Java best practice

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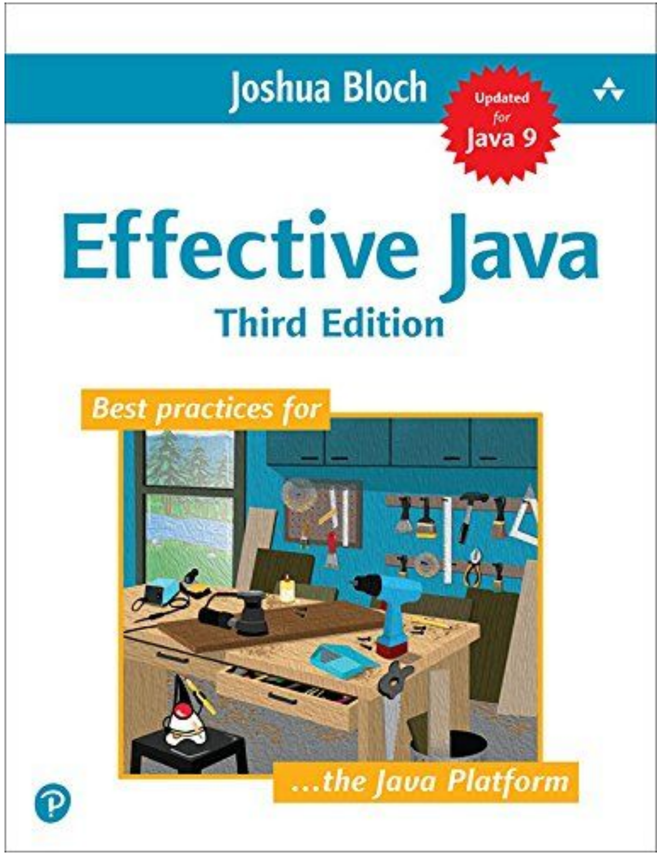
Special thanks

This presentation was made from the ideas of Joshua Bloch’s Efficicetive Java 3rd Edition, 2018



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The problem with constructors

```
public class RandomIntGenerator {
    private final int min;
    private final int max;

    public int next() {...}
}
```

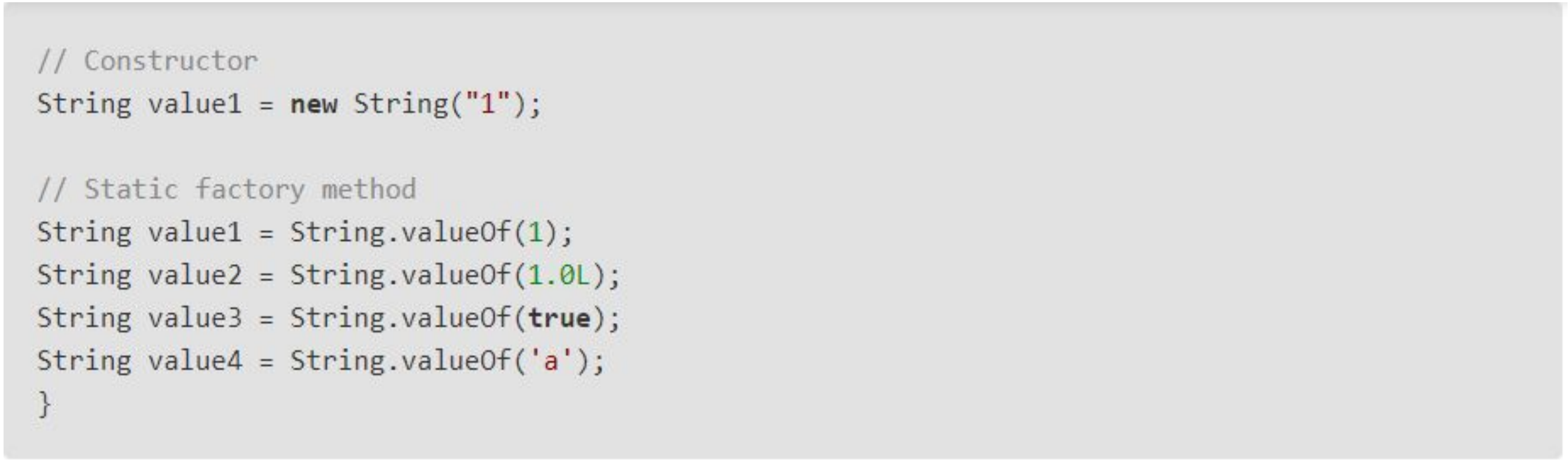
The problem with constructors

```java
public class RandomIntGenerator {
    private final int min;
    private final int max;

    public int next() {...}

    public RandomIntGenerator(int min, int max) {
    this.min = min;
    this.max = max;
    }
    public RandomIntGenerator(int min) {
    this.min = min;
    this.max = Integer.MAX_VALUE;
    }
    //Compilation error
    public RandomIntGenerator(int max) {
    this.min = Integer.MIN_VALUE;
    this.max = max;
    }

}
```

