CSCB07 - Software Design

Design Patterns

Summer 2022

What are Design Patterns

- Descriptions of communicating objects and classes that are customized to **solve** a general design **problem** in a particular **context**
- Gamma et al. described 23 design patterns divided into three categories:
    1. Creational Patterns
    2. Structural Patterns
    3. Behavioral Patterns

Freeman et al., Head First Design Patterns, © 2004 O'Reilly Media, Inc.
Gamma et al., Design Patterns: Elements of Reusable Object-oriented Software, 1995

Creational Patterns

- Concern the process of object creation
- Six creational patterns
    1. Factory Method
    2. Abstract Factory
    3. Singleton
    4. Prototype
    5. Builder
    6. Object Pool

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Structural Patterns

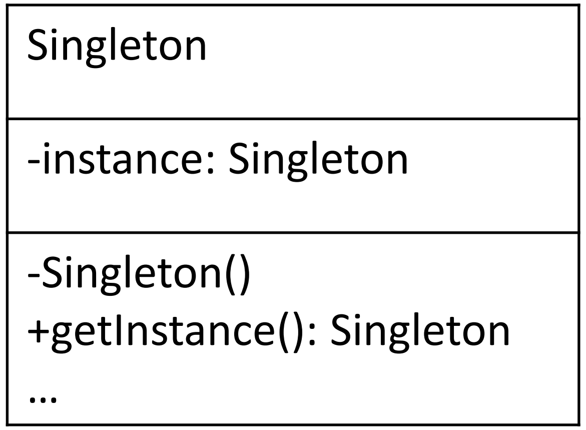
- Deal with the composition of classes or objects
- Seven structural patterns
    1. Adapter
    2. Bridge
    3. Composite
    4. Decorator
    5. Facade
    6. Flyweight
    7. Proxy

Behavioral Patterns

- Characterize the ways in which classes or objects interact and distribute responsibility
- Ten Behavioral patterns
  1. Chain of Responsibility
  2. Command
  3. Interpreter
  4. Iterator
  5. Mediator
  6. Memento
  7. Observer
  8. State
  9. Strategy
  10. Template

Singleton (Creational)

- Intent: Ensure a class has only one instance, and provide a global point of access to it

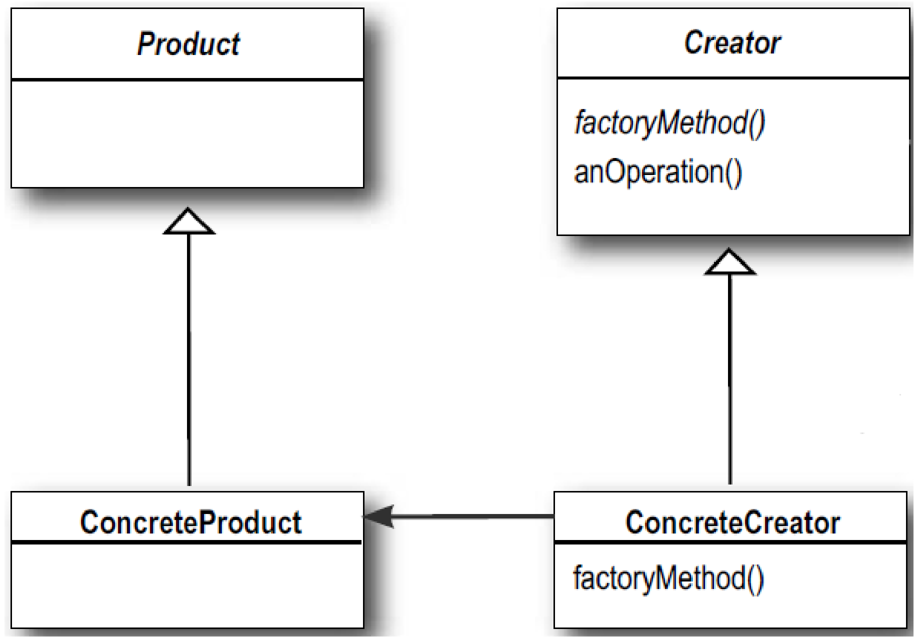


Singleton (Creational)

Example

Factory Method (Creational)

- Intent: Define an interface for creating an object, but let subclasses decide which class to instantiate.

