DePaul University

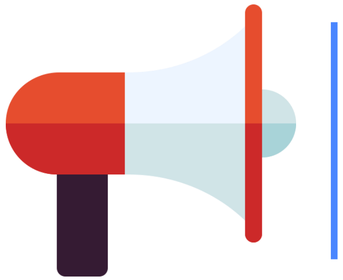
Design Patterns:

Decorator

Object-oriented Software Development
SE 350– Spring 2021

Vahid Alizadeh

Week 9.1
May 25, 2021



Announcements

Future Schedule

Assignment 3 solutions on D2L

Assignment 4 Due date: May 28

- ~~Assignment 1~~
- ~~Assignment 2~~
- ~~Mid Term Exam~~
- ~~Assignment 3:~~
  - ~~Release: Week 7~~
  - ~~Due: Week 8~~
- **Assignment 4:**
  - ~~Release: Week 8~~
  - Due: Week 9
- **Bonus Research Project:**
  - Presentation Due: Week 10
  - Report Due: Week 11
- **Final Exam:**
  - Week 11

SE 350: OO Software Development

Assignment 4: Design Patterns (2)

Instructor: Vahid Alizadeh
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Quarter: Spring 2021

DEPAUL UNIVERSITY
COLLEGE OF COMPUTING AND DIGITAL MEDIA

Last update: May 19, 2021

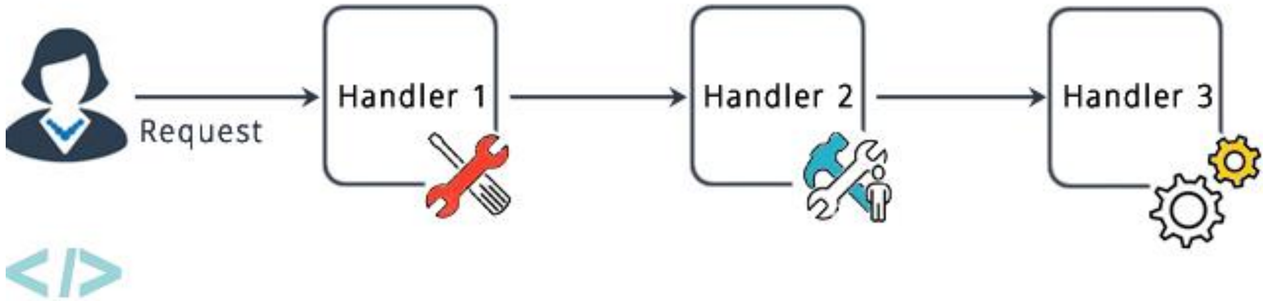
Chain of Responsibility Pattern

CoR / Chain of Commands

BEHAVIORAL

CoR Pattern Introduction

Chain of Responsibility is a behavioral design pattern that can be used when we want to give more than one object a chance to handle a request.



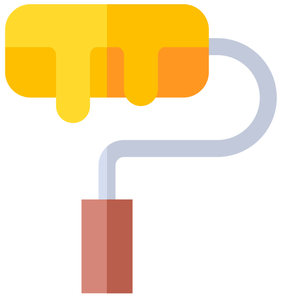
CoR Pattern Pros & Cons

Pros

- Decouple sender and receiver.
- Dynamically add or remove responsibilities.
- Control over the order of handlers.
- Single responsibility and Open/closed principles.

Cons

- The request may fail to be executed by the end of the chain.
- Many implementation classes leads to maintenance and debugging difficulties.

