DePaul University

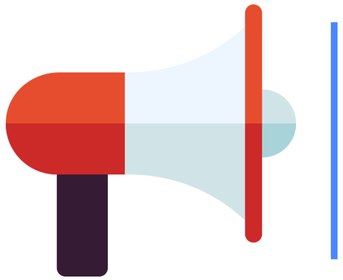
Design Patterns:

Composite, Adapter

Object-oriented Software Development
SE 350– Spring 2021

Vahid Alizadeh

Week 10.1
June 1, 2021



Announcements

Future Schedule

Assignment 3 is graded.

Assignment 4 Solutions > GitHub

- ~~**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 10.2 >> **7 Mins**
  - Report Due: Week 11 >> **June 8**
- **Final Exam:**
  - Week 11 - June 9-11 (Wed-Fri)

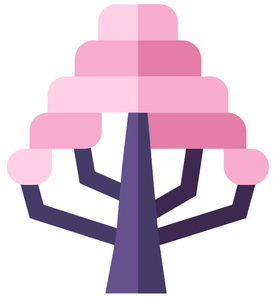
SE 350: OO Software Development

Final Exam

Instructor: Vahid Alizadeh
Email: v.alizadeh@depaul.edu
Quarter: Spring 2021
Date: June 9-11, 2021

DEPAUL UNIVERSITY
COLLEGE OF COMPUTING AND DIGITAL MEDIA

Last update: May 27, 2021

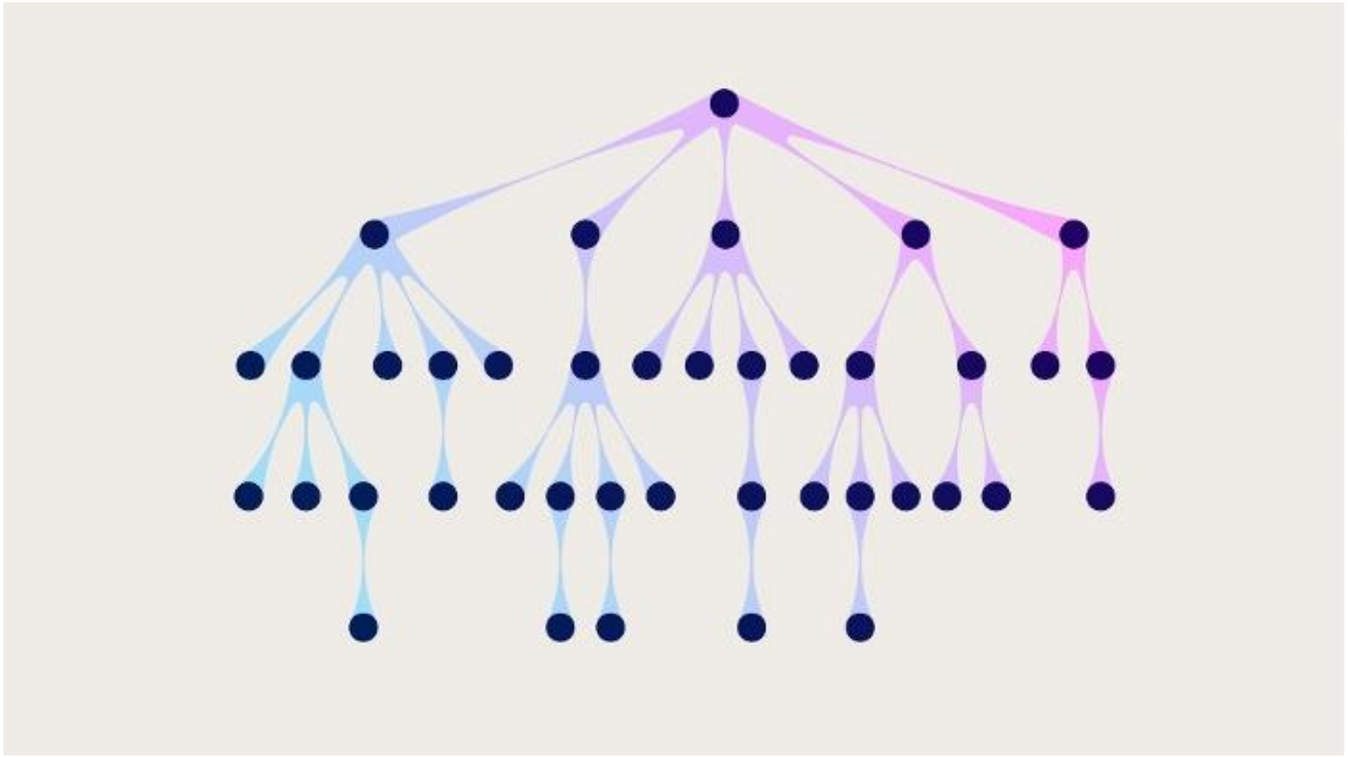


Composite Pattern

STRUCTURAL

Composite Pattern Introduction

Composite is a structural pattern that let us Compose objects into tree structures to represent part-whole hierarchies. Composite allows clients treat individual objects and compositions of objects uniformly.



