Module 13:
"Template Method"

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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""?>");
    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();
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?

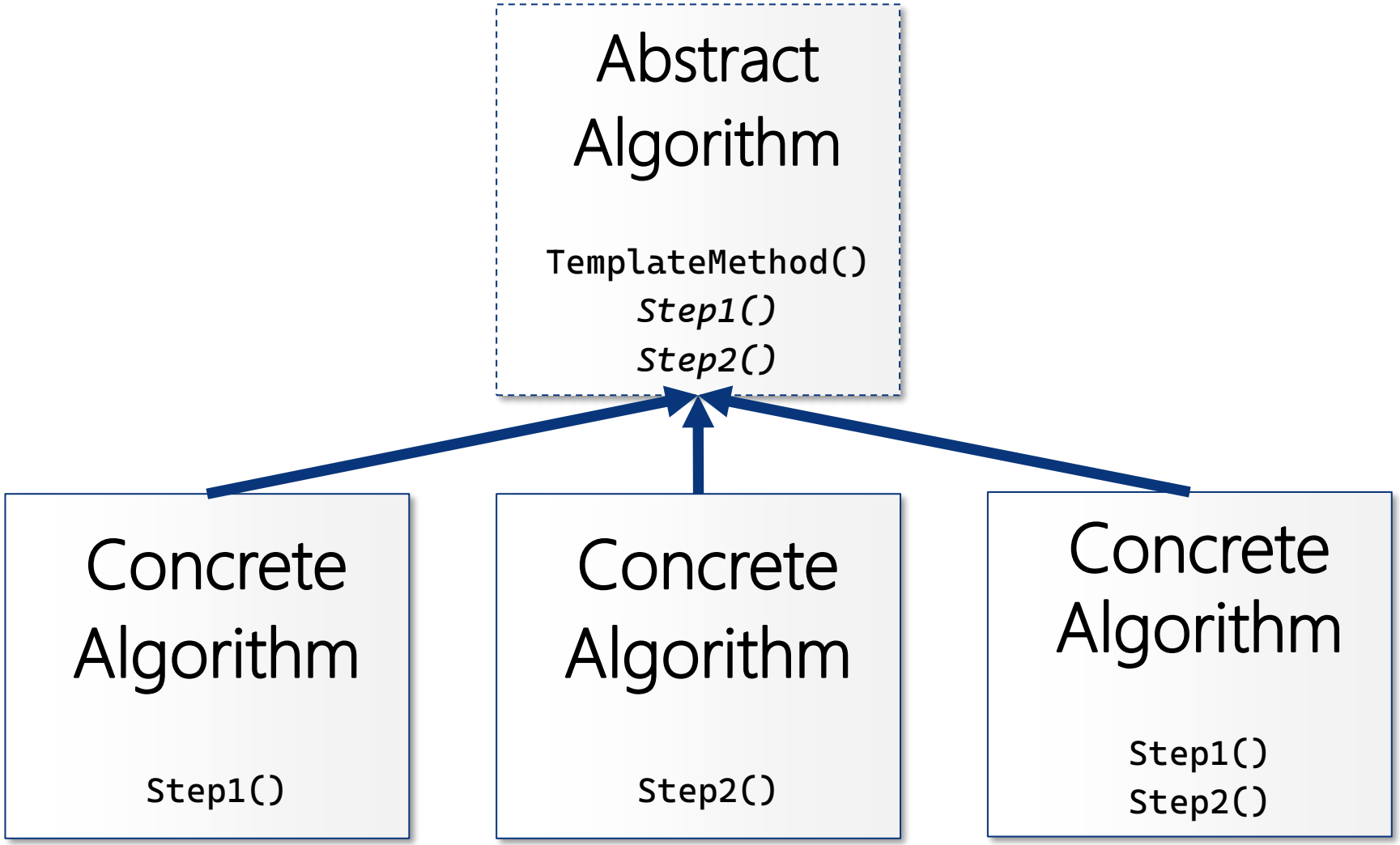
Pattern: Template Method

- *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



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 **`Step`*`X`*`()`** 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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