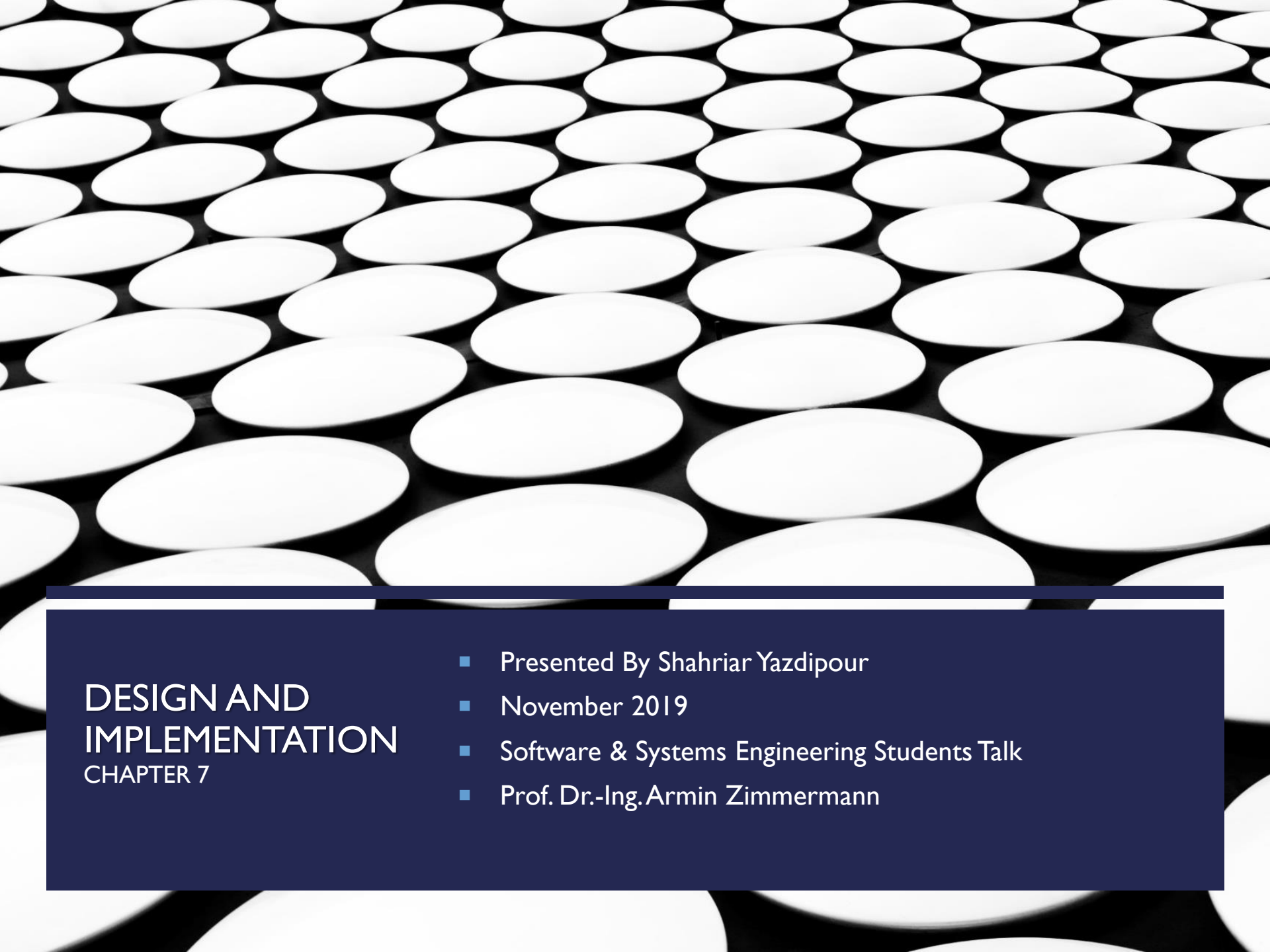


DESIGN AND IMPLEMENTATION
CHAPTER 7

- Presented By Shahriar Yazdipour
- November 2019
- Software & Systems Engineering Students Talk
- Prof. Dr.-Ing. Armin Zimmermann

AGENDA

- DESIGN AND IMPLEMENTATION
- OBJECT-ORIENTED DESIGN USING UML
- DESIGN PATTERNS
- IMPLEMENTATION ISSUES
- OPEN SOURCE DEVELOPMENT

DESIGN AND IMPLEMENTATION

DESIGN AND IMPLEMENTATION

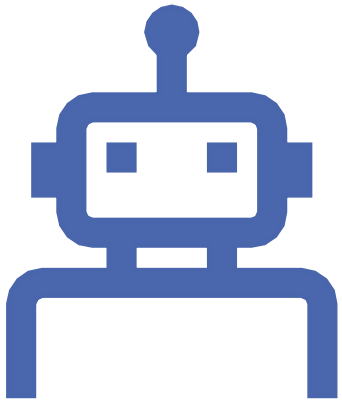
Software design & implementation is the stage in the software engineering process that an executable software system is developed.