Composite Design Pattern

INTENT

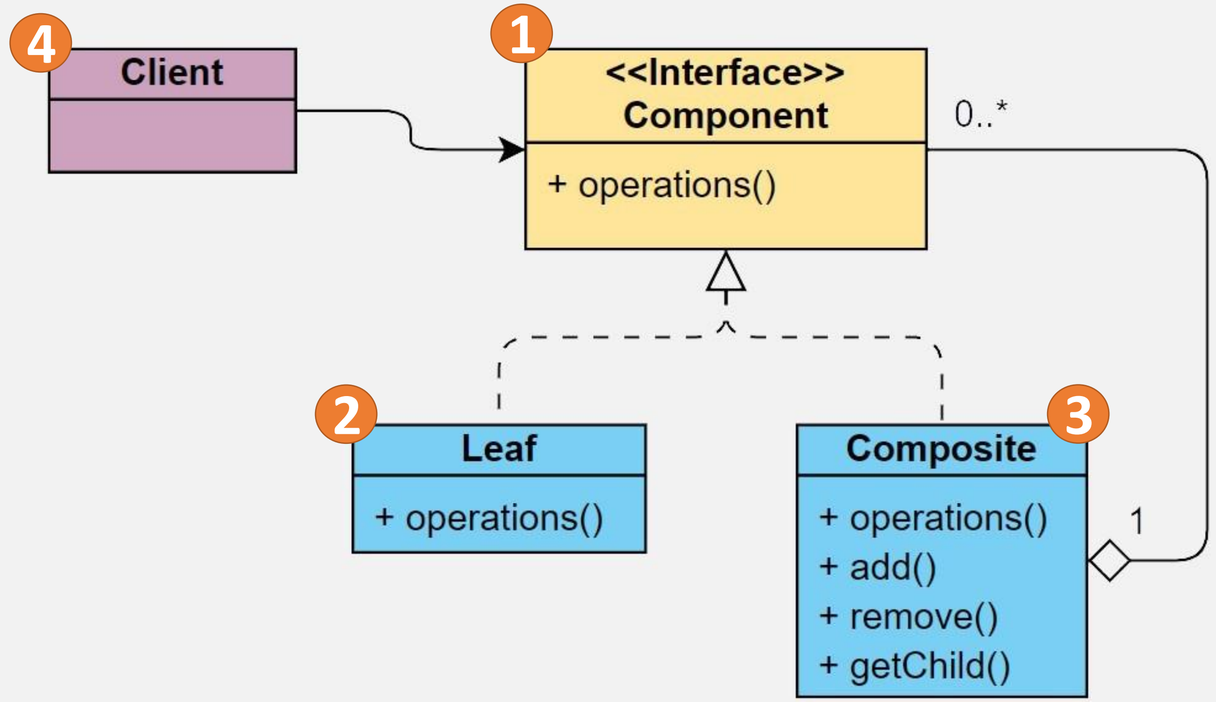
- Modeling of objects into a tree structure and treat them in the same manner.
- The client doesn't know a node is an individual or a composition of objects.

PROBLEM

- Need to manipulate a hierarchy of "primitive" and "composite" objects.

