Overview of Java 8 Streams (Part 3)

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Learning Objectives in this Part of the Lesson

- Understand the structure & functionality of Java 8 streams, e.g.,
  - Fundamentals of streams
  - Common stream aggregate operations
  - "Splittable iterators" (Spliterators)

Interface Spliterator<T>

Type Parameters:

T - the type of elements returned by this Spliterator

All Known Subinterfaces:

Spliterator.OfDouble, Spliterator.OfInt, Spliterator.OfLong, Spliterator.OfPrimitive<T,T_CONS,T_SPLITR>

All Known Implementing Classes:

Spliterators.AbstractDoubleSpliterator, Spliterators.AbstractIntSpliterator, Spliterators.AbstractLongSpliterator, Spliterators.AbstractSpliterator

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public interface **Spliterator<T>**

An object for traversing and partitioning elements of a source. The source of elements covered by a Spliterator could be, for example, an array, a Collection, an IO channel, or a generator function.

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

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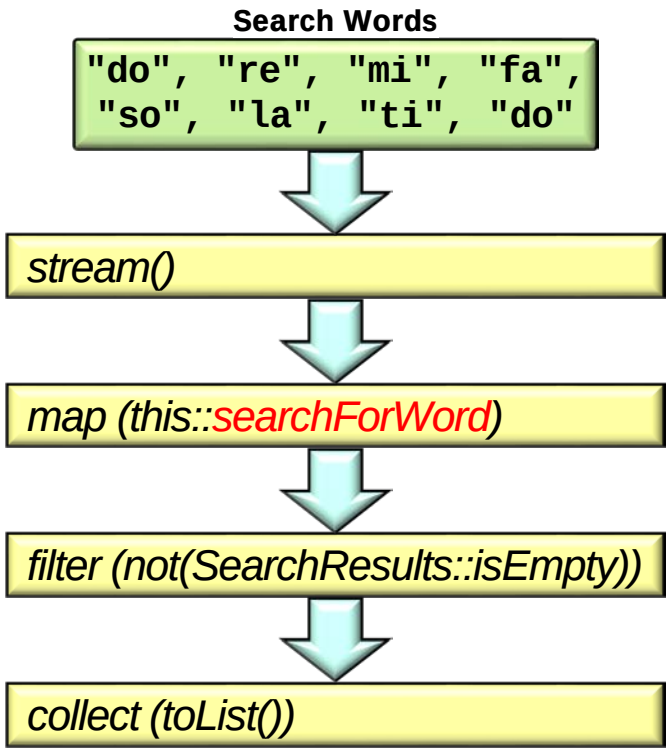
- Understand the structure & functionality of Java 8 streams, e.g.,
  - Fundamentals of streams
  - Common stream aggregate operations
  - "Splittable iterators" (Spliterators)
    - We'll show how a Spliterator is used in the SimpleSearchStream



See github.com/douglascraigschmidt/LiveLessons/tree/master/SimpleSearchStream

Overview of the Java Spliterator

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A Spliterator may traverse elements individually (tryAdvance()) or sequentially in bulk (forEachRemaining()).

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Overview of the Java Spliterator

- A Spliterator is a new type of ”splittable iterator” in Java 8
  - It can be used to traverse elements of a source
    - e.g., a collection, array, etc.

```
List<String> quote = Arrays.asList
   ("This ", "above ", "all- ",
    "to ", "thine ", "own ",
    "self ", "be ", "true", ",\n",
    ...);

for (Spliterator<String> s =
        quote.spliterator();
     s.tryAdvance(System.out::print)
        != false;
     )
  continue;
```

See github.com/douglascraigschmidt/LiveLessons/tree/master/Java8/ex13

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The source is an array/list of strings

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Create a spliterator for the entire array/list

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tryAdvance() combines the hasNext() & next() methods of Iterator

Overview of the Java Spliterator

- A Spliterator is a new type of "splittable iterator" in Java 8
  - It can be used to traverse elements of a source
  - It can also partition all elements of a source

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    ...);

