Creational Pattern: Abstract Factory

Kevin Dockx
Architect

@KevinDockx https://www.kevindockx.com

Coming Up

Describing the abstract factory pattern

Structure of the abstract factory pattern

Implementation

- Real-life sample: shopping cart

Comparing abstract factory and factory method patterns

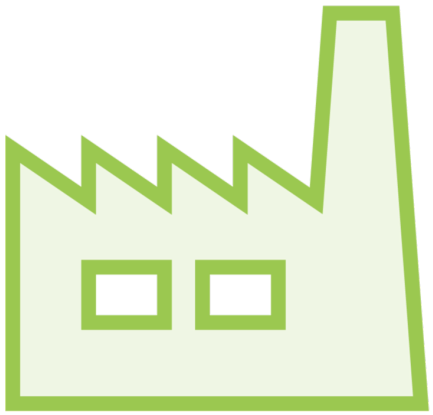
Coming Up

Use cases for this pattern

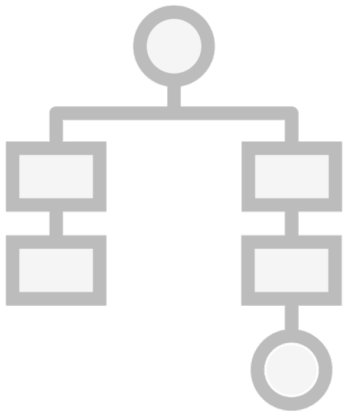
Pattern consequences

Related patterns

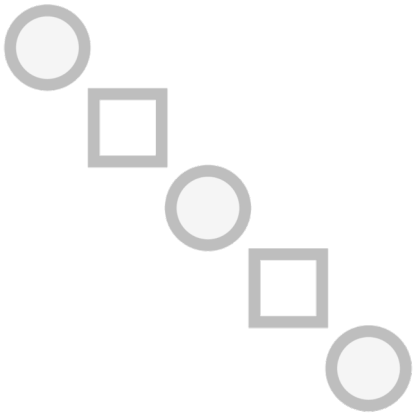
Describing the Abstract Factory Pattern



Creational



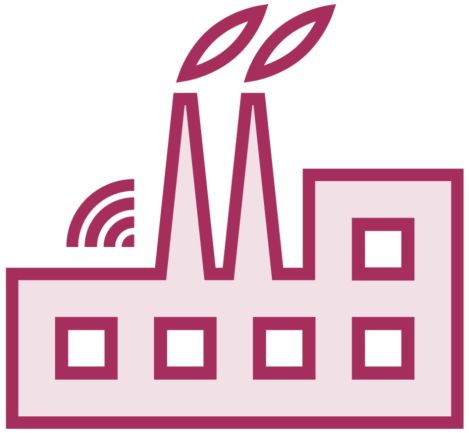
Structural



Behavioral

Describing the Abstract Factory Pattern

Factory method



Abstract factory

Abstract Factory

The intent of the abstract factory pattern is to provide an interface for creating families of related or dependent objects without specifying their concrete classes

Describing the Abstract Factory Pattern

Shopping cart scenario

- DiscountService by country
- ShippingCostsService by country

Family of objects that belong together

```
var belgiumDiscountService = new BelgiumDiscountService();
var discount = belgiumDiscountService.DiscountPercentage;

var belgiumShippingCostsService = new BelgiumShippingCostsService();
var shippingCosts = belgiumShippingCostsService.ShippingCosts;
```

Describing the Abstract Factory Pattern

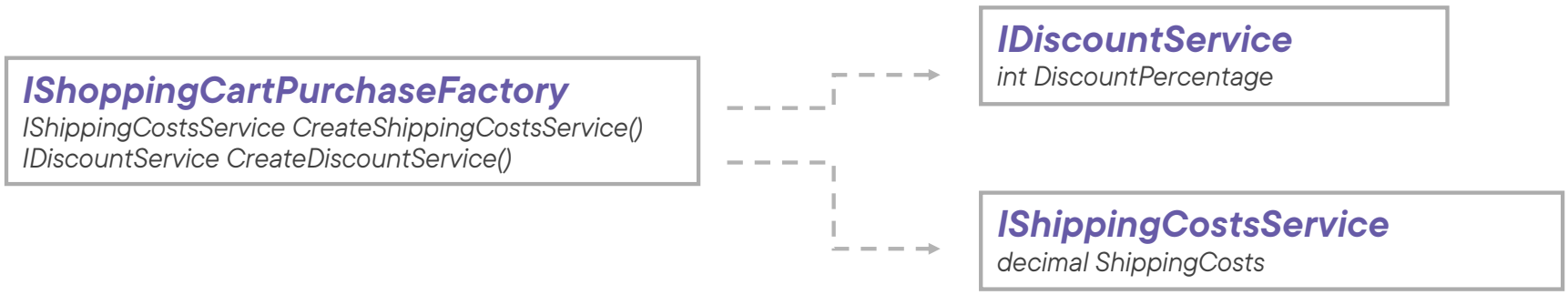
```
var belgiumDiscountService = new BelgiumDiscountService();
var discount = belgiumDiscountService.DiscountPercentage;

var belgiumShippingCostsService = new BelgiumShippingCostsService();
var shippingCosts = belgiumShippingCostsService.ShippingCosts;
```

Describing the Abstract Factory Pattern

Tight coupling
Doesn’t convey the intent that these objects belong together

Describing the Abstract Factory Pattern

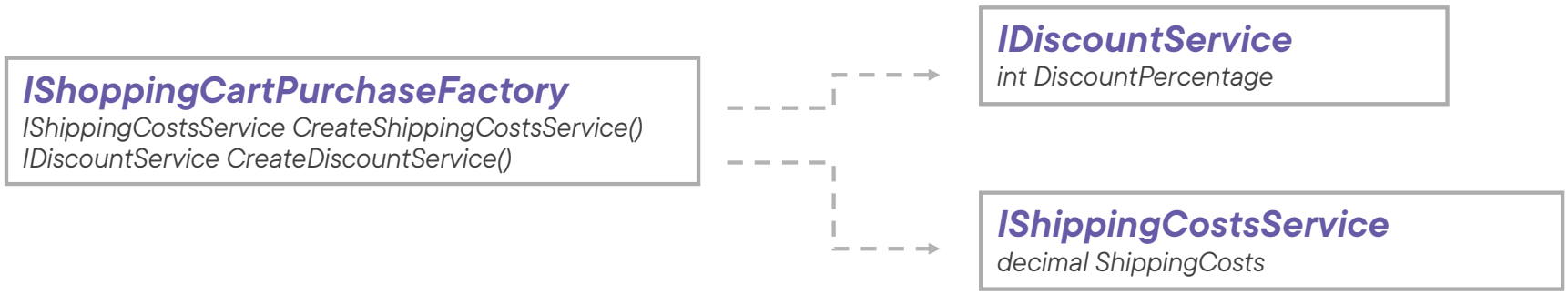
Describing the Abstract Factory Pattern



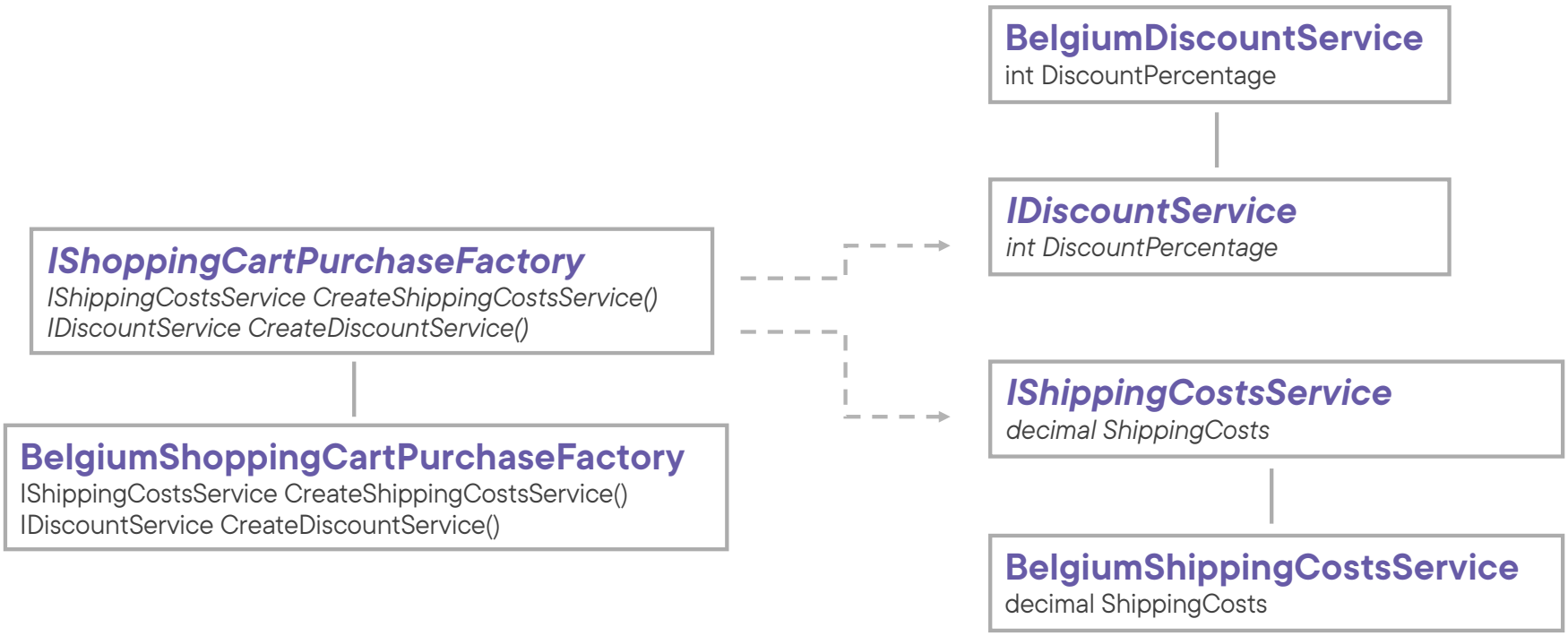
Use an abstract base class when you need to provide some basic functionality that can potentially be overridden