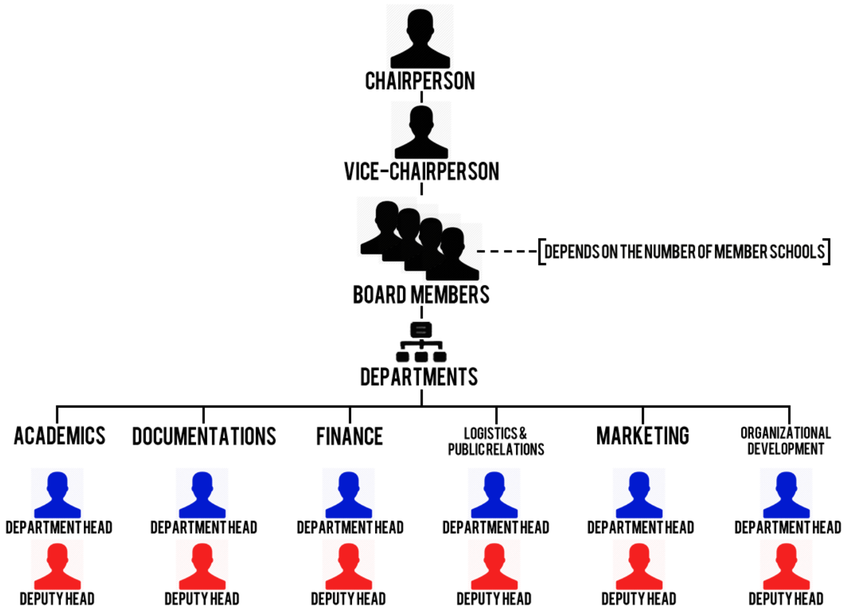
STRUCTURE

- 1- Component Interface
- 2- Leaf Nodes
- 3- Composite
- 4- Client



Composite Pattern: Real-world Example

1



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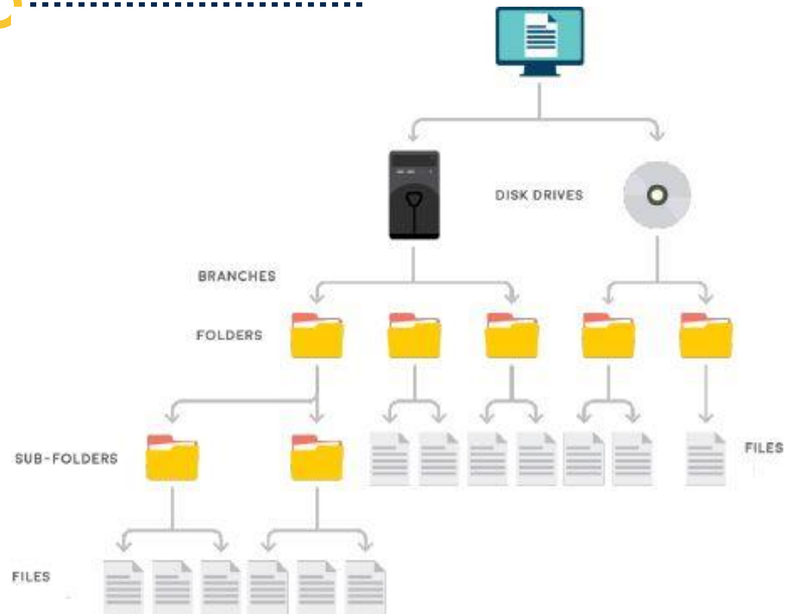

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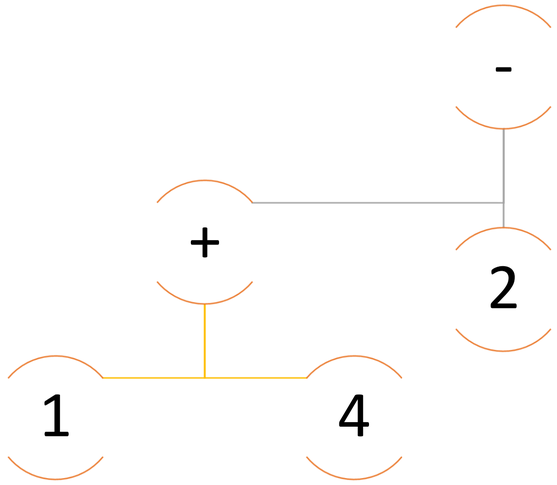