Spliterator<String> secondHalf =
                quote.spliterator();
Spliterator<String> firstHalf =
                secondHalf.trySplit();

firstHalf.forEachRemaining
            (System.out::print);
secondHalf.forEachRemaining
            (System.out::print);
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trySplit() returns a spliterator covering elements that will no longer be covered by the invoking spliterator

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Performs the action for each element in the spliterator

Overview of the Java Spliterator

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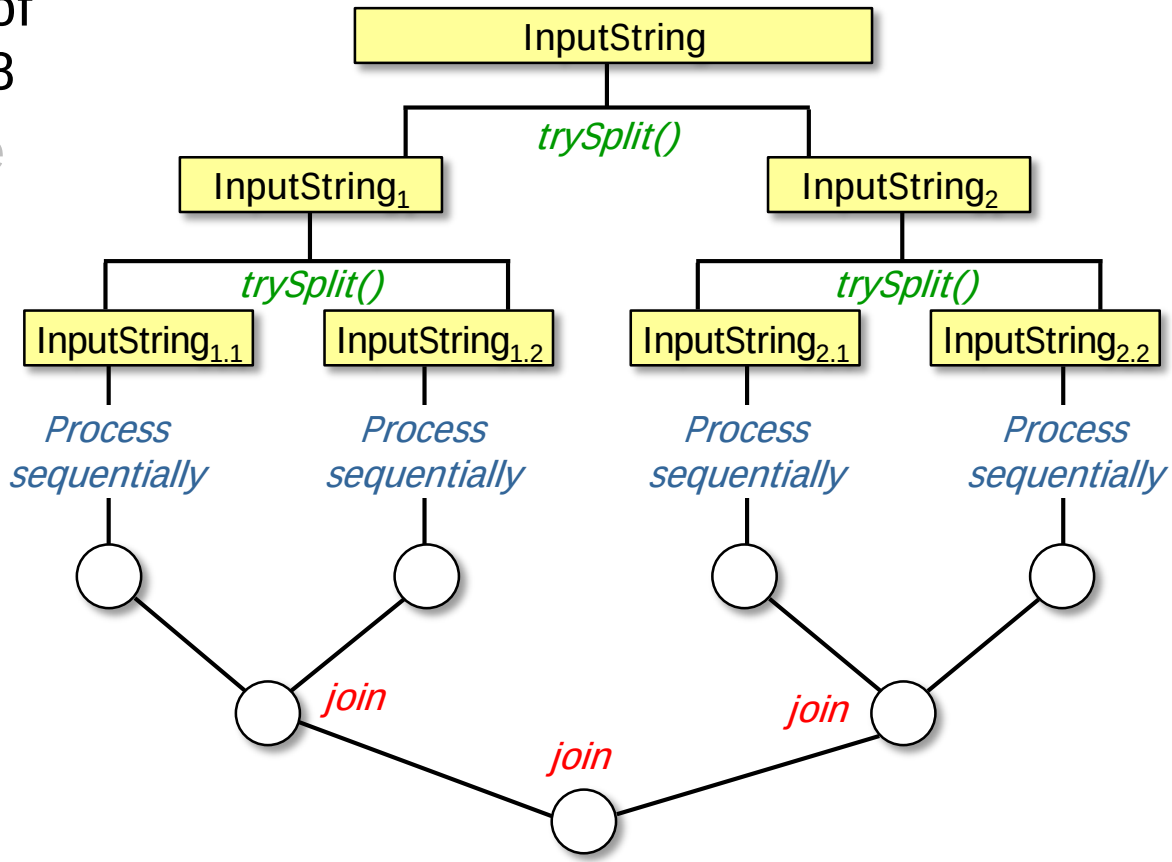
  - It can be used to traverse elements of a source
  - It can also partition all elements of a source
    - Mostly used with Java 8 parallel streams



See blog.logentries.com/2015/10/java-8-introduction-to-parallelism-and-spliterator

