

Visualizing the WordSearcher

`.findWords()` Method

Douglas C. Schmidt

d.schmidt@vanderbilt.edu

www.dre.vanderbilt.edu/~schmidt

Professor of Computer Science

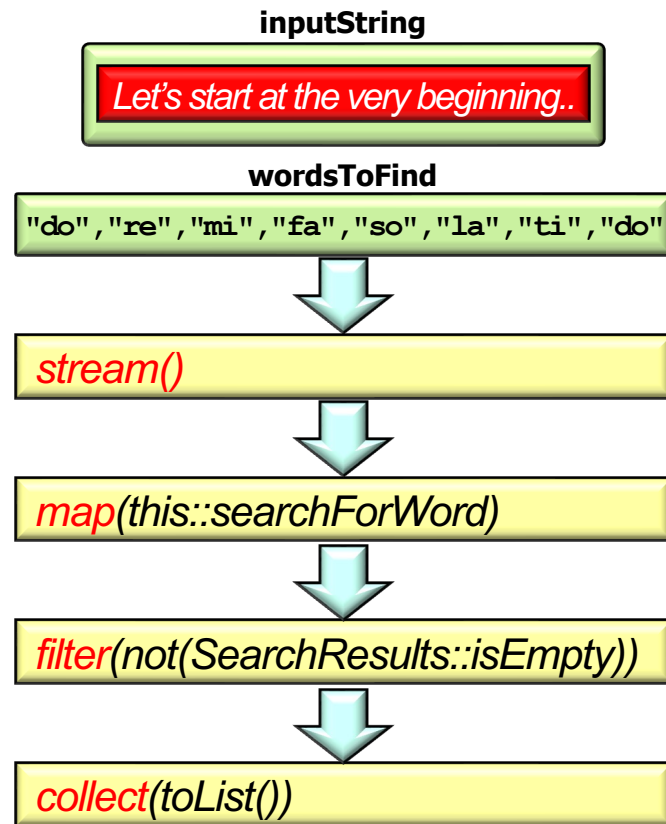
**Institute for Software
Integrated Systems**

**Vanderbilt University
Nashville, Tennessee, USA**



Learning Objectives in this Part of the Lesson

- Recognize the structure & functionality of the SimpleSearchStream example
- Visualize aggregate operations in SimpleSearchStream's WordSearcher.findWords() method

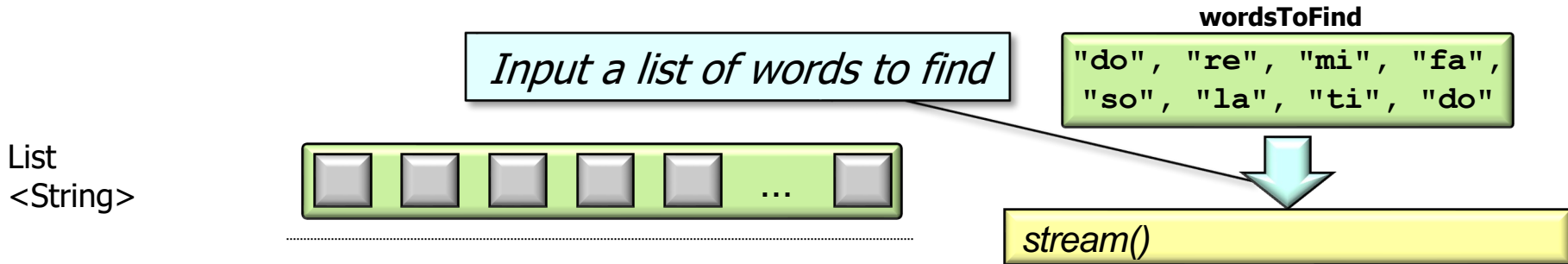


See github.com/douglasraigschmidt/LiveLessons/tree/master/SimpleSearchStream

Visualizing the Word Searcher.findWords() Method

Visualizing the WordSearcher.findWords() Method

- WordSearcher.findWords() searches for words in an input string



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

Visualizing the WordSearcher.findWords() Method

- WordSearcher.findWords() searches for words in an input string

List
<String>



wordsToFind

"do", "re", "mi", "fa",
"so", "la", "ti", "do"

