Overview of Java Streams
Terminal Operations

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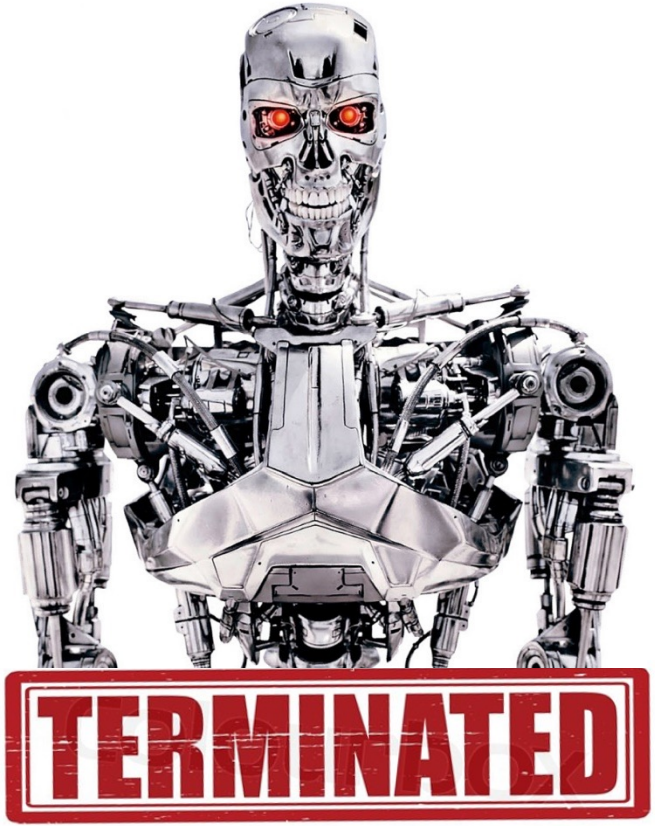
Learning Objectives in this Part of the Lesson

- Understand the structure & functionality of Java Streams terminal operations
  - Terminal operations start the internal iteration of stream elements, trigger the intermediate operations, & produce some result



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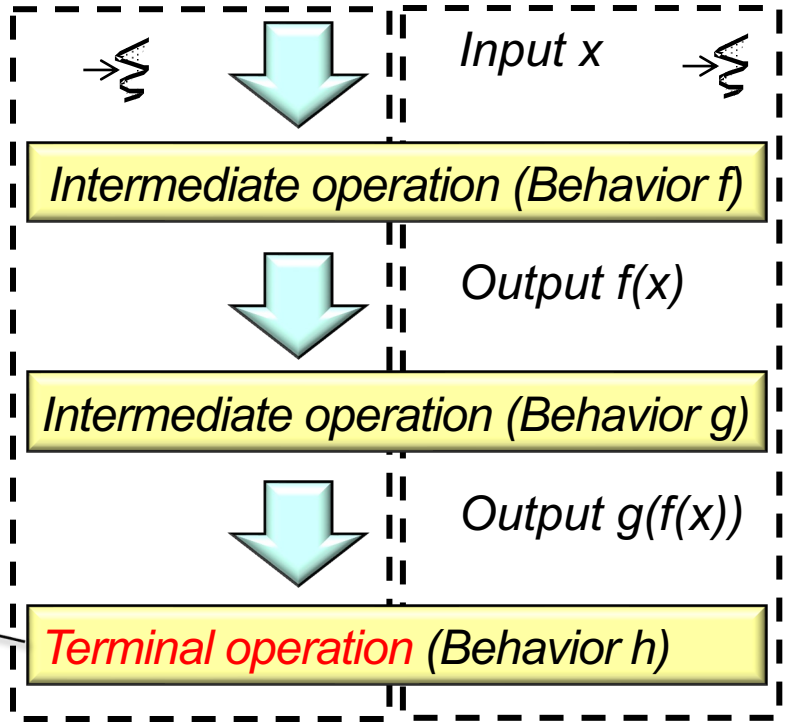