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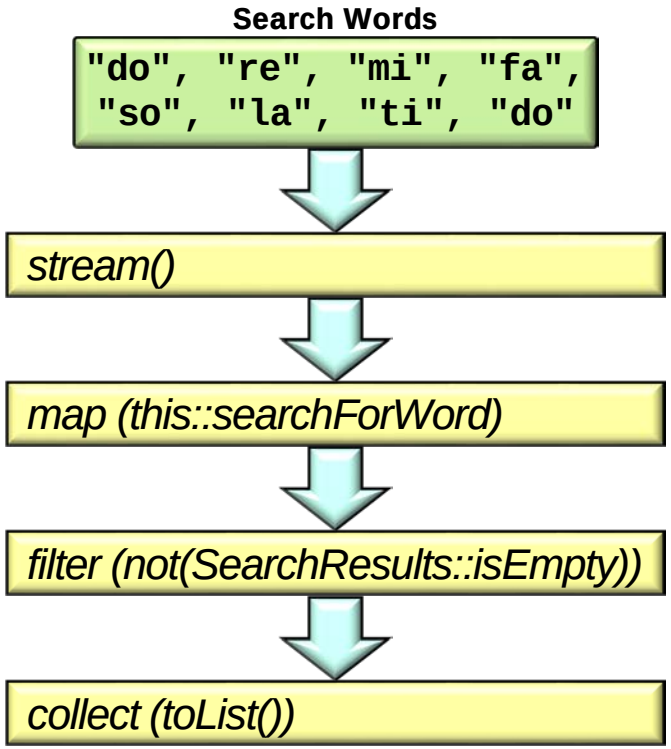
We’ll focus on traversal now & on partitioning when we cover parallel streams

Using Java Spliterator in SimpleSearchStream

Using Java Spliterator in SimpleSearchStream

- The SimpleSearchStream program uses a sequential spliterator



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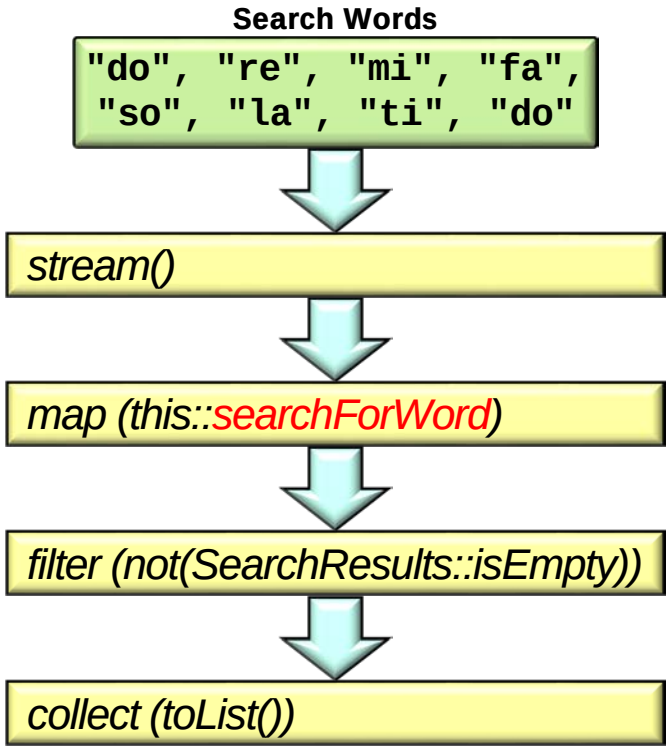
Using Java Spliterator in SimpleSearchStream

- Its searchForWord() method uses spliterator to find all instances of a word in the input & return a list of all the SearchResults

```
SearchResults searchForWord
                          (String word){
  return new SearchResults
    (..., word, ..., StreamSupport
      .stream(new WordMatchSpliterator
                          (mInput, word),
              false)
      .collect(toList()));
}
```