Use an interface when you only need to specify the expected functionality of a class

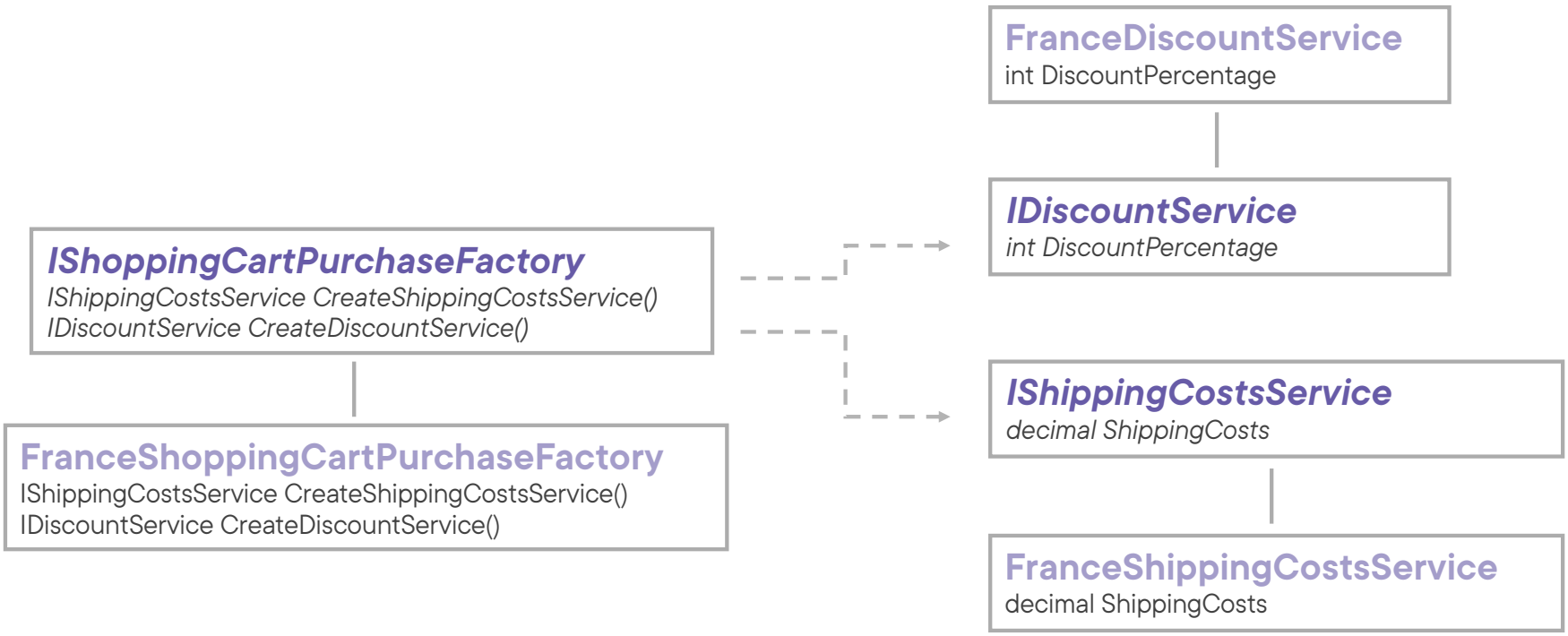
Describing the Abstract Factory Pattern



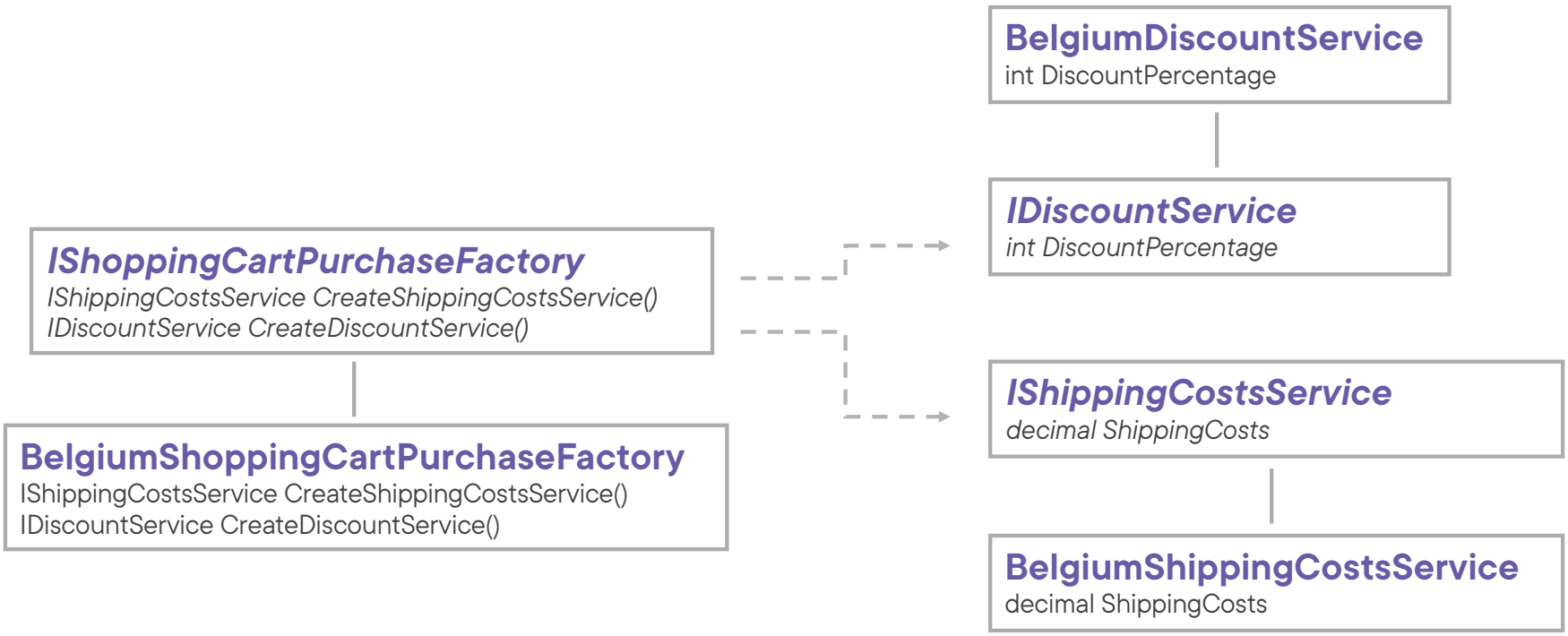
Describing the Abstract Factory Pattern



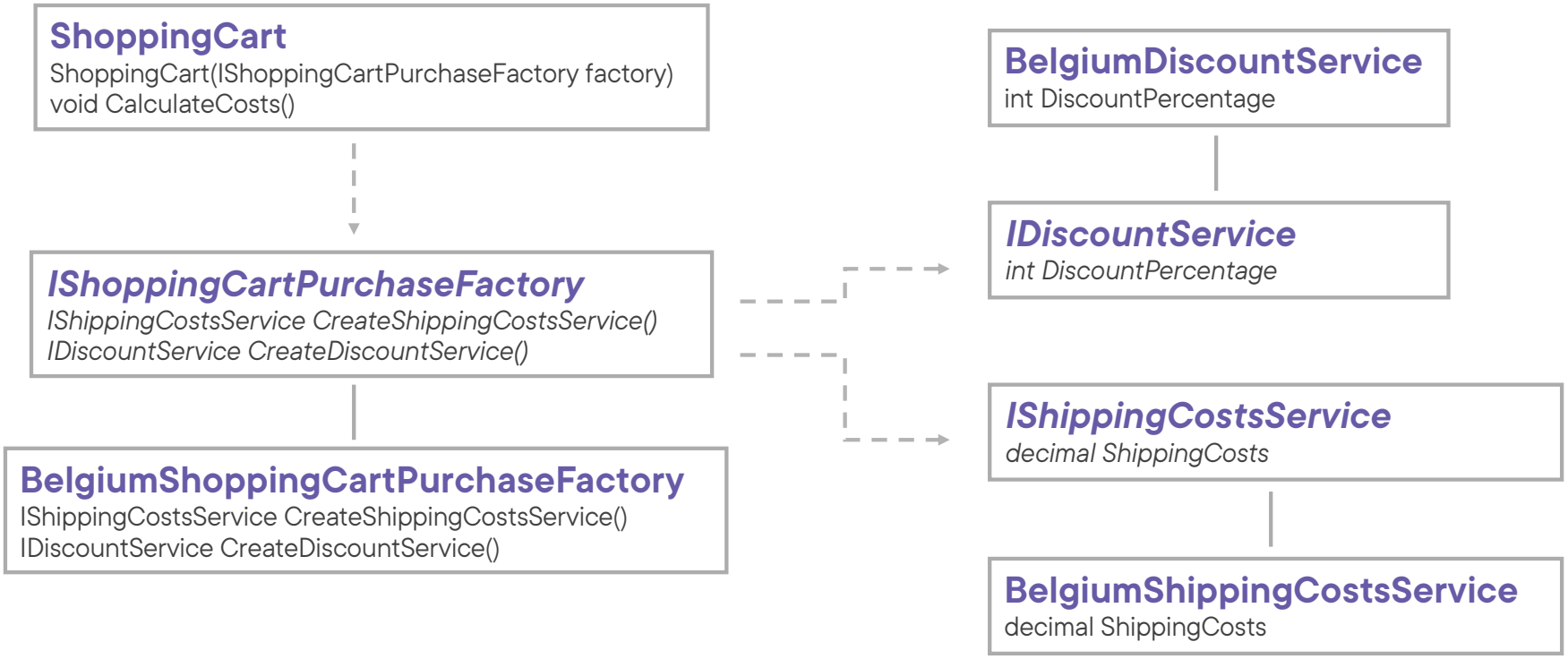
Describing the Abstract Factory Pattern



Describing the Abstract Factory Pattern



