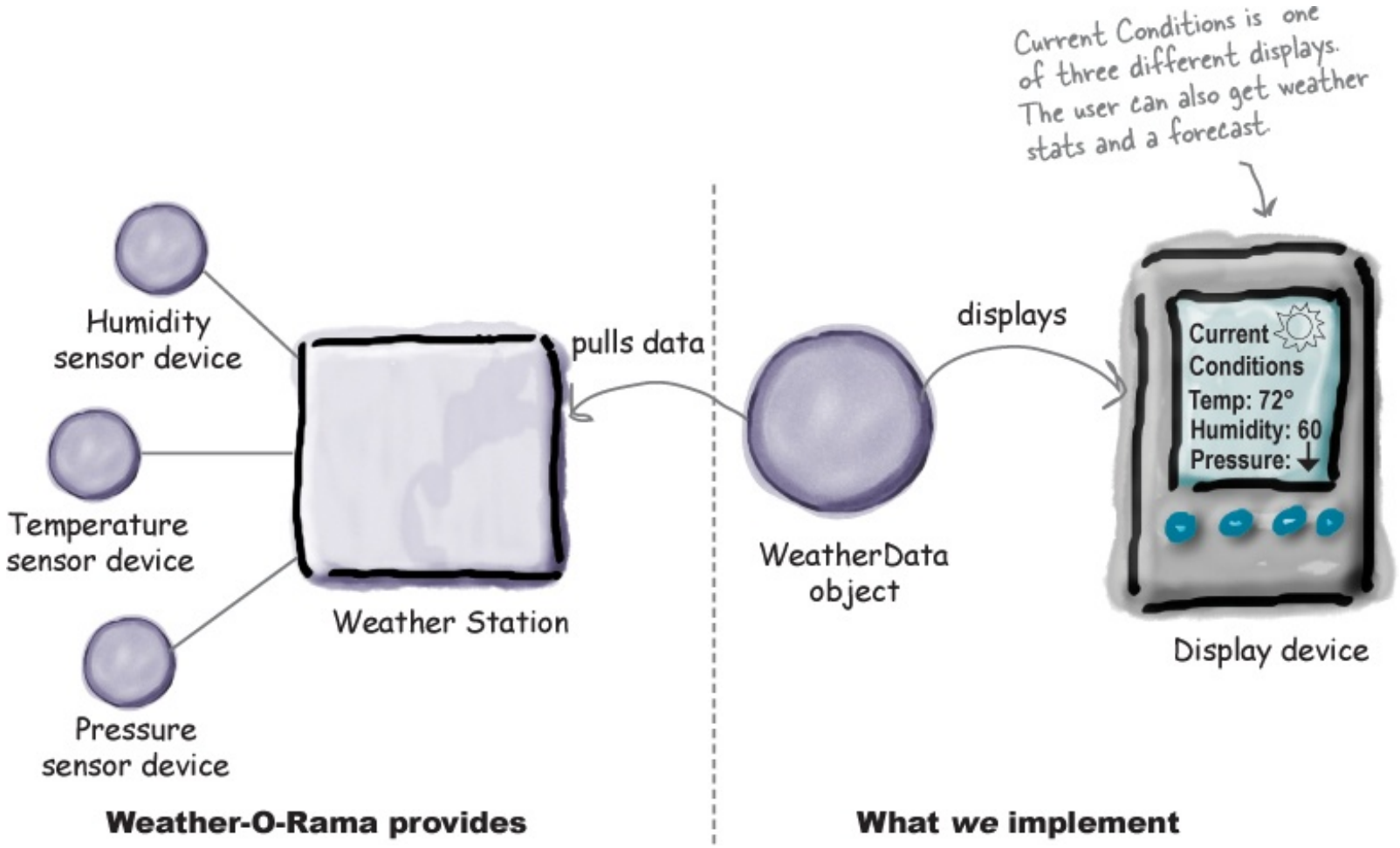
Week 1-2

Today

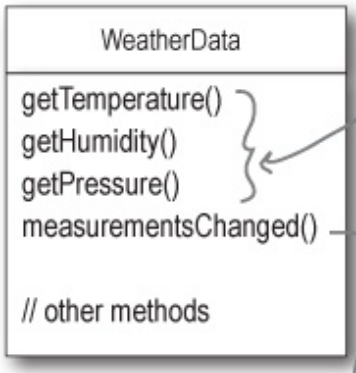


- The Observer Pattern
- In-House vs Java's Built-In implementations
- Usage of the Observer Patterns
- But first, let's discuss about Monday's client meeting!