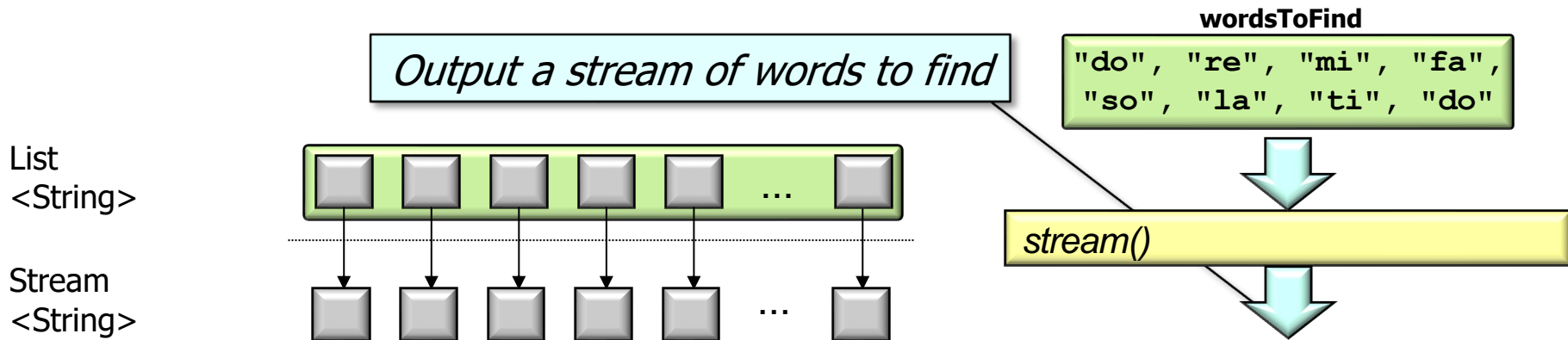


stream()

Convert collection to a (sequential) stream

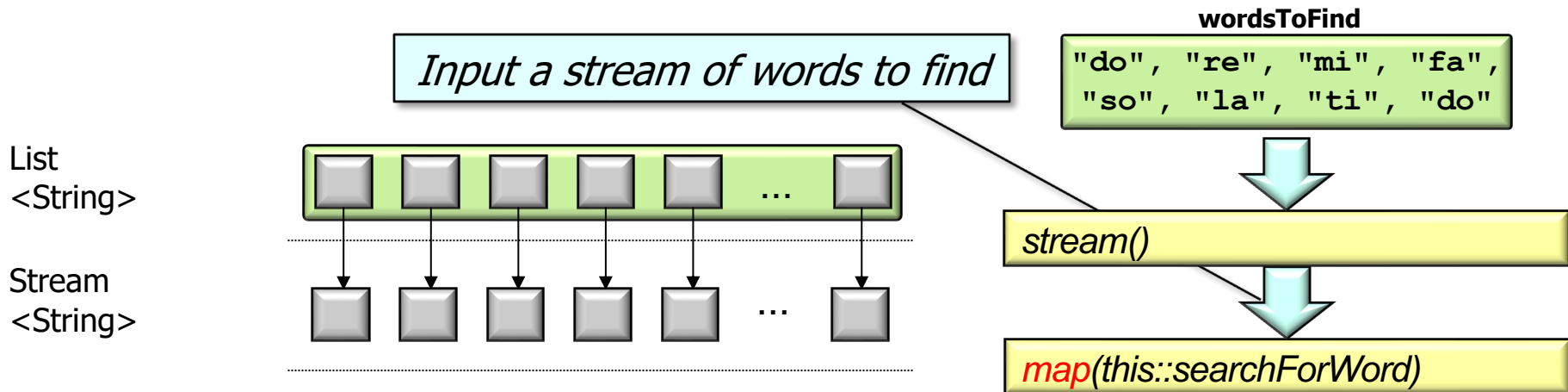
Visualizing the WordSearcher.findWords() Method

- WordSearcher.findWords() searches for words in an input string



Visualizing the WordSearcher.findWords() Method

- WordSearcher.findWords() searches for words in an input string



Visualizing the WordSearcher.findWords() Method

- WordSearcher.findWords() searches for words in an input string

List
<String>



Stream
<String>



wordsToFind

"do", "re", "mi", "fa",
"so", "la", "ti", "do"



stream()