These operations also apply to both sequential & parallel streams

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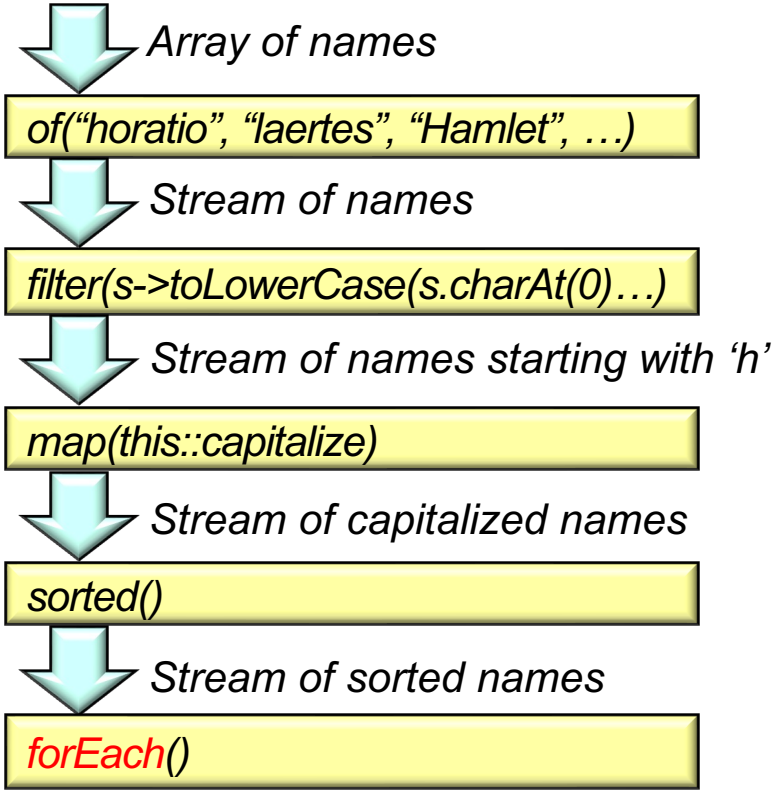
We continue to showcase the "Hamlet" program

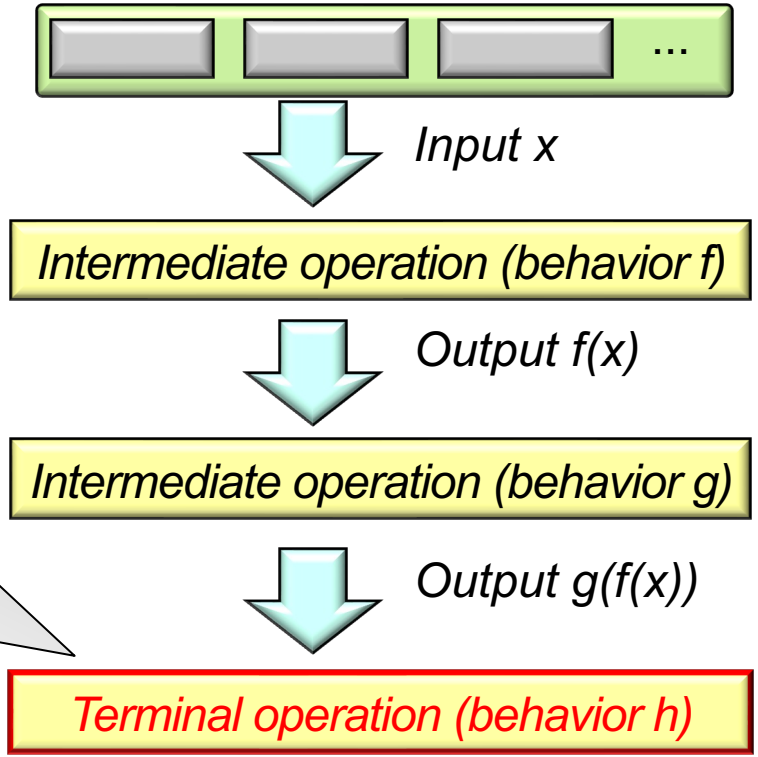


Overview of Terminal Operations

Overview of Common Stream Terminal Operations

- Every stream finishes with a terminal operation that (typically) yields a non-stream result


```
Stream
   .of("horatio",
       "laertes",
       "Hamlet", ...)
   .filter(s -> toLowerCase
               (s.charAt(0)) == 'h')
   .map(this::capitalize)
   .sorted()
   .forEach(System.out::println);
```



See github.com/douglascraigschmidt/LiveLessons/tree/master/Java8/ex12

Overview of Common Stream Terminal Operations

- Every stream finishes with a terminal operation that (typically) yields a non-stream result, e.g.
  - No value at all
    - e.g., forEach() & forEachOrdered()

Java Stream : forEachOrdered() vs forEach()

By Arvind Rai, June 13, 2020

On this page we will provide differences between `Stream.forEachOrdered()` and `Stream.forEach()` methods. Both methods perform an action as `Consumer`. The difference between `forEachOrdered()` and `forEach()` methods is that `forEachOrdered()` will always perform given action in encounter order of elements in stream whereas `forEach()` method is non-deterministic. In parallel stream `forEach()` method may not necessarily respect the order whereas `forEachOrdered()` will always respect the order. In sequential stream both methods respect the order. So we should use `forEachOrdered()` method, if we want action to be perform in encounter order in every case whether the stream is sequential or parallel. If the stream is sequential, we can use any method to respect order. But if stream can be parallel too, then we should use `forEachOrdered()` method to respect the order.

