Java Streams: Implementing Pre-defined Non-Concurrent Collectors

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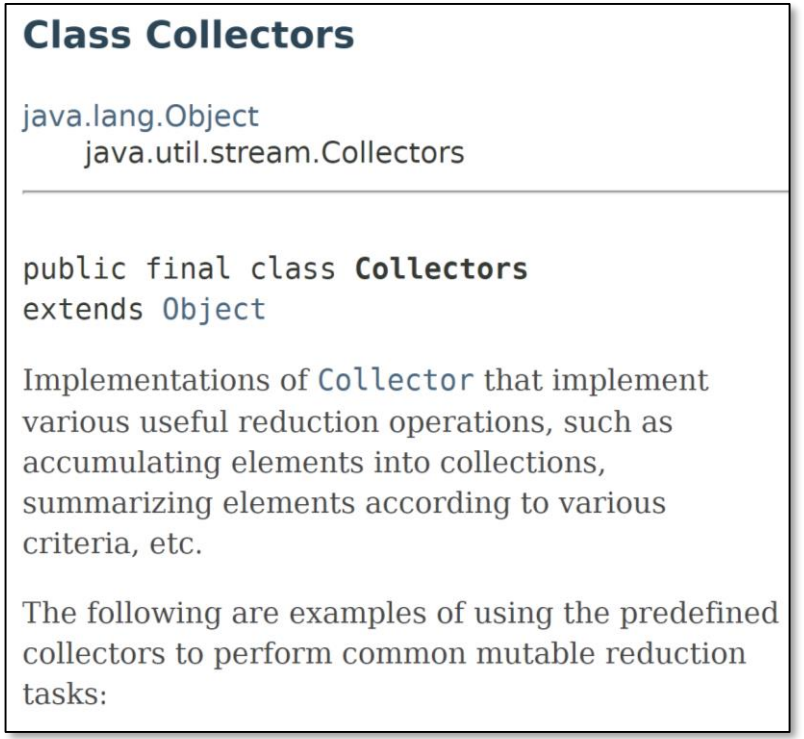
Learning Objectives in this Part of the Lesson

- Understand the structure & functionality of non-concurrent collectors for sequential streams
- Know the API for non-concurrent collectors
- Recognize how pre-defined non-concurrent collectors are implemented in the JDK



Class Collectors

java.lang.Object
    java.util.stream.Collectors

```
public final class Collectors
extends Object
```

Implementations of `Collector` that implement various useful reduction operations, such as accumulating elements into collections, summarizing elements according to various criteria, etc.

The following are examples of using the predefined collectors to perform common mutable reduction tasks:

How Pre-defined Non-Concurrent Collectors are Implemented

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- Collectors is a utility class whose factory methods create collectors for common collection types