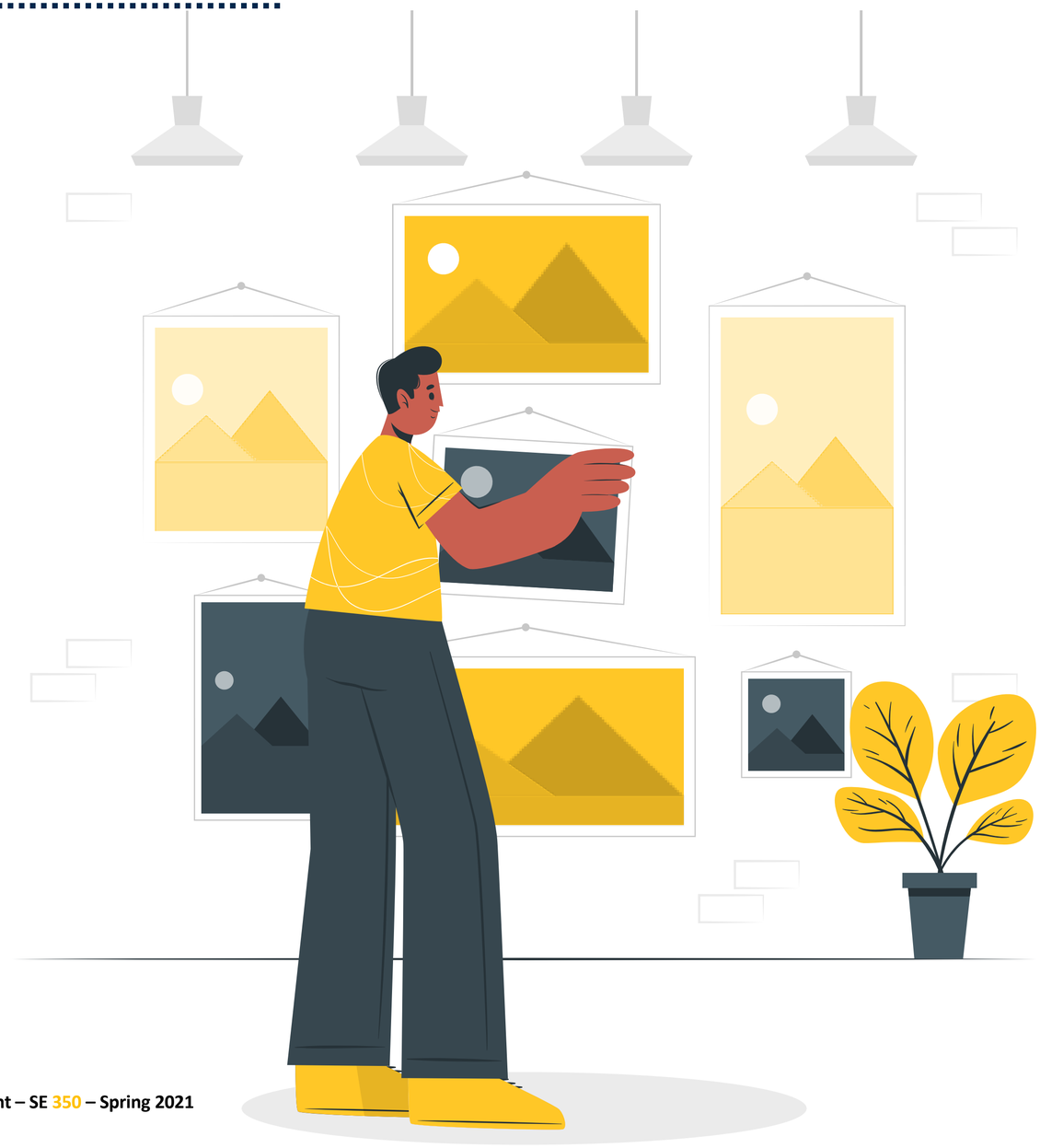


Decorator Pattern

STRUCTURAL

Decorator Pattern Introduction

Decorator is a structural design pattern that allows for an object's behavior to be extended dynamically at run time.



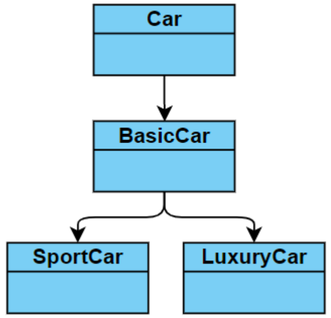
Decorator Design Pattern

INTENT

- Add additional responsibilities to individual objects dynamically.
- withdraw responsibilities from an object.