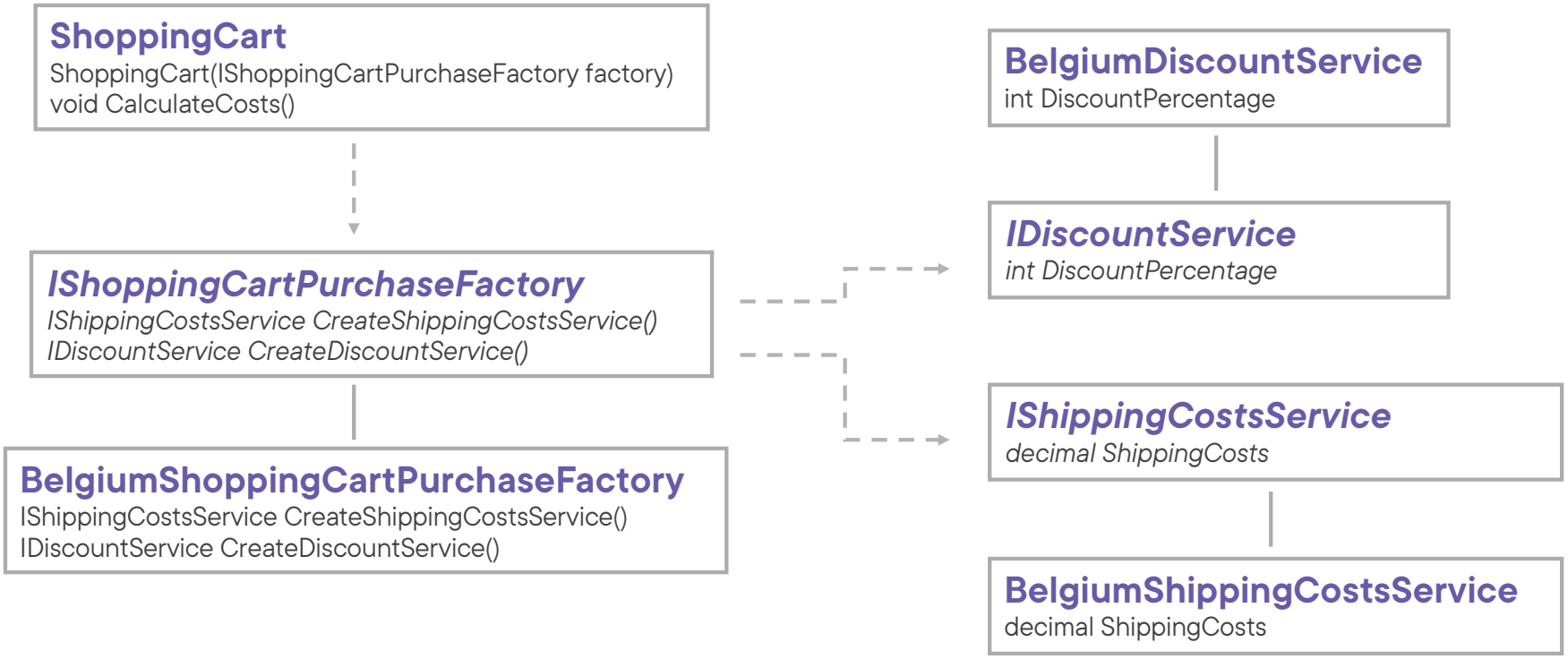
Describing the Abstract Factory Pattern



Provide a concrete factory implementation via the constructor

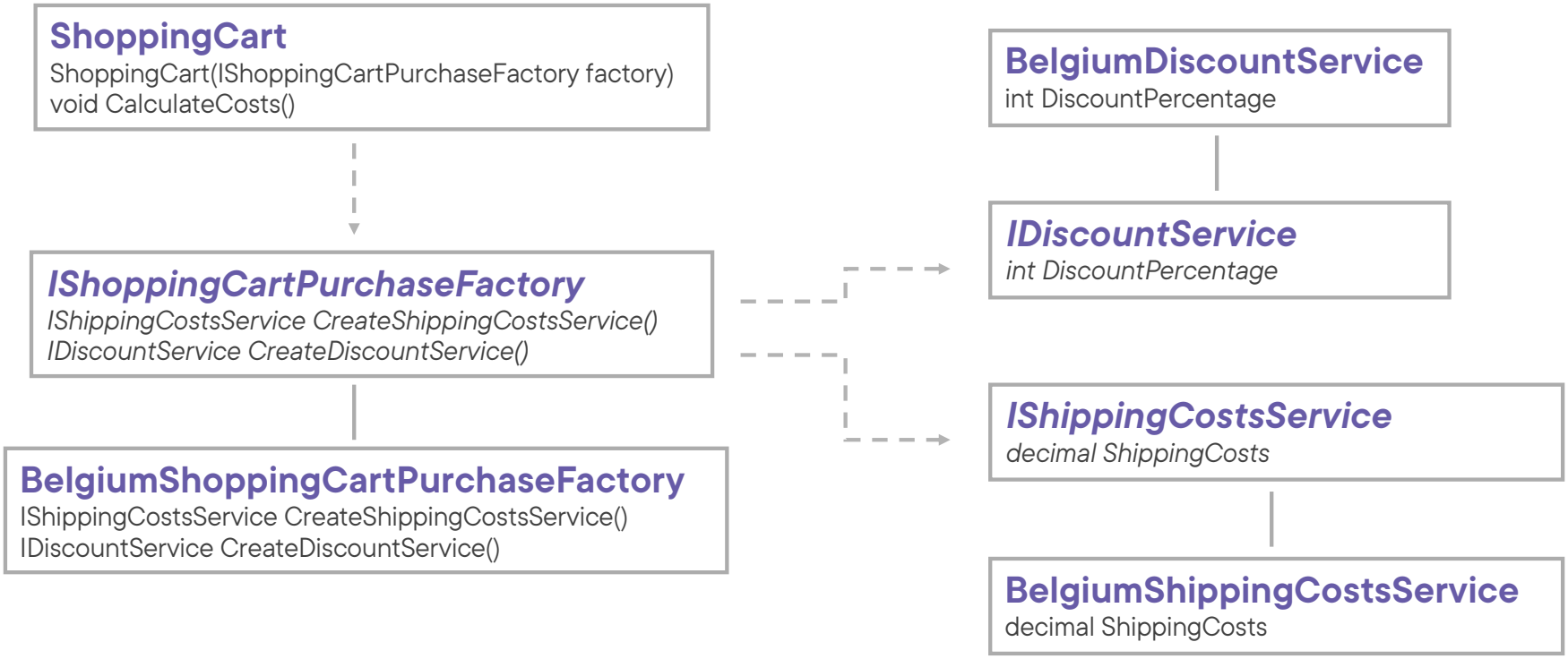
Optionally add methods that use the concrete service implementations

Describing the Abstract Factory Pattern



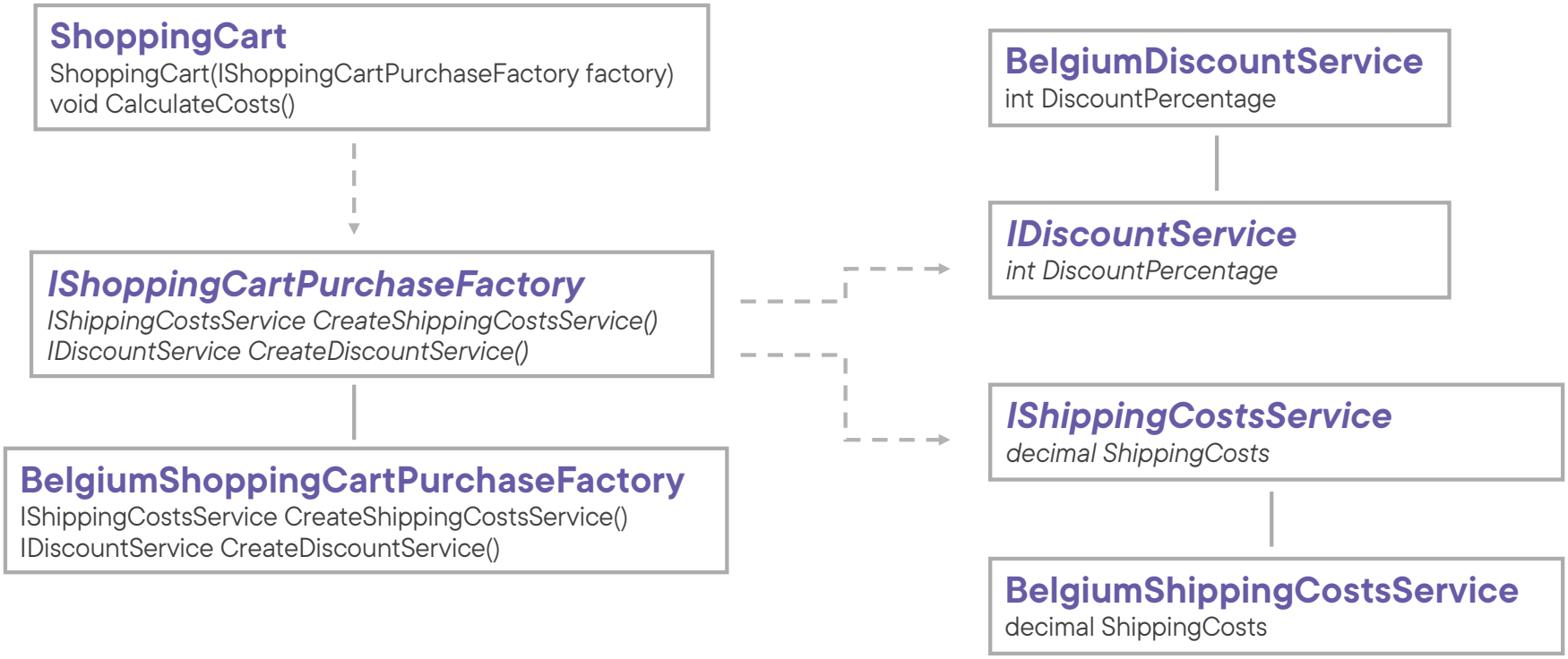
The client is decoupled from the concrete factory implementation