The Weather Monitoring Application



The WeatherData class



These three methods return the most recent weather measurements for temperature, humidity, and barometric pressure, respectively.

We don't care HOW these variables are set; the WeatherData object knows how to get updated info from the Weather Station.

The developers of the WeatherData object left us a clue about what we need to add...

```
/*
 * This method gets called
 * whenever the weather measurements
 * have been updated
 *
 */
public void measurementsChanged() {
    // Your code goes here
}
```

WeatherData.java

Remember, this Current Conditions is just ONE of three different display screens.

Display device

What do we know so far

The WeatherData class has getter methods for three measurement values:

getTemperature()
getHumidity()
getPressure()

The measurementsChanged() method is called any time new weather measurement data is available.

measurementsChanged()

We need to implement three display elements that use the weather data: a *current conditions* display, a *statistics display,* and a *forecast* display.

These displays must be updated each time WeatherData has new measurements.

The system must be extensible - other developers can create new custom display elements and users can add or remove as many display elements as they want to the application.

First Misguided SWAG at the Weather Station

SWAG: **S**cientific **W**ild **A**** **G**uess

```
public class WeatherData {

    // instance variable declarations

    public void measurementsChanged() {

        float temp = getTemperature();
        float humidity = getHumidity();
        float pressure = getPressure();

        currentConditionsDisplay.update(temp, humidity, pressure);
        statisticsDisplay.update(temp, humidity, pressure);
        forecastDisplay.update(temp, humidity, pressure);
    }

    // other WeatherData methods here
}
```

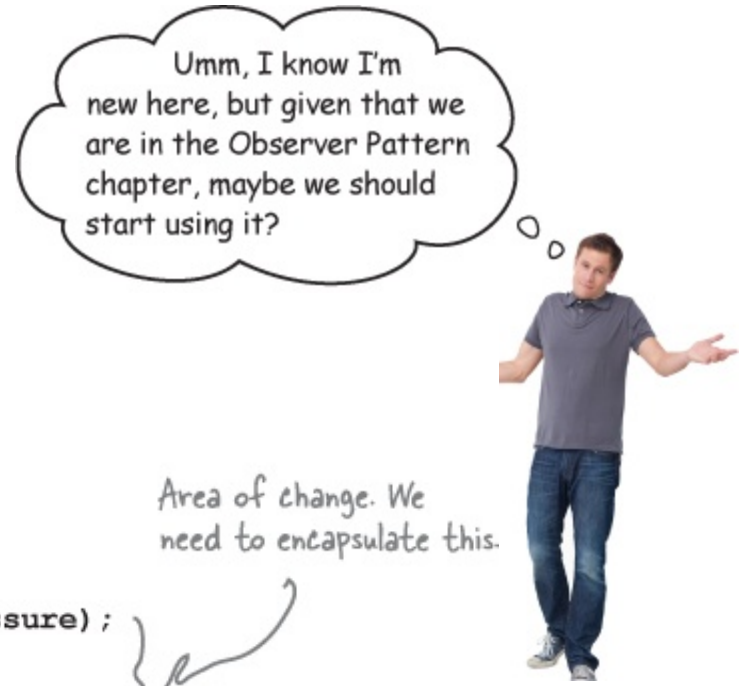
Grab the most recent measurements by calling the WeatherData's getter methods (already implemented).

Now update the displays...

Call each display element to update its display, passing it the most recent measurements.

Start Q1

What's wrong with our implementation?