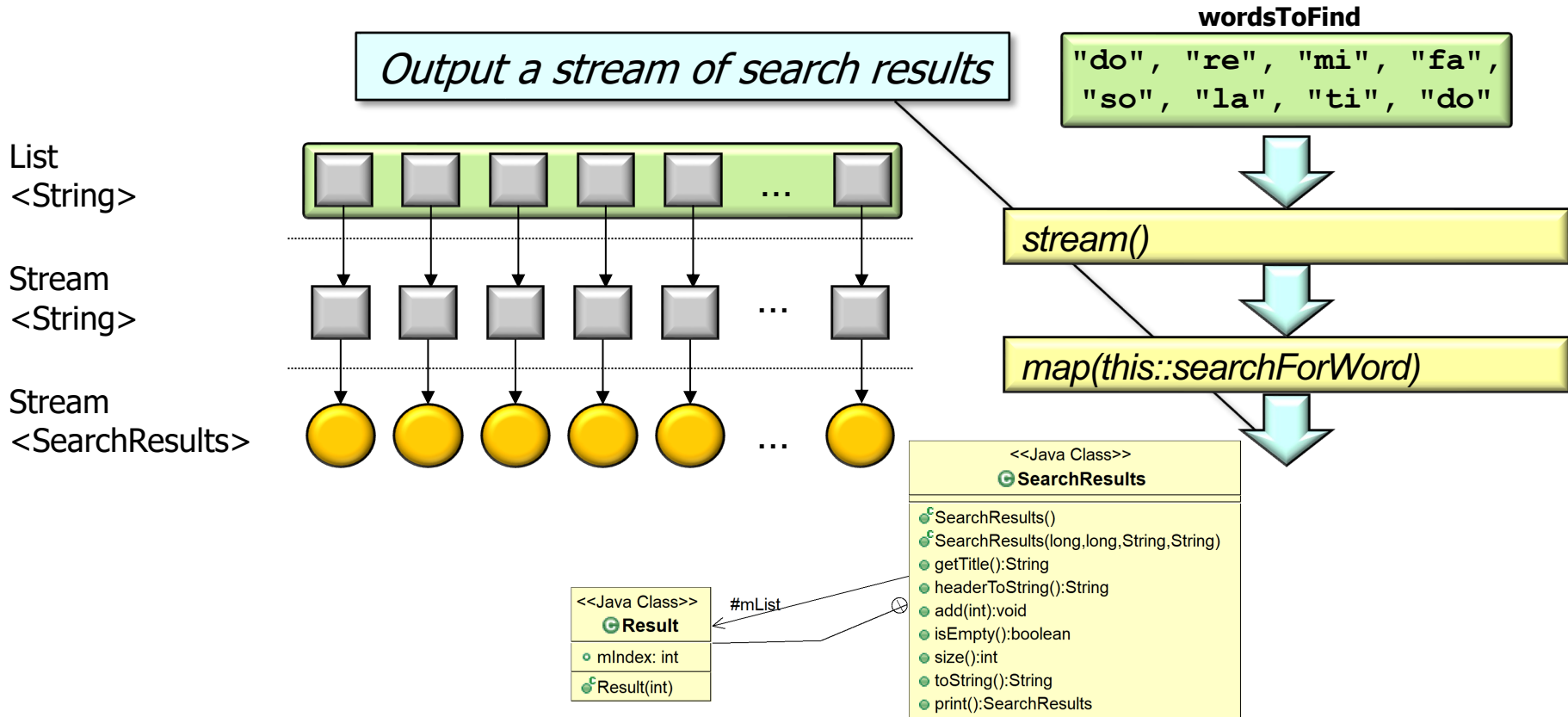


map(this::searchForWord)

Search for the word in the input string

Visualizing the WordSearcher.findWords() Method

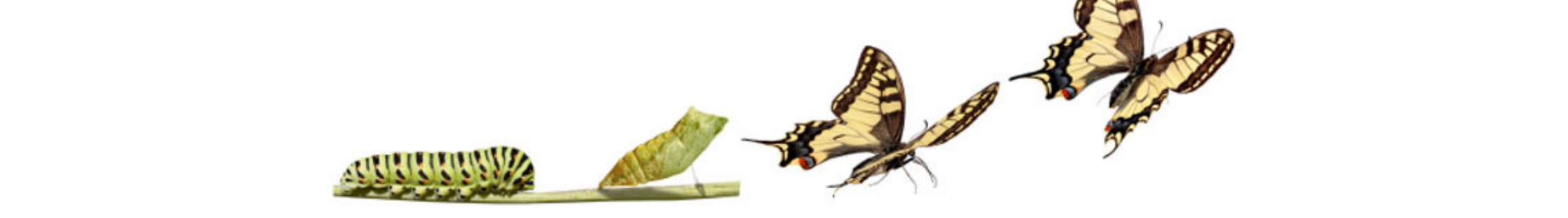
- WordSearcher.findWords() searches for words in an input string



