Overview of Functional Interfaces

BiFunction

Douglas C. Schmidt

Learning Objectives in This Lesson

- Recognize foundational functional programming features in Java 8, e.g.,
  - Lambda expressions
  - Method & constructor references
  - Key functional interfaces
    - Predicate
    - Function
    - BiFunction

Interface BiFunction<T,U,R>

Type Parameters:

`T - the type of the first argument to the function`

`U - the type of the second argument to the function`

`R - the type of the result of the function`

All Known Subinterfaces:

`BinaryOperator<T>`

Functional Interface:

`This is a functional interface and can therefore be used as the assignment target for a lambda expression or method reference.`

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Overview of Functional Interfaces: BiFunction

Overview of Common Functional Interfaces: BiFunction

- *BiFunction* applies a computation on two parameters & returns a result, e.g.,
  - `public interface BiFunction<T, U, R> { R apply(T t, U u); }`

See docs.oracle.com/javase/8/docs/api/java/util/function/BiFunction.html

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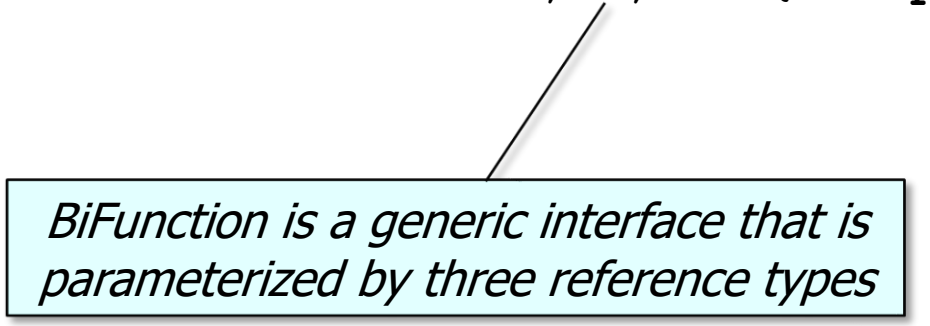

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Its abstract method is passed two parameters of type T & U & returns a value of type R

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```
Map<String, Integer> iqMap =
  new ConcurrentHashMap<String, Integer>() {
    { put("Larry", 100); put("Curly", 90); put("Moe", 110); }
};
```

Create a map of "stooges" & their IQs!

```
for (Map.Entry<String, Integer> entry : iqMap.entrySet())
   entry.setValue(entry.getValue() - 50);
```

vs.

```
iqMap.replaceAll((k, v) -> v - 50);
```

See github.com/douglascraigschmidt/LiveLessons/tree/master/Java8/ex4

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for (Map.Entry<String, Integer> entry : iqMap.entrySet())
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vs.

Conventional way of subtracting 50 IQ points from each stooge in map

```
iqMap.replaceAll((k, v) -> v - 50);
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```

vs.

BiFunction lambda subtracts 50 IQ points from each stooge in map.

```
iqMap.replaceAll((k, v) -> v - 50);
```

See docs.oracle.com/javase/8/docs/api/java/util/concurrent/ConcurrentHashMap.html#replaceAll

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vs.

Unlike Entry operations, replaceAll() operates in a thread-safe manner!

```
iqMap.replaceAll((k, v) -> v - 50);
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See winterbe.com/posts/2015/05/22/java8-concurrency-tutorial-atomic-concurrent-map-examples

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```
class ConcurrentHashMap<K,V> {
  ...
  public void replaceAll
    (BiFunction<? super K, ? super V, ? extends V> function) {
    ...
    for (Node<K,V> p; (p = it.advance()) != null; ) {
      V oldValue = p.val;
      for (K key = p.key;;) {
        V newValue = function.apply(key, oldValue);
        ...
        replaceNode(key, newValue, oldValue)
        ...
```

The replaceAll() method uses the BiFunction passed to it in a thread-safe way.

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        ...
```

```
(k, v) -> v - 50
```

The BiFunction parameter is bound to the lambda expression v – 50.

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        V newValue = function.apply(key, oldValue);
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        replaceNode(key, newValue, oldValue)
        ...
```

`(k, v) -> v - 50`

`V newValue = oldValue - 50`

The apply() method is replaced by the v – 50 BiFunction lambda.