See SimpleSearchStream/src/main/java/search/WordSearcher.java

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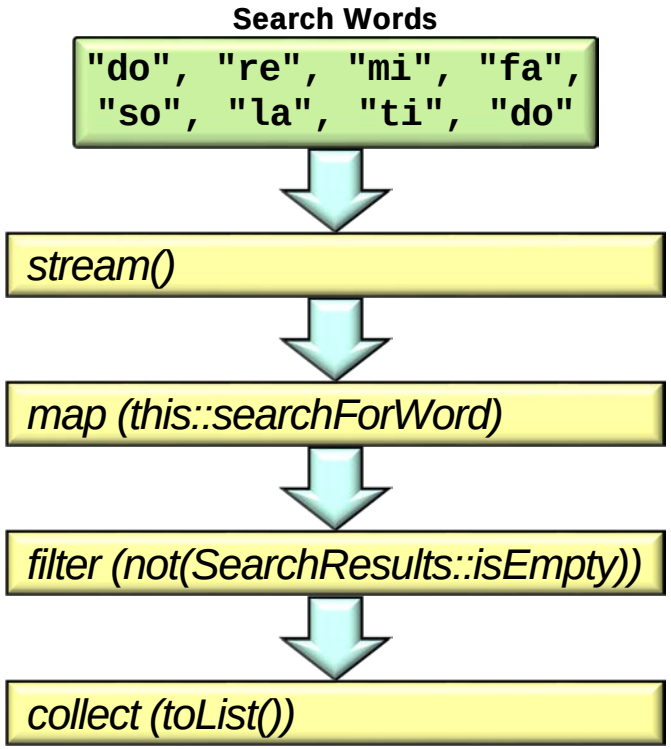
StreamSupport.stream() creates a sequential stream via the WordMatchSpliterator class



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

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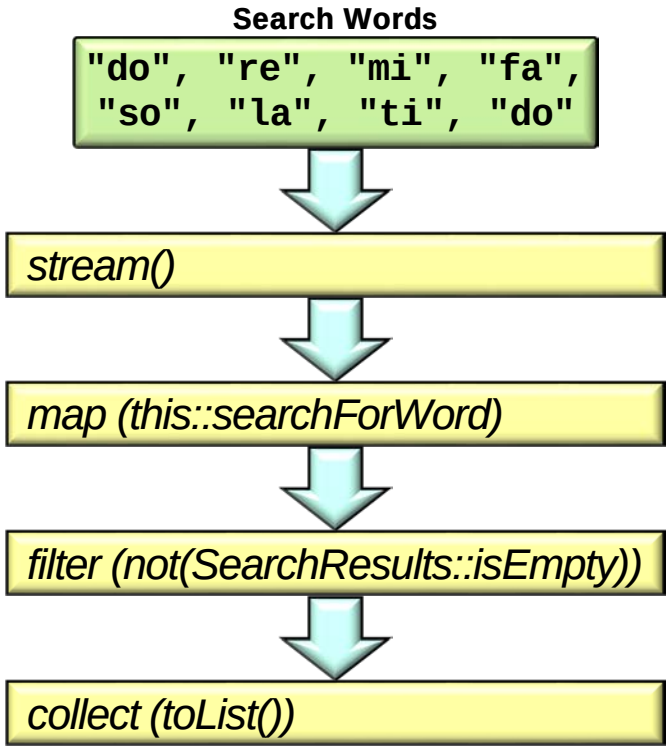
This stream is collected into a list of SearchResult.Result objects



Using Java Spliterator in SimpleSearchStream

- WordMatchSpliterator uses Java regex to create a stream of SearchResults Result objects that match the # of times a word appears in an input string

```
class WordMatchSpliterator
      extends Spliterators.AbstractSpliterator<Result> {
  private final Matcher mWordMatcher;

  public WordMatchSpliterator(String input, String word) {
    ...
    String regexWord = "\\b" + word.trim() + "\\b";

    mWordMatcher =
      Pattern.compile(regexWord,
                      Pattern.CASE_INSENSITIVE)
            .matcher(input);
  }
```

See SimpleSearchStream/src/main/java/search/WordMatchSpliterator.java

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Create a regex that matches only a "word"