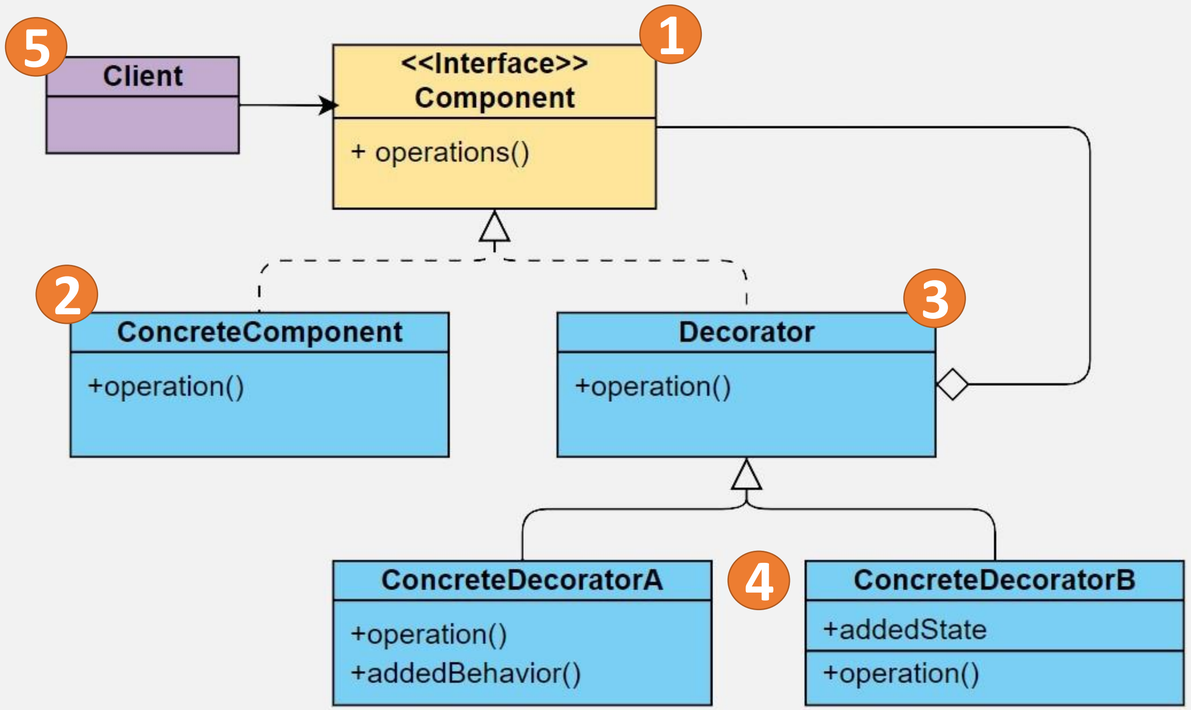
PROBLEM

- Adding a behavior to an object at run-time in not possible by inheritance.
- Car example

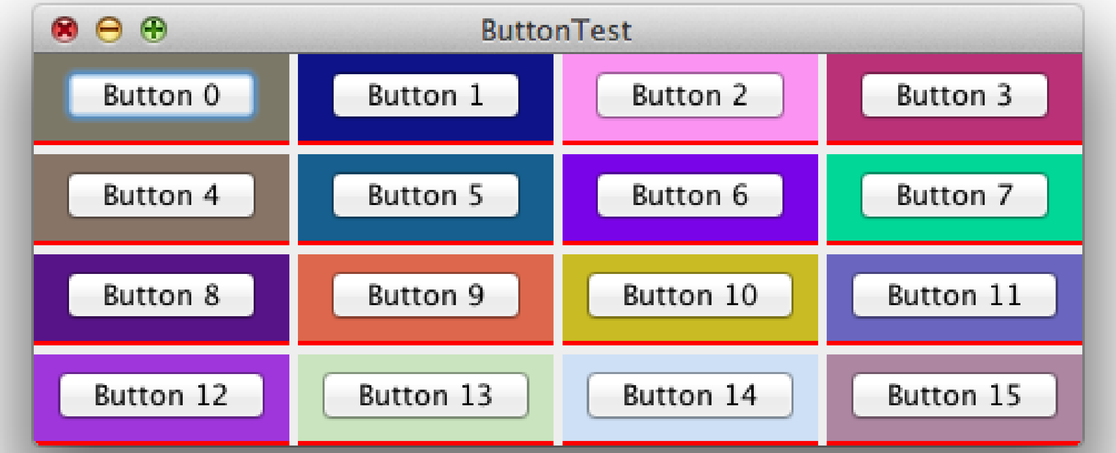


STRUCTURE

- 1- Component Interface
- 2- Concrete Component
- 3- Decorator
- 4- Concrete Decorators