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public void measurementsChanged() {

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}
```

Area of change. We need to encapsulate this.

By coding to concrete implementations we have no way to add or remove other display elements without making changes to the program.

At least we seem to be using a common interface to talk to the display elements... they all have an update() method that takes the temp, humidity, and pressure values.

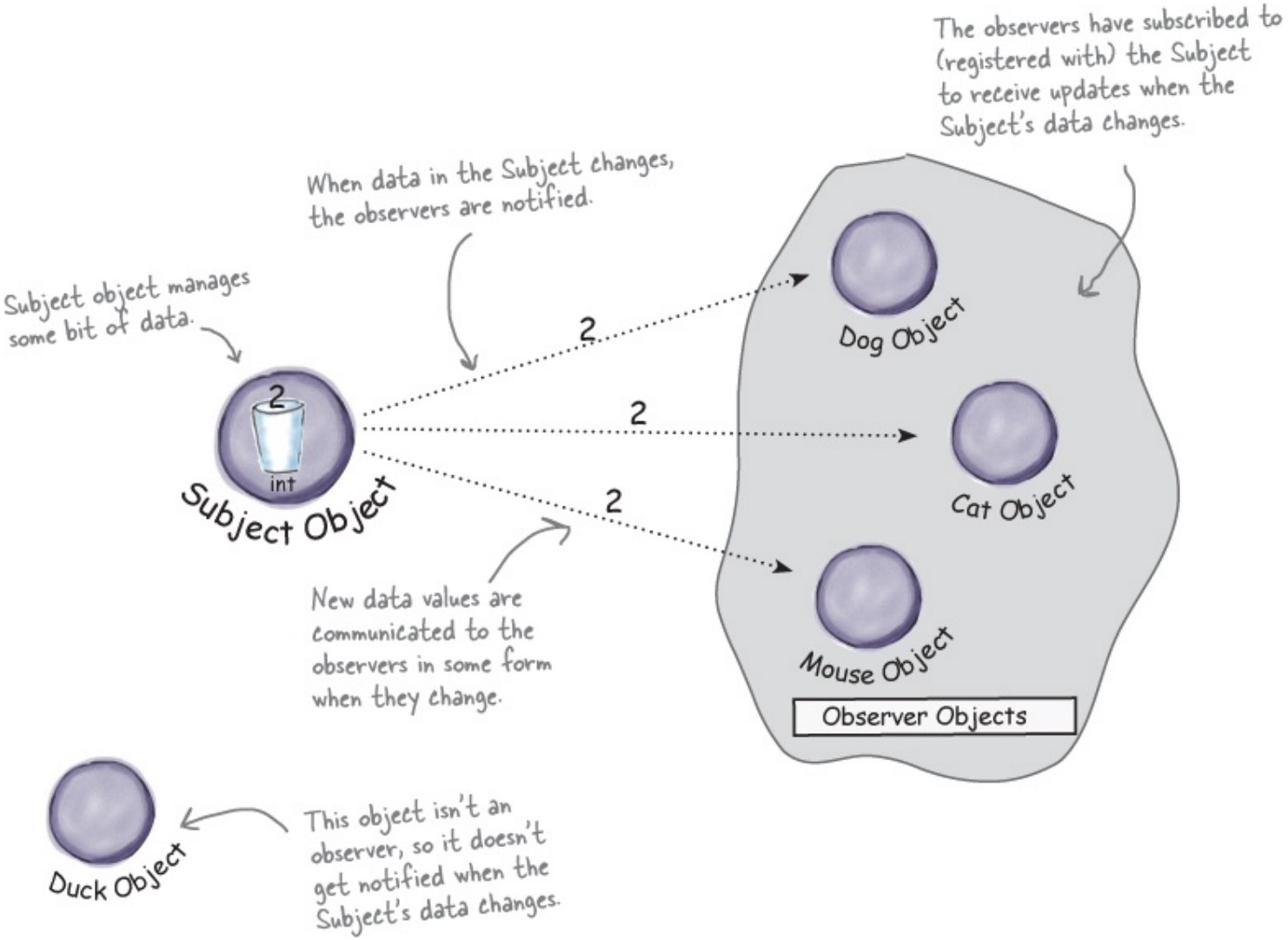
Finish Q1

Meet the Observer Pattern

Newspaper subscription

- A publisher goes into business
- If you subscribe, every time there's a new edition, it gets delivered to you
- If you unsubscribe, they stop being delivered