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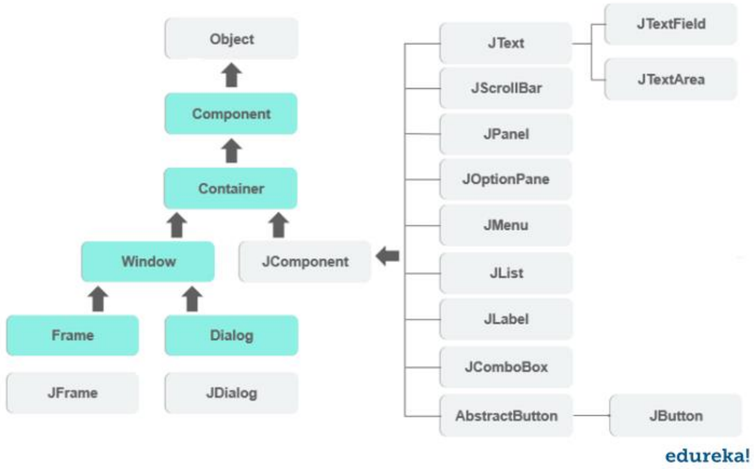
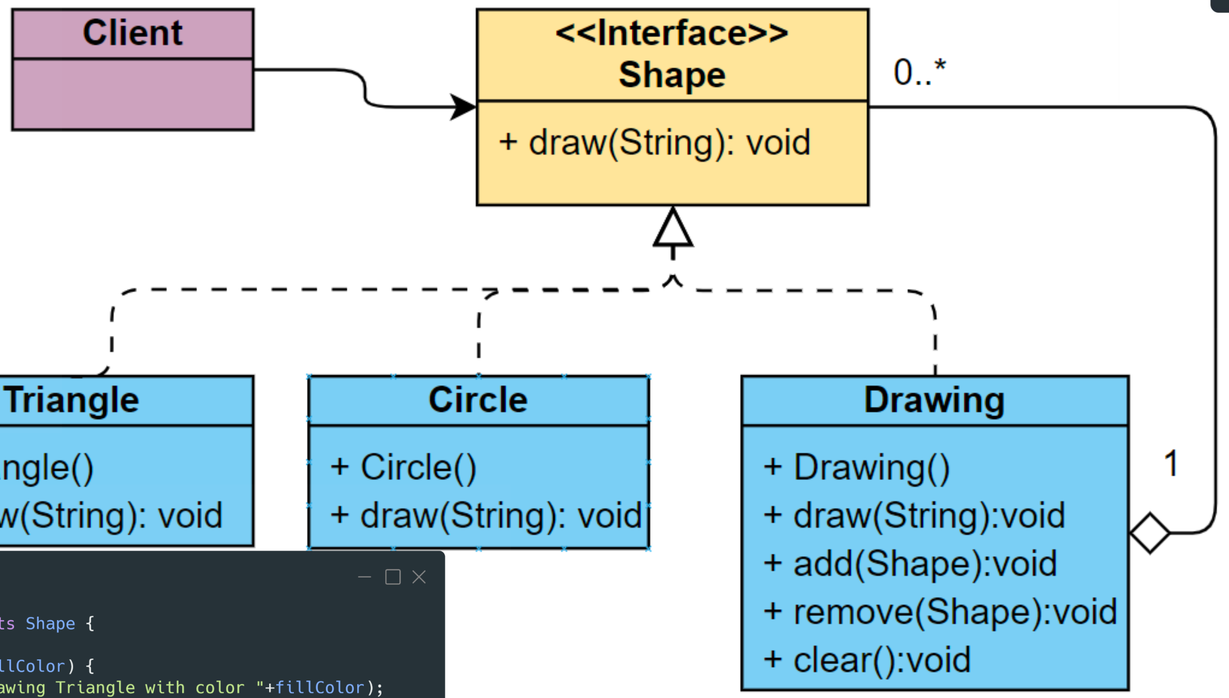


Composite Use Case Example: Drawing App

```java
public class CompisiteClient {

    public static void main(String[] args) {
        Shape tri = new Triangle();
        Shape tri1 = new Triangle();
        Shape cir = new Circle();

        Drawing drawing = new Drawing();
        drawing.add(tri1);
        drawing.add(tri1);
        drawing.add(cir);

        drawing.draw("Red");

        drawing.clear();

        drawing.add(tri);
        drawing.add(cir);
        drawing.draw("Green");
    }
}
```




```java
public interface Shape {
    public void draw(String fillColor);
}
```