Decorator Pattern: Real-world Example

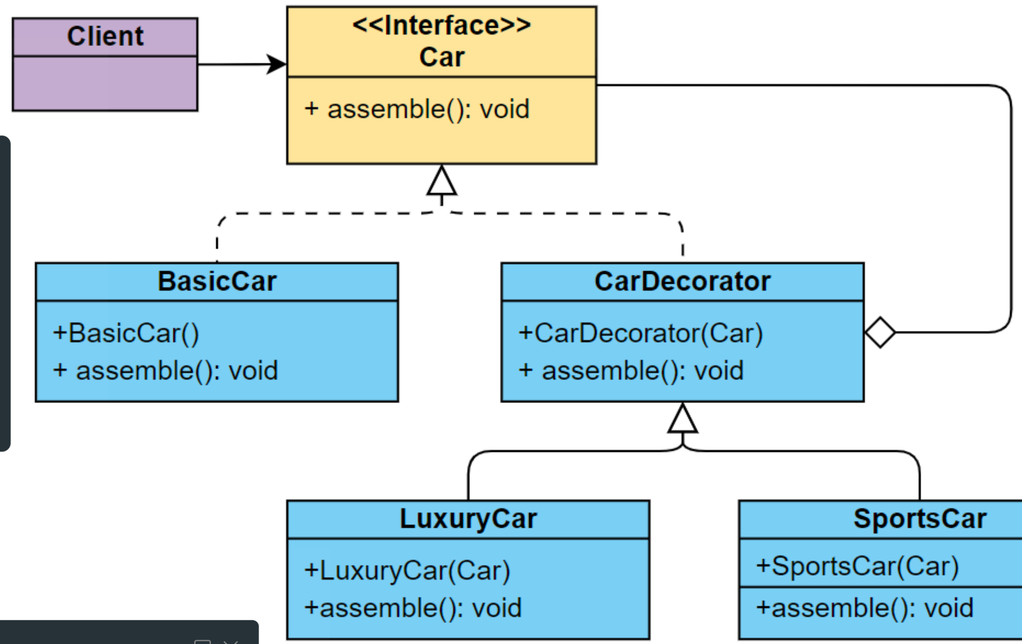


Find the source codes in the course GitHub repository.

Decorator Use Case Example: Car Manufacturing

```java
public class CarManufacturingDriver {
    public static void main(String[] args) {
        Car sportsCar = new SportsCar(new BasicCar());
        sportsCar.assemble();
        System.out.println("\n*****");
        Car sportsLuxuryCar = new SportsCar(new LuxuryCar(new BasicCar()));
        sportsLuxuryCar.assemble();
    }
}
```

```java
public interface Car {
    public void assemble();
}
```