Solution - static factory method

```
public class RandomIntGenerator {
    private final int min;
    private final int max;

    private RandomIntGenerator(int min, int max) {
        this.min = min;
        this.max = max;
    }

    public static RandomIntGenerator between(int max, int min) {
        return new RandomIntGenerator(min, max);
    }

    public static RandomIntGenerator biggerThan(int min) {
        return new RandomIntGenerator(min, Integer.MAX_VALUE);
    }

    public static RandomIntGenerator smallerThan(int max) {
        return new RandomIntGenerator(Integer.MIN_VALUE, max);
    }

    public int next() {...}
}
```

1- Constructors vs factory method

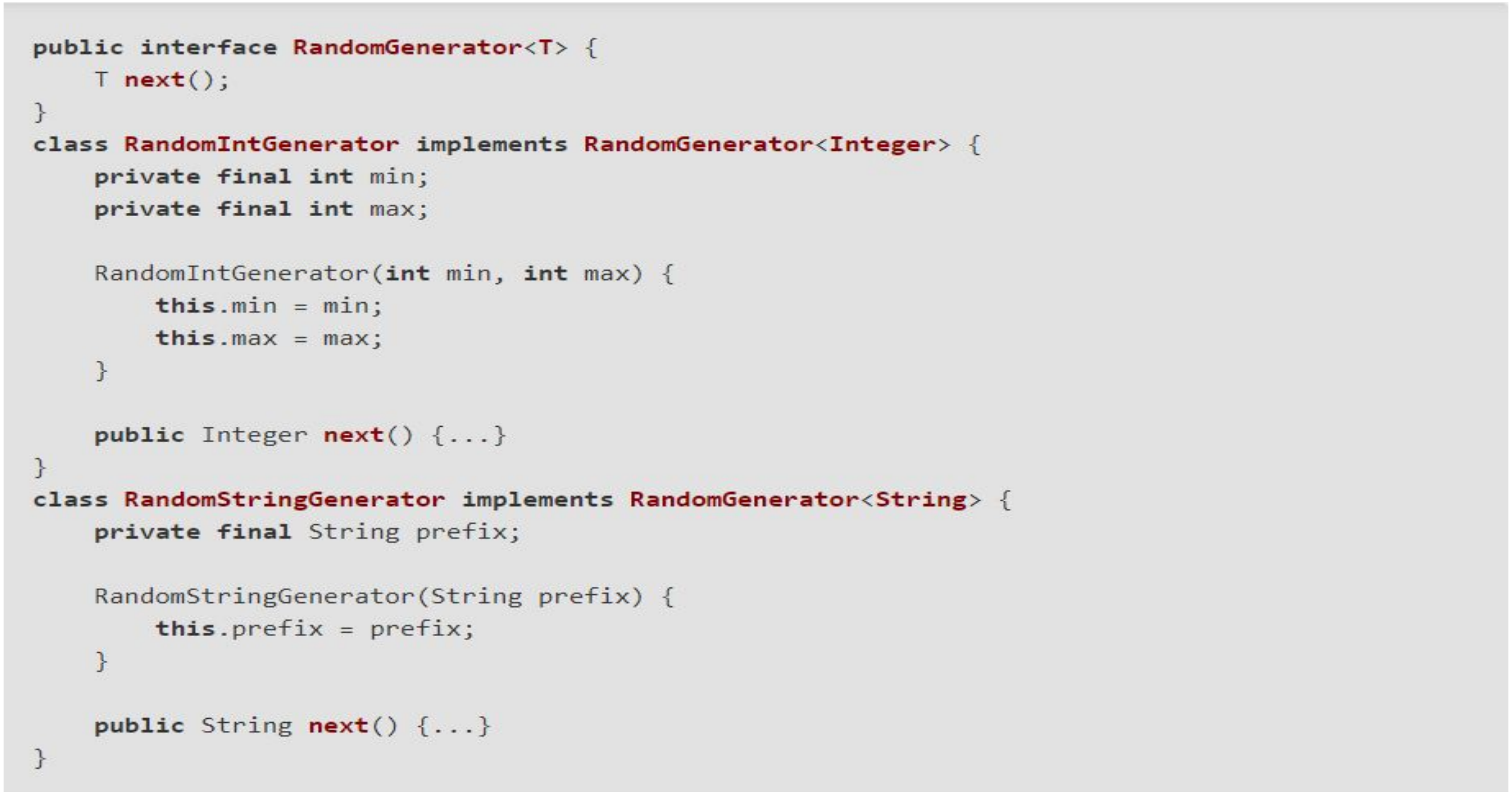


```
// Constructor
String value1 = new String("1");

// Static factory method
String value1 = String.valueOf(1);
String value2 = String.valueOf(1.0L);
String value3 = String.valueOf(true);
String value4 = String.valueOf('a');
}
```

1- Why static factory methods?

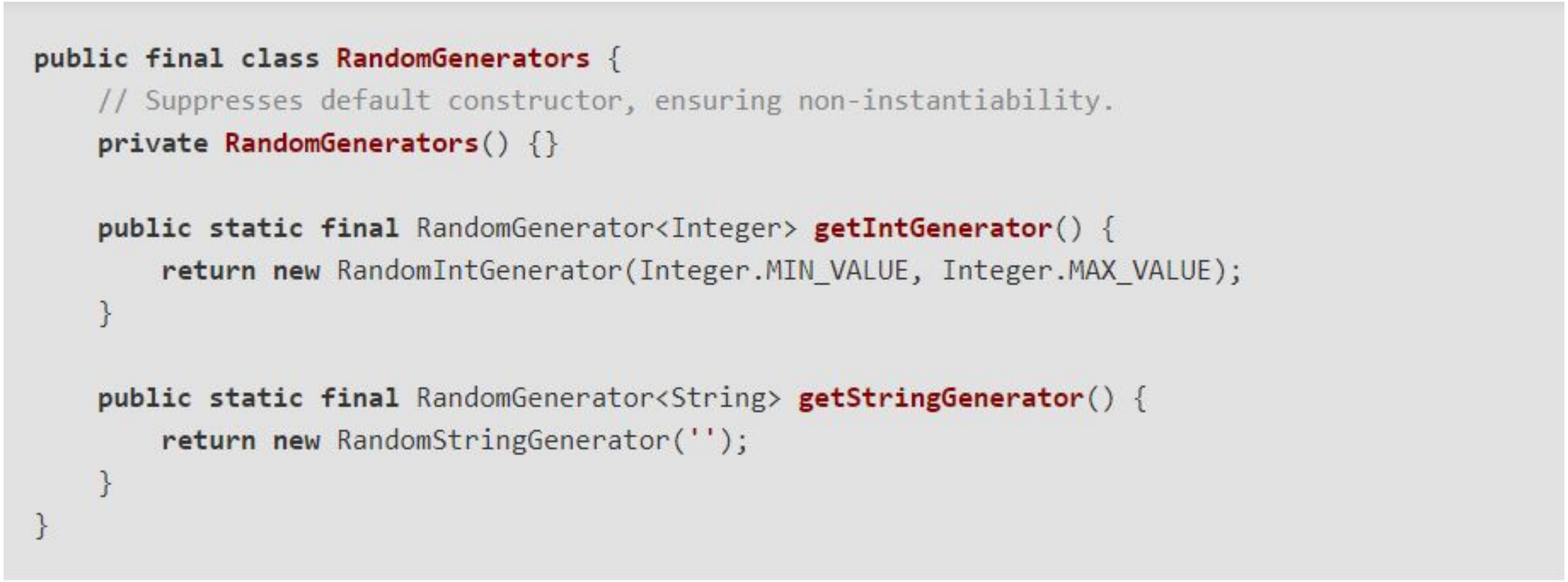
- Methods have name, Constructors not.
- Returns same object from repeated invocations
- Can return an object of any subtype of their return type
- Move logic out of constructor

