SWEN20003

Workshop 10, Week 11

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Part 1: Event-driven programming

A modern paradigm

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- **Event-driven:** behaviour defined by responses to **events**

Example

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User clicks “save”	Data saved to disk
Network disconnected	Retry connection

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- Event-driven programming de-couples **event creation** from **event handling**.
- In Java: often use the **Observer** design pattern.

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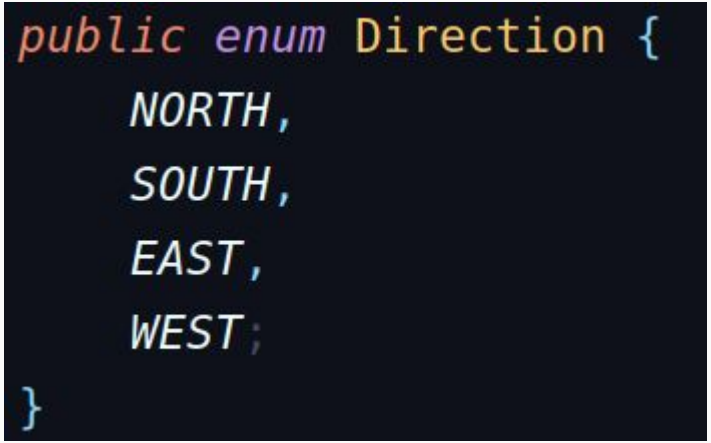
- Not well-supported in Java; see `java.util.concurrent`

Part 2: Enumerated types

What is an enum?

- A class with **a set number of** instances

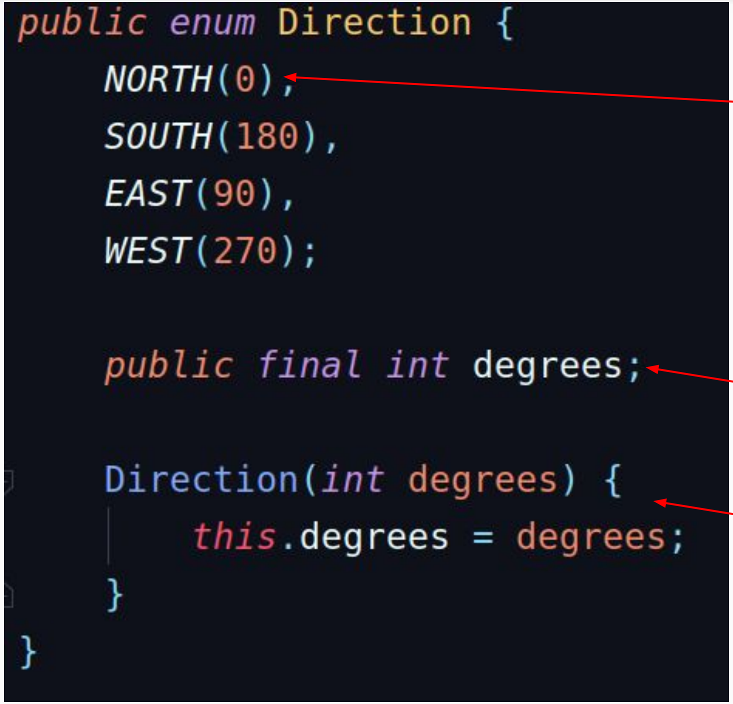


```java
public enum Direction {
    NORTH,
    SOUTH,
    EAST,
    WEST;
}
```

Why enum?