- **Software design** is a creative activity in which you identify software components and their relationships, based on a customer's requirements.
- **Implementation** is the process of realizing the design as a program.

BUILD OR BUY

- In a wide range of domains, it is possible to buy off-the-shelf systems (COTS) that can be adapted and tailored to the users' requirements.
  - e.g for implement a medical records system, we can buy a package that is already used in hospitals vs developing a system. One can be cheaper and one faster ...

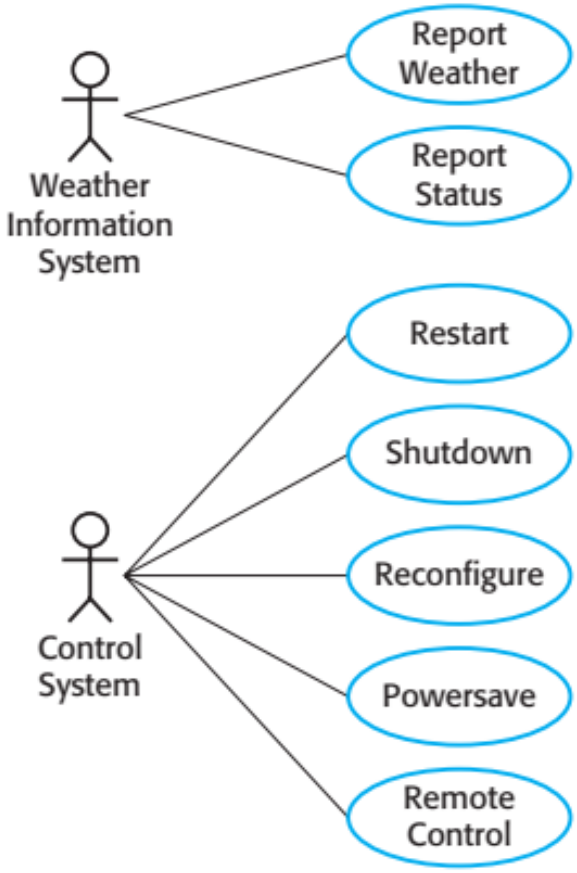
* COTS = Commercial off-the-shelf



OBJECT-ORIENTED DESIGN USING UML

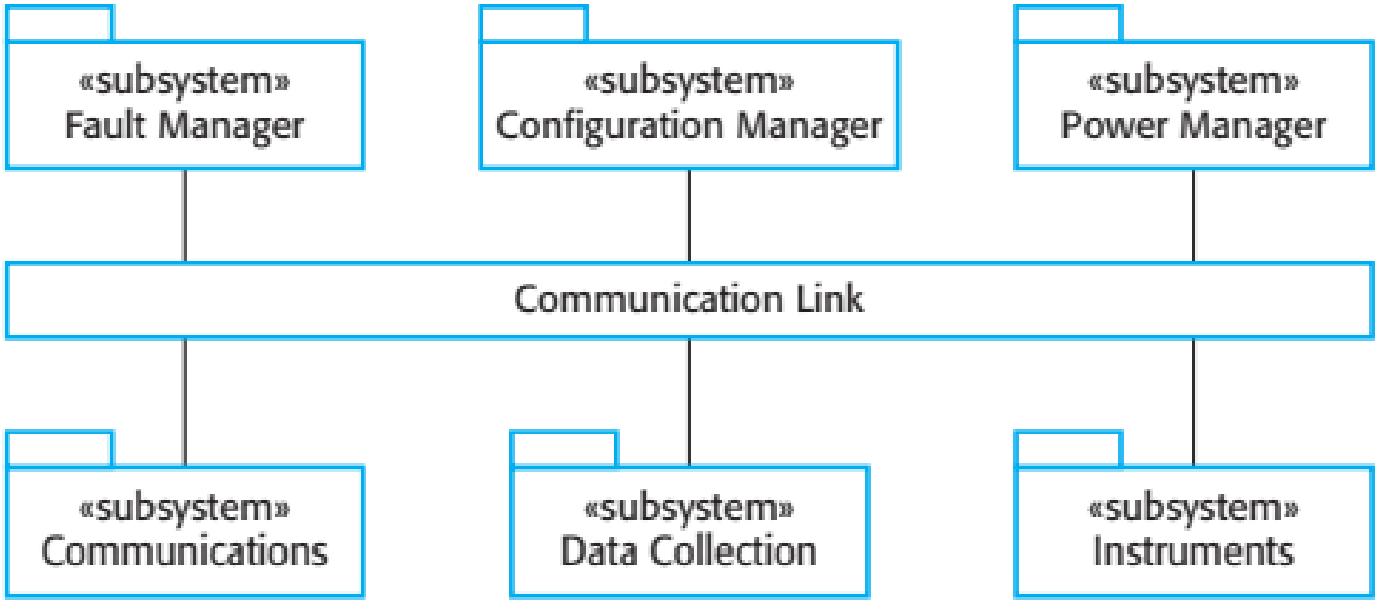
OBJECT-ORIENTED DESIGN PROCESS

- It involves developing a number of different system models.
- They require a lot of effort for development and maintenance which for **small systems** this may **not be cost-effective**. However, for **large systems** developed by different groups design models are an **important communication mechanism**.