- Any organizations and people can subscribe and unsubscribe while the publisher remains in business

Publishers + Subscribers = Observer Pattern



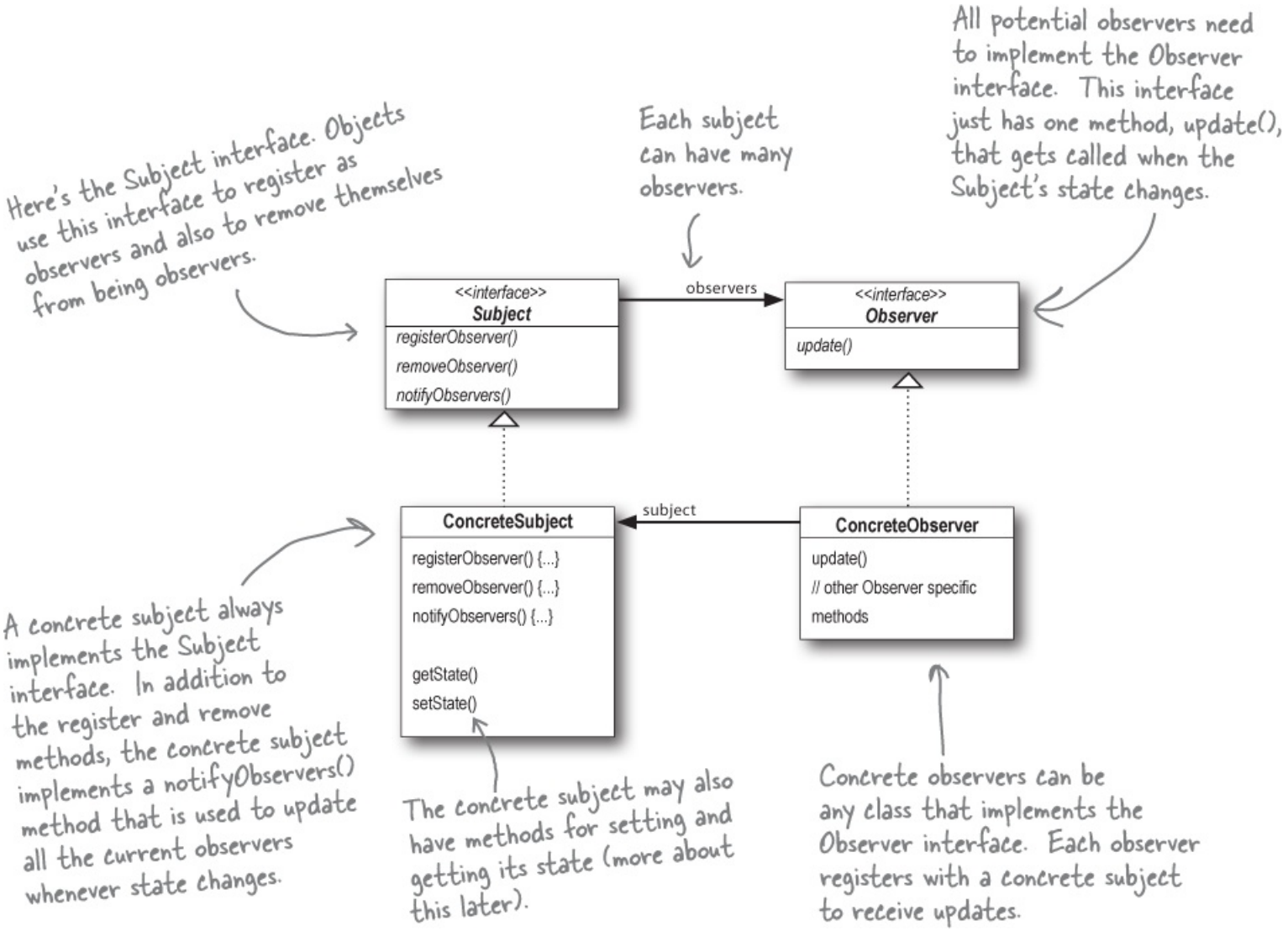
Loose Coupling

Design Principle:

Strive for loosely coupled designs between objects that interact

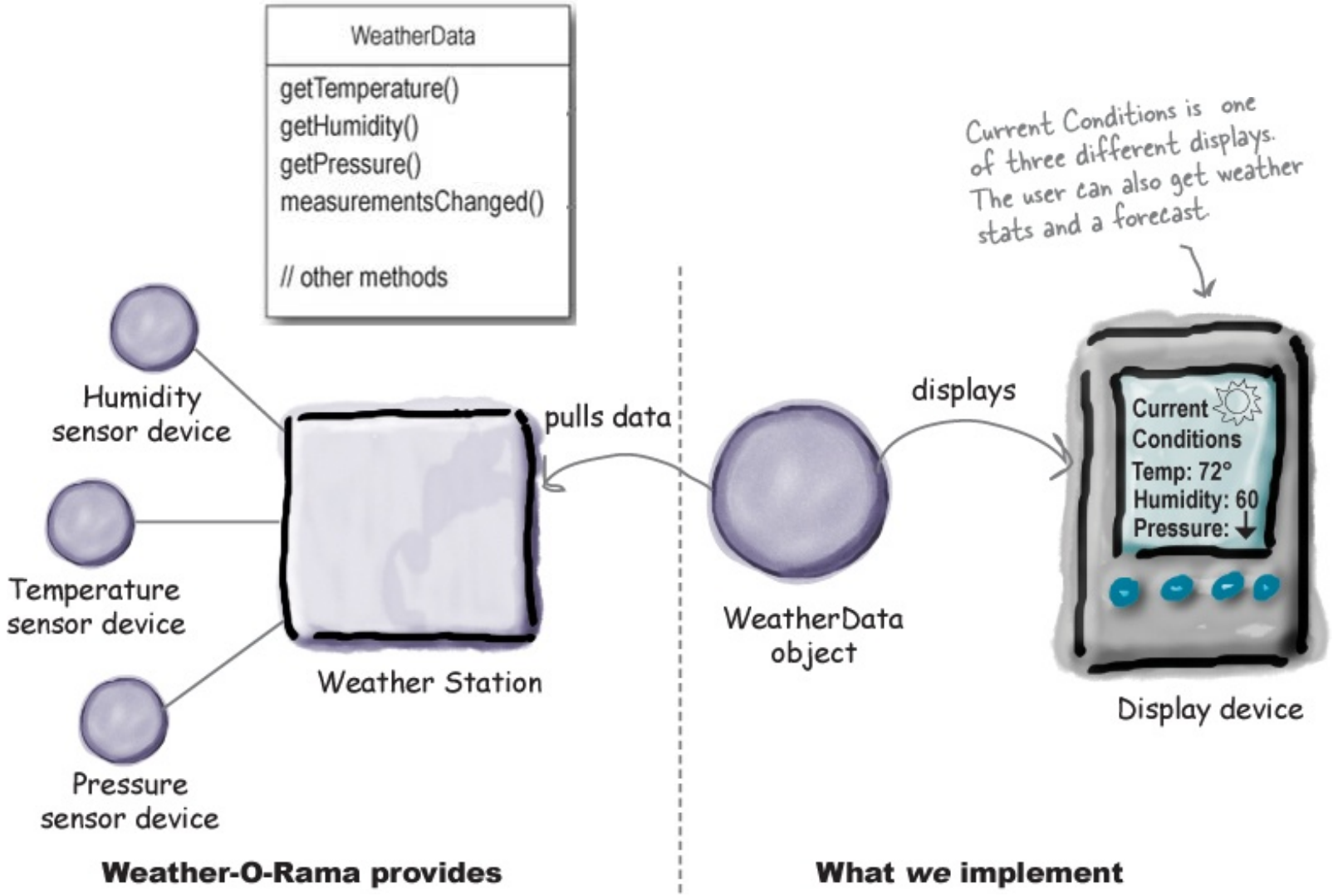
Loosely coupled designs allow us to build flexible OO systems that can handle change