- More clearly express intent
- Better than `String` with constants: invalid values are syntax errors

Enums are classes



```java
public enum Direction {
    NORTH(0),
    SOUTH(180),
    EAST(90),
    WEST(270);

    public final int degrees;

    Direction(int degrees) {
        this.degrees = degrees;
    }
}
```

calling the constructor

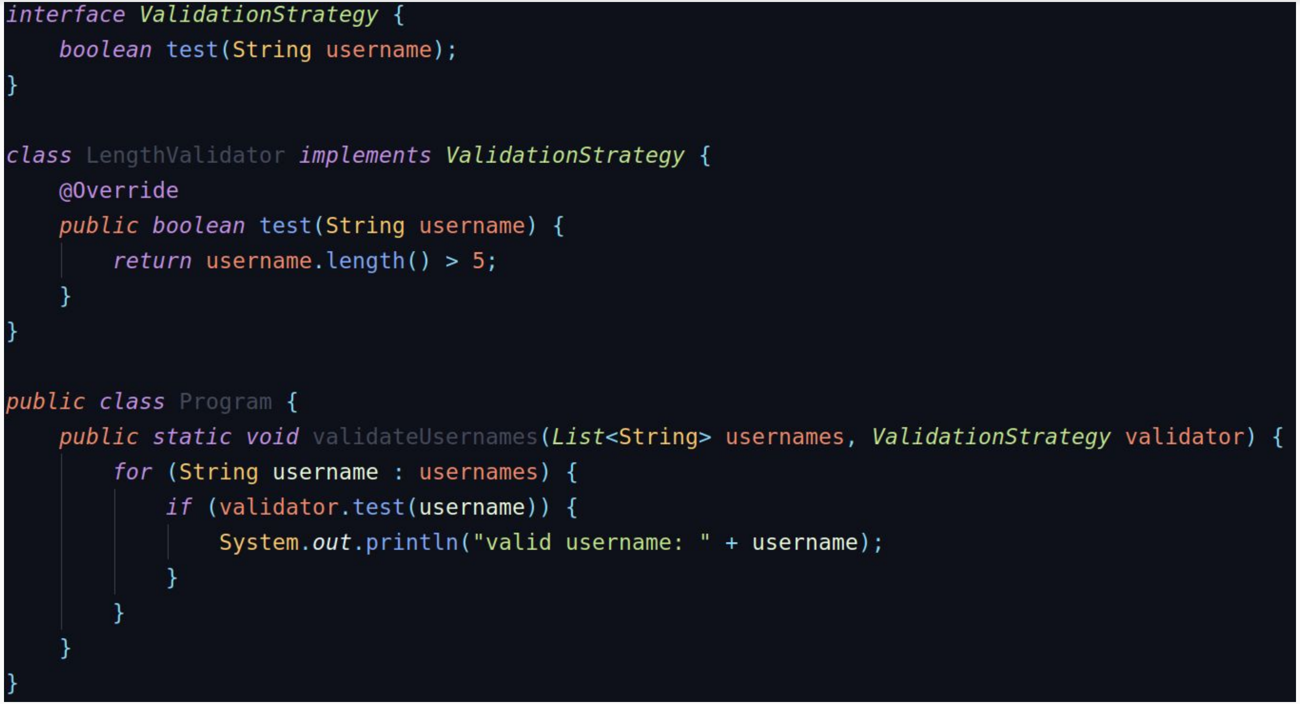
attribute

constructor

Can you think of examples?

Part 3: Functional Java with streams

The Strategy pattern

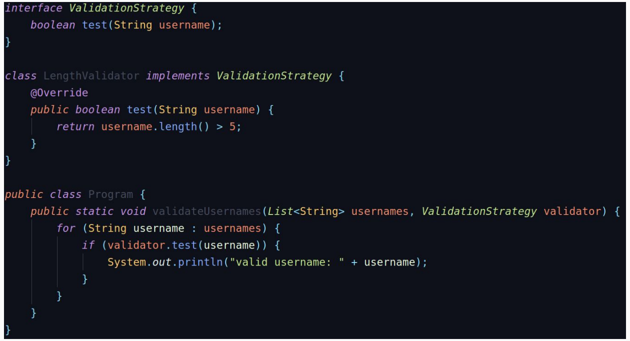


```java
interface ValidationStrategy {
    boolean test(String username);
}

class LengthValidator implements ValidationStrategy {
    @Override
    public boolean test(String username) {
        return username.length() > 5;
    }
}

public class Program {
    public static void validateUsernames(List<String> usernames, ValidationStrategy validator) {
        for (String username : usernames) {
            if (validator.test(username)) {
                System.out.println("valid username: " + username);
            }
        }
    }
}
```