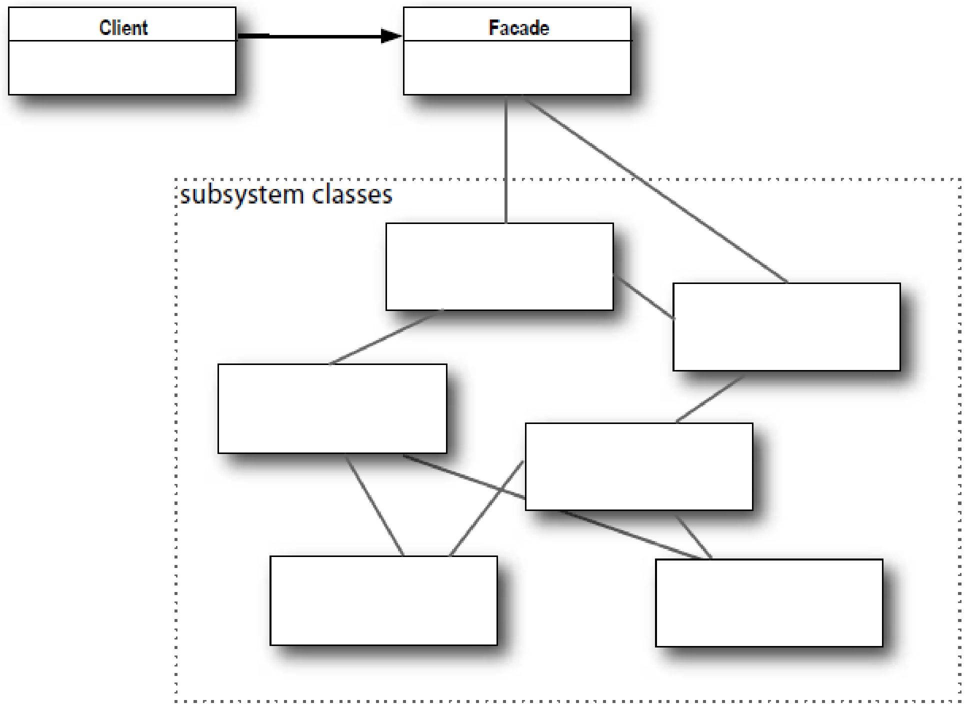


Factory Method (Creational)

Example

Facade (Structural)

- Intent: Hide complexities and provide a unified interface to a set of interfaces in a subsystem

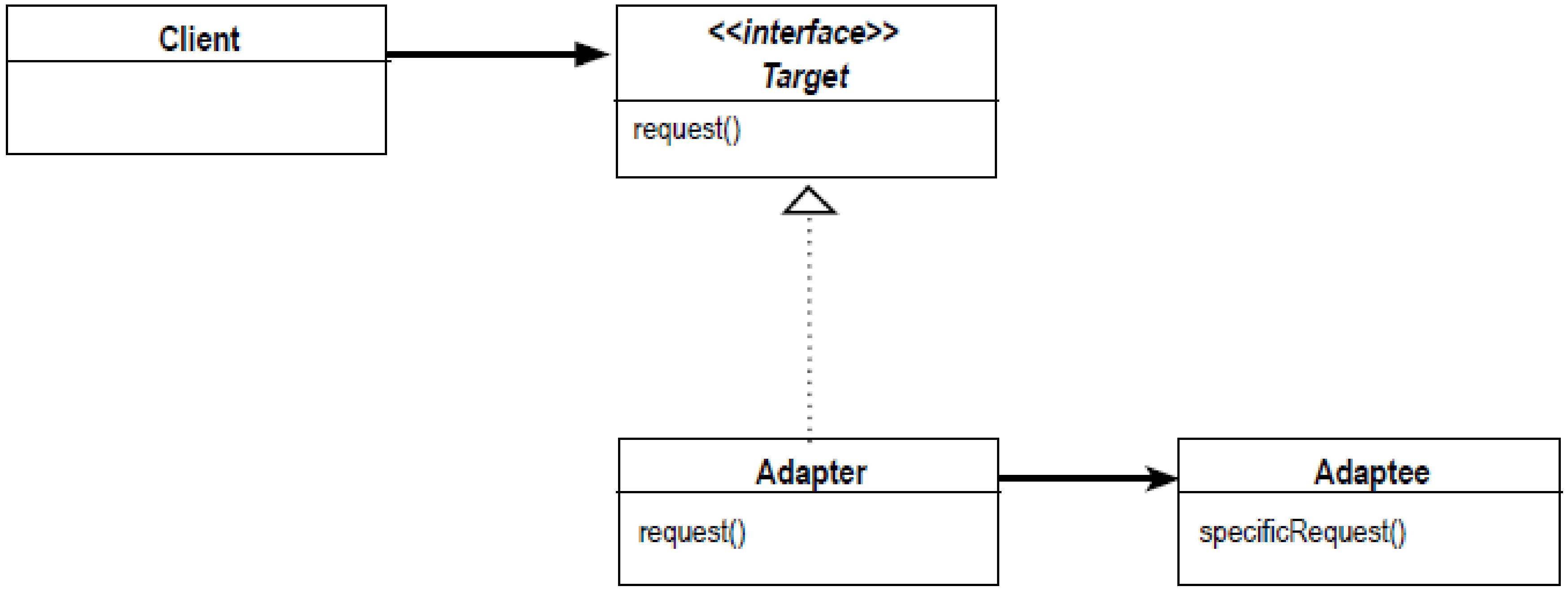


Facade (Structural)

Example

Adapter (Structural)

- Intent: Let classes work together that couldn't otherwise because of incompatible interfaces

