Fachhochschule Nordwestschweiz
Hochschule für Technik

# Software Architecture

## Exercise – Box and Arrow Diagrams

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# Exercise Opening
## Overview

An essential element of software architecture is to abstract from details that are not "architecture-relevant". See also the article Design vs. Architecture by Paul Clements of the SEI ([Clemens] – available on the file server).

As a prerequisite for performing the *observer exercise*, please study the observer design pattern.

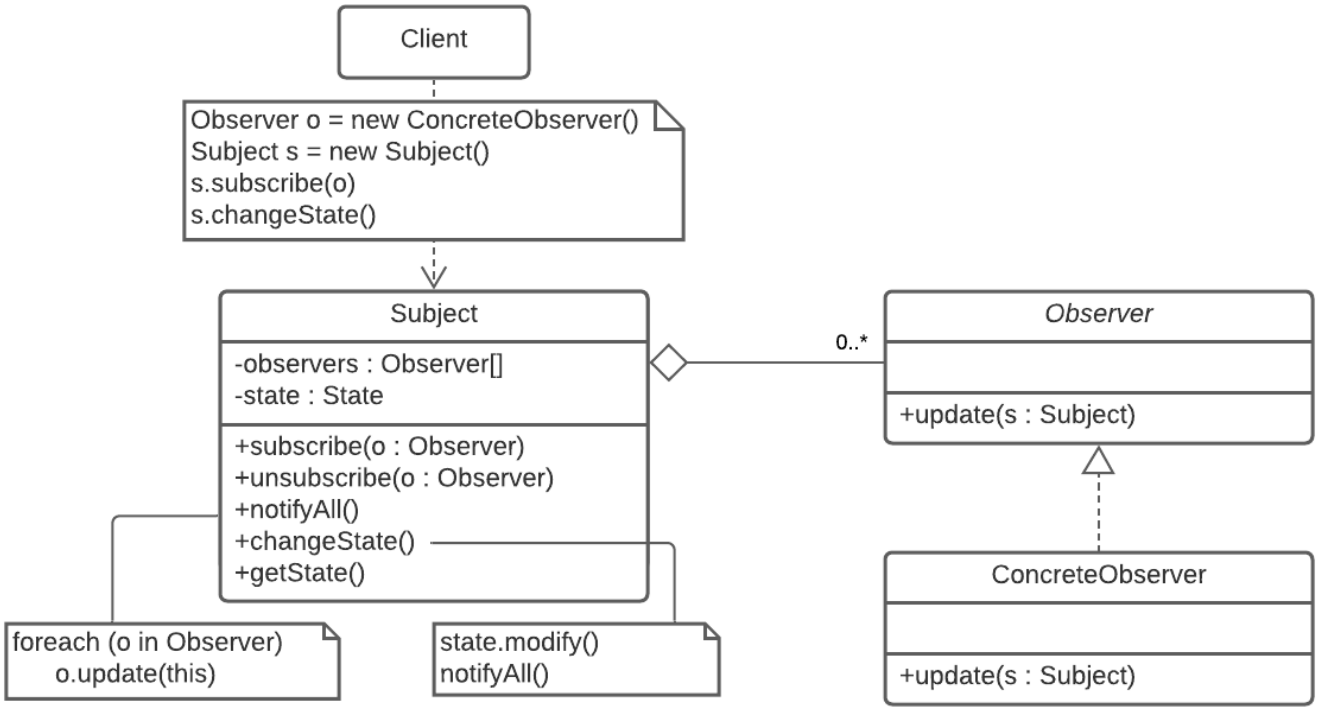
# Exercise Agenda

- Observer
- Demilitarized Zone

# Observer
## Overview

The representation of software architecture as interacting components allows freedom to be left for design decisions that are not classified as architecture-relevant.

Examine this with the concrete example of the *observer design pattern*.



# Observer
## Overview

The four boxes in the *observer pattern* diagram represent four architecture components. The arrows between them represent different relationships between these components.