Abstract Factory Pattern Structure

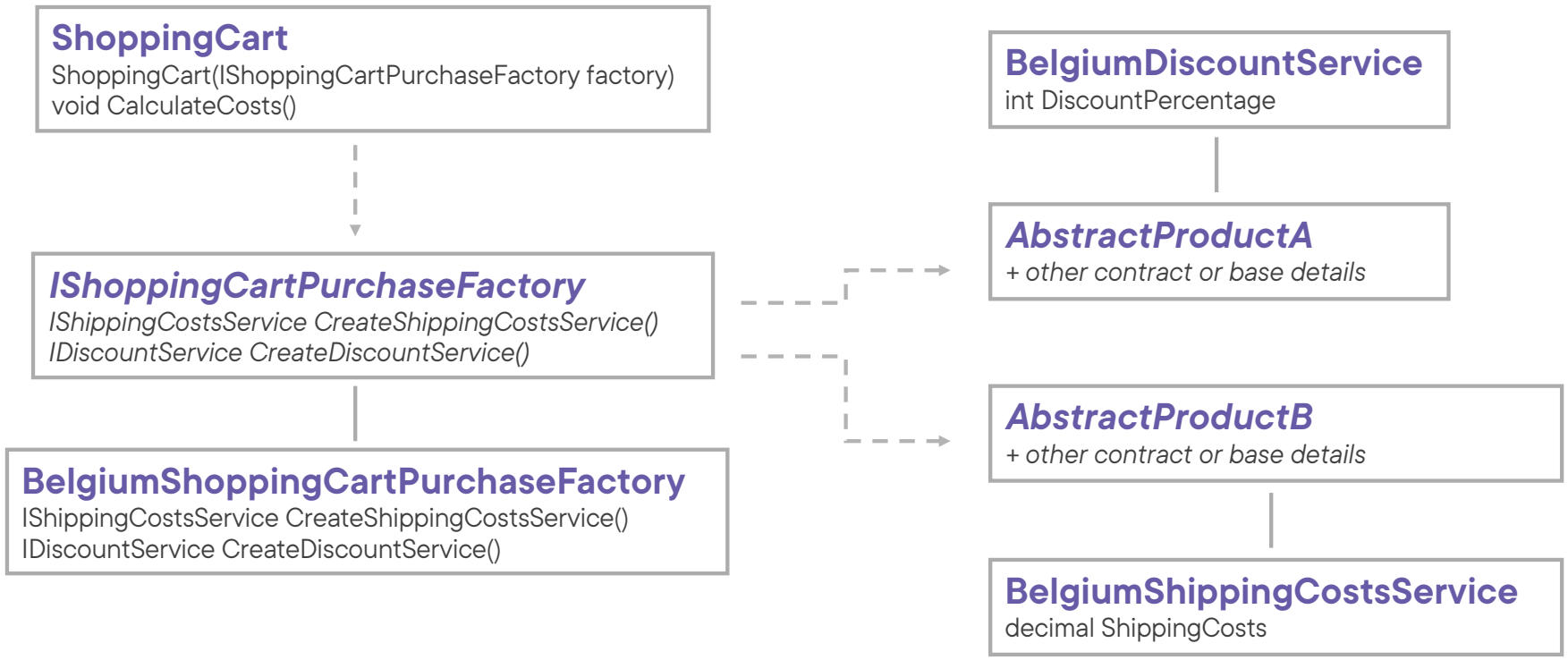


AbstractProduct declares an interface for a type of product object

Abstract Factory Pattern Structure

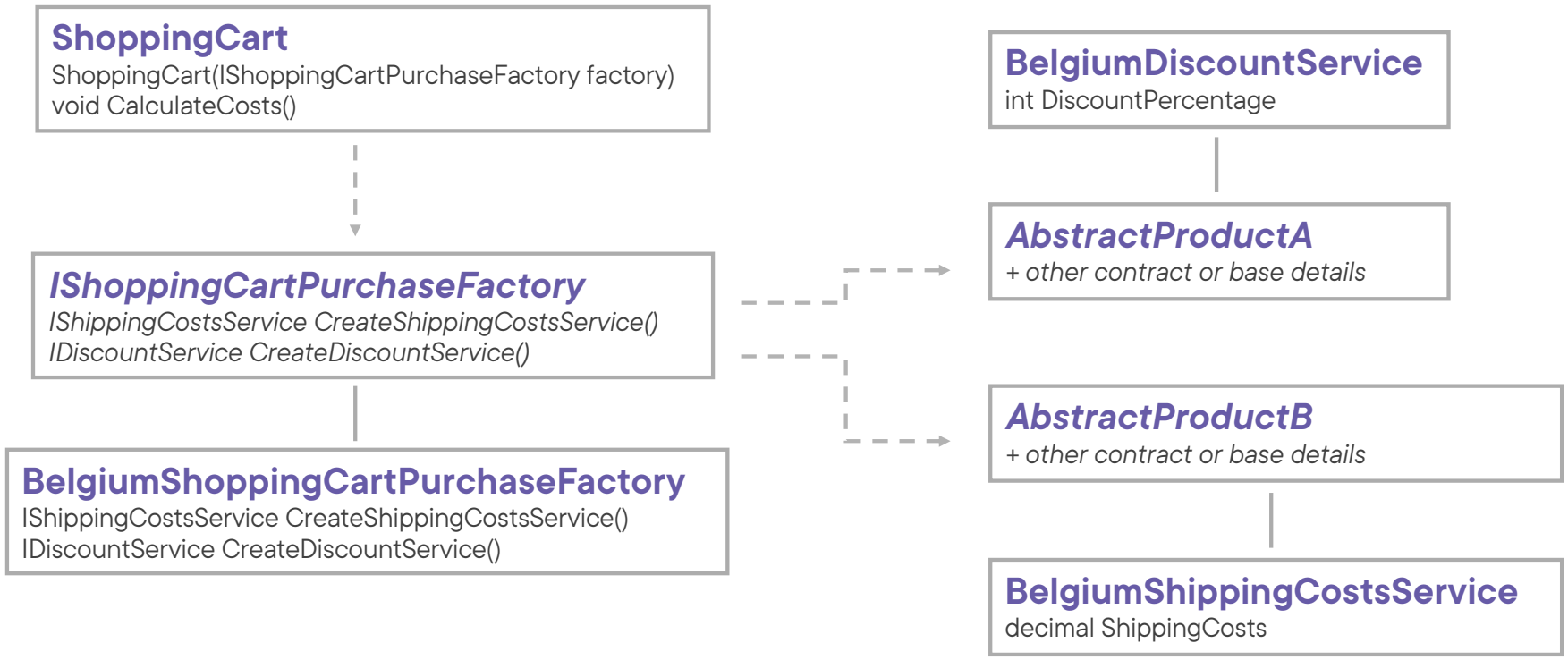


Abstract Factory Pattern Structure

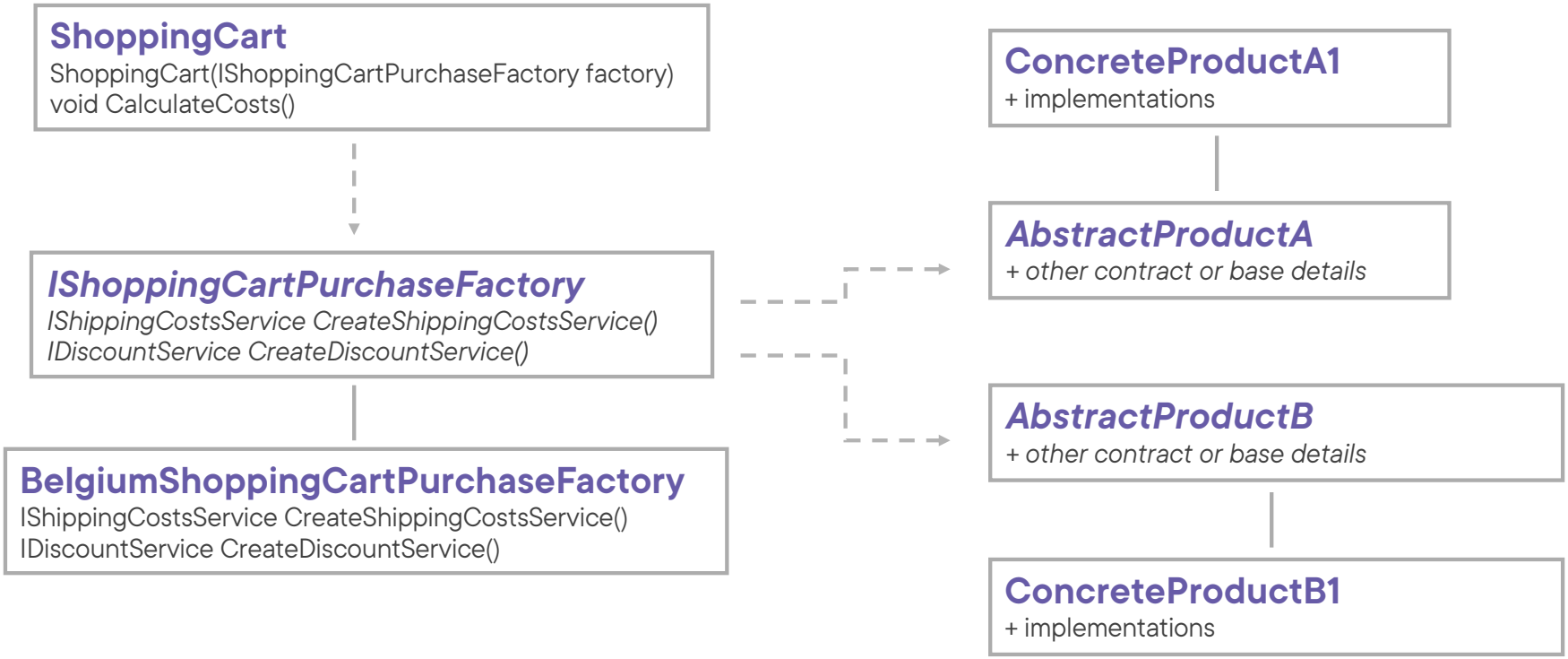


ConcreteProduct defines the product that has to be created by a corresponding factory, and implements the **AbstractProduct** interface

