Module 01:
"What are Design Patterns?"

TEKNOLOGISK
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Agenda

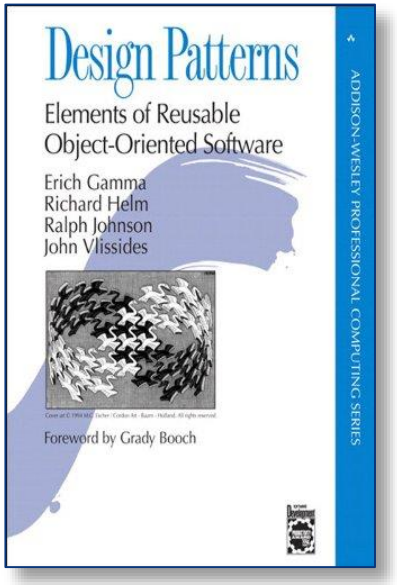
- Introducing Design Patterns
- Design Patterns Background
- Our Approach
- General OO Principles

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…

- … 23-25 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
    - Data-centric
    - Concurrency
    - …

Our Approach

- Goal: *Present an up-to-date account of selected modern design patterns specialized for current C# and .NET*

- Include all selected 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 of low-level modules. Both should depend upon abstractions
  - Abstractions should not depend on details. Concrete implementations should depend upon abstractions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