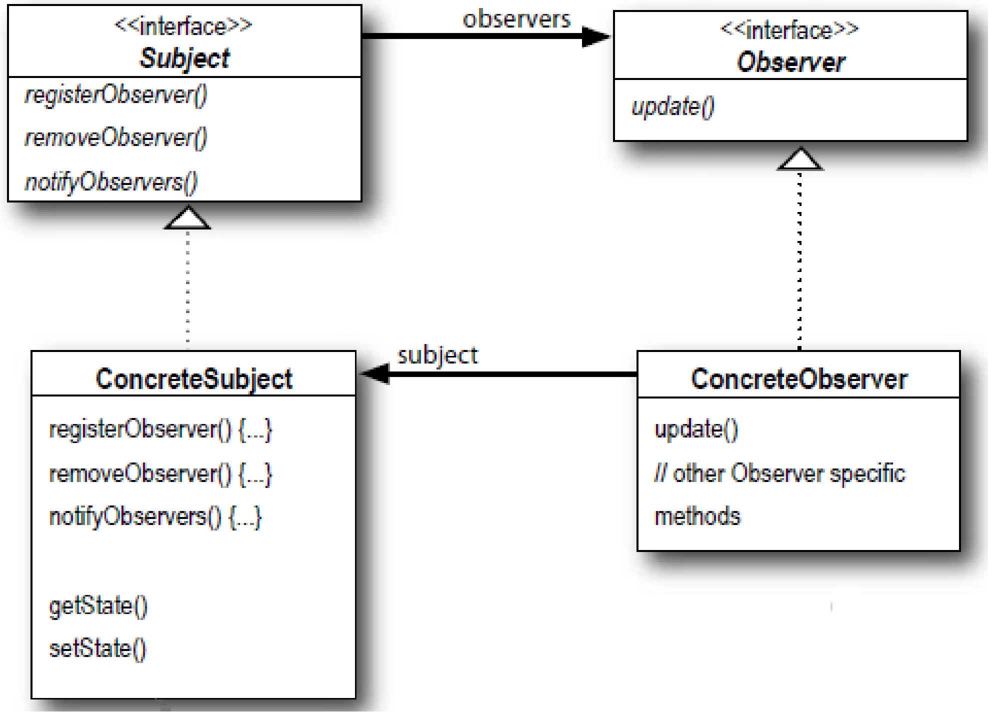


Adapter (Structural)

Example

Observer (Behavioral)

- Intent: Define a one-to-many dependency between objects so that when one object changes state, all its dependents are notified and updated automatically



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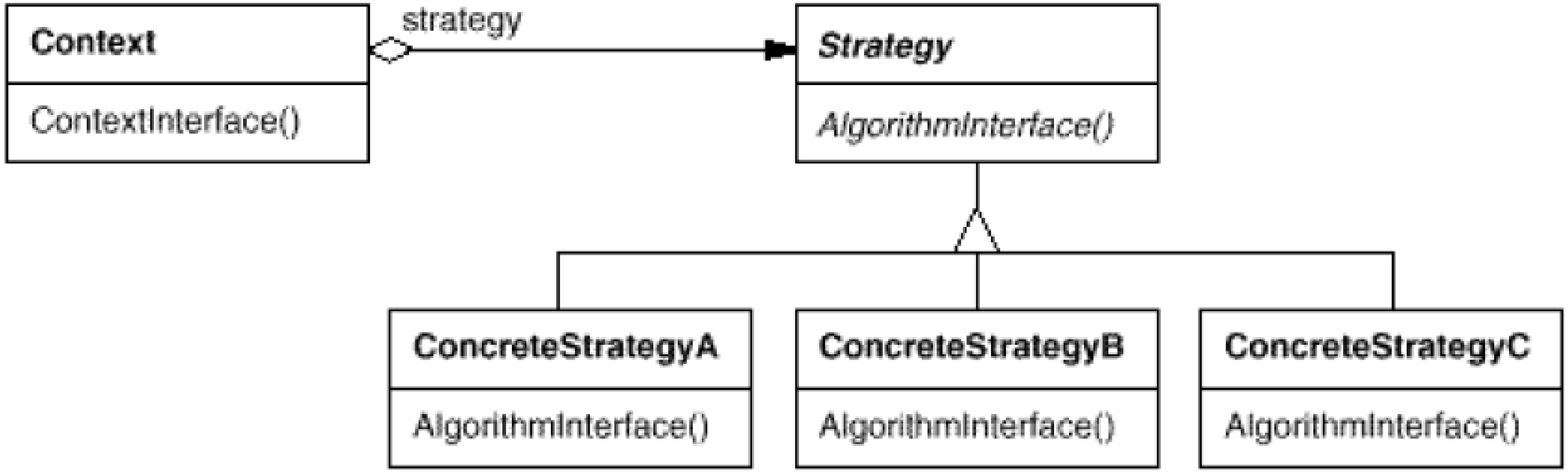
Observer (Behavioral)

Example

Strategy (Behavioral)

- Intent: Define a family of algorithms, encapsulate each one, and make them interchangeable



Strategy (Behavioral)

Example