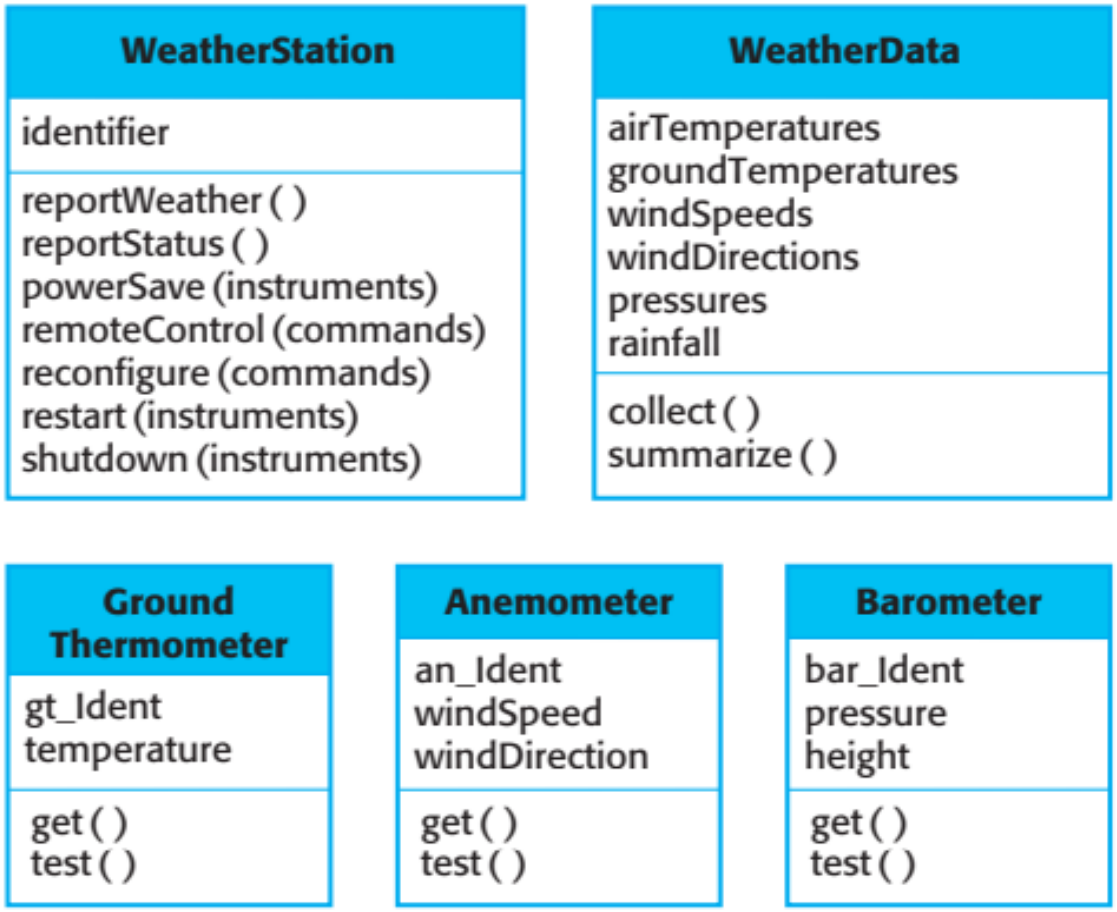


System	Weather station
Use case	Report weather
Actors	Weather information system, Weather statio
Dat	The weather station sends a summary of th the instruments in the collection period to t are the maximum, minimum, and average g minimum, and average air pressures; the m the total rainfall; and the wind direction as
Stimulus	The weather information system establishes weather station and requests transmission
Response	The summarized data are sent to the weath
Comments	Weather stations are usually asked to repor from one station to another and may be m