SearchResults stores # of times a word appeared in the input string

- `WordSearcher.findWords()` searches for words in an input string

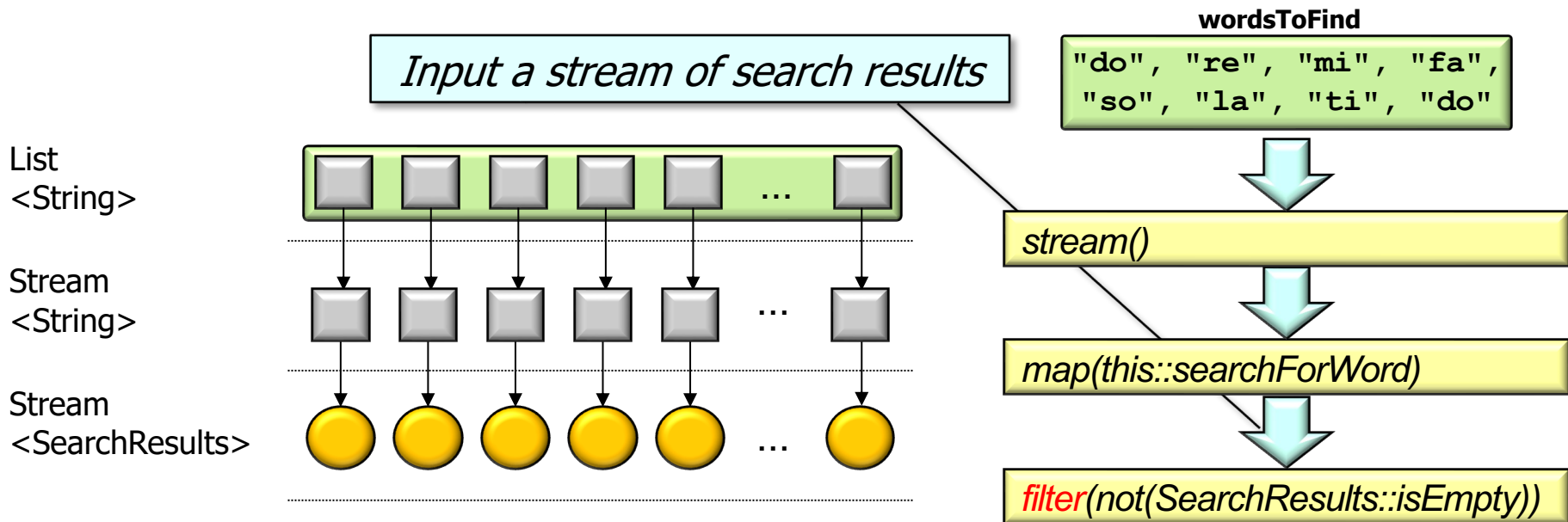
- A diagram illustrating the output of the search process. A light blue box on the left contains the text *Output a stream of search results*. A line connects this box to a light green box on the right. The green box is titled **wordsToFind** and contains a list of words: "do", "re", "mi", "fa", "so", "la", "ti", "do".



Note the transformation of types at this point in the stream!

Visualizing the WordSearcher.findWords() Method

- WordSearcher.findWords() searches for words in an input string



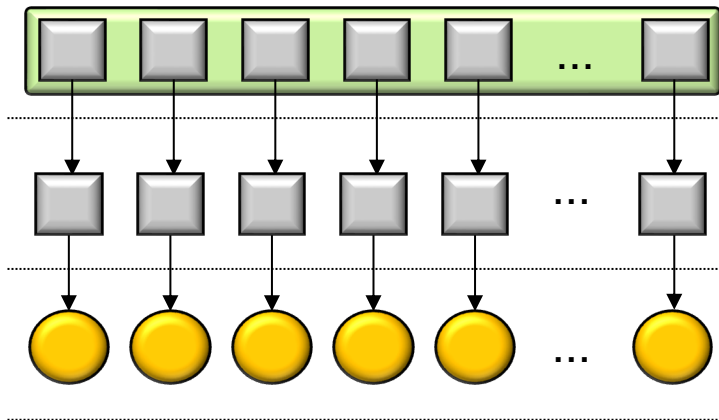
Visualizing the WordSearcher.findWords() Method