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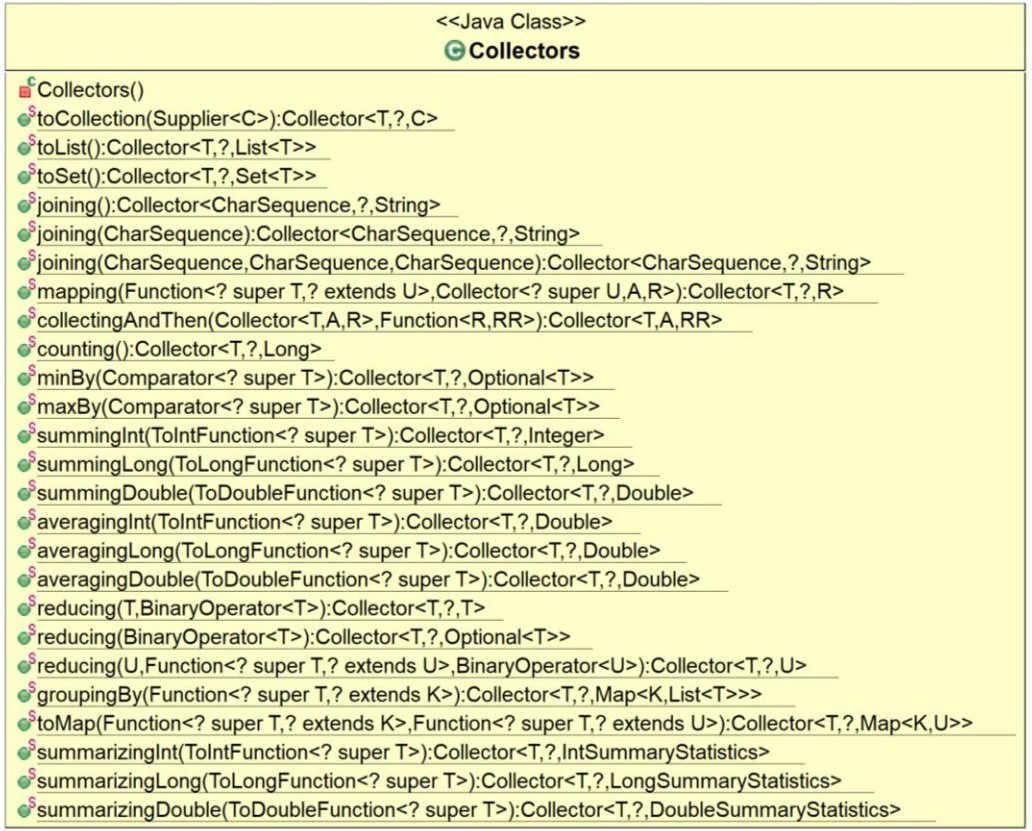
The following are examples of using the predefined collectors to perform common mutable reduction tasks:

See docs.oracle.com/javase/8/docs/api/java/util/stream/Collectors.html

How Pre-defined Non-Concurrent Collectors are Implemented

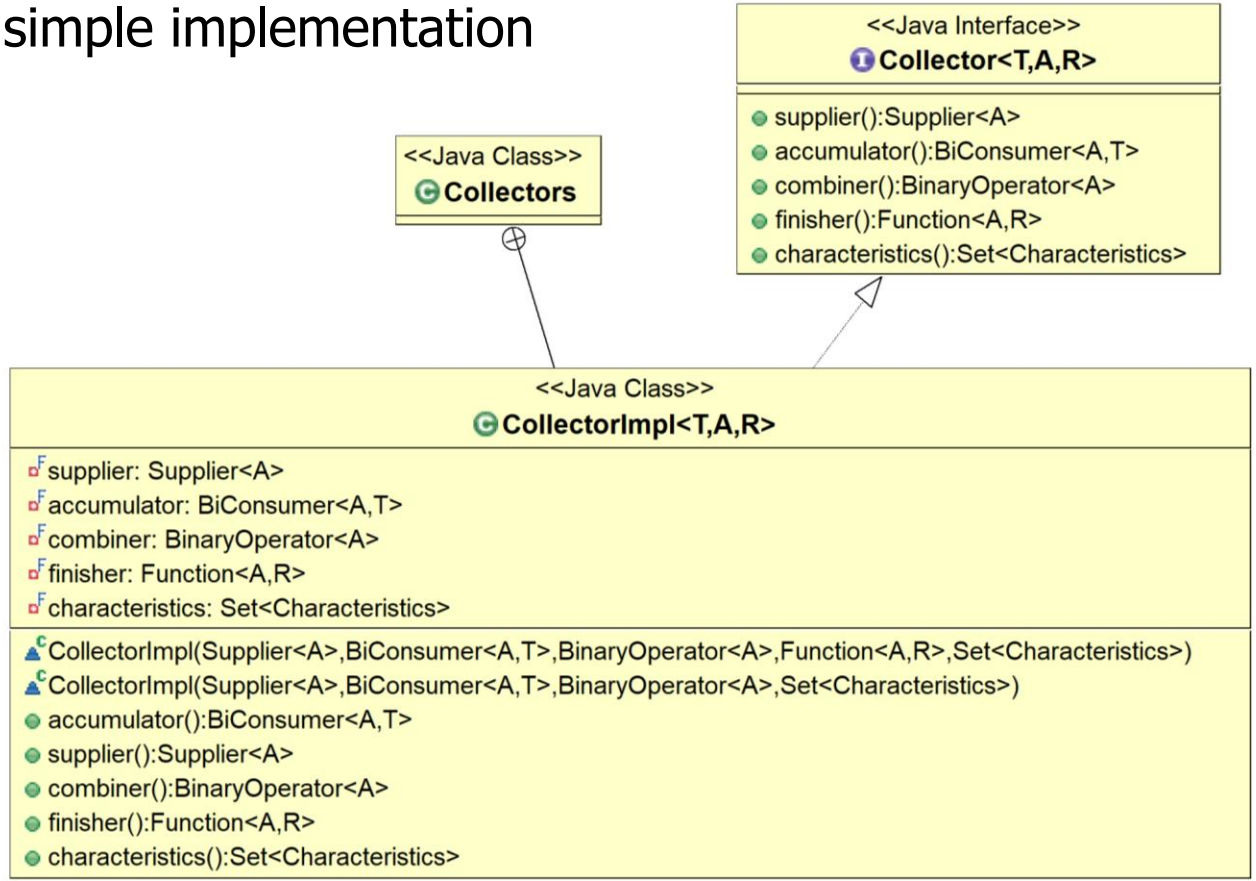
- Collectors is a utility class whose factory methods create collectors for common collection types
  - A utility class is final, has only static methods, no (non-static) state, & a private constructor