WEATHER STATION USE CASES

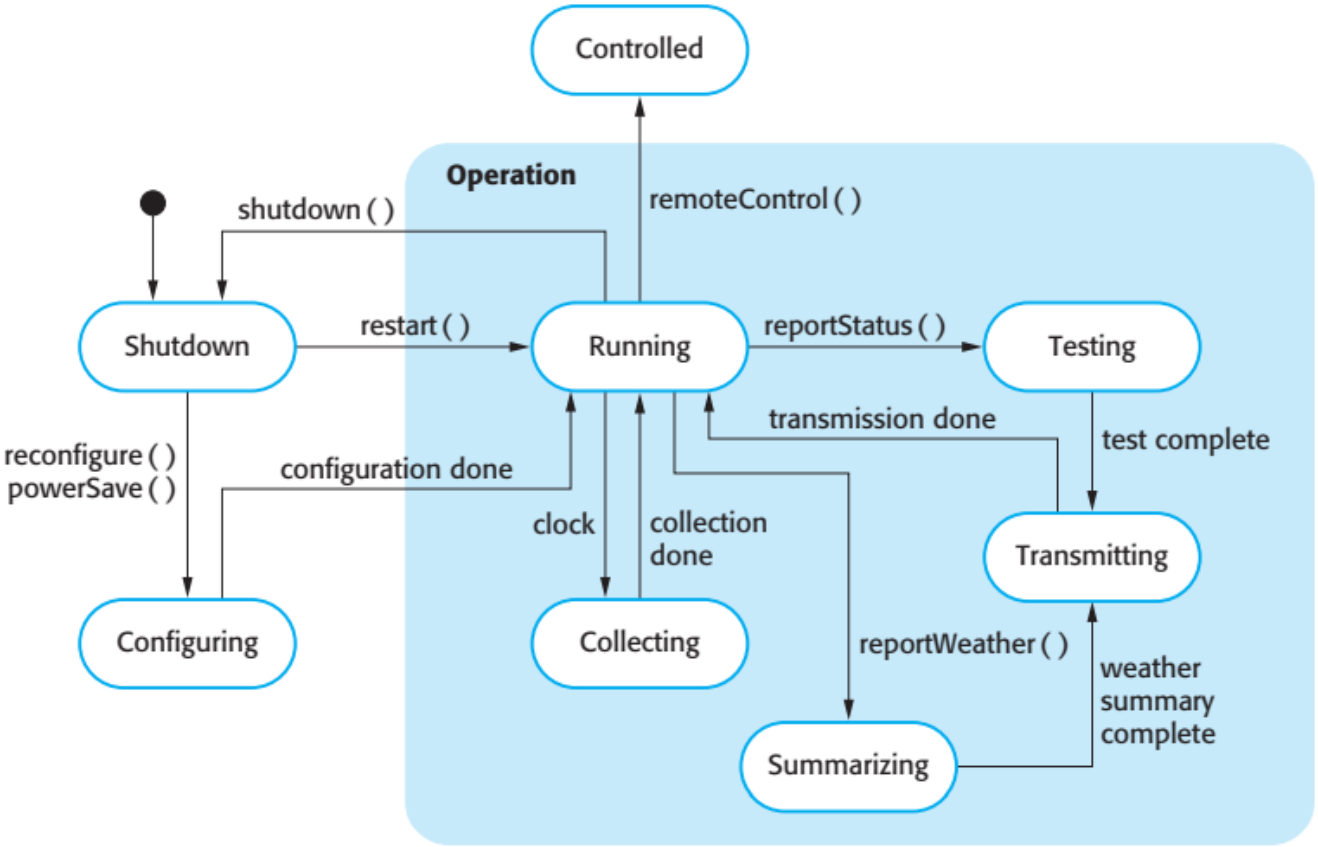


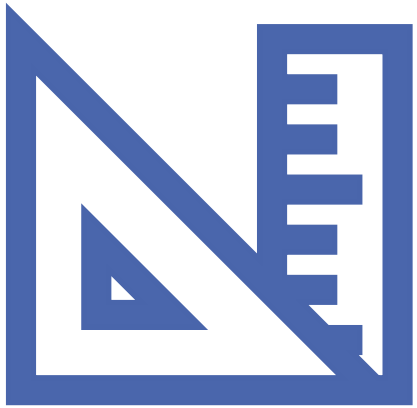
HIGH-LEVEL ARCHITECTURE OF THE WEATHER STATION



WEATHER STATION OBJECT CLASS IDENTIFICATION

STATE DIAGRAM





DESIGN PATTERNS

DESIGN PATTERNS

- A way of reusing abstract knowledge about a common problem and its solution.
- Patterns are a great idea but you need experience of software design to use them effectively.
- You have to recognize situations where a pattern can be applied.

DESIGN PATTERNS

Creational Patterns

- Object Pool / Resource Pool
- Prototype
