Design Patterns

Observer, State

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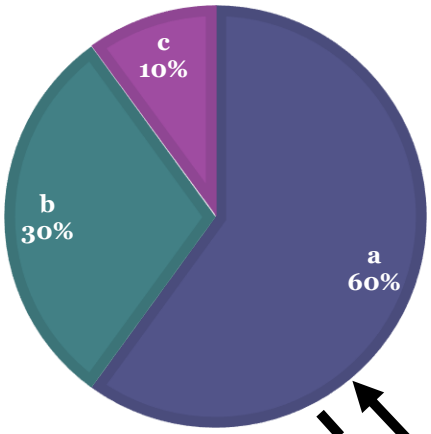
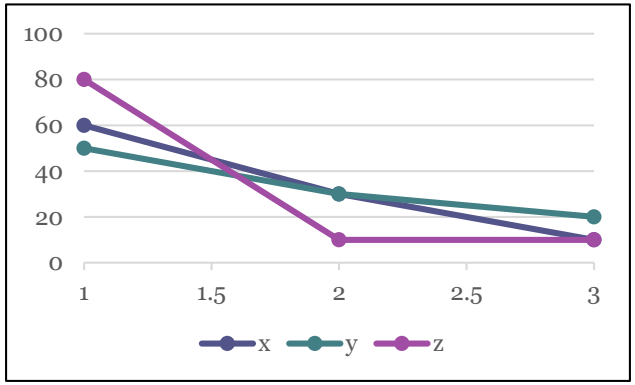
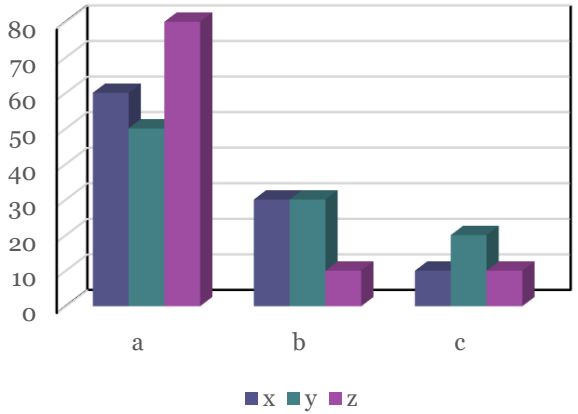
Design pattern: Observer

- **Category**: Behavioral design pattern
- **Intent**:
  - Define one-to-many dependency so that when one object changes state all of its dependents are notified and updated automatically
- **Motivation**
  - Collection of cooperating objects needing to maintain consistency/updates without becoming tightly coupled

Motivation cont.