See www.quora.com/What-is-the-best-way-to-write-utility-classes-in-Java/answer/Jon-Harley

How Pre-defined Non-Concurrent Collectors are Implemented

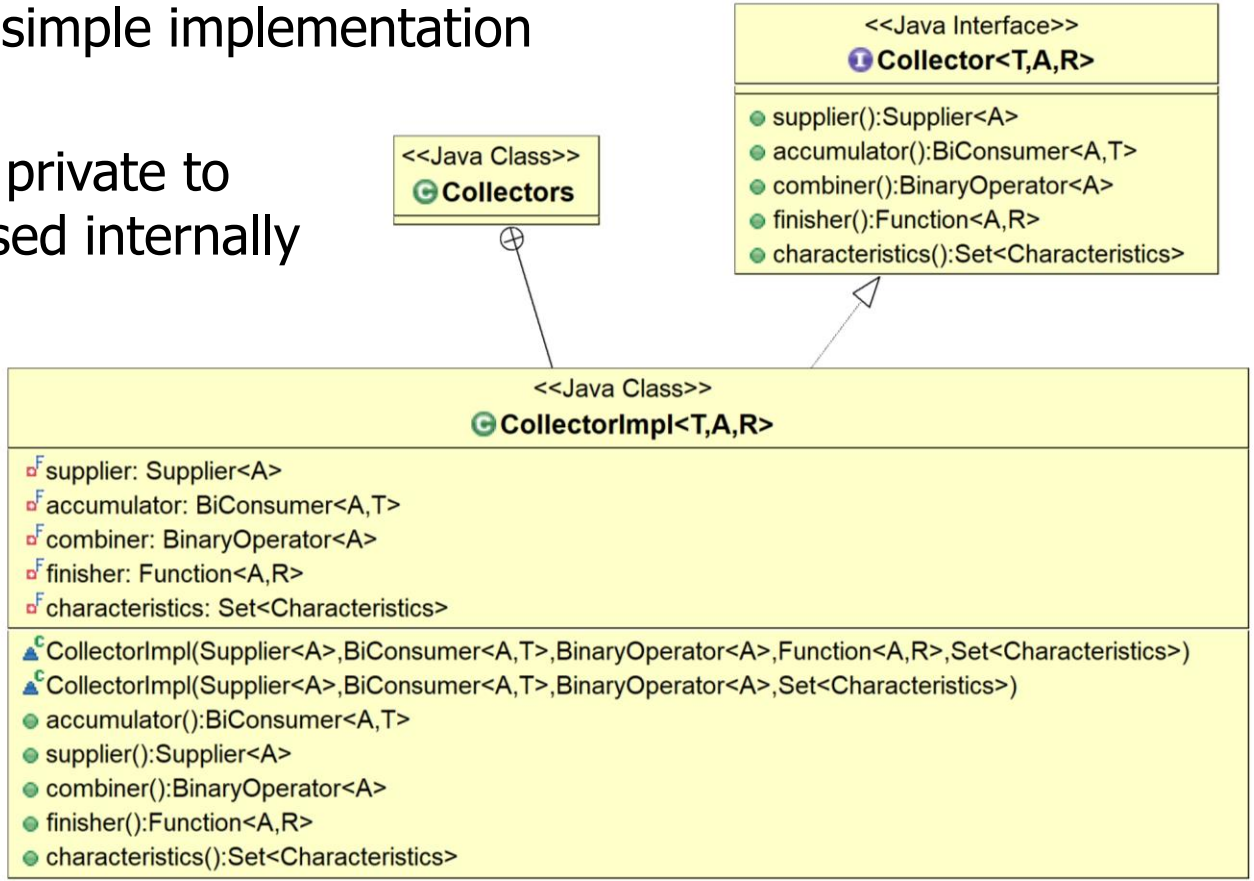
- CollectorImpl defines a simple implementation class for a Collector