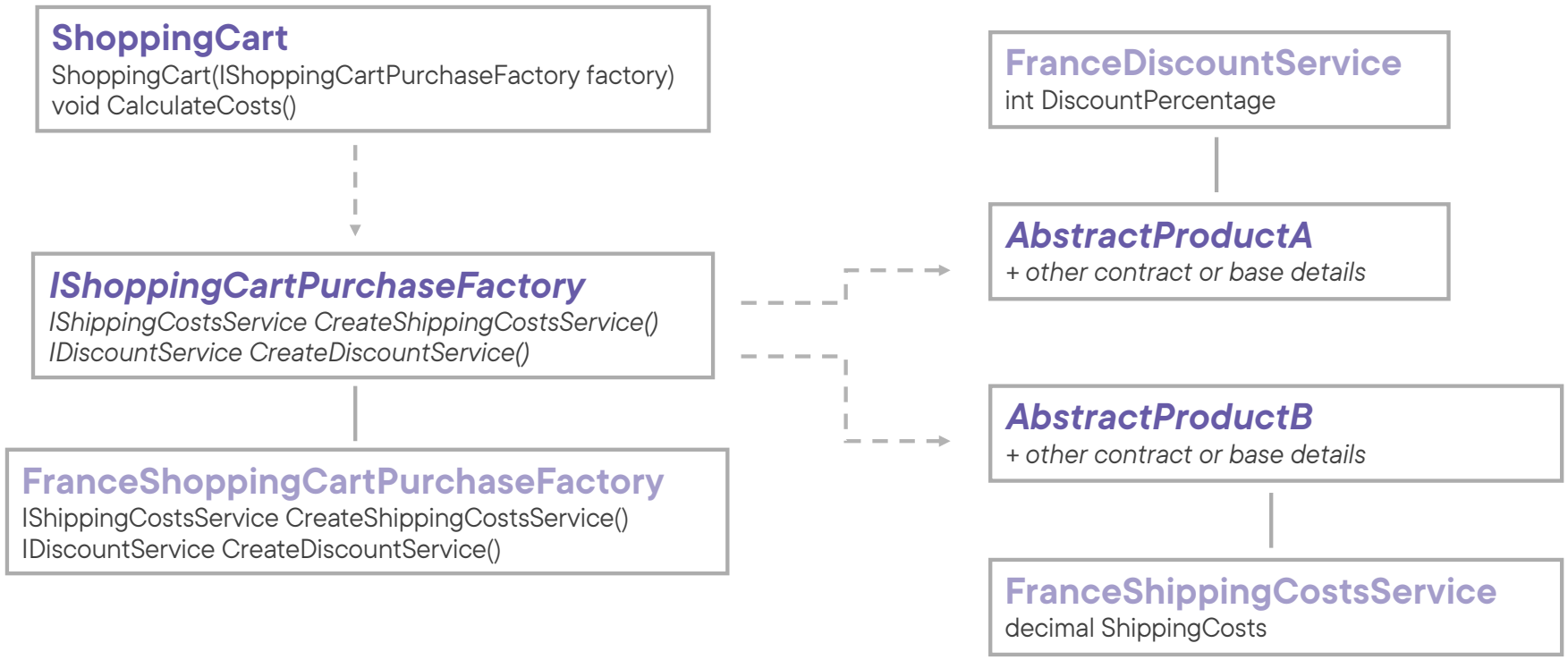
Abstract Factory Pattern Structure



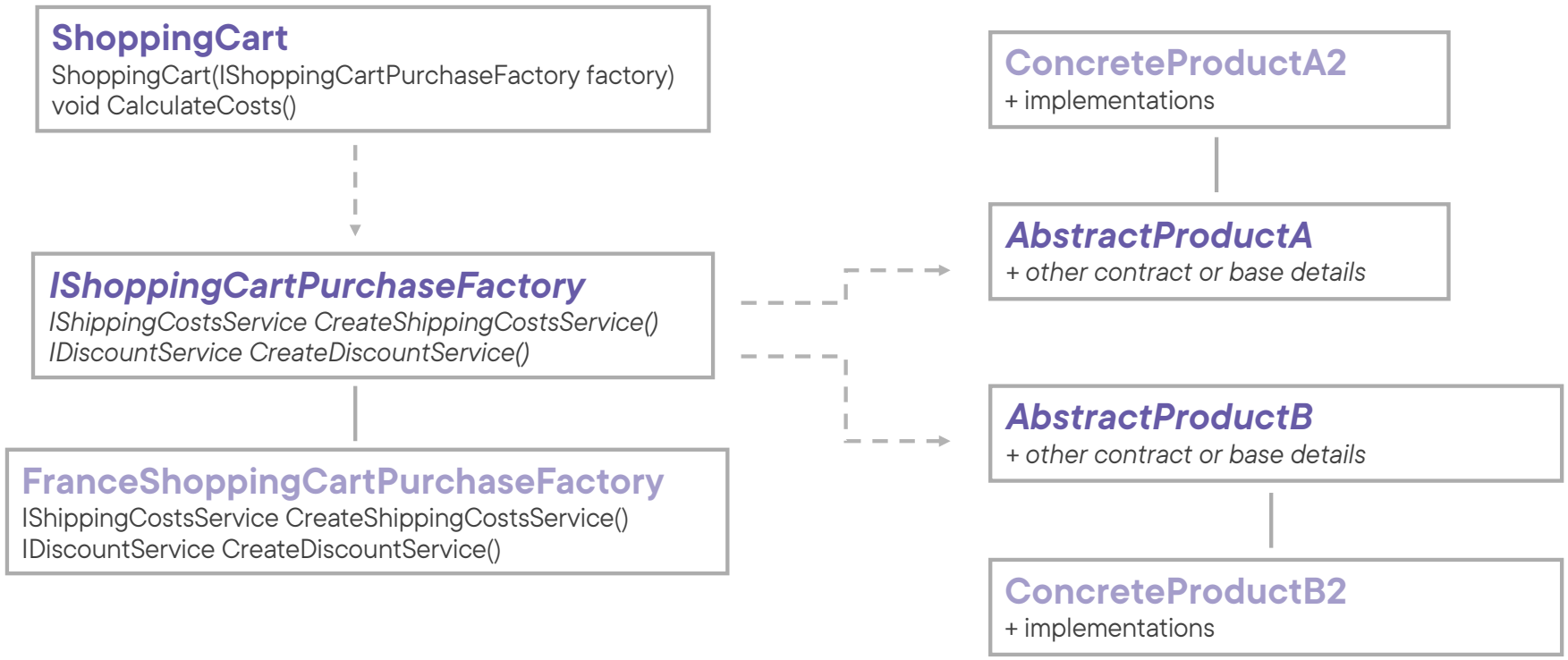
Abstract Factory Pattern Structure



Abstract Factory Pattern Structure