…

	a	b	c
x	60	30	10
y	50	30	20
z	80	10	10

notification

modifications

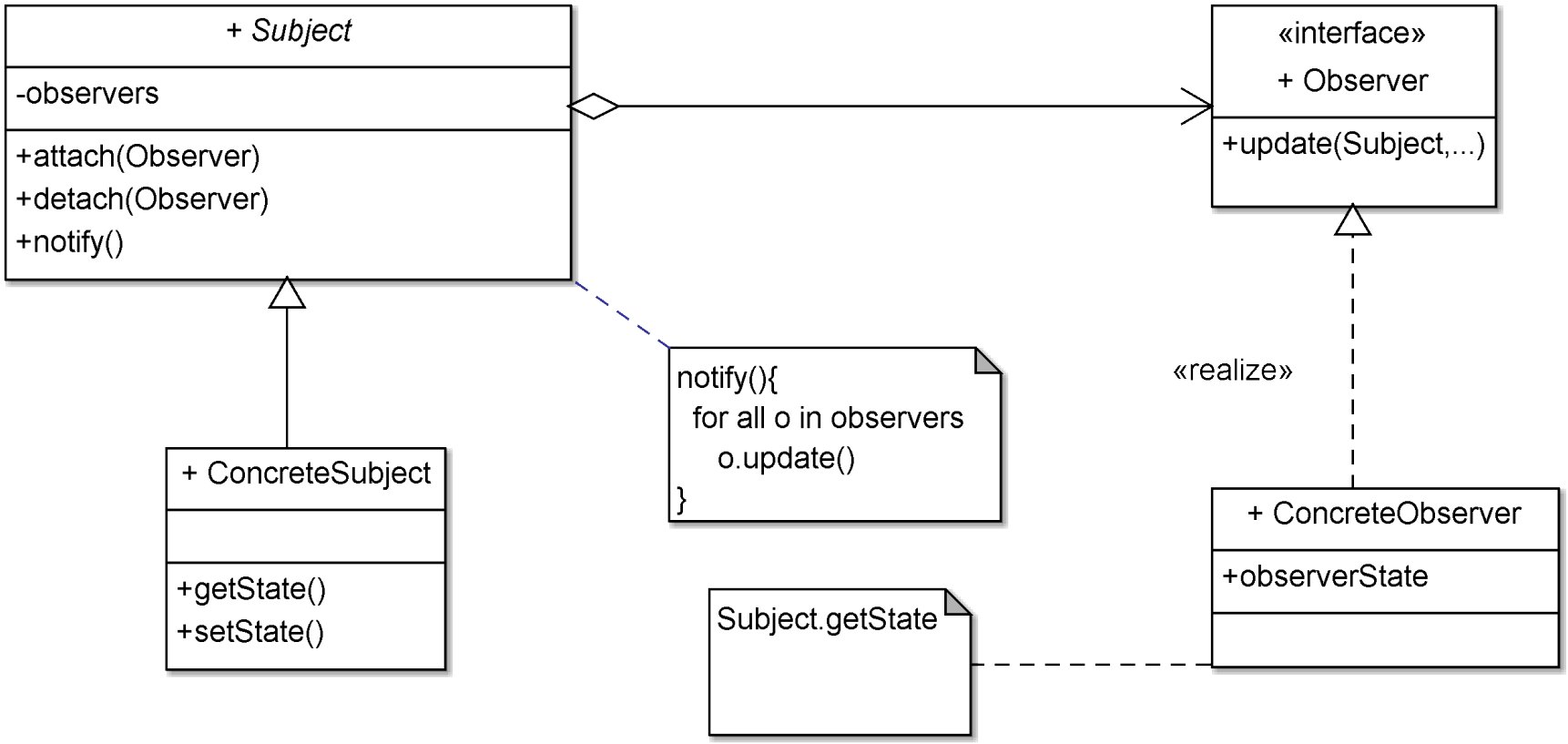
Applicability

- Abstraction has two aspects, one dependent on the other. Encapsulating in separate objects lets you vary and reuse them independently
- Changing one requires changing others and you don't know how many others will need to change
- Object should be able to notify others without making assumptions about that object – you don't want the objects tightly coupled