1- Why static factory methods?



```java
public interface RandomGenerator<T> {
    T next();
}
class RandomIntGenerator implements RandomGenerator<Integer> {
    private final int min;
    private final int max;

    RandomIntGenerator(int min, int max) {
        this.min = min;
        this.max = max;
    }

    public Integer next() {...}
}
class RandomStringGenerator implements RandomGenerator<String> {
    private final String prefix;

    RandomStringGenerator(String prefix) {
        this.prefix = prefix;
    }

    public String next() {...}
}
```

1- Why static factory methods?



```java
public final class RandomGenerators {
    // Suppresses default constructor, ensuring non-instantiability.
    private RandomGenerators() {}

    public static final RandomGenerator<Integer> getIntGenerator() {
        return new RandomIntGenerator(Integer.MIN_VALUE, Integer.MAX_VALUE);
    }

    public static final RandomGenerator<String> getStringGenerator() {
        return new RandomStringGenerator('');
    }
}
```

1- Why static factory methods?

```java
public class User {

    private static final Logger LOGGER = Logger.getLogger(User.class.getName());
    private final String name;
    private final String email;
    private final String country;

    // standard constructors / getters

    public static User createWithLoggedInstantiationTime(
      String name, String email, String country) {
        LOGGER.log(Level.INFO, "Creating User instance at : {0}", LocalTime.now());
        return new User(name, email, country);
    }
}
```

1- Limitations

- **Classes without public or protected constructors cannot be subclassed**
- **Difficult to find in document**

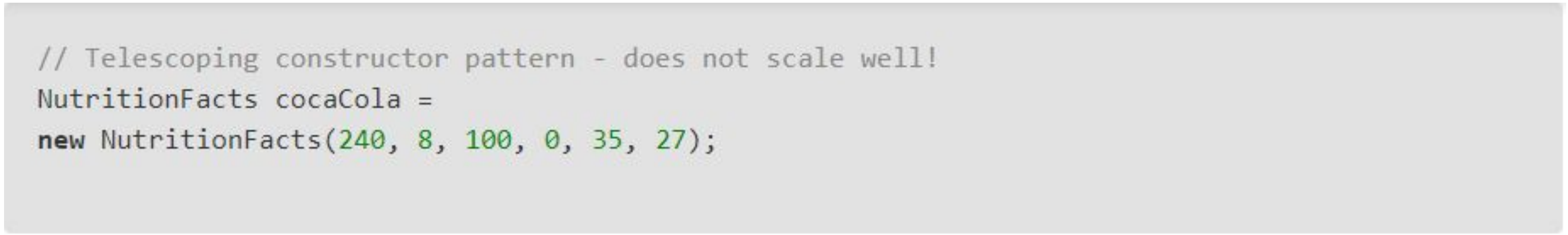
Consider a builder when faced with many constructor parameters

