

Module 01:

“What are Design Patterns?”



TEKNOLOGISK
INSTITUT

Agenda

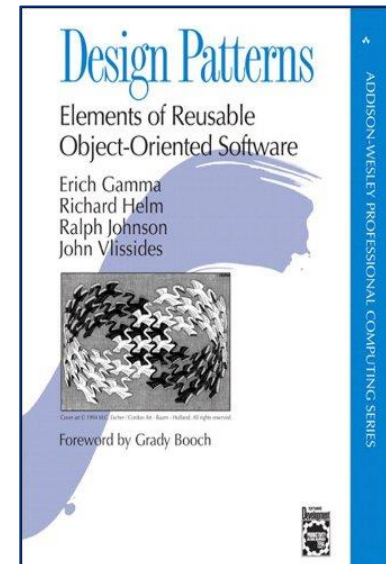
- ▶ Introducing Design Patterns
- ▶ Design Patterns Background
- ▶ Our Approach
- ▶ General OO Principles

Introducing Design Patterns

- ▶ Reusable techniques for commonly occurring software design problems
- ▶ A common “OO design language” for developers
- ▶ Template solutions are starting points for development
 - Application design
 - Relationship between components and/or classes
 - Presented at an abstract level
 - Avoid re-inventing new solutions every day
 - Provide a uniform design quality in system design
- ▶ Design Patterns describe structure – not algorithms!

Design Patterns Background

- ▶ 1977
 - Christopher Alexander
 - Architect proposing a pattern language for buildings
- ▶ 1987:
 - Kent Beck and Ward Cunningham
 - Conference paper presenting similar ideas for software
- ▶ 1994:
 - Erich Gamma, Richard Helm, Ralph Johnson, and John Vlissides (a.k.a. "Gang of Four ☺")
 - *Design Patterns: Elements of Reusable Object-Oriented Software*
 - ISBN-13: 978-0-201-63361-0
 - <https://www.amazon.co.uk/Design-Patterns-Object-Oriented-Addison-Wesley-Professional-ebook/dp/B000SEIBB8>



23 Gang of Four Design Patterns

- ▶ Considered the cornerstone of design patterns
- ▶ Classifies patterns into categories such as
 - Creational
 - Structural
 - Behavioral
- ▶ Presented in general terms using UML
- ▶ Presented in a language-agnostic way (but C++ style)

Beautiful! Classic! But...

- ▶ ... 27 years is a long time in IT!
- ▶ Amount of design patterns theory and practice continually evolving and being refined
 - Evolves with research and practice
 - Evolves with new architectural paradigms
 - Refined by programming languages such as C#
- ▶ Consequently,
 - New design patterns emerge
 - Additional categories of patterns seem natural
 - User interface
 - Concurrency
 - Distributed
 - ...

Our Approach

- ▶ Goal: *Present an up-to-date account of modern design patterns specialized for current C# and .NET*
- ▶ Include all original 23 design patterns from GoF in newer and more modern versions
- ▶ Include additional newer design patterns not included in GoF
- ▶ Present C#-optimized versions of all patterns (preferably in .NET Core)
- ▶ Use practical examples instead of general terms and UML

General OO Principles

- ▶ Foundational principles ensuring adaptable and maintainable code
 - Program to an interface – not an implementation
 - Favor object composition over inheritance
 - Favor loose coupling between classes
 - Sometimes even at the expense of duplication

The Principles of SOLID

- ▶ Single Responsibility Principle
 - Every class should have only one reason to change
- ▶ Open/Closed Principle
 - Classes should be open for extension, but closed for modification
- ▶ Liskov Substitution Principle
 - Objects should always be replaceable with instances of subtypes without altering program correctness
- ▶ Interface Segregation Principle
 - Clients should not be forced to implement interface methods they don't need
- ▶ Dependency Inversion Principle
 - High-level modules should not depend on low-level modules. Both should depend upon abstractions
 - Abstractions should not depend on details. Concrete implementations should depend upon abstractions



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