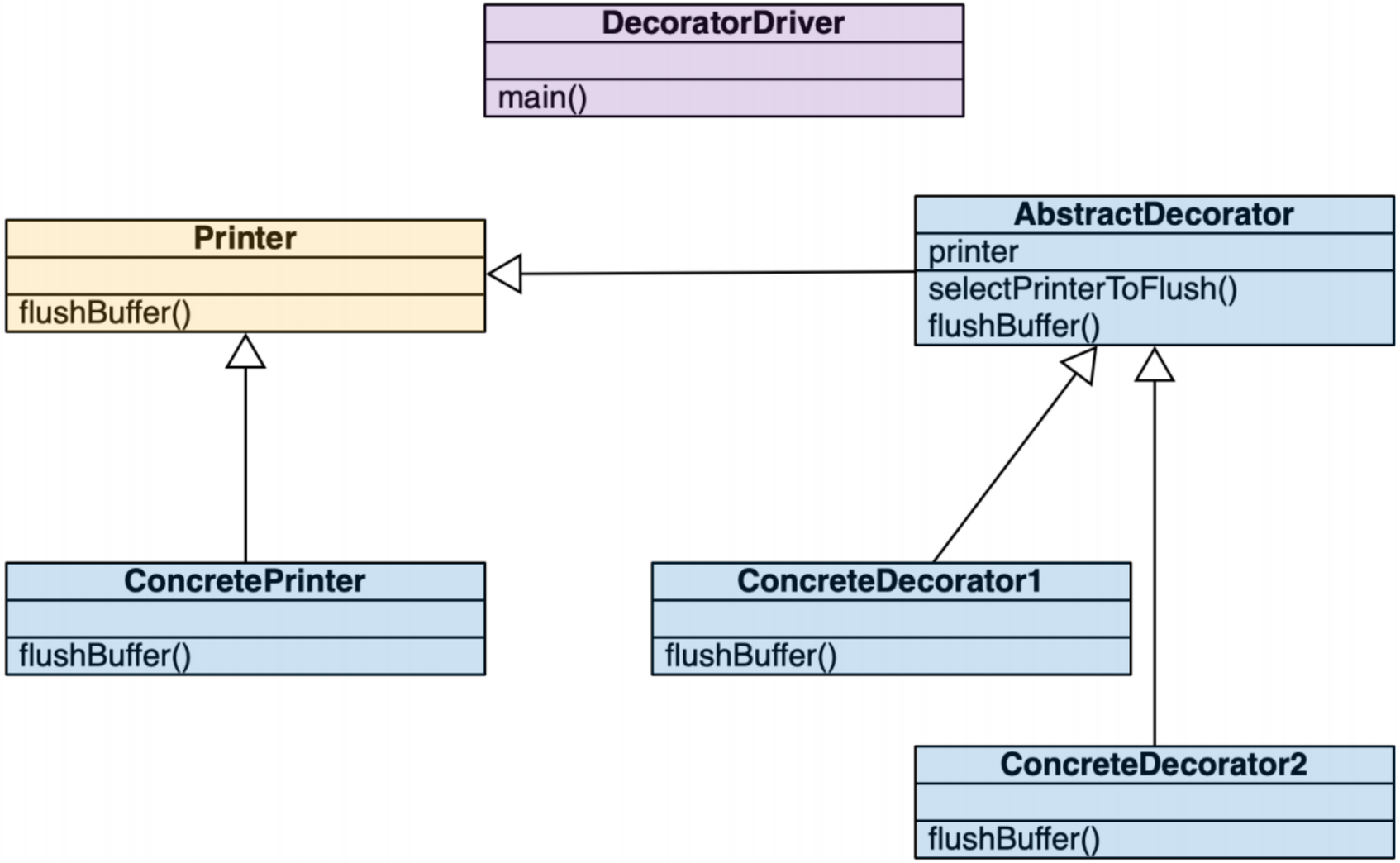

```java
public class BasicCar implements Car {
    @Override
    public void assemble() {
        System.out.print("Basic Car.");
    }
}
```

```java
public class CarDecorator implements Car {
    protected Car car;
    public CarDecorator(Car c){
        this.car=c;
    }
    @Override
    public void assemble() {
        this.car.assemble();
    }
}
```

```java
public class LuxuryCar extends CarDecorator {
    public LuxuryCar(Car c) {
        super(c);
    }
    @Override
    public void assemble(){
        super.assemble();
        System.out.print(" Adding features of Luxury Car.");
    }
}
```

```java
public class SportsCar extends CarDecorator {
    public SportsCar(Car c) {
        super(c);
    }
    @Override
    public void assemble(){
        super.assemble();
        System.out.print(" Adding features of Sports Car.");
    }
}
```

