Module 17: "Strategy"

Agenda

- Introductory Example: Running a Bar
- Challenges
- Implementing the Strategy Pattern
- Pattern: Strategy
- Overview of Strategy Pattern
- Variation: Strategies as Delegates
- .NET Framework Example: Sorting Collections

Introductory Example: Running a Bar

```
enum Billing
{
    Normal,
    StudentDiscount,
    Regular
}
```

```
class Customer
{
   public BarTab Tab { get; }
   public Customer( Billing billing ) { ... }
   public void PlaceOrder( Order order ) { ... }
}
```

```
Customer customer = new Customer( Billing.Normal );
customer.PlaceOrder( new Order { Product = new Peanuts(), Count = 1 });
customer.PlaceOrder( new Order { Product = new Beer(), Count = 3 });
customer.PlaceOrder( new Order { Product = new PepsiMax(), Count = 2 });

customer.Tab.Print();
```

Challenges

- What if a new Billing options would be introduced?
  - Happy Hour?
  - Code will throw exception!
- Have to manually extend switch statement!
- Need to change other(!) classes
- Breaks the Open/Closed Principle

- A lot of ugly, unnecessary coupling!

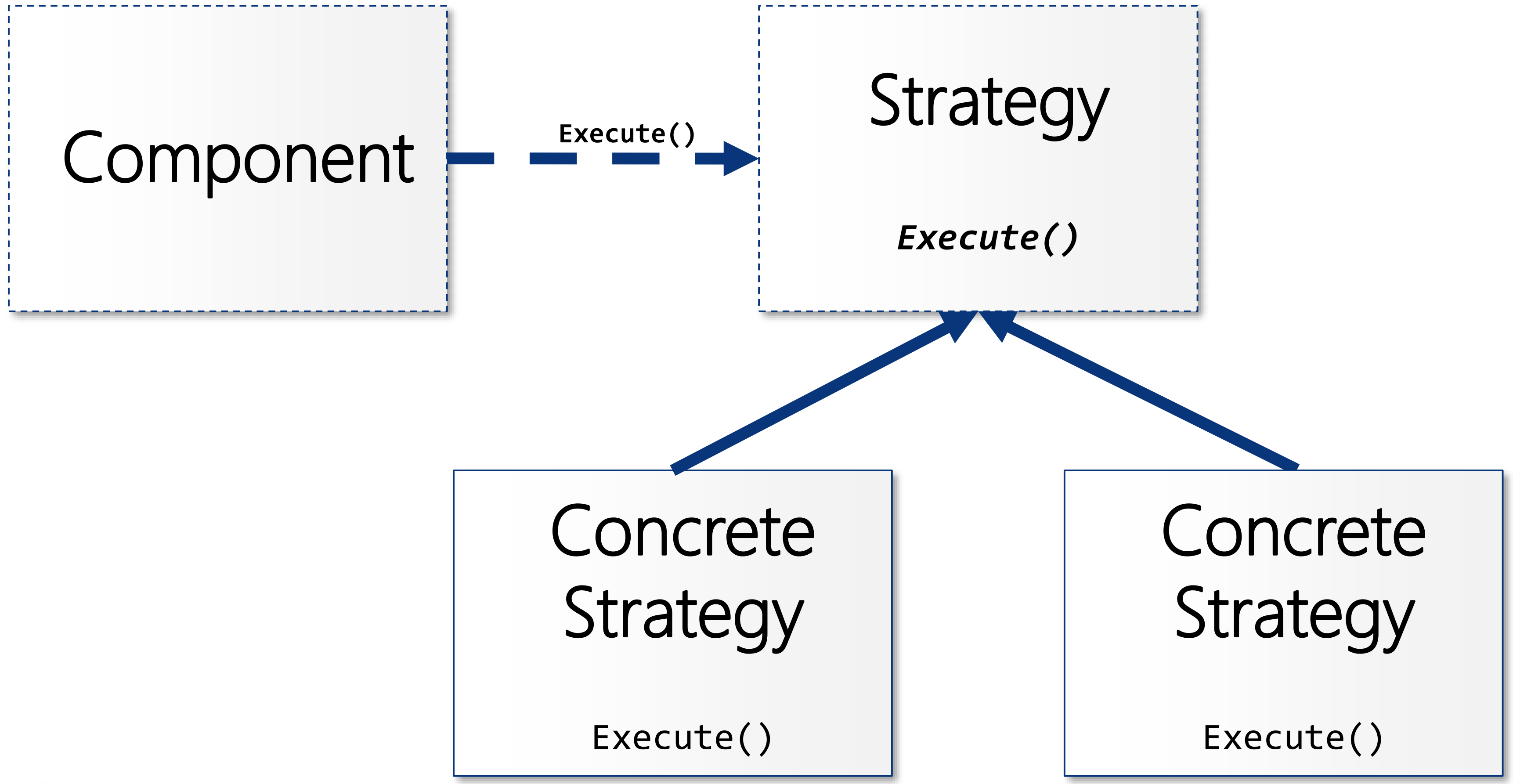
Pattern: Strategy

- *Define a family of algorithms, encapsulate each one, and make them interchangeable. Strategy lets the algorithm vary independently from clients that use it.*