- Factory Method (Abstract Factory Similar)
- Singleton
- Builders

Structural Patterns

- Adapter
- Decorator
- Bridge (Handle-Body Pattern)
- Composite
- Facade
- Flyweight
- Proxy

Behavioral Patterns

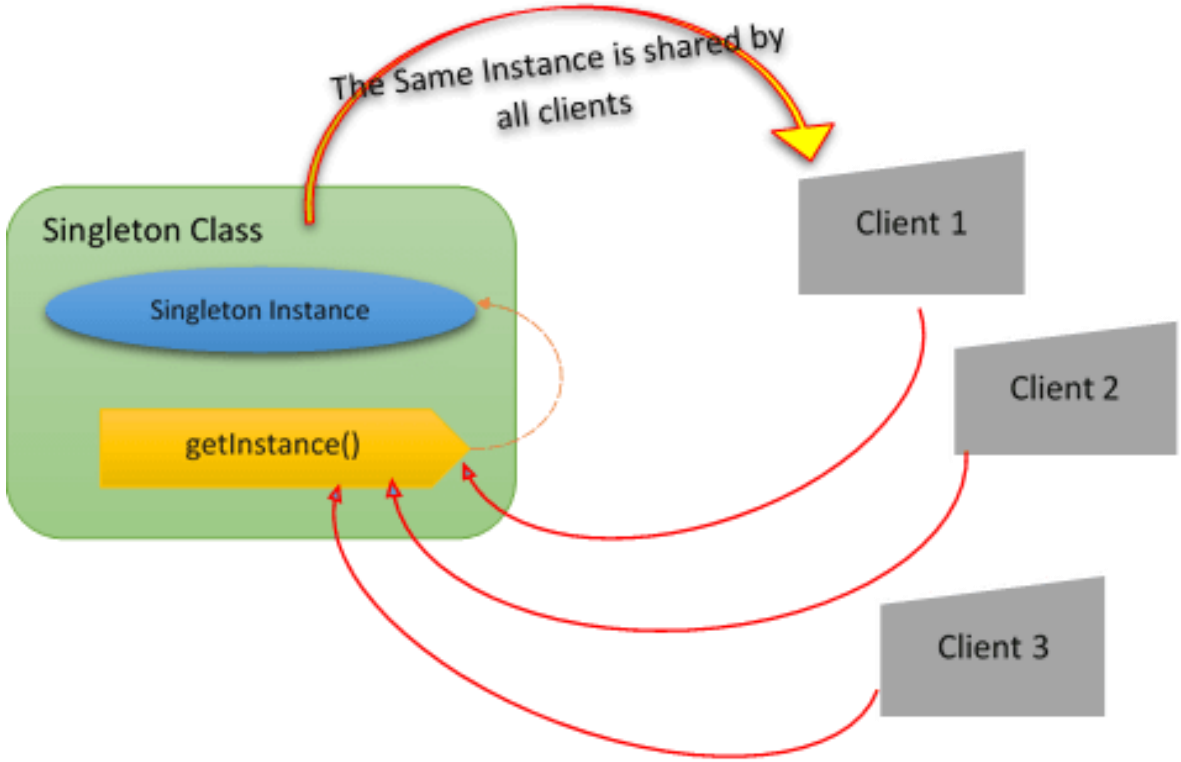
- Chain of Responsibility
- Command
- Interpreter
- Mediator
- Memento
- Template
- Visitor
- Null Object
- Iterator/Collection
- State
- Observer
- Strategy

https://yazdipour.github.io/notes/#/principles/design-patterns

SINGLETON

When? When the application needs an object frequently, and the object itself is very computationally expensive.