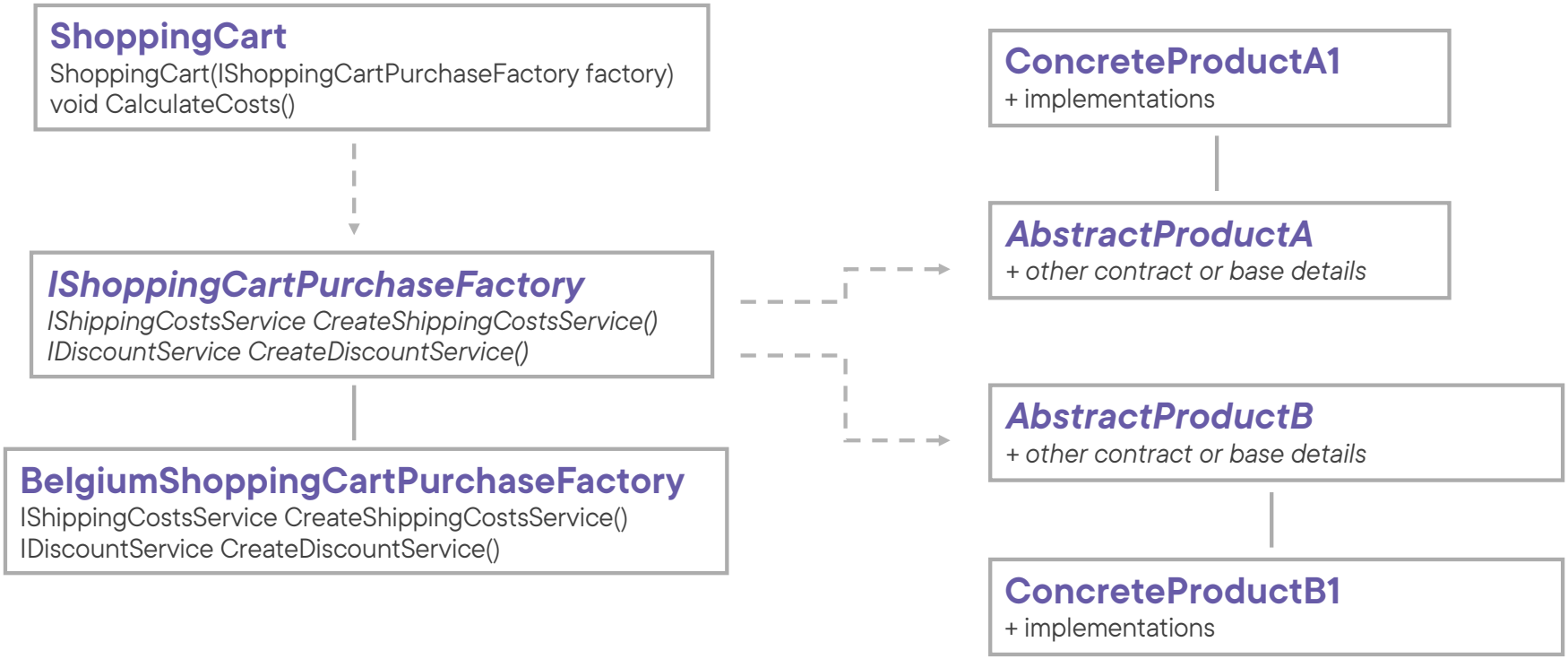


Abstract Factory Pattern Structure

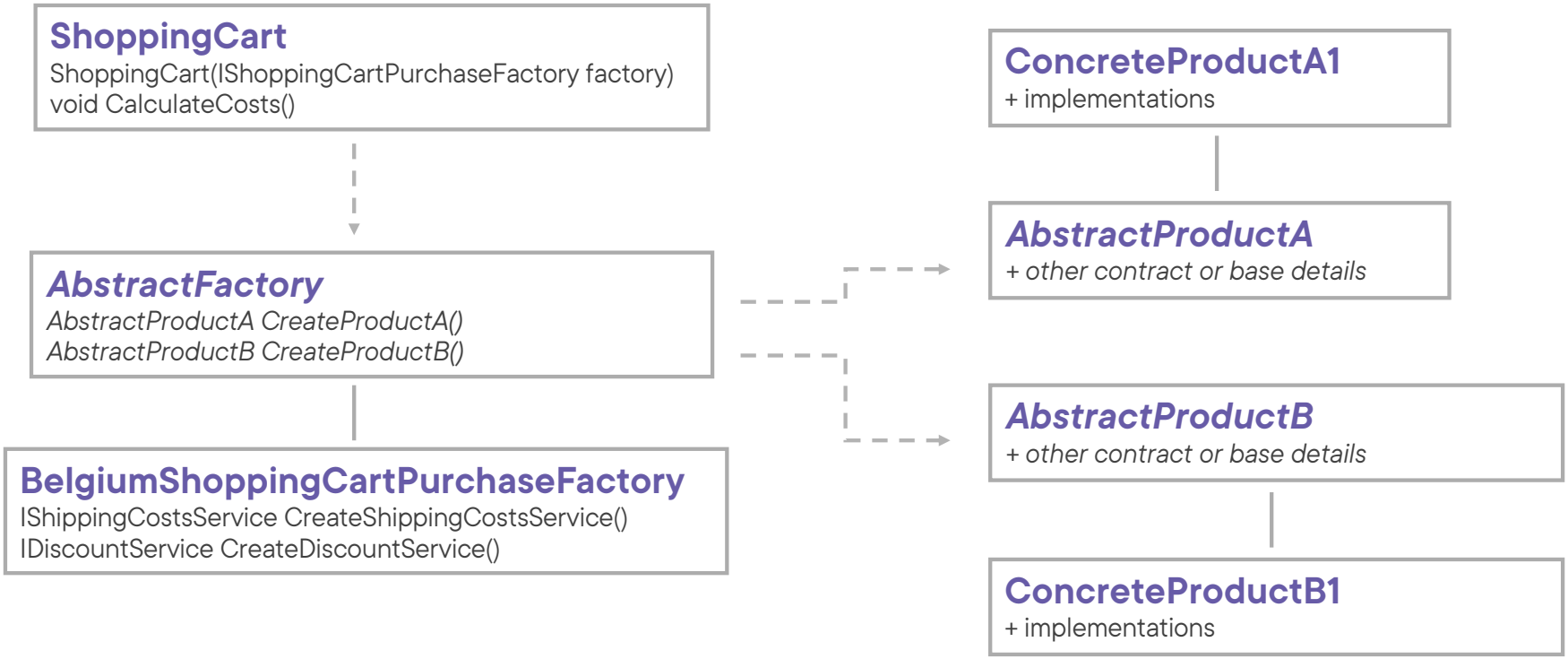


AbstractFactory declares an interface for operations that create **AbstractProduct** objects

