Lambdas

Lambdas in Java

- ▶ Lambda expression express instances of *functional interface*, an interface with a single abstract method.
- ▶ Lambda expressions provide the following:
  - ▶ Treat functionality as a method argument or code as data
  - ▶ Allow us to create a function without belonging to any class
  - ▶ An expression that can be passed around as if it were an object and executed on demand
  - ▶ Simpler than anonymous classes with a single method. However Lambdas do not have state but anonymous classes may

Lambda Expression Syntax

► A zero-parameter lambda expression:

```
() -> System.out.println("Zero parameter lambda");
```

► A one-parameter lambda expression:

```
(p) -> System.out.println("One parameter: " + p);
//() is optional for one parameter
//if the type can be inferred from the context
p -> System.out.println("One parameter: " + p);
```

► A two-parameter lambda expression.

```
(p, q) -> System.out.println("Multiple parameters: "
        + p + q);
```

► See example: SimpleLambdas.java in class repo

Storing Lambdas

- ▶ Lambdas can be stored as a string and then executed.
- ▶ To use a lambda expression in a method, the method should have a parameter with a single-method interface as its type. Calling the interface's run method will run the lambda expression.
- ▶ Example: StoringLambdasExample1.java
- ▶ Example: StoringLambdasExample2.java (stick it in a hash table!)
- ▶ We can also pass lambda expression to threads. See example: ThreadLambdaExample1.java

Method References (1)

▶ Consider the following typical use of a lambda.

```
public interface MyPrinter{
    public void print(String s);
}
MyPrinter myPrinter = s -> System.out.println(s);
```

▶ The lambda can be replaced by a reference to the `println` method as it simply forwards the string parameter to the `println` method. The double-colon tells the compiler that what follows is a reference to a method.

```
MyPrinter myPrinter = System.out::println;
```

▶ Following types of method references may be used:
  ▶ Static method
  ▶ Parameter method
  ▶ Instance method
  ▶ Constructor

Method References (2)

- Static. `ClassName::StaticMethodName`
- Parameter method

```java
public interface Finder {
    public int find(String s1, String s2);
}
Finder finder = String.indexOf;
//Finder finder = (s1, s2) -> s1.indexOf(s2);
```

- Instance method

```java
public interface Deserializer {
    public int deserialize(String v1);
}
public class StringConverter {
    public int convertToInt(String v1){
        return Integer.valueOf(v1);
    }
}
StringConverter stringConverter = new StringConverter();
Deserializer des = stringConverter::convertToInt;
```

- Constructors: use the class name followed by `::new`

```java
public interface Factory {
    public String create(char[] val); // matches String
    constructor
}
Factory factory = String::new;
//Factory factory = chars -> new String(chars);
```

More Examples

- Example: FunctionPtrs.java
- Example: User.java, UserTest.java, UserTestWithLambdas.java