These terminal operations both *"run-to-completion"*

See www.concretepage.com/java/java-8/java-stream-foreachordered-vs-foreach

Overview of Common Stream Terminal Operations

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  - No value at all
    - e.g., forEach() & forEachOrdered()

forEach() & forEachOrdered() only have side-effects!

Overview of Common Stream Terminal Operations

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```
Stream
   .of("horatio",
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   .filter(s -> toLowerCase
           (s.charAt(0)) == 'h')
   .map(this::capitalize)
   .sorted()
   .forEach
      (System.out::println);
```

Print each character in Hamlet that starts with 'H' or 'h' in consistently capitalized & sorted order.

Overview of Common Stream Terminal Operations

- Every stream finishes with a terminal operation that (typically) yields a non-stream result, e.g.
  - No value at all
  - The result of a reduction operation
    - e.g., collect() & reduce()

These terminal operations both *"run-to-completion"*

See docs.oracle.com/javase/tutorial/collections/streams/reduction.html

Overview of Common Stream Terminal Operations

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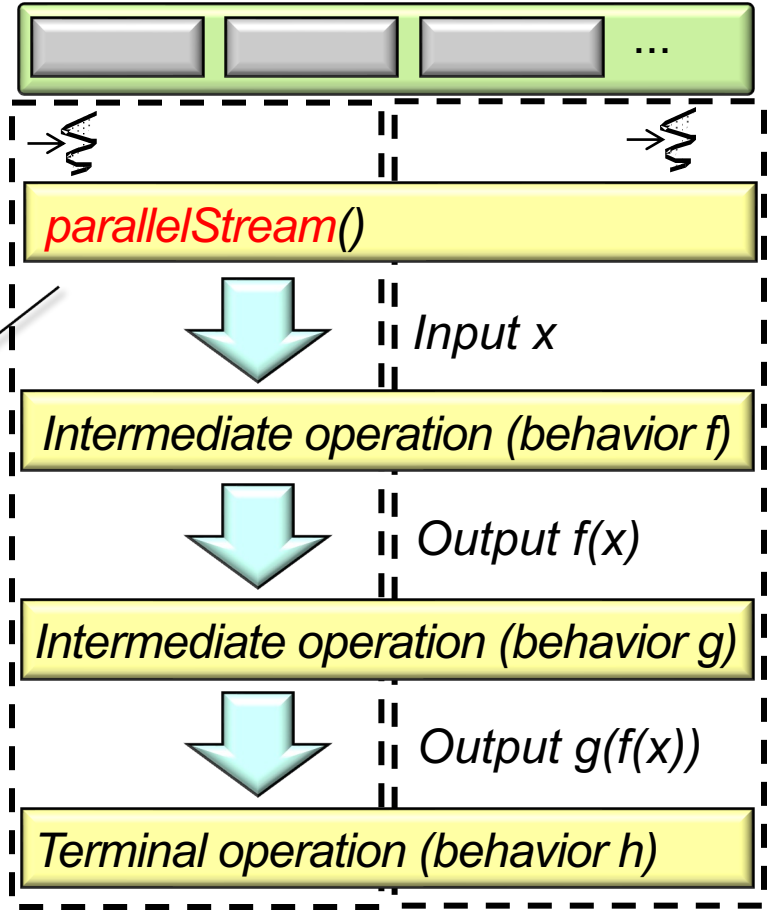
collect() & reduce() terminal operations work seamlessly with parallel streams.



See docs.oracle.com/javase/tutorial/collections/streams/parallelism.html

Overview of Common Stream Terminal Operations

- Every stream finishes with a terminal operation that (typically) yields a non-stream result, e.g.
  - No value at all
  - The result of a reduction operation
  - An Optional or boolean value
    - e.g., findAny(), findFirst(), noneMatch(), allMatch(), etc.

```
List<String> countries = Arrays
   .asList("france", "india",
           "china", "usa");

print(countries.stream()
   .filter(country -> country
           .contains("i"))
   .findFirst().get());

print(countries.stream()
    .filter(country -> country
            .contains("i"))
    .findAny().get());

print(countries.stream()
    .noneMatch(country -> country
    .contains("z")));
```

See dzone.com/articles/collectors-part-1-%E2%80%93-reductions

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