- Outline
  - Avoid unnecessary coupling
  - Configure a class with one of a family of algorithms at run-time
  - Strategy object implements algorithm

- Origin: Gang of Four

Overview of Strategy Pattern



Overview of Strategy Pattern

- Component
  - Concrete class parameterized by a Strategy supplied to it
  - Employs the Strategy by invoking **`Execute()`** whenever needed
- Strategy
  - Interface or abstract base class for algorithm declaring abstract **`Execute()`** method
- Concrete Strategy
  - Implements a concrete strategy in the **`Execute()`** method

Variation: Strategies as Delegates

- Strategies are essentially stateless "algorithm" objects

- In .NET we can implement Strategy using delegates
  - Method names
  - Anonymous Methods
  - Lambda Expressions

- Can either be
  - Injected into constructors
  - Passed as method arguments
    - Easier to change dynamically

Strategy vs. Template Method

- Strategy
  - Based on Composition
  - Can be change at run-time
  - No dictated algorithm structure

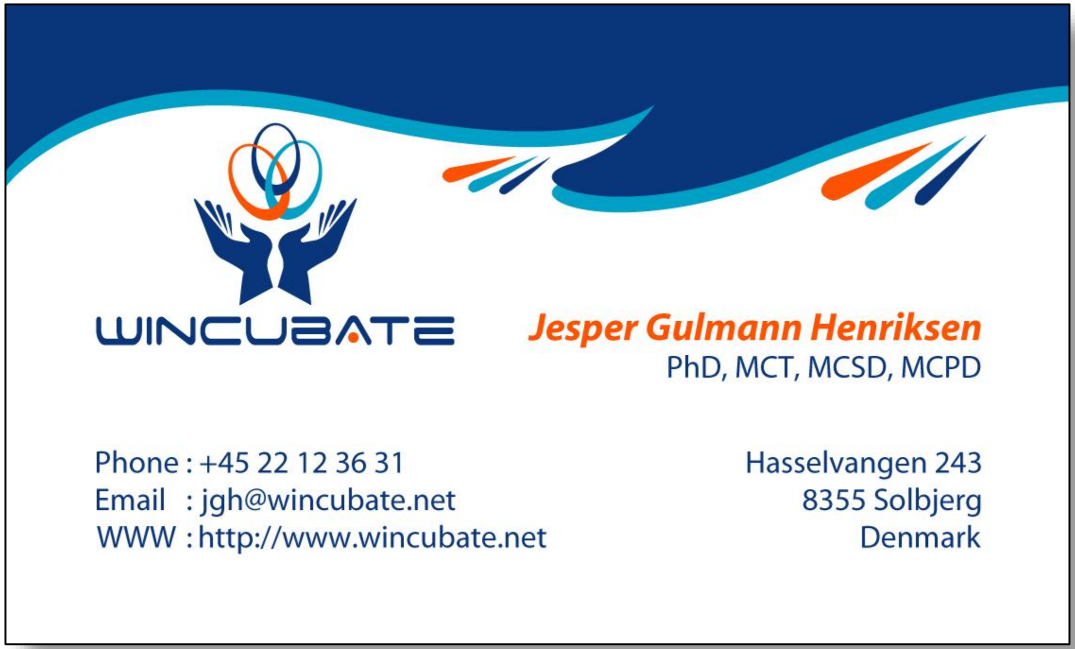
- Template Method
  - Based on Inheritance
  - Can be changed at compile-time only
  - Fixed predefined set of algorithm steps
    - Some can be refined
  - Can have a default pre-implemented functionality

.NET Framework Example: Sorting Collections

- Sorting collections implements comparisons as Strategy
  - `IComparable` or `IComparable<T>` are strategy interfaces

```
abstract class Product : IComparable<Product>
{
    public abstract string Name { get; }
    public abstract decimal SuggestedPrice { get; }

    public int CompareTo( Product other )
    {
        if (SuggestedPrice < other.SuggestedPrice) { return -1; }
        else if (SuggestedPrice > other.SuggestedPrice) { return 1; }
        else { return 0; }
    }
}
```



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