When not a good idea? When we using it in multi-thread scenario.

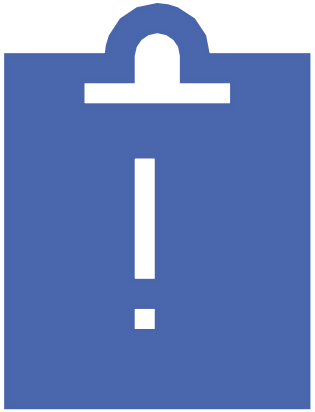



```
class Singleton {
    private static Singleton instance = new Singleton();

    private Singleton() { }

    public static Singleton getInstance() {
        return instance;
    }
}
```

https://www.javagists.com/singleton-design-pattern



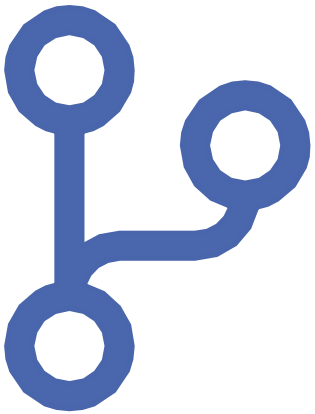
IMPLEMENTATION ISSUES

IMPLEMENTATION ISSUES

- **Reuse**
  - Make as much use as possible of existing code.
- **Configuration management**
  - During the development process, you have to keep track of the many different versions of each software component in a configuration management system.
- **Host-target development**
  - Production software does not usually execute on the same computer as the software development environment

REUSE LEVELS

- The abstraction level
- The object level
- The component level
- The system level



OPEN SOURCE DEVELOPMENT

OPEN SOURCE

Is an approach that we publish our source code and volunteers are invited to participate in the development process

ISSUES

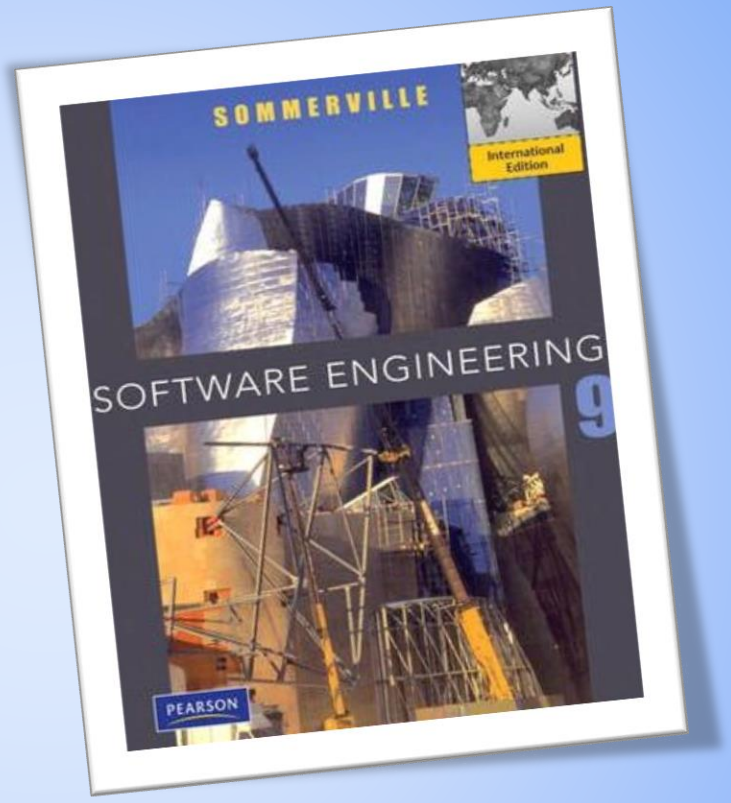
- Should we make use of open source components?
- Should an open source approach be used for the software's development?

BUSINESS

- Open source projects business model is not reliant on selling a software product but on selling support for that product.
- It is believed that involving the open source community will allow software to be developed more cheaply, more quickly and will create a community of users for the software.

LICENSE: GPL, LGPL, BSD, …

REFERENCE



SOFTWARE ENGINEERING
SOMMERVILLE

THANK YOU FOR YOUR ATTENTION.