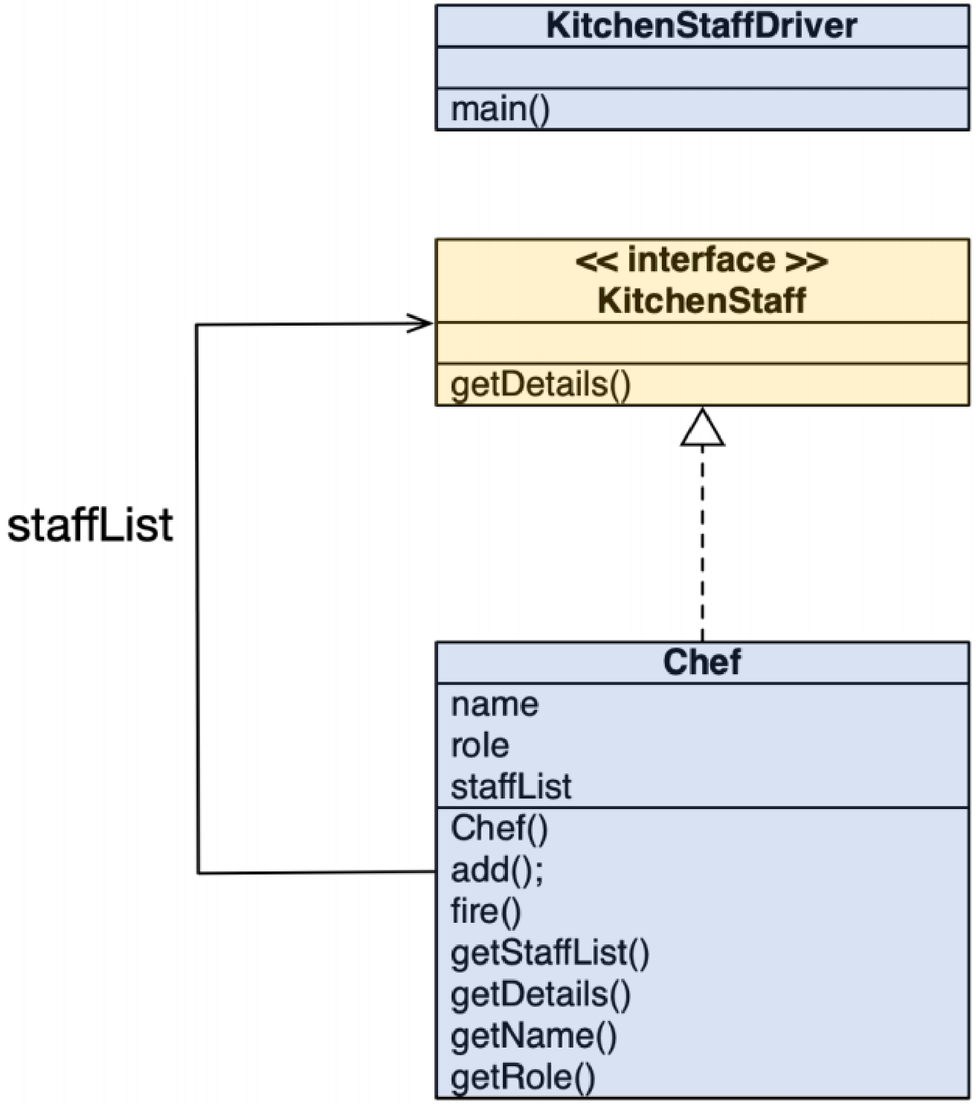
```java
public class Triangle implements Shape {
    @Override
    public void draw(String fillColor) {
        System.out.println("Drawing Triangle with color "+fillColor);
    }
}
```

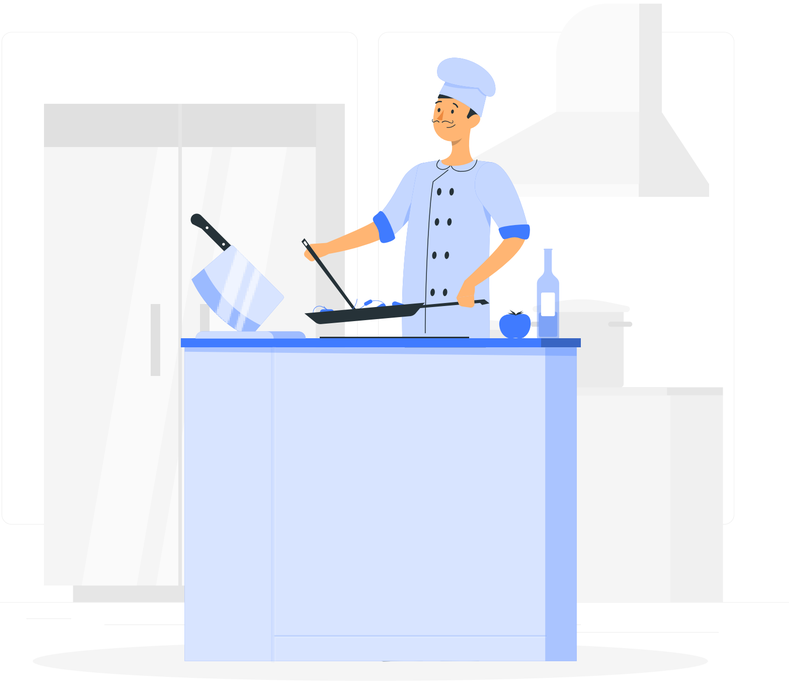
```java
public class Circle implements Shape {
    @Override
    public void draw(String fillColor) {
        System.out.println("Drawing Circle with color "+fillColor);
    }
}
```

```java
public class Drawing implements Shape{
    //collection of Shapes
    private List<Shape> shapes = new ArrayList<Shape>();
    @Override
    public void draw(String fillColor) {
        for(Shape sh : shapes)
        {
            sh.draw(fillColor);
        }
    }
    //adding shape to drawing
    public void add(Shape s){
        this.shapes.add(s);
    }
    //removing shape from drawing
    public void remove(Shape s){
        shapes.remove(s);
    }
    //removing all the shapes
    public void clear(){
        System.out.println("Clearing all the shapes from drawing");
        this.shapes.clear();
    }
}
```