See openjdk/8-b132/java/util/stream/Collectors.java#Collectors.CollectorImpl

How Pre-defined Non-Concurrent Collectors are Implemented

- CollectorImpl defines a simple implementation class for a Collector
  - However, this class is private to Collectors & is only used internally



How Pre-defined Non-Concurrent Collectors are Implemented

- Collectors.toList() uses CollectorImpl to return a non-concurrent Collector that accumulates input elements into a new (Array)List

```
final class Collectors {
  ...
  public static <T> Collector
                      <T, ?, List<T>>
    toList() {
      return new CollectorImpl<>
        ((Supplier<List<T>>)
         ArrayList::new,
         List::add,
         (left, right) -> {
            left.addAll(right);
            return left;
         },
         CH_ID);
    } ...
```

See docs.oracle.com/javase/8/docs/api/java/util/stream/Collectors.html#toList

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            return left;
         },
         CH_ID);
  } ...
```

The supplier constructor reference

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  } ...
```

The accumulator method reference

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```

The combiner lambda expression

This combiner is only used for parallel streams

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```

Characteristics set

`CH_ID` is defined as `Collector.Characteristics.IDENTITY_FINISH`

How Pre-defined Non-Concurrent Collectors are Implemented

- Collector.of() defines a simple public factory method that implements a Collector

```
interface Collector<T, A, R> { ...
  static<T, R> Collector<T, R, R> of
    (Supplier<R> supplier,
     BiConsumer<R, T> accumulator,
     BinaryOperator<R> combiner,
     Characteristics... chars) {
     ...
    return new Collectors
      .CollectorImpl<>
        (supplier,
         accumulator,
         combiner,
         chars);
    } ...
```

This of() method is passed four params

See docs.oracle.com/javase/8/docs/api/java/util/stream/Collector.html#of

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    (Supplier<R> supplier,
     BiConsumer<R, T> accumulator,
     BinaryOperator<R> combiner,
     Function<A,R> finisher,
     Characteristics... chars) {
     ...
    return new Collectors
      .CollectorImpl<>
        (supplier,
         accumulator,
         combiner,
         chars);
    } ...
```

This of() method is passed five params

See docs.oracle.com/javase/8/docs/api/java/util/stream/Collector.html#of

How Pre-defined Non-Concurrent Collectors are Implemented

- Collector.of() defines a simple public factory method that implements a Collector
  - Both of() versions internally use the private CollectorImpl class

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interface Collector<T, A, R> { ...
  static<T, R> Collector<T, R, R> of
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End of Java Streams: Implementing Pre-defined Non-Concurrent Collectors