Decorator Use Case Example: Printer Demo



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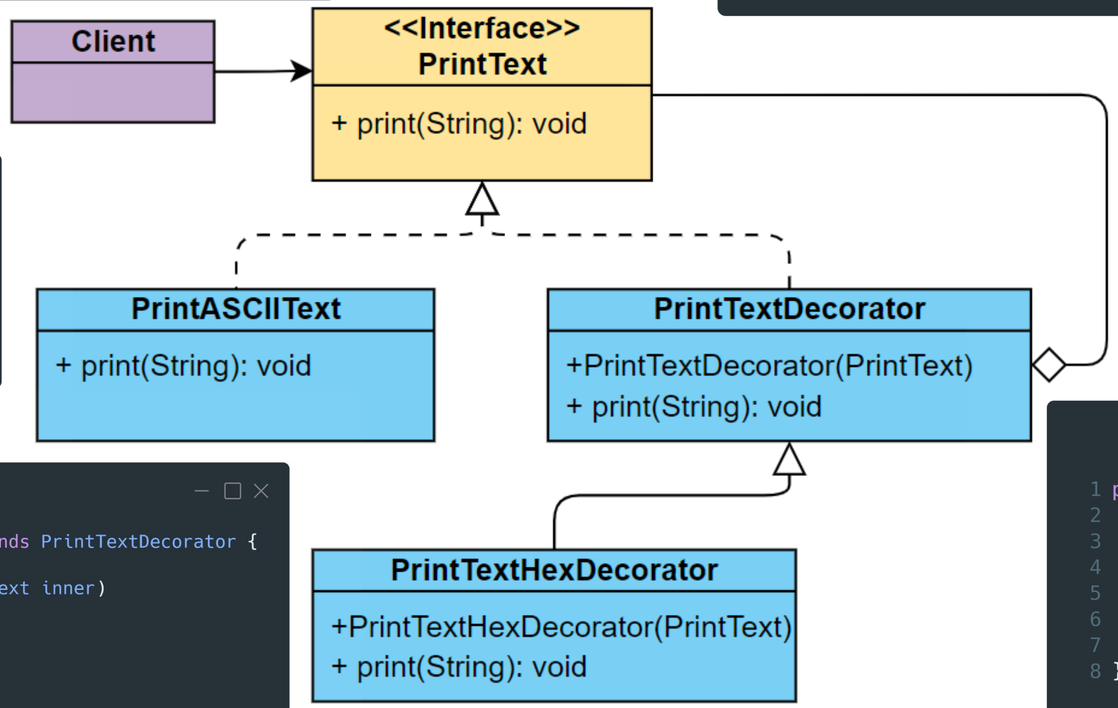
Decorator Use Case Example: Print Text Demo

```java
public class PrintTextDriver {
    public static void main (String[] args) throws java.lang.Exception
        {
            final String text = "SE 450 - Winter 2021 - Decorator Pattern Example";
            final PrintText object = new PrintAsciiText();
            final PrintText printer = new PrintTextHexDecorator(object);
            object.print(text);
            printer.print(text);
        }
}
```

```java
public interface PrintText {
    public void print(String text);
}
```




```java
public class PrintAsciiText implements PrintText {
    public void print(String text)
    {
        System.out.println("Print ASCII: " + text);
    }
}
```

```java
public abstract class PrintTextDecorator implements PrintText {
    private PrintText inner;
    public PrintTextDecorator(PrintText inner)
    {
        this.inner = inner;
    }
    public abstract void print(String text);
}
```

```java
public class PrintTextHexDecorator extends PrintTextDecorator {
    private PrintText inner;
    public PrintTextHexDecorator(PrintText inner)
    {
        super(inner);
    }
    public void print(String text)
    {
        String hex = text.chars()
                .boxed()
                .map(x -> "0x" + Integer.toHexString(x))
                .collect(Collectors.joining(" "));
        inner.print(text + " -> HEX: " + hex);
    }
}
```


Find the source codes in the course GitHub repository.