Find the source codes in the course GitHub repository.

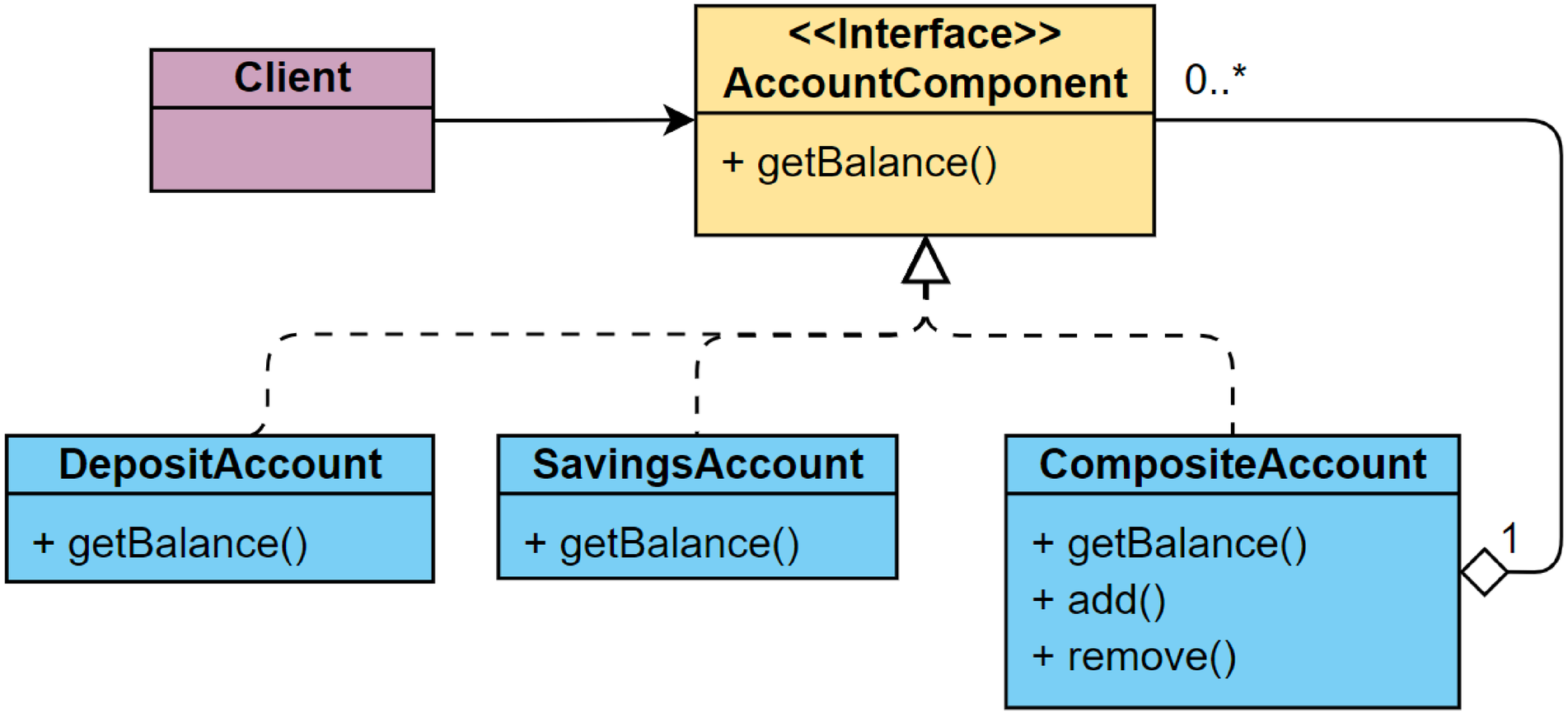
Composite Use Case Example: Kitchen staff management system





Find the source codes in the course GitHub repository.

