

Refactoring, S.O.L.I.D. Principles and Simple Design



Dario Campagna

Head of Research



S.O.L.I.D. Principles

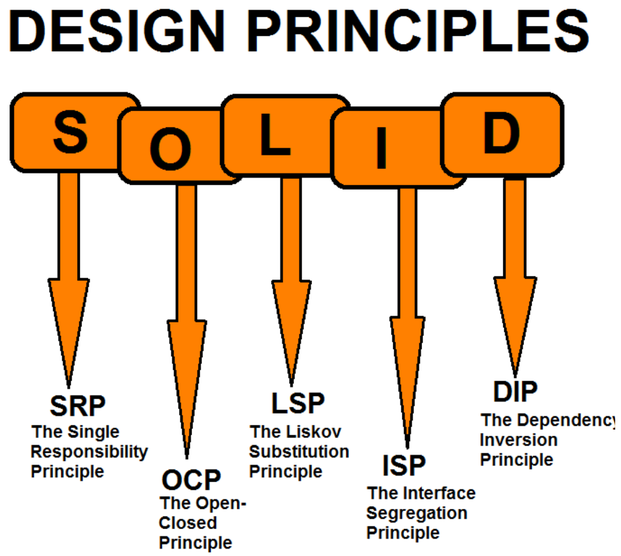
Principle of class design



S.O.L.I.D. Principles

Principle of class design that focus very tightly on dependency management.

- Single Responsibility Principle
- Open-closed Principle
- Liskov Substitution Principle
- Interface Segregation Principle
- Dependency Inversion Principle



Single Responsibility Principle

Every object should have a single responsibility, and that responsibility should be entirely encapsulated by the class.

- We want classes to be cohesive
- Only one reason to change
- Can be applied to methods too

```
public class Rectangle {

    private double width;
    private double height;
    private Graphics graphics;

    // ...

    public double area() {
        return width * height;
    }

    public void draw() {
        // Do something with Graphics
    }

}
```



Single Responsibility Principle

Move responsibilities to other (new) classes.

- Composition over inheritance
- Move related behaviors close to each other

```
public class GeometricRectangle {

    private double width;
    private double height;

    public double area() {
        return width * height;
    }

}

public class Rectangle {

    private GeometricRectangle geometricRectangle;
    private Graphics graphics;

    // ...

    public void draw() {
        // Draw geometricRectangle using Graphics
    }

}
```



Open-Closed Principle

Software entities should be open for extension, but closed for modification.

- Minimize changes to existing code when adding new behavior
- Take advantage of object composition and polymorphism

```
public class Shape {
    // ...
}

public class Rectangle extends Shape {
    // ...
}

public class Circle extends Shape {
    // ...
}

public class GraphicEditor {

    public void drawShape(Shape s) {
        if (s instanceof Rectangle) {
            drawRectangle((Rectangle) s);
        } else if (s instanceof Circle) {
            drawCircle((Circle) s);
        }
    }

    public void drawRectangle(Rectangle rectangle) {
        // ...
    }

    public void drawCircle(Circle c) {
        // ...
    }

}
```

Open-Closed Principle

Introduce abstraction.

- Law of Demeter
- Move responsibilities

```
public abstract class Shape {

    // ...

    public abstract void draw();

}

public class Rectangle extends Shape {

    // ...

    @Override
    public void draw() {
        // Draw the rectangle
    }

}

public class Circle extends Shape {

    // ...

    @Override
    public void draw() {
        // Draw the circle
    }

}

public class GraphicEditor {

    public void drawShape(Shape s) {
        s.draw();
    }

}
```



Dependency Inversion Principle

High level classes should not depend on low level classes.

- We want a flexible design
- We want to easily replace low level classes
- We want low coupling

```
public class Human {

    public void work() {
        // ...working
    }

}

public class Manager {

    private Human worker;

    public void setWorker(Human worker) {
        this.worker = worker;
    }

    public void manage() {
        worker.work();
    }
}

public class Robot {

    public void work() {
        // ...working longer
    }

}
```



Dependency Inversion Principle

Introduce an abstraction that decouples the high-level and low-level classes from each other.

- High level classes depends on abstractions
- Low level classes are created based on abstractions

```java
public interface Worker {

    void work();

}

public class Human implements Worker {

    public void work() {
        // ...working
    }

}

public class Robot implements Worker {

    public void work() {
        // ...working much more
    }

}

public class Manager {

    private Worker worker;

    public void setWorker(Worker worker) {
        this.worker = worker;
    }
    public void manage() {
        worker.work();
    }

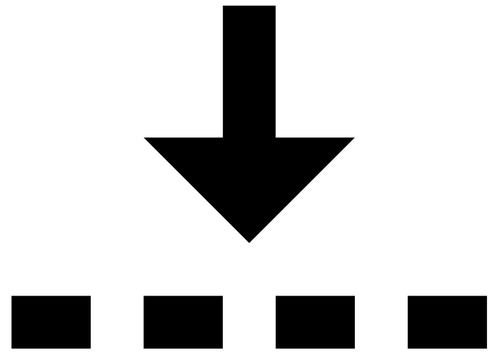
}
```



Examples of Dependency Inversion Principle violation

Four high-level classes that depends on low-level classes.

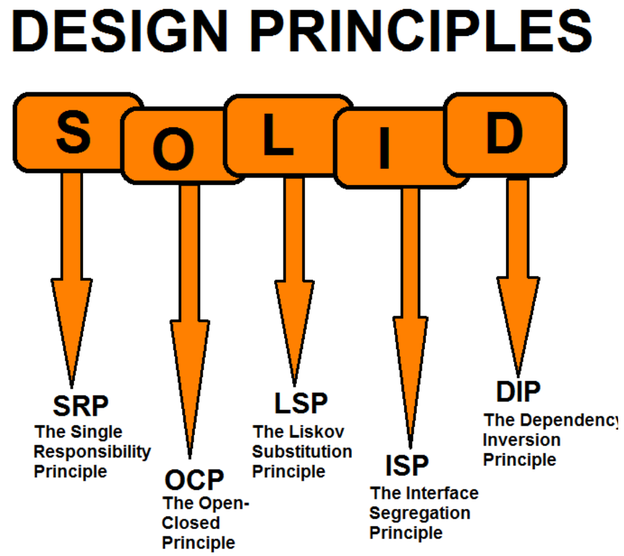
- ConsoleIO
- ConsoleUI
- StartingMenu
- GridInitializer



Exercises

Let’s put S.O.L.I.D. principles into practice.

- Find principle violations in this project https://github.com/bebosudo/it.units.muli.poker
- Work on the Tennis Refactoring Kata, use S.O.L.I.D. principles (and all the other concepts) when refactoring.







Simple Design

A goal/guide when refactoring



Simple Design

According to Kent Beck, a design is “simple” if it follows this guidelines:

1. Passes the tests
2. Minimizes duplication
3. Reveals its intents
4. Has fewer classes/modules/packages…



The Simple Design Dynamo

Removing duplication and revealing intent/ increasing clarity quickly form a rapid, tight feedback cycle.

Putting An Age-Old Battle To Rest, J.B. Rainsberger

- When we remove duplication, we create buckets.
- When we improve names, we create more cohesive, more easily-abstracted buckets.