Answer the following questions for the above example:

a) What properties of the overall system does the *observer architecture* ensure?

b) From which design decisions (non-architecture decisions) does the *oberver pattern* abstract and to which of the individual components are they left? Specify such non-architecture design decisions together with the components to which they are left.

# Observer
## Overall System Properties

**a)** what properties of the overall system does the observer architecture ensure?

# Observer
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**a)** what properties of the overall system does the observer architecture ensure?

- The behavior in response to state changes notified by the *subject* can be changed and extended at system runtime by connecting other or additional *observers* to the *subject* (extensibility, modifiability).
- Whoever implements *subjects* does not need to know the implementations of the *observers*. Additional *observers* can be implemented later by anyone interested. (*reusability*, *extensibility*).

# Observer
## Open Design Decisions

**b)** From which design decisions (non-architecture decisions) does the observer pattern abstract and to which of the individual components are they left? Specify such non-architecture design decisions together with the components to which they are left?

# Observer
## Open Design Decisions

**b)** From which design decisions (non-architecture decisions) does the observer pattern abstract and to which of the individual components are they left? Specify such non-architecture design decisions together with the components to which they are left?

- Subject
  - How (e.g., data structures) are connected observers stored?
  - In which order are the observers called?
  - What happens if an observer object is bound multiple times?
  - What happens if an observer object attaches or detaches additional observers during an update?
  - What happens if an observer is a subject (e.g., cyclic update relationships)?
  - Which actions trigger which state changes in a concrete subject?
  - How are states internally represented in a subject?
  - Which additional behavior do subjects implement – additional to that observable with observers?
- Observer
  - is mostly just a basic type with an abstract method (in Java mostly an interface) – thus without further design possibilities.
- Concrete Observer (ViewOne, ViewTwo)
  - What is the exact behavior of these observers on update calls?

# Exercise Agenda

- Observer
- Demilitarized Zone

# Demilitarized Zone
## Overview

**Box-and-arrow diagrams can represent various structures of abstractions and dependencies**, not only software components but also, for example, subnetworks in IT networks.

An important relationship between such subnets is the ability to open a connection from one to another. This requires that devices can be addressed and that no firewall blocks the connection.

A common IT network configuration pattern distinguishes between an *intranet* that is shielded from the outside (i.e. an internal network area that cannot be accessed by devices from outside), a so-called *demilitarized zone* (DMZ) in which servers are located whose services are also to be used from the public Internet (e.g., by customers), and the globally open *Internet*.

Illustrate the situation described above in a simple box-and-arrow diagram that shows from which network areas components can open connections to components in which other network areas.

# Demilitarized Zone

## DMZ in a box-and-arrow diagram

How is this represented by a box-and-arrow diagram?

# Demilitarized Zone
## DMZ in a box-and-arrow diagram

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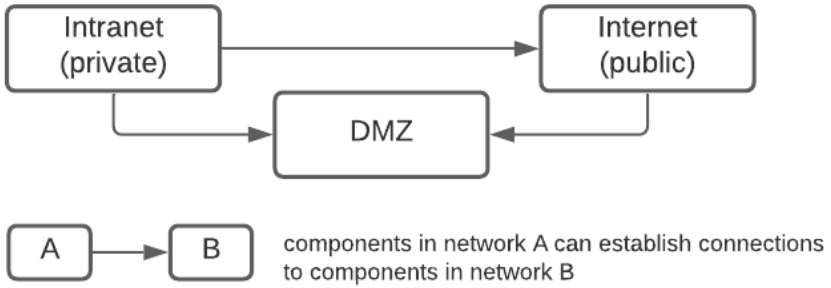

# Bibliography
## Lecture

**[Clemens]**
Clemens, Paul; *What is the difference between Architecture and Design?* 1.3-BSc_SWA_WHAT_Concepts_Exercise_Paul Clements_Design vs Architecture

# Questions