See www.vogella.com/tutorials/JavaRegularExpressions/article.html

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```

Compile the regex & create a matcher for the input string

See docs.oracle.com/javase/8/docs/api/java/util/regex/Pattern.html

Using Java Spliterator in SimpleSearchStream

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```
class WordMatchSpliterator
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  ...
  public boolean tryAdvance(Consumer<? super Result> action) {
    if (!mWordMatcher.find())
      return false;

    else {
      action.accept(new Result(mWordMatcher.start()));
      return true;
    }
  }
}
```

Attempt to advance the spliterator by one word match

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If there's no match then we're done

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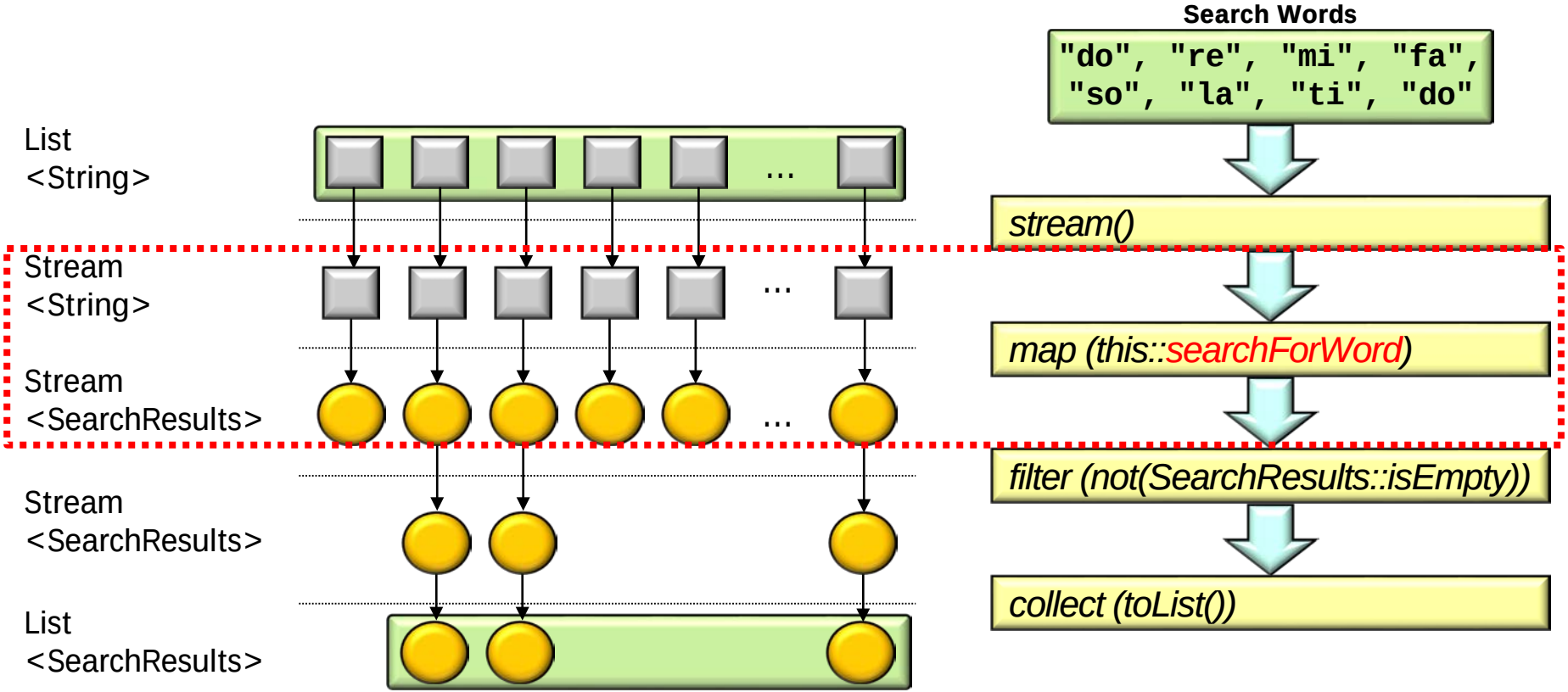
If there's a match the consumer records the index where the match occurred

Using Java Spliterator in SimpleSearchStream

- Here's the output that searchForWord() & WordMatchSpliterator produce



End of Overview of Java 8 Streams (Part 3)