The Strategy pattern



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interface ValidationStrategy {
    boolean test(String username);
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    @Override
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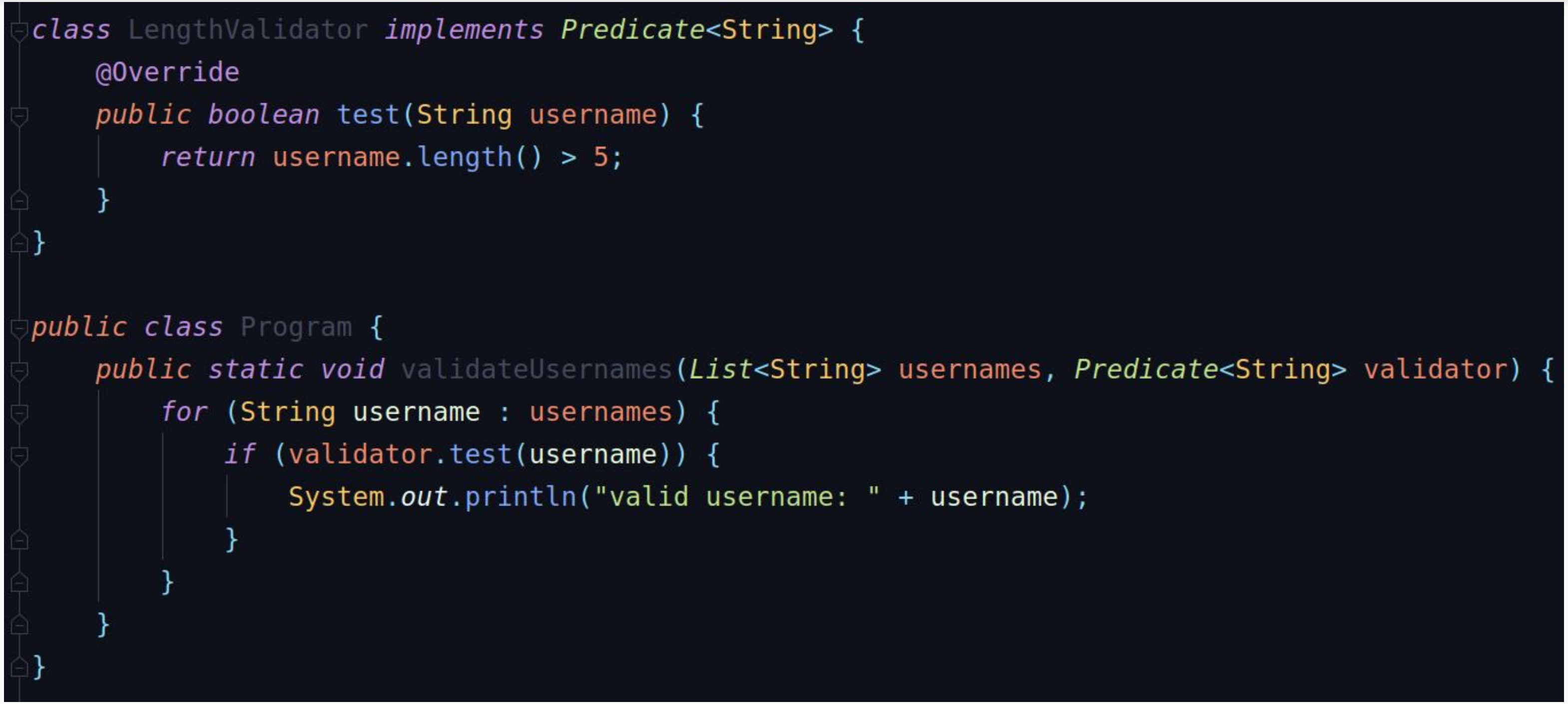
                System.out.println("valid username: " + username);
            }
        }
    }
}
```

- A strategy to test a condition is so common that it’s built in: `Predicate<T>`

The Strategy pattern



