Design Patterns

CS6.401 Software Engineering

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Acknowledgements

The materials used in this presentation have been gathered/adapted/generated from various sources as well as based on my own experiences and knowledge

-- Karthik Vaidhyanathan

Sources:

1. **Design Patterns: Elements of Reusable Object-Oriented Software** by Erich Gamma, Richard Helm, Ralph Johnson and John Vlissides
2. **Head first Design Patterns**, Second Edition, Eric Freeman and Elisabeth Robson

Being an Observer! - The Observer Pattern [Behavioral]

Meet the Observer Pattern!

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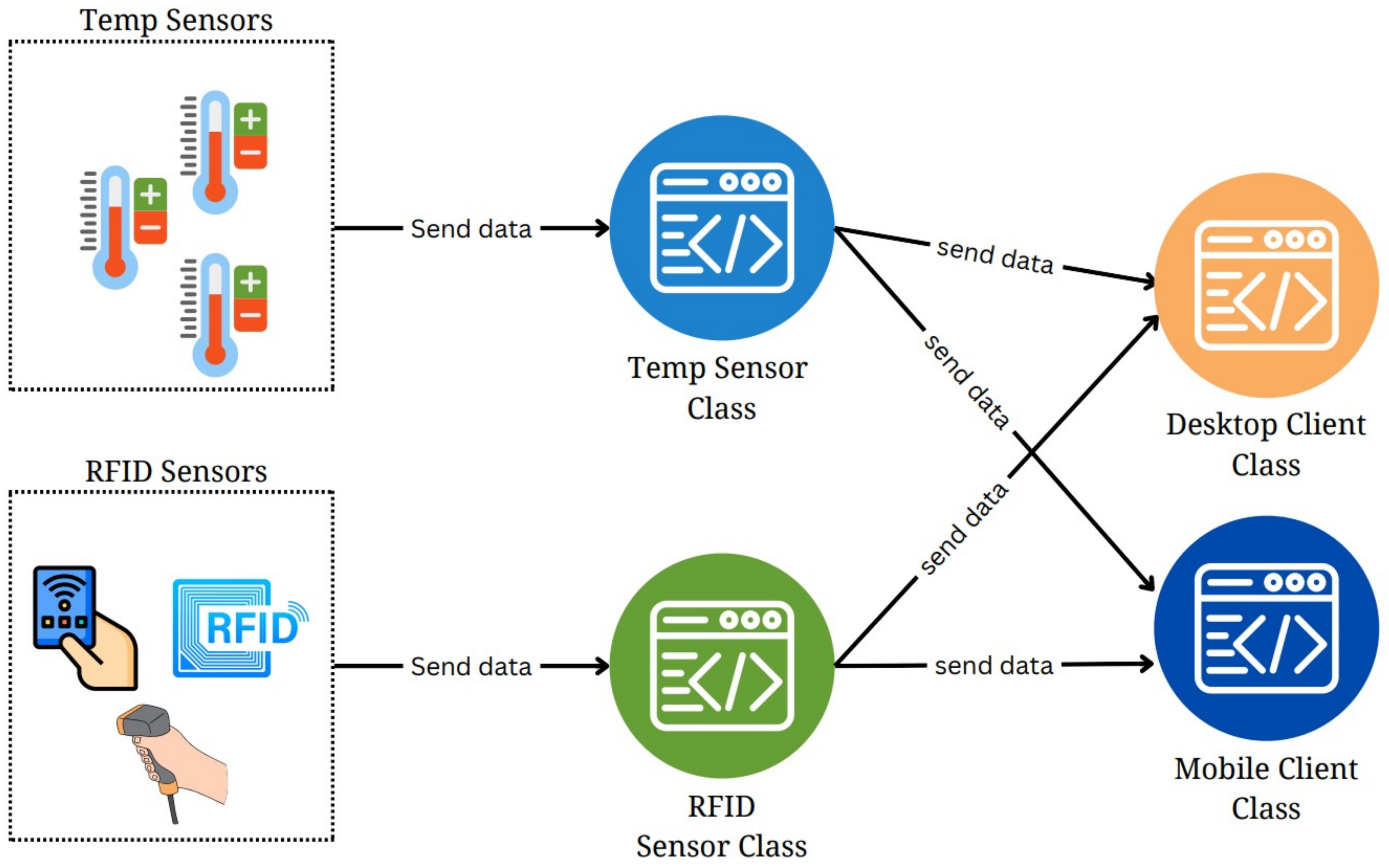
- Subscriber chooses the (channel) publisher by pressing on subscribe button
- The channel who is posting (Publisher) delivers only to its subscribers
- publisher has to maintain a list of subscribers (channel subscribers)

Meet the Observer Pattern: Motivation



Can we push the data to all clients as soon a s it arrives?