Composite Use Case Example: Financial App



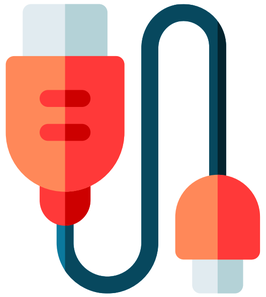
Composite Pattern Pros & Cons

Pros

- Open/Closed Principle: Easy to add new components to our structure.
- Makes the client code simpler.
- Easier to work with complex structures.
- Open/Closed Principle

Cons

- Difficult to define a common interface for every scenario.
- Difficult to restrict the components of the tree to only particular types.

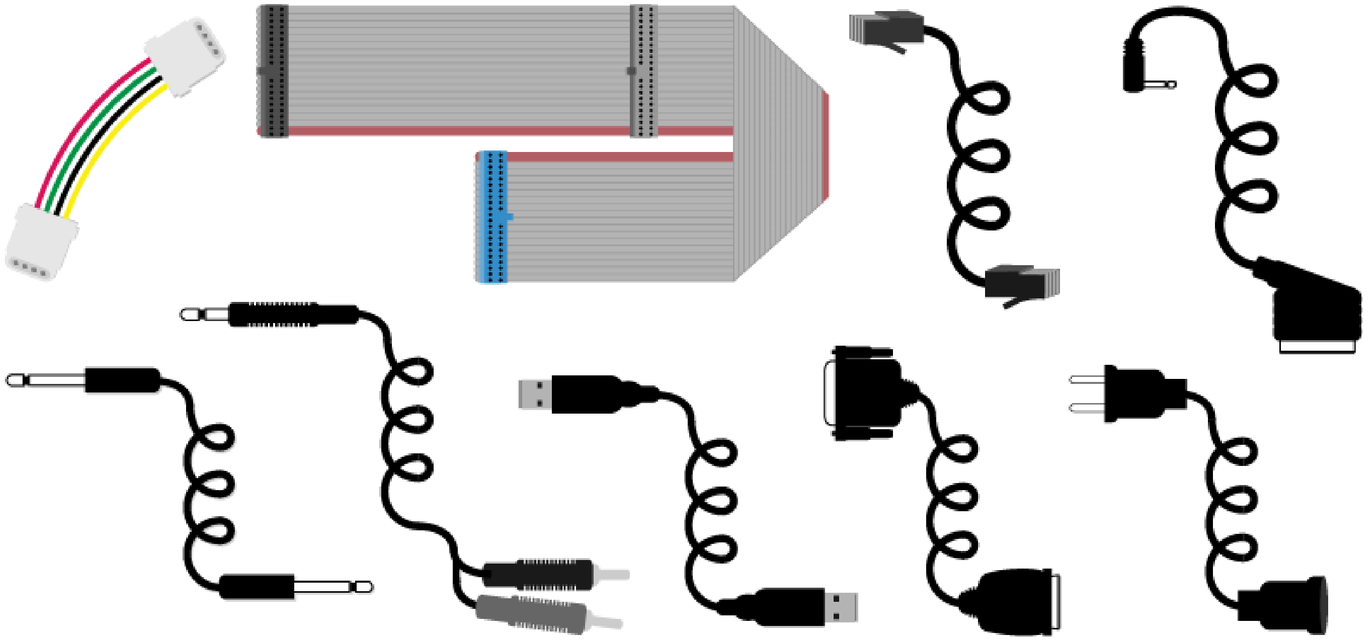


Adapter Pattern

STRUCTURAL

Adapter Pattern Introduction

Adapter is a structural pattern that allows two incompatible interfaces work together. The object that joins these unrelated interface is called an Adapter.



Adapter Design Pattern

INTENT

- Adopt an interface to a new client interface.
- Wrap an old existing class with a new interface.

PROBLEM

- Reusing an already existed component but its representation is not compatible with your architecture.