because they minimize the interdependency between objects.

The Observer Pattern

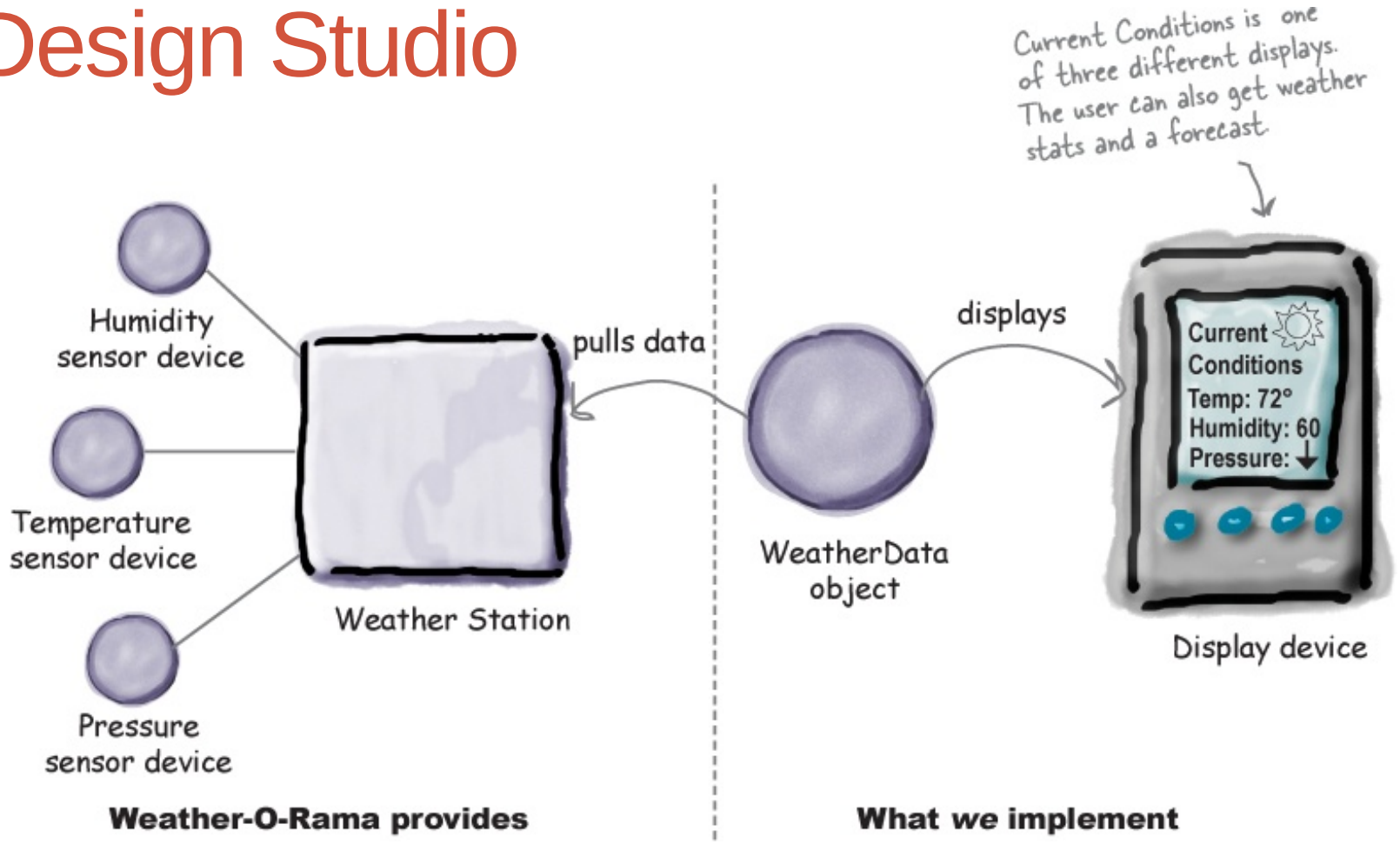


Design Studio

Design the Weather Monitoring Application

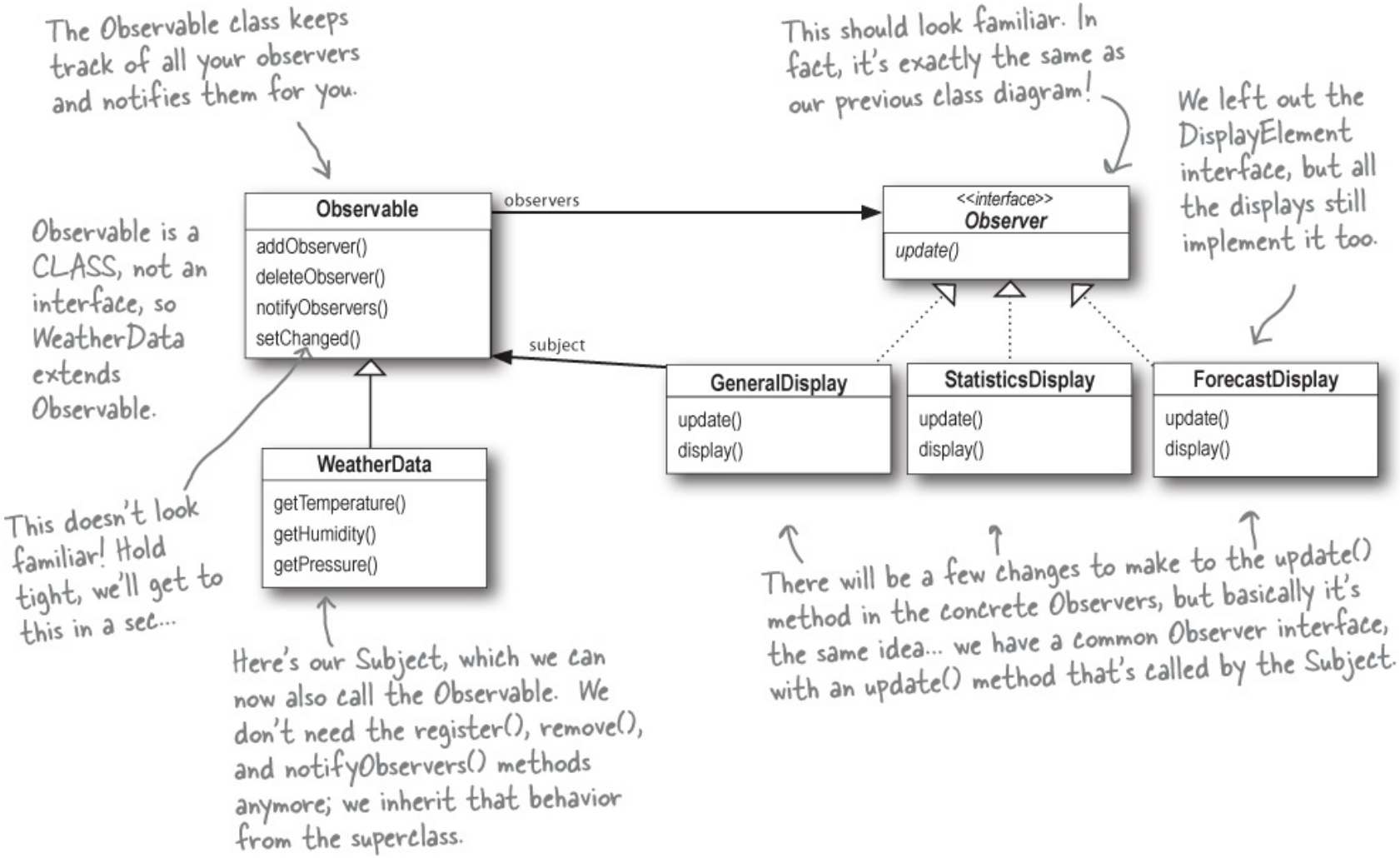


Design Studio



See pp. 58 – 70 for solutions

Solution Using Java's Observer Pattern



Recap

Design Principle:

Strive for loosely coupled designs between objects that interact

The Observer pattern allows loose coupling between Subject and Observers

Java's built-in Observer pattern violates DIP

Java's built-in Observer pattern favors inheritance over composition

Next Week

- Things Due
  - Client meeting, during class
  - Homework 1 by Tuesday, 8:00 am
- Concepts
  - The Decorator Pattern
  - The Open-Close Principle
  - Coupling and Cohesion