```java
class LengthValidator implements Predicate<String> {
    @Override
    public boolean test(String username) {
        return username.length() > 5;
    }
}

public class Program {
    public static void validateUsernames(List<String> usernames, Predicate<String> validator) {
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            }
        }
    }
}
```
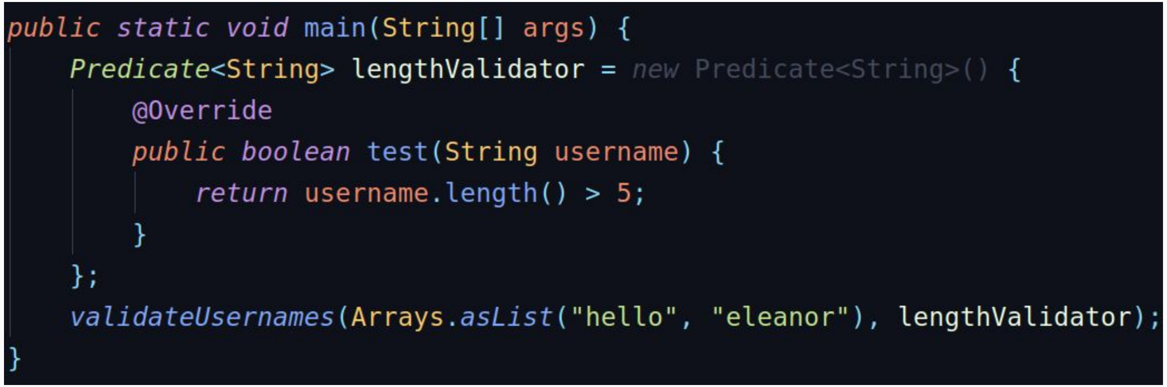

Anonymous classes

- A class that is only used once adds unnecessary complexity.

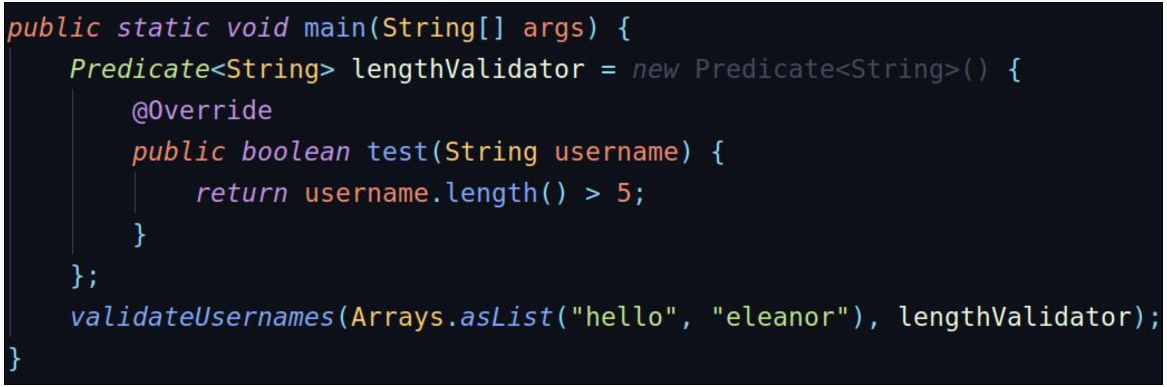