Abstract Factory Pattern Structure

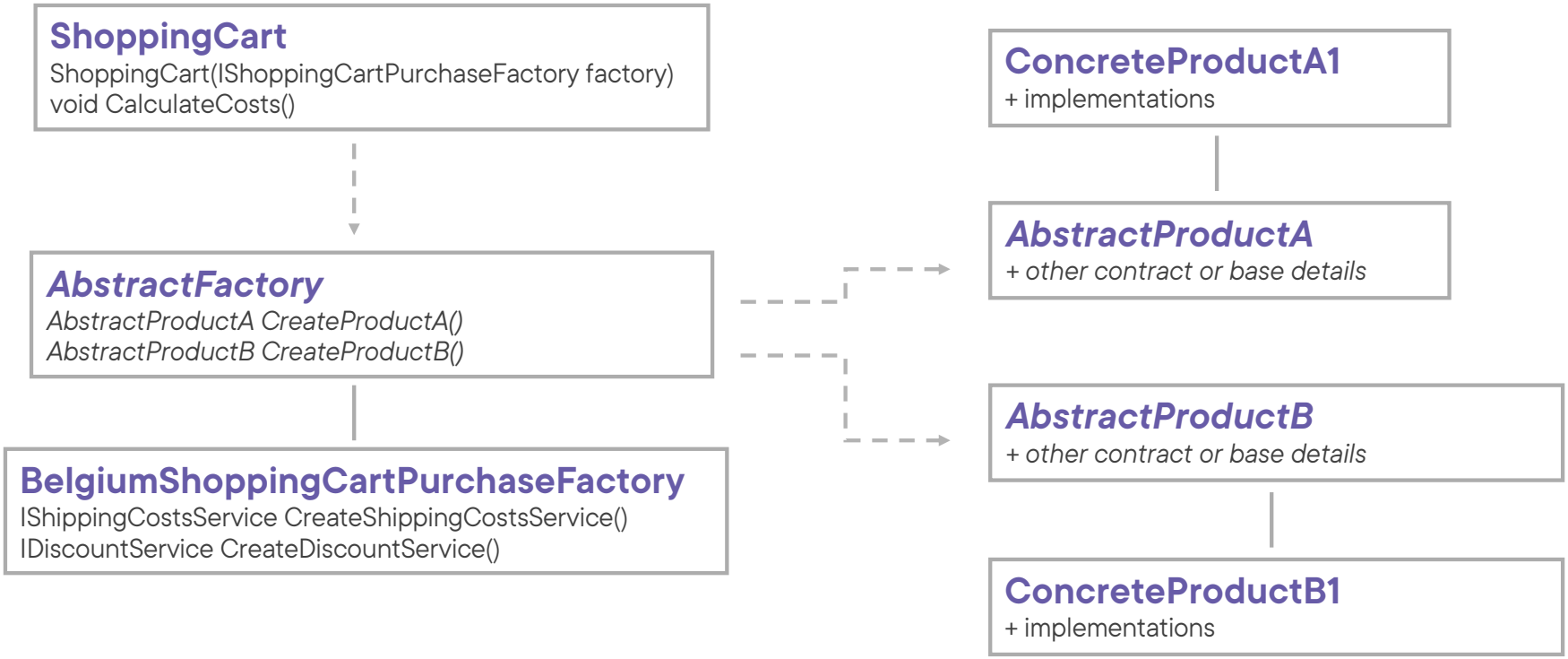


Abstract Factory Pattern Structure

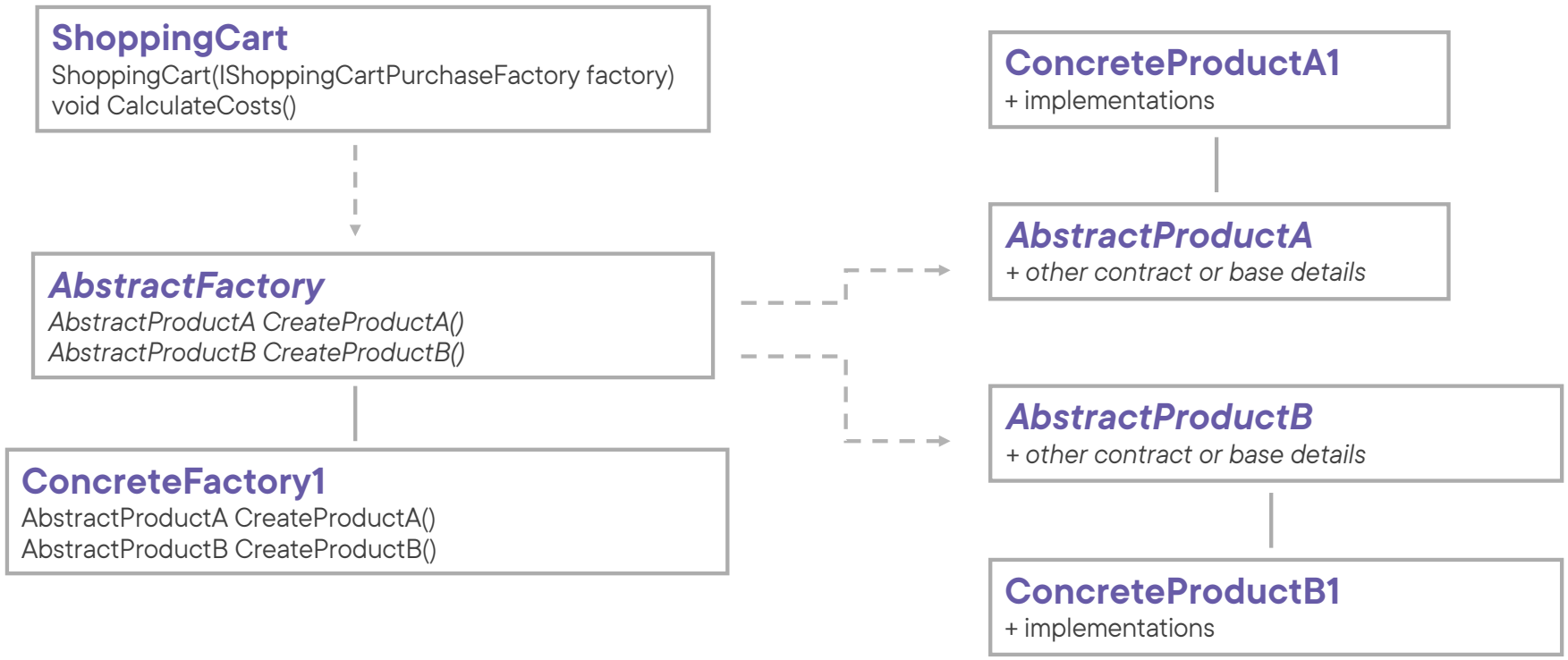


ConcreteFactory implements the operations to create **ConcreteProduct** objects

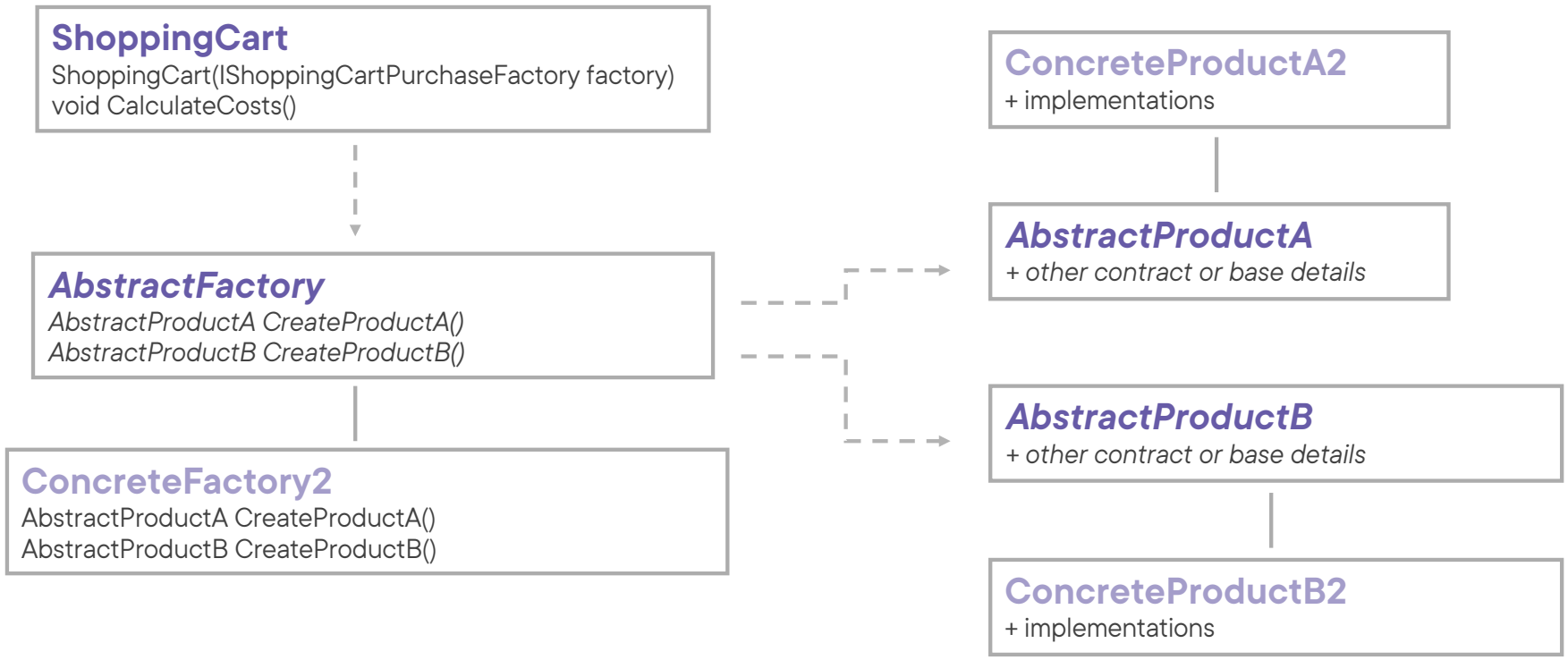
Abstract Factory Pattern Structure



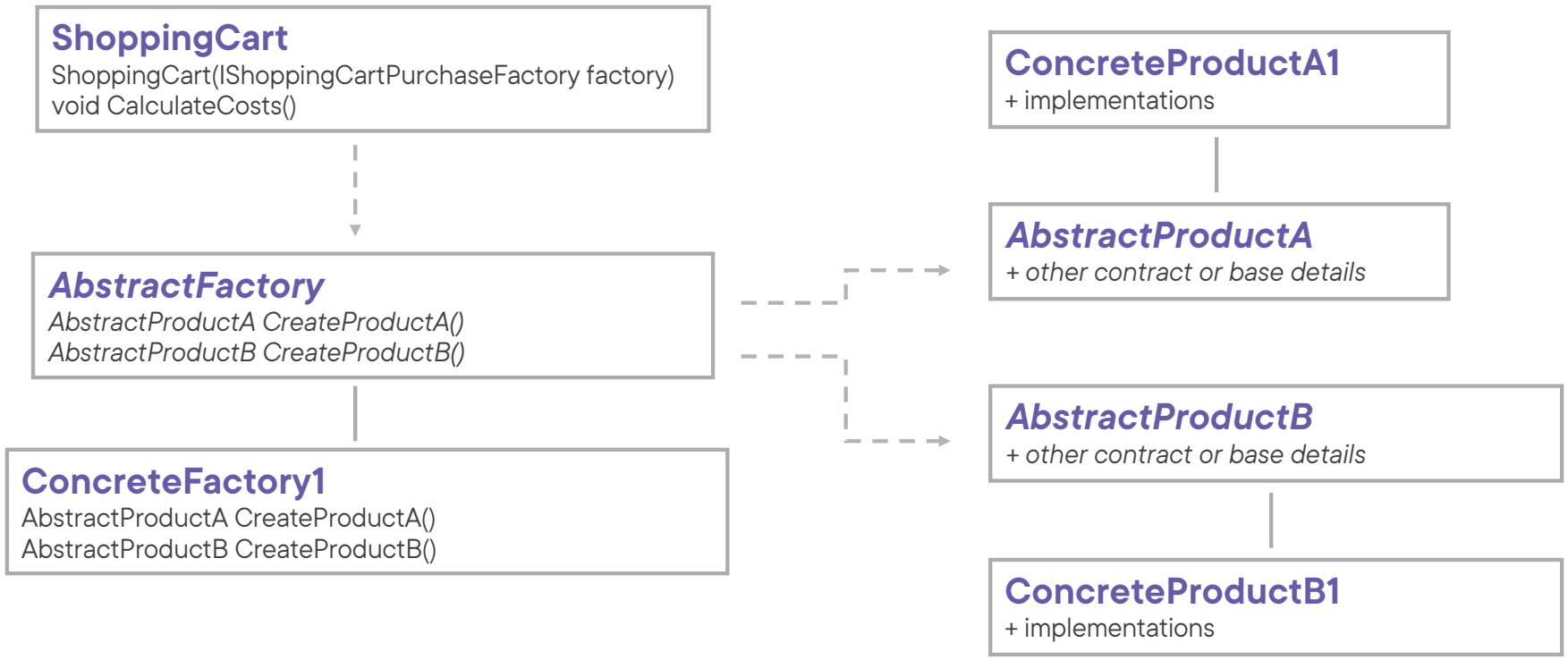
Abstract Factory Pattern Structure



Abstract Factory Pattern Structure

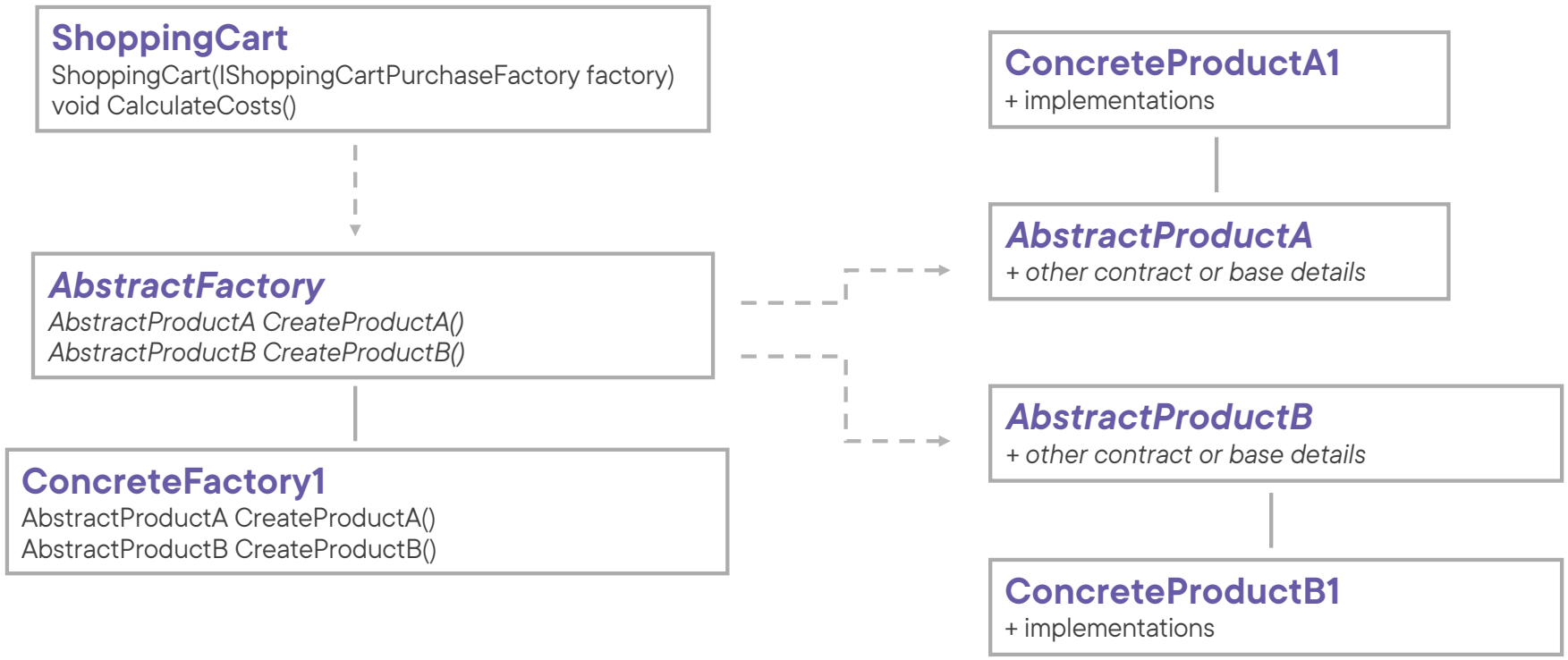


Abstract Factory Pattern Structure

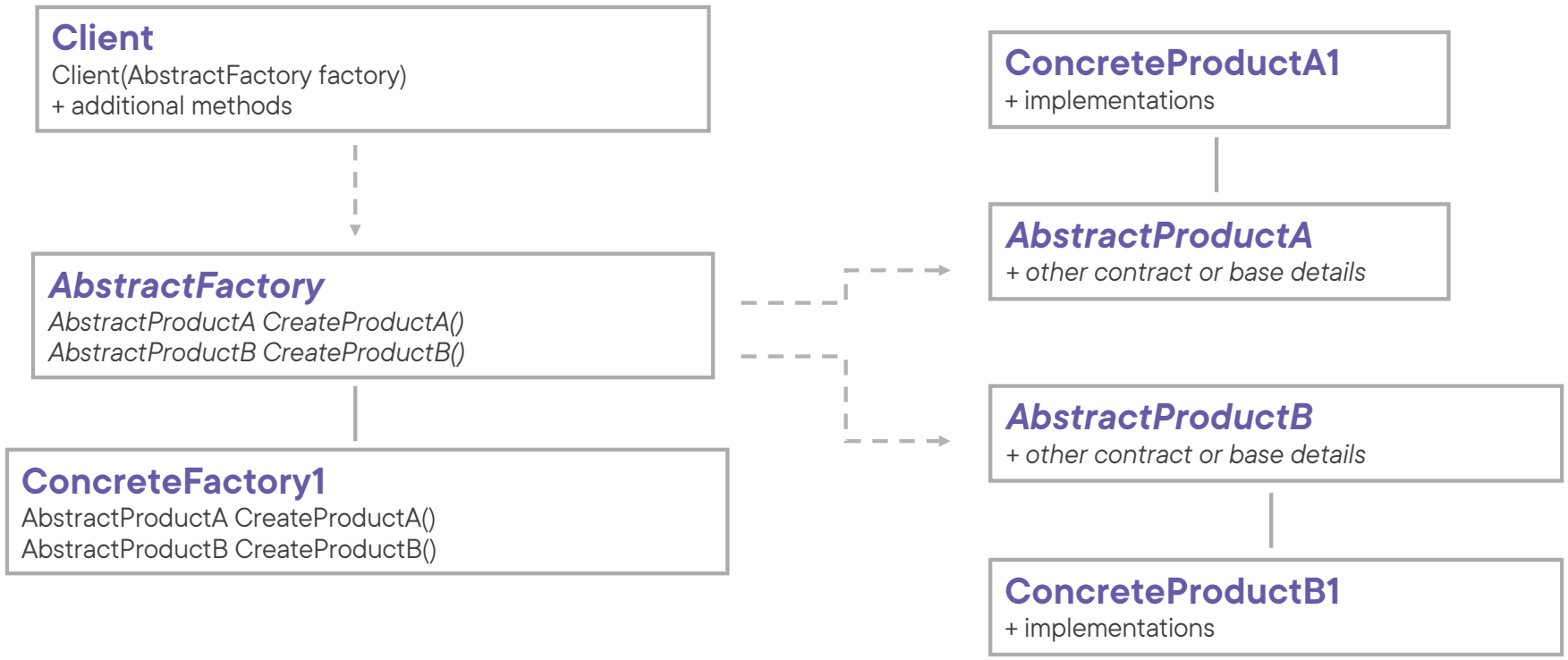


Client uses only interfaces declared by **AbstractFactory** and **AbstractProduct**

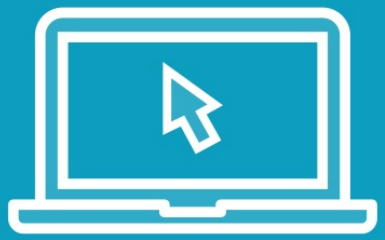
Abstract Factory Pattern Structure



Abstract Factory Pattern Structure



Demo



Implementing the abstract factory pattern

Use Cases for the Abstract Factory Pattern

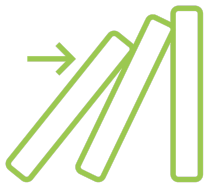
When a system should be independent of how its products are created, composed and represented

When you want to provide a class library of products and you only want to reveal their interfaces, not their implementations

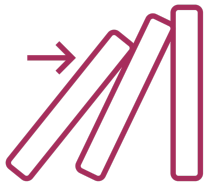
When a system should be configured with one of multiple families of products

When a family of related product objects is designed to be used together and you want to enforce this constraint

Pattern Consequences



It isolates concrete classes, because it encapsulates the responsibility and the process of creating product objects