The problem

- Both static factory method and constructor does not scale well to large number of parameters

=> Traditional approach: Telescoping constructor pattern

Telescoping constructor

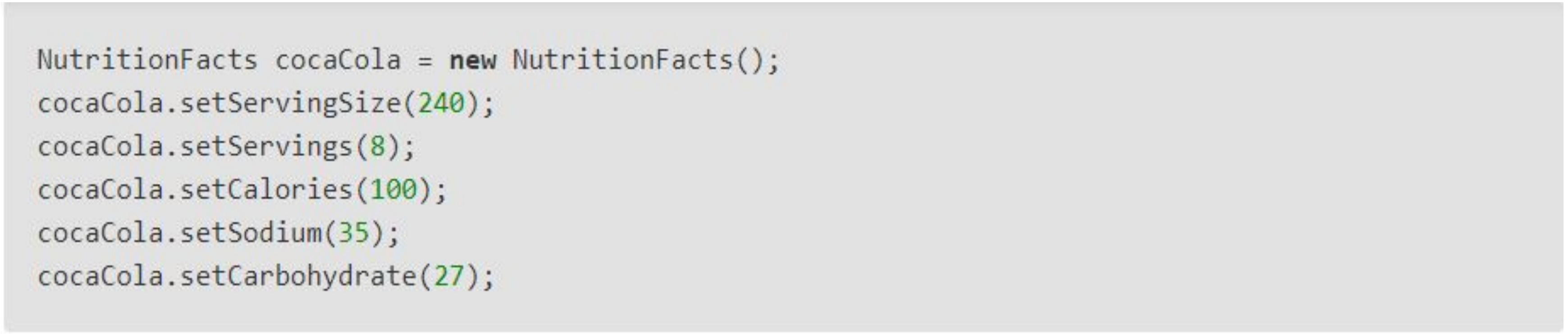


```
// Telescoping constructor pattern - does not scale well!
NutritionFacts cocaCola =
new NutritionFacts(240, 8, 100, 0, 35, 27);
```

- **When number of paramters increase, hard to write client code**
- **Hard to read**

=> Another solution: JavaBean pattern

Java Bean pattern

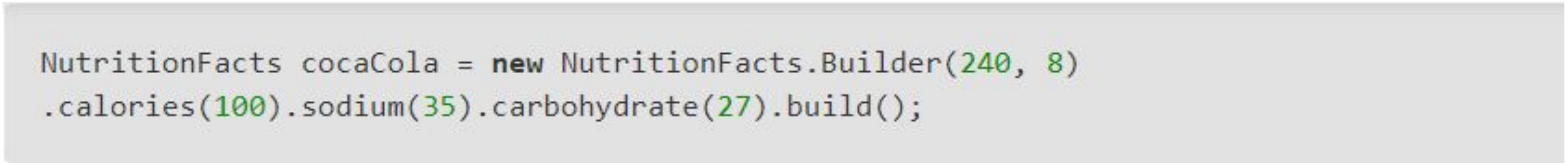


```
NutritionFacts cocaCola = new NutritionFacts();
cocaCola.setServingSize(240);
cocaCola.setServings(8);
cocaCola.setCalories(100);
cocaCola.setSodium(35);
cocaCola.setCarbohydrate(27);
```

Limitation: a JavaBean may be in an inconsistent state partway through its construction => Class must be mutable

=> Final solution: Builder pattern

Builder pattern



```
NutritionFacts cocaCola = new NutritionFacts.Builder(240, 8)
.calories(100).sodium(35).carbohydrate(27).build();
```

- Easy to read
- Work with immutable classes
- Scale friendly