```java
public static void main(String[] args) {
    Predicate<String> lengthValidator = new Predicate<String>() {
        @Override
        public boolean test(String username) {
            return username.length() > 5;
        }
    };
    validateUsernames(Arrays.asList("hello", "eleanor"), lengthValidator);
}
```

- lengthValidator is an instance of an **anonymous class**.

A further simplification

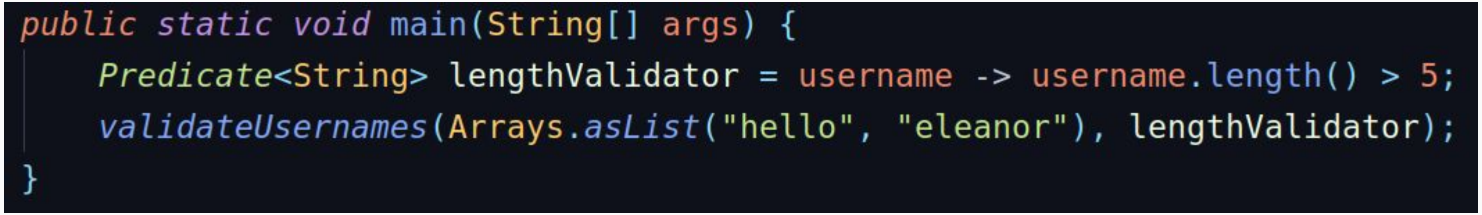
- Notice that we use lengthValidator *as though it were a function*!



```java
public static void main(String[] args) {
    Predicate<String> lengthValidator = new Predicate<String>() {
        @Override
        public boolean test(String username) {
            return username.length() > 5;
        }
    };
    validateUsernames(Arrays.asList("hello", "eleanor"), lengthValidator);
}
```

A further simplification: lambda functions

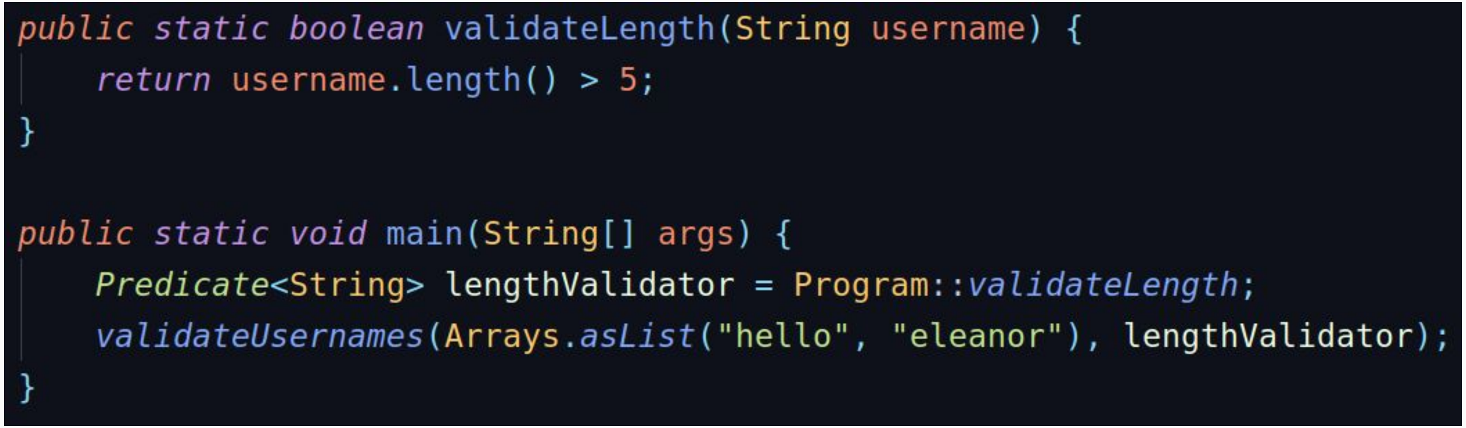
- Notice that we use lengthValidator *as though it were a function*!
- Introduce **lambda functions:** anonymous classes that act like functions.



```
public static void main(String[] args) {
    Predicate<String> lengthValidator = username -> username.length() > 5;
    validateUsernames(Arrays.asList("hello", "eleanor"), lengthValidator);
}
```

Method references

- We can also use existing methods as though they were anonymous classes (similar to **function pointers**).



```
public static boolean validateLength(String username) {
    return username.length() > 5;
}

public static void main(String[] args) {
    Predicate<String> lengthValidator = Program::validateLength;
    validateUsernames(Arrays.asList("hello", "eleanor"), lengthValidator);
}
```

Demonstration of Java streams using lambda functions