Assignments

Assignment 3 Solution

Assignment 4 – Q 2

Assignment 4

Due date: May 28, Friday, 11:59PM

SE 350: OO Software Development

Assignment 4: Design Patterns (2)

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Assignment 3 Solutions

Assignment 3 Solutions on D2L

SE 350: OO Software Development

Assignment 3: Design Principles and Design Patterns

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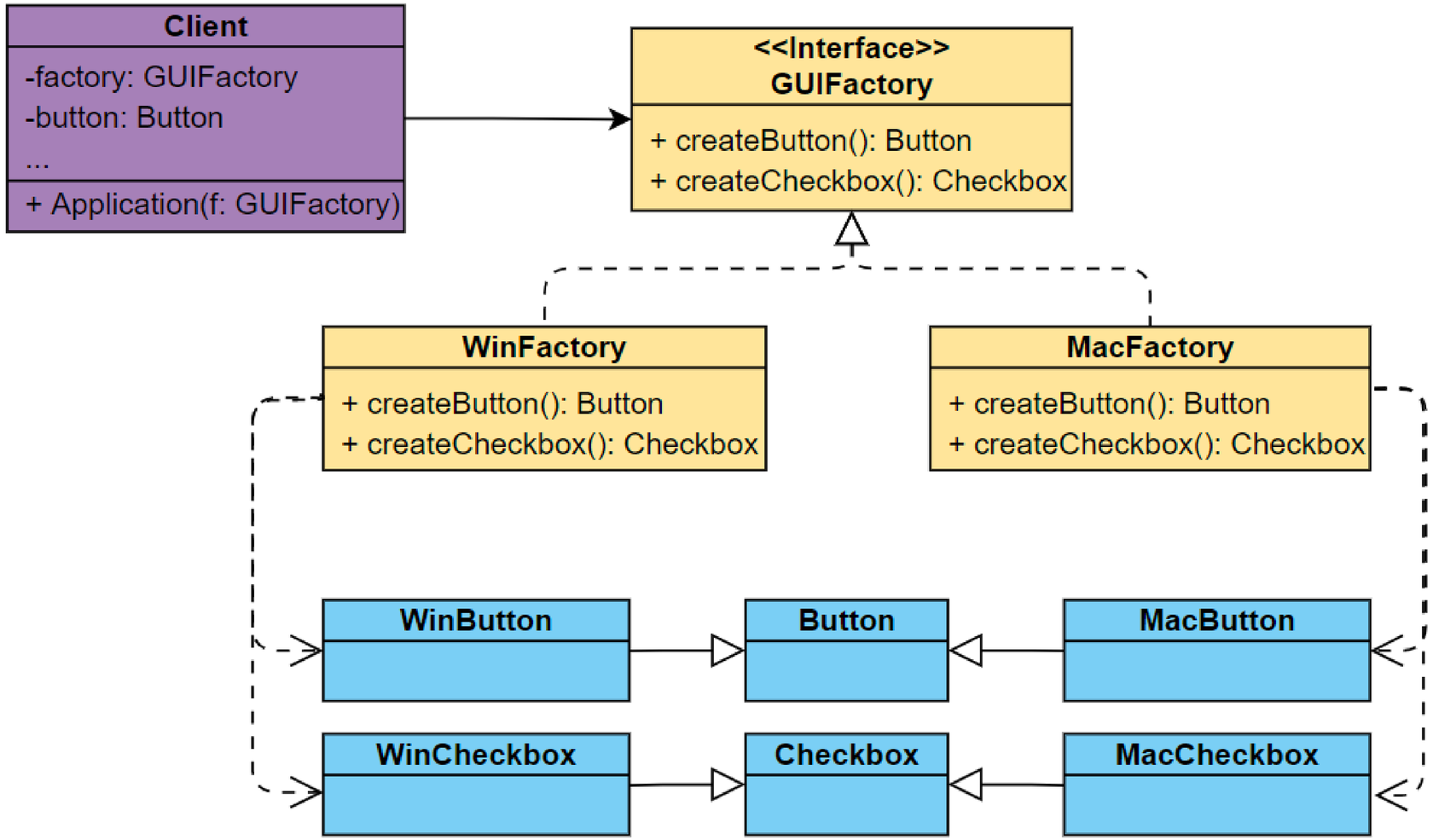
Use Case Example: Cross-platform UI Elements



Any Question

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