- WordSearcher.findWords() searches for words in an input string

List
<String>

Stream
<String>

Stream
<SearchResults>



wordsToFind

"do", "re", "mi", "fa",
"so", "la", "ti", "do"

stream()

map(this::searchForWord)

filter(not(SearchResults::isEmpty))

Remove empty search results from the stream

Visualizing the WordSearcher.findWords() Method

- WordSearcher.findWords() searches for words in an input string

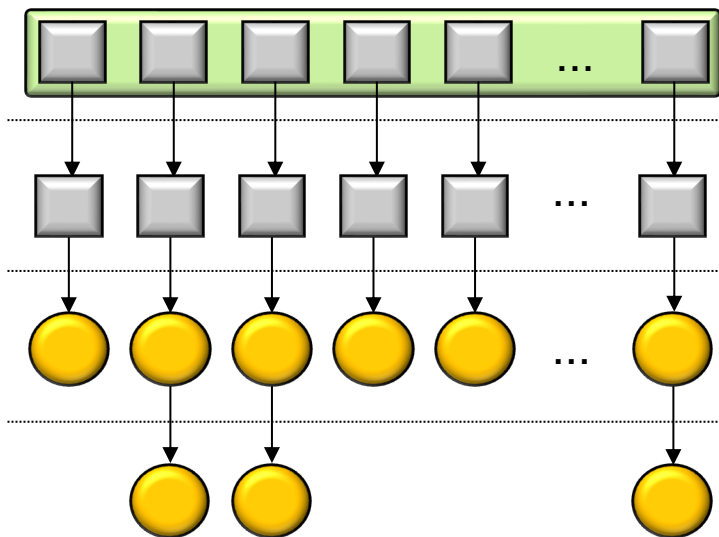
Output a stream of non-empty search results

List
<String>

Stream
<String>

Stream
<SearchResults>

Stream
<SearchResults>



wordsToFind

"do", "re", "mi", "fa",
"so", "la", "ti", "do"

stream()

map(this::searchForWord)

filter(not(SearchResults::isEmpty))

Visualizing the WordSearcher.findWords() Method

- WordSearcher.findWords() searches for words in an input string

Input a stream of non-empty search results

List
<String>



Stream
<String>



Stream
<SearchResults>



Stream
<SearchResults>



wordsToFind

"do", "re", "mi", "fa",
"so", "la", "ti", "do"

stream()

