# Module 16: "Template Method"





### Agenda

- Introductory Example: Pretty Printing Objects
- Challenges
- Implementing the Template Method Pattern
- Pattern: Template Method
- Overview of Template Method Pattern
- Pros and Cons



## Introductory Example: Pretty-printing Objects

```
class XmlPrettyPrinter
    public void PrintPreamble() =>
        Console.WriteLine(@"<?xml version=""1.0"" encoding=""UTF-8""?>");
    public void PrintBegin( string className ) =>
        Console.WriteLine($"<{className}>");
    public void PrintEnd( string className ) =>
        Console.WriteLine($"</{className}>");
    public void PrintProperty( string name, object value ) =>
        Console.WriteLine($" <{name}>{value}</{name}>");
```

```
XmlPrettyPrinter pp = new XmlPrettyPrinter();
pp.PrintPreamble();
pp.PrintBegin(nameof(person));
foreach( ... ){ pp.PrintProperty(...); }
pp.PrintEnd(nameof(person));
```



#### Challenges

- Do we have to repeat everything?
- What if we need to create, say, a JSON pretty-printer?



#### Pattern: Template Method

Define the skeleton of an algorithm in a method, deferring some steps to subclasses. Template Method lets subclasses redefine certain steps of an algorithm without changing the algorithm's structure.

#### Outline

- Encapsulate general algorithm process in a template method
- Use template method for multiple variations of same algorithm
- Subclasses customize details of the individual steps
- Base class template method always calls subclass methods
- Origin: Gang of Four



#### Overview of Template Method Pattern

Abstract Algorithm

TemplateMethod()

Step1()

Step2()

Concrete Algorithm

Step1()

Concrete Algorithm

Step2()

Concrete Algorithm

Step1()

Step2()



#### Overview of Template Method Pattern

- Abstract Algorithm
  - Abstract base class for algorithm
  - Defines general algorithm flow in TemplateMethod()
  - Individual steps of the algorithm are available to be (re)defined in abstract or virtual **StepX()** methods
- Concrete Algorithm
  - Concrete subclass of Abstract Algorithm
  - (Re)defines any number of steps of the algorithm



#### Pros and Cons

- Pros
  - Simple way to achieve adaptation of algorithm steps
  - Satisfies the Open/Closed Principle nicely
- Cons
  - Algorithm steps are somewhat rigidly fixed
  - Use Inheritance instead of Composition
    - See Strategy Pattern