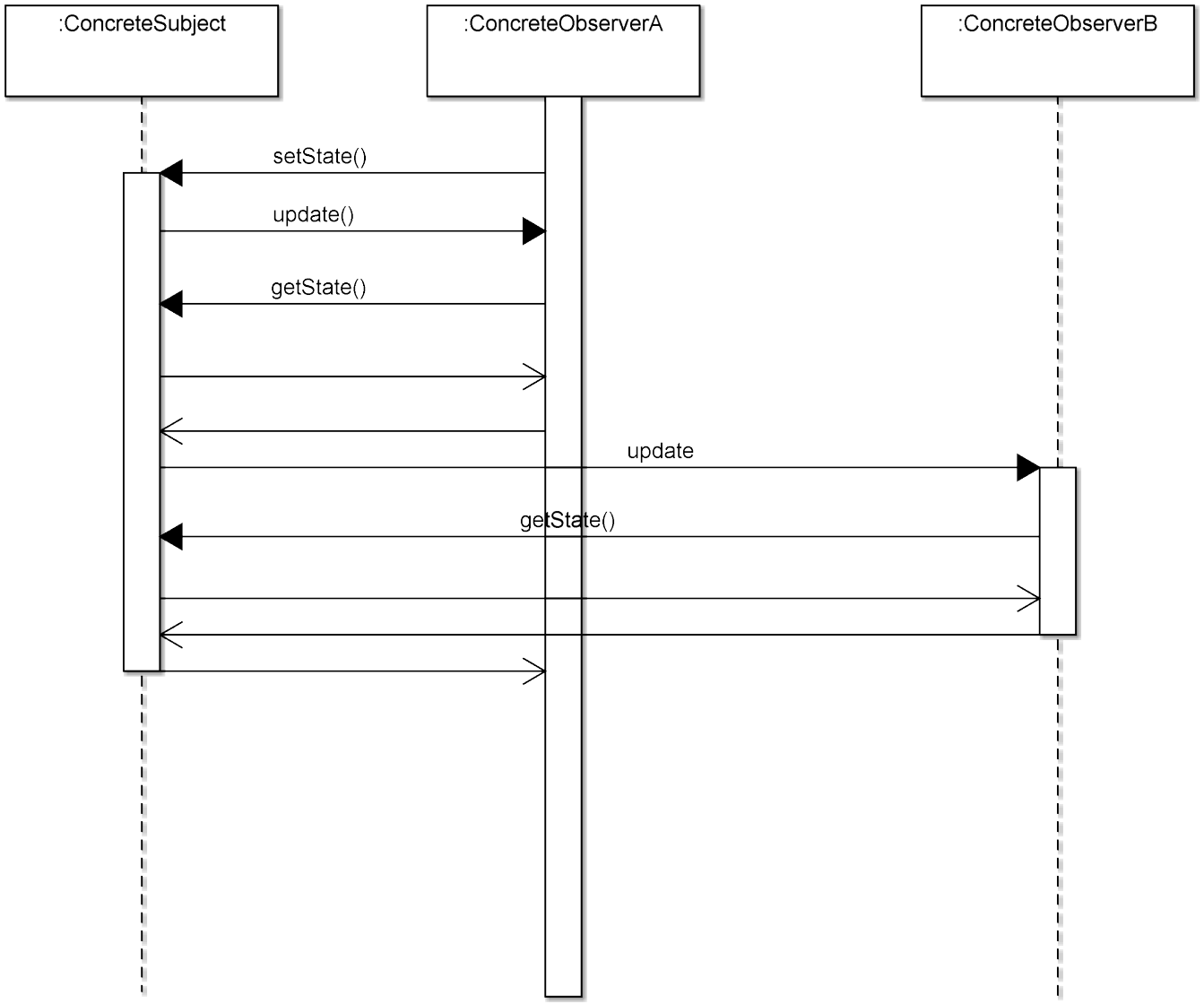
Participants

- Subject
  - Knows its observers. Any number of Observer objects may observe
  - Provides interface for attaching/detaching Observer object
- Observer
  - Defines an updating interface for objects that should be notified of changes in a subject
- ConcreteSubject
  - Stores state of interest to ConcreteObservers
  - Sends notification to its observers when its state changes
- ConcreteObserver
  - Maintains reference to ConcreteSubject object
  - Stores state that should stay consistent with the subject's
  - Implements the Observer updating interface

Observer UML



Sequence


:ConcreteSubject
:ConcreteObserverA
:ConcreteObserverB
setState()
update()
getState()
update
getState()

In class examples

- Excel document
- Class registration waitlist

Design pattern: State

- **Category**: Behavioral design pattern
- **Intent**:
  - Allow an object to alter its behavior when internal state changes. The object appears to change its class
- **Motivation**
  - Significant changes in behavior of same object depending on state
  - Reduce complexity of long conditional logic

Applicability

Use in either of these cases:

- Object's behavior depends on its state, and it must change its behavior at runtime depending on state
- Operations have large multipart conditional logic with several containing same conditional structure

Participants

- Context
  - Class defines the interface of interest to client
  - Maintains an instance of ConcreteState subclass that defines current state
- State
  - Defines interface for encapsulating the behavior associated with particular state of the Context
- ConcreteState subclasses
  - Each subclass implements a behavior associated with a state of the Context

In class examples

- TCP connection
  - Open
  - PassiveOpen
  - Closed
- Phone
  - Off
  - Locked
  - On
  - Camera