

Module 12: "Flyweight"



Agenda

- ▶ Introductory Example: Brewing Coffee
- ▶ Challenges
- ▶ Implementing the Flyweight Pattern
- ▶ Pattern: Flyweight
- ▶ Overview of Flyweight Pattern
- ▶ .NET Framework Example: String Interning
- ▶ Additional Comments on Flyweight



Introductory Example: Brewing Coffee

```
interface ICoffee
{
    CoffeeKind Kind { get; }
    int Strength { get; }
    CoffeeSize Size { get; }
    string CustomerName { get; }

    void Serve();
}
```

```
class Cappuccino : Coffee
{
    public Cappuccino( string name )
        : base(
            CoffeeKind.Cappuccino,
            3,
            CoffeeSize.Regular,
            customerName) { }
}
```

```
ICoffee c1 = new Cappuccino("John Doe");
c1.Serve();
ICoffee c2 = new Espresso("Jane Doe");
c2.Serve();
```

Challenges

- ▶ Very many (nearly) identical objects are created
- ▶ But how could that be avoided when customer names varies..?
- ▶ Can we separate objects' state into
 - Shared +
 - Non-shared?

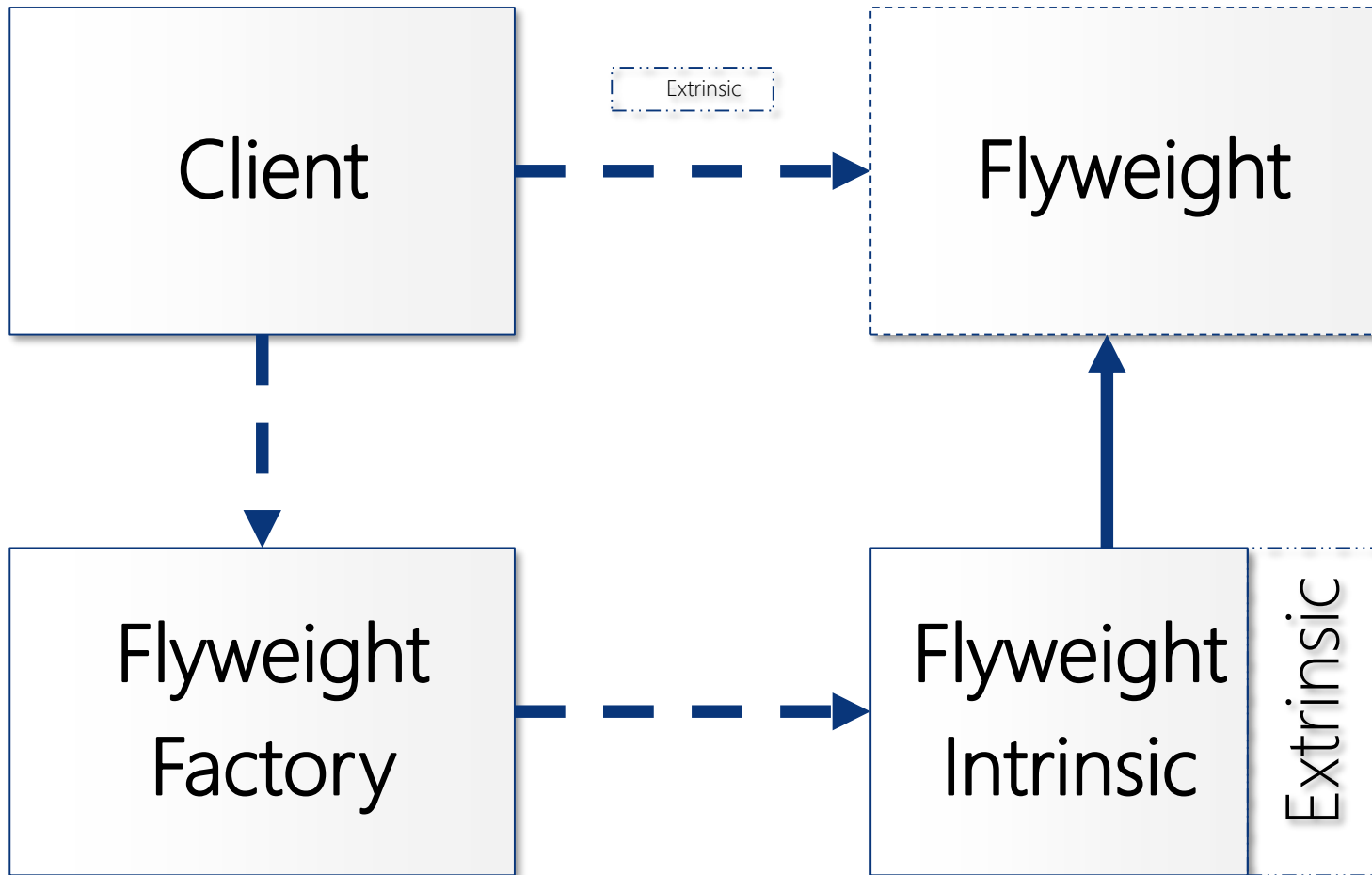


Pattern: Flyweight

- ▶ *Use sharing to support large numbers of fine-grained objects efficiently.*
- ▶ Outline
 - Creating a large number of objects should be avoided
 - Store "*intrinsic*" (i.e. invariant) state that can be shared
 - Allow "*extrinsic*" (i.e. variant) state to be passed in methods
- ▶ Origin:
 - Paul Calder and Mark Linton (1990) (also in Gang of Four)



Overview of Flyweight Pattern



Overview of Flyweight Pattern

- ▶ Client
 - Gets Flyweight Intrinsic object from Flyweight Factory
 - Invokes operations on Flyweight Intrinsic providing extrinsic state
- ▶ Flyweight Factory
 - Cache for Flyweight objects
- ▶ Flyweight
 - Interface or abstract base class for concrete Flyweight objects
- ▶ Flyweight Intrinsic
 - Concrete Flyweight class storing intrinsic state
 - Immutable value object



.NET Framework Example: String Interning

- ▶ Strings in .NET are interned as flyweights
 - Intrinsic state only

```
string s1 = "Hello";  
string s2 = "Hello";  
string s3 = Console.ReadLine();  
string s4 = string.Intern( s3 );  
  
Console.WriteLine( ReferenceEquals( s1, s2 ) );  
Console.WriteLine( ReferenceEquals( s1, s3 ) );  
Console.WriteLine( ReferenceEquals( s1, s4 ) );
```



Additional Comments on Flyweight

- ▶ Mostly applicable to very specific scenarios
 - Frameworks
 - Graphics and rendering
- ▶ Not used very frequently nowadays in business code
- ▶ Flyweights should be immutable for safe sharing
- ▶ Should flyweight be structs?
- ▶ What about thread-safety?





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