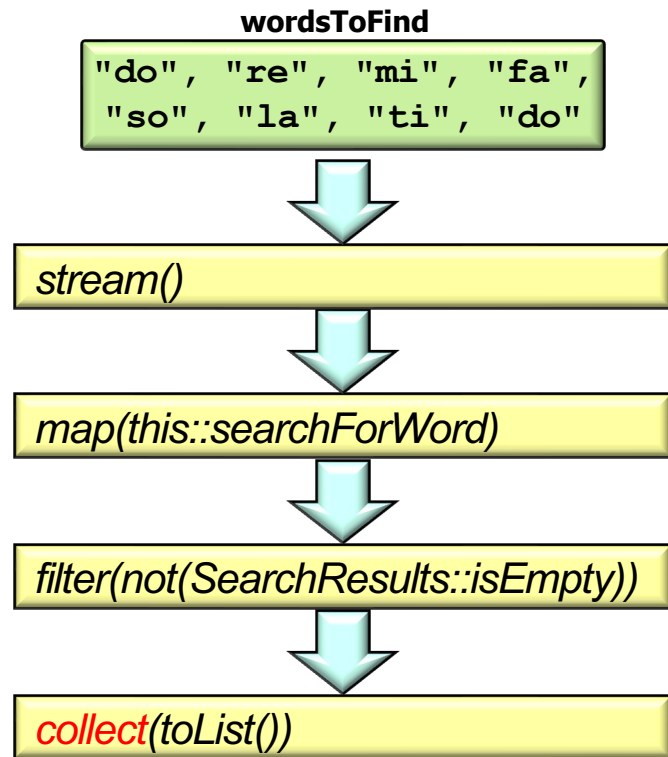
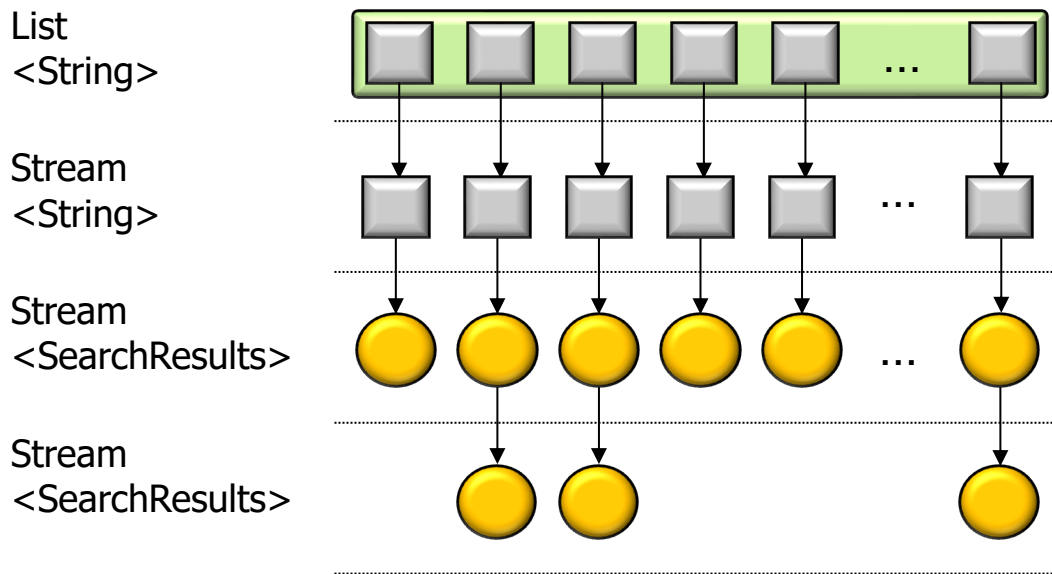
map(this::searchForWord)

filter(not(SearchResults::isEmpty))

collect(toList())

Visualizing the WordSearcher.findWords() Method

- WordSearcher.findWords() searches for words in an input string



Trigger intermediate operation processing

Visualizing the WordSearcher.findWords() Method

- WordSearcher.findWords() searches for words in an input string

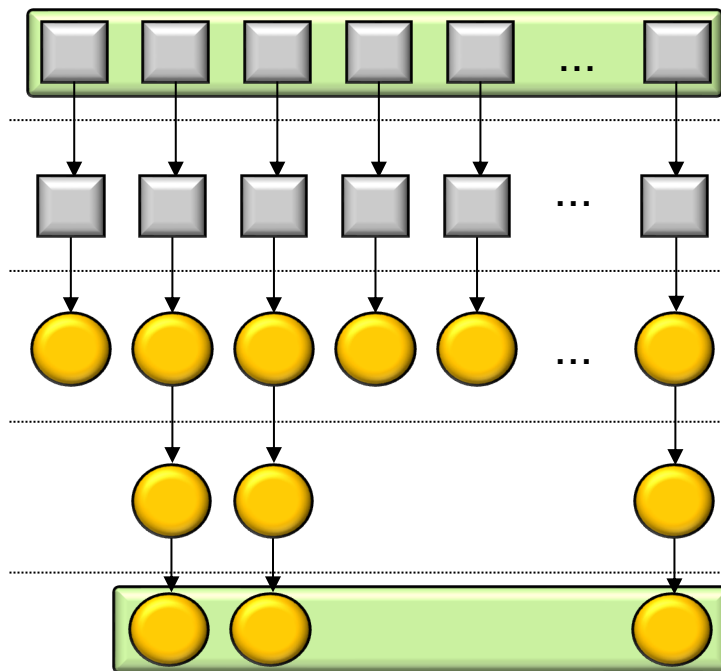
List
<String>

Stream
<String>

Stream
<SearchResults>

Stream
<SearchResults>

List
<SearchResults>



wordsToFind

"do", "re", "mi", "fa",
"so", "la", "ti", "do"

stream()

map(this::searchForWord)

filter(not(SearchResults::isEmpty))