Meet the Observer Pattern

- What if we had the sensor data to be publishers?
- What if the clients just become subscribers?
- Every time data comes, all the subscribers are notified
- Publishers and subscribers can be decoupled
- Adding new clients also is just same as adding a new subscriber

Observer Pattern: Documentation

Intent

Defining a one-to-many dependency between objects
Change in object notifies all dependent objects

Also Known As: Dependents, Publish-subscribe

Motivation

- Maintaining consistency between objects
- Reduce tight coupling and increase reusability
- Two key objects: *Subject and Observer*

Example: Presentation components and application data

Observer Pattern: Documentation

Applicability

- When abstraction has two aspects – One dependent on the other and separation promotes reusability
  - Eg: Think of having just one class, Display instead of mobile and web
- When a change in one object requires changing others [Not clear how many!]
- When object should notify others without assuming about the objects [reduce coupling]

Observer Pattern: Documentation

Structure

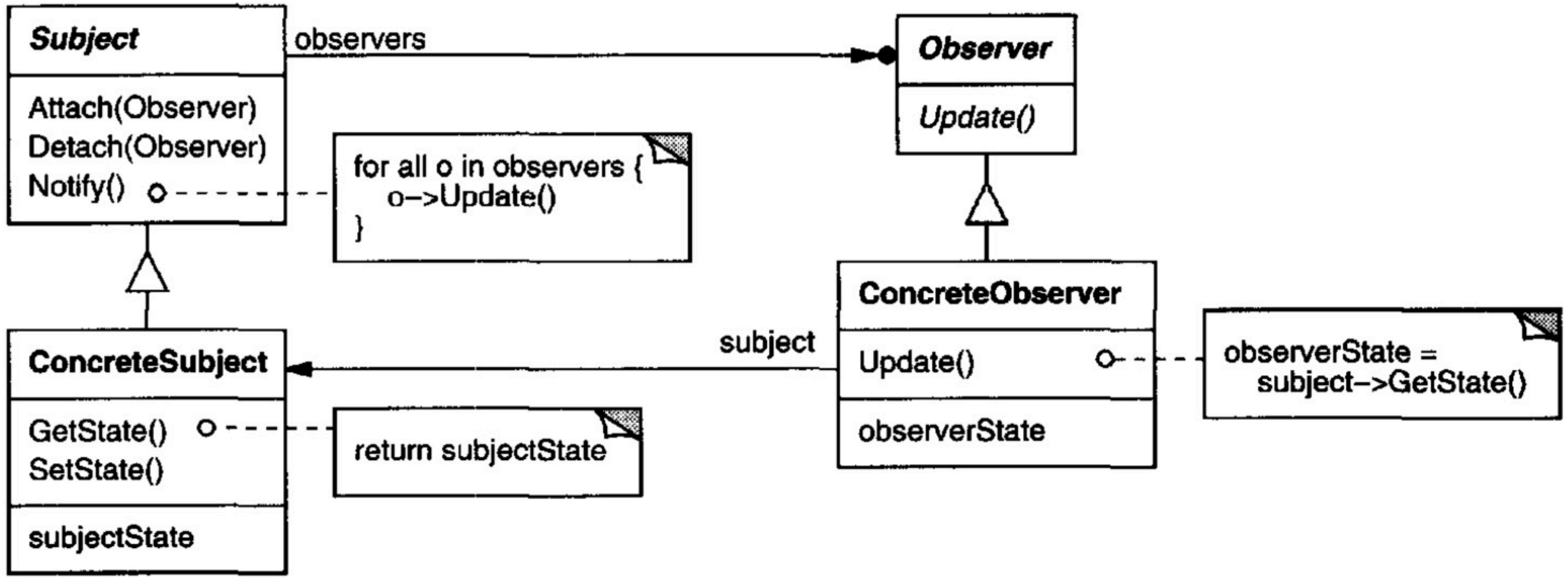


Image source: Gang of four book

Observer Pattern: Documentation

Participants

Subject (IoTInterface)

- Knows its observers – Many observers per subject
- Provides interface for attaching and detaching observer objects

Observer (DataSubscribers)

- Defines an update interface for objects that should be notified

Concrete Subject (RfidPublisher)

- The key subject that contains the state information
- Sends a notification to its observers when state change happens

Concrete Observer (MobileSubscriber)

- Maintains reference to concrete subject object
- Implements observer update interface

Observer Pattern: Documentation

Consequences

- Abstract coupling between Subject and Observer
  - Subject doesn't know the concrete class of any observer
  - The coupling is as minimal as possible
- Support for broadcast communication
  - Subject doesn't care about number of observers
  - The notifications are automatically sent as broadcast to all interested
- Unexpected updates
  - Unintended updates on subject may cause cascade of updates on observers
  - Often simple update notification may not provide enough changes on state changes of subject

Observer Pattern: Documentation

Implementation

Check the source code given along: IoTObserver

Thank You

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