



Προσχεδιασμένος & ευέλικτος προγραμματισμός



S.O.L.I.D Principles

Introduced by Robert Martin (Uncle Bob), named by Michael Feathers

- Make code maintainable
- Add new functionality without breaking the existing ones
- Read & understand code easier, spend more time on develop than on figuring how things work



S.O.L.I.D Principles

Single Responsibility

Open-Closed

Liskov Substitution

Interface Segregation

Dependency Inversion



Single Responsibility Principle

A class should have one and only one reason to change, meaning that a class should have only one job.

Single Responsibility Principle

```
public class AreaCalculator{
    public AreaCalculator() {}

    public <T> double sum(List<T> shapes) {
        double sum = 0;
        for (var shape: shapes) {
            if(shape.getClass().getName().equals("Circle"))
            {
                Circle c = (Circle) shape;
                sum += Math.PI * Math.pow(c.radius(), 2);
            } else if
            (shape.getClass().getName().equals("Square")) {
                Square c = (Square) shape;
                sum += Math.pow(c.length(), 2);
            }
        }
        return sum;
    }
}
```

```
public class Circle {
    public int radius;

    public Circle(int radius) {
        this.radius = radius;
    }
}

public class Output {
    public Output() {}

    public void defaultOutput(double value) {
        System.out.println(value);
    }

    public void detailedOutput(double value) {
        System.out.println("The calculated area is: "
+value);
    }
}
```

```
public class Square {
    public int length;

    public Square(int length) {
        this.length = length;
    }
}

public static void main(String[] args) {
    List<Object> shapes = Arrays.asList(
        new Circle(3), new Square(7));

    AreaCalculator calculator = new AreaCalculator();
    Output output = new Output();

    double sum = calculator.sum(shapes);
    output.defaultOutput(sum);
    output.detailedOutput(sum);
}
```



Single Responsibility Principle

- Code is easier to expand
- Code is easier to maintain
- Reduces the possibility of bugs
- Facilitating debugging processes
- Reduces unexpected side-effects
- better organization of the project



Open-Closed Principle

Software entities (classes, modules, functions, etc.) should be able for extension, but closed for modification.

Open-Closed Principle

```
public class AreaCalculator{
    public AreaCalculator() {}

    public <T> double sum(List<T> shapes) {
        double sum = 0;
        for (var shape: shapes) {
            if(shape.getClass().getName().equals("Circle"))
            {
                Circle c = (Circle) shape;
                sum += c.area();
            } else if(shape.getClass().getName().
                equals("Square")) {
                Square c = (Square) shape;
                sum += c.area();
            }
        }
        return sum;
    }
}
```

```
public class Circle {
    private int radius;
    public Circle(int radius) {
        this.radius = radius;
    }
    public double area() {
        return Math.PI * Math.pow(radius, 2);
    }
}

public class Square {
    private int length;
    public Square(int length) {
        this.length = length;
    }
    public double area() {
        return Math.pow(length, 2);
    }
}
```



Open-Closed Principle

- Reduces possible errors
- Allows extended testing
- Extend existing code
- Deploy new code only



Liskov Substitution Principle

Let $q(x)$ be a property provable about objects of x of type T . Then $q(y)$ should be provable for objects y of type S where S is a subtype of T .

Derived classes must be substitutable for their base classes.

Liskov Substitution Principle

```
public class AreaCalculator {
    private List<Object> shapes;
    public AreaCalculator() {}
    public AreaCalculator(List<Object> shapes) {
        this.shapes = shapes;
    }
    public double sum() {
        double sum = 0;
        for (var shape: shapes) {
            if(shape.getClass().getName().equals("Circle")) {
                Circle c = (Circle) shape;
                sum += c.area();
            }
            else if(shape.getClass().getName().equals("Square")) {
                Square c = (Square) shape;
                sum += c.area();
            }
        }
        return sum;
    }
}
```

```
public class VolumeCaluator extends AreaCalculator{
    private List<Object> shapes;
    public VolumeCaluator(List<Object> shapes) {
        this.shapes = shapes;
    }
    @Override
    public double sum() {
        double sum = 0;
        for (var shape: shapes) {
            System.out.println(shape.getClass().getName());
            if (shape.getClass().getName().equals("Circle")) {
                Circle c = (Circle) shape;
                sum += c.volume();
            } else if (shape.getClass().getName().equals("Square")) {
                Square c = (Square) shape;
                sum += c.volume();
            }
        }
        return sum;
    }
}
```



Liskov Substitution Principle

- Offers consistency on using parent classes or its subclasses without any errors
- Loose coupled code



Interface Segregation Principle

Many client-specific interfaces are better than one general-purpose interface.

Interface Segregation Principle

```
public class AreaCalculator {
    private List<IShape> shapes;
    public AreaCalculator() {

    }

    public AreaCalculator(List<IShape> shapes) {
        this.shapes = shapes;
    }

    public double sum() {
        double sum = 0;

        for (var shape : shapes) {
            sum += shape.area();
        }
        return sum;
    }
}
```

```
public interface IShape {
    public double area();
    public double volume();
}

public class Circle implements IShape {
    private int radius;
    public Circle(int radius) {
        this.radius = radius;
    }

    public double area() {
        return Math.PI * Math.pow(radius, 2);
    }

    public double volume() {
        return Math.PI * Math.pow(radius, 3);
    }
}
```

```
public class Circle implements IShape {
    private int radius;
    public Circle(int radius) { this.radius = radius; }
    public double area() {
        return Math.PI * Math.pow(radius, 2);
    }
    public double volume() {
        return Math.PI * Math.pow(radius, 3);
    }
}

public static void main(String[] args) {
    List<IShape> shapes = Arrays.asList(
        new Circle(3), new Square(7));
    AreaCalculator calculator = new
        AreaCalculator(shapes);
    SumOutput output = new SumOutput(calculator);
    output.defaultOutput();
    output.detailedOutput();
}
```



Interface Segregation Principle

- Simplifies the code
- Prevention of coupling
- reduce the required changes
- Reduces the possibility of bugs
- Facilitating debugging processes



Dependency Inversion Principle

Depend on abstractions, not on concretions.

Dependency Inversion Principle

```
public interface ICalculator {
    public double sum();
}

public class AreaCalculator implements ICalculator {
    private List<IShape> shapes;

    public AreaCalculator() {
    }

    public AreaCalculator(List<IShape> shapes) {
        this.shapes = shapes;
    }

    public double sum() {
        double sum = 0;
        for (var shape : shapes) {
            sum += shape.area();
        }
        return sum;
    }
}
```

```
public class SumOutput {
    private ICalculator calculator;
    public SumOutput(ICalculator calculator) {
        this.calculator = calculator;
    }
    public void defaultOutput() {
        System.out.println(calculator.sum());
    }
    public void detailedOutput() {
        System.out.println("The value is: " + calculator.sum());
    }
}

public static void main(String[] args) {
    List<IShape> shapes = Arrays.asList(new Circle(3), new
    Square(7));
    SumOutput output = new SumOutput(new
    AreaCalculator(shapes));
    output.defaultOutput();
}
}
```



Dependency Inversion Principle

- Change an implementation easily
- Changes in one component does not affect others
- Reuse components across multiple applications



“the representatives of things do not share the relationship of the things they represent”

Robert C. Martin (Uncle Bob)



Thank you