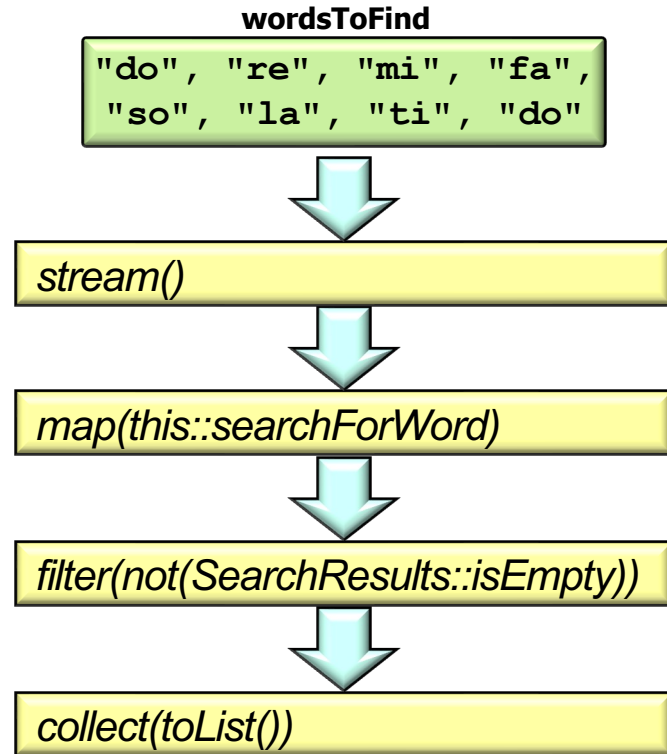
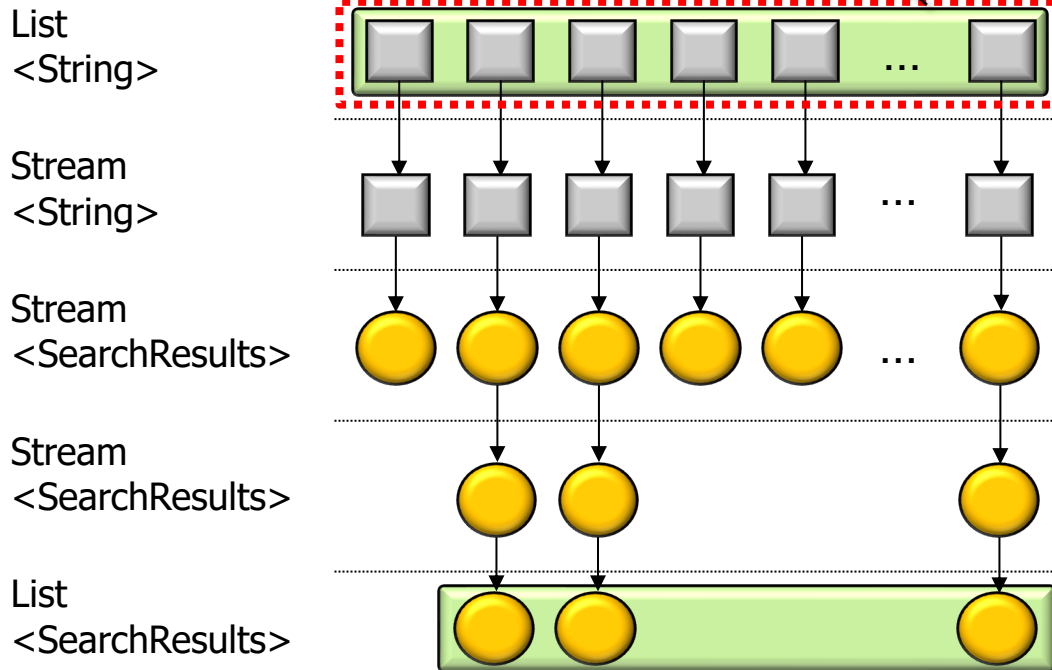
collect(toList())

Return a list of non-empty search results

Visualizing the WordSearcher.findWords() Method

- The “physical” processing of a stream differs from the “logical” model

It may appear that each “row” of data is processed from “left to right”