STRUCTURE

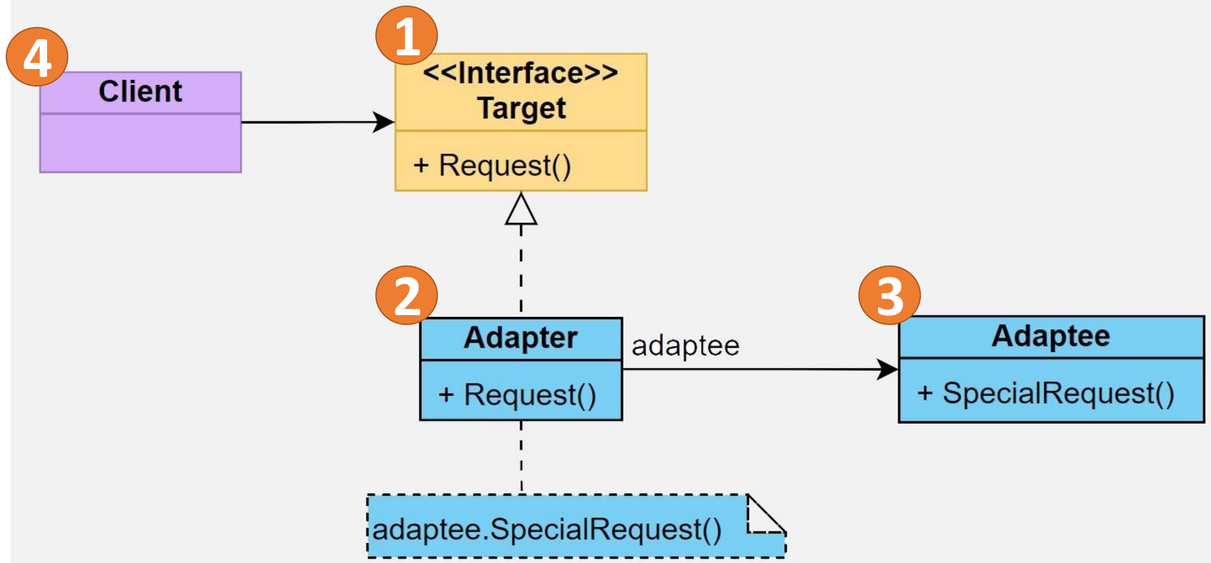
Class Adapter
(via Java Inheritance)

Object Adapter
(via Java Composition)

Adapter Design Pattern: Structures

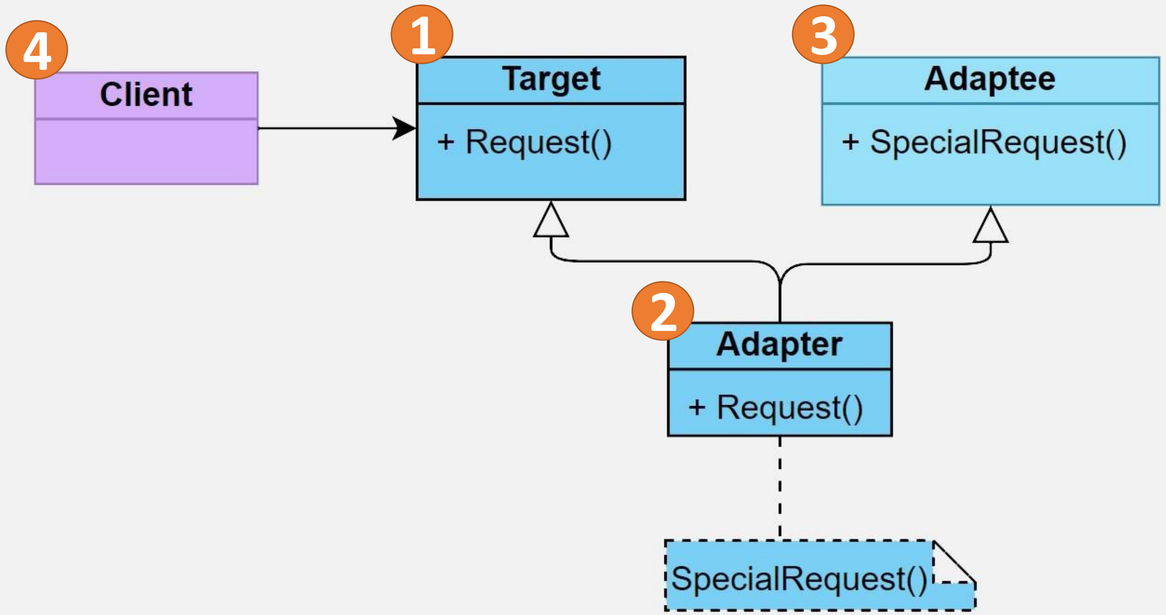
STRUCTURE: Object Adapter

- 1- Target
- 2- Adapter (Uses **composition**)
- 3- Adaptee
- 4- Client



STRUCTURE: Class Adapter

- 1- Target
- 2- Adapter (Uses **inheritance**)
- 3- Adaptee
- 4- Client



Any Question

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