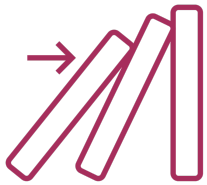


New products can easily be introduced without breaking client code: open/closed principle

Code to create products is contained in one place: single responsibility principle

Pattern Consequences

It makes exchanging product families easy



It promotes consistency among products

Supporting new kinds of products is rather difficult

Comparing Abstract Factory to Factory Method

Factory method

Exposes an interface with a method on it, the factory method, to create an object of a certain type

Produces one product

Creates objects through inheritance

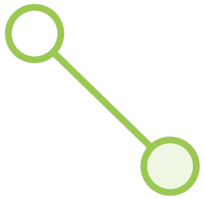
Abstract factory

Exposes an interface to create related objects: families of objects

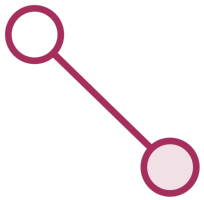
Produces families of products

Creates families of objects through composition

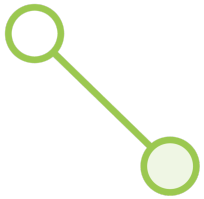
Related Patterns



Factory method
Abstract factory can be implemented using factory methods



Prototype
Abstract factory can be implemented using prototypes



Singleton
A concrete factory is often implemented as a singleton

Summary

Intent of the abstract factory pattern:

- To provide an interface for creating families of related or dependent objects without specifying their concrete classes

Clients are isolated from implementation classes: decoupling

Summary

Implementation:

- Return `ConcreteProduct` via the underlying interface

Up Next:
Creational Pattern: Builder