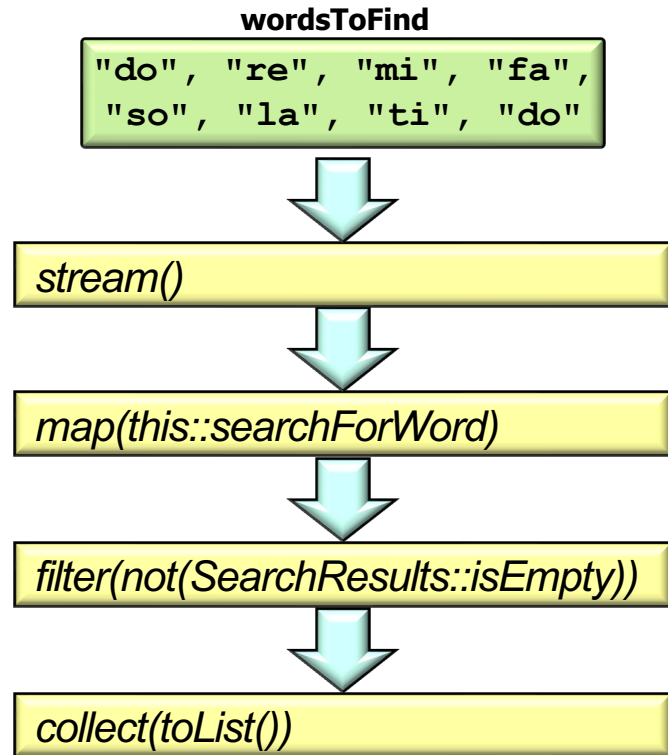
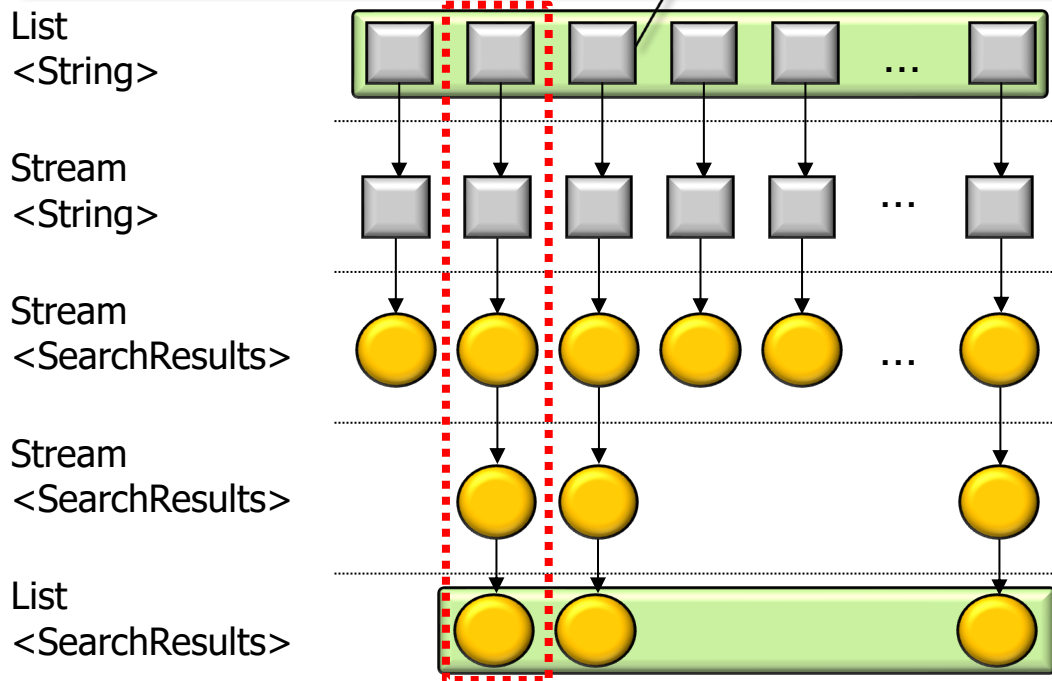


See www.ibm.com/developerworks/library/j-java-streams-3-brian-goetz

Visualizing the WordSearcher.findWords() Method

- The “physical” processing of a stream differs from the “logical” model

However, each element is actually “pulled” from the source through each aggregate operation



This implementation is much more efficient & supports “short-circuit” operations

End of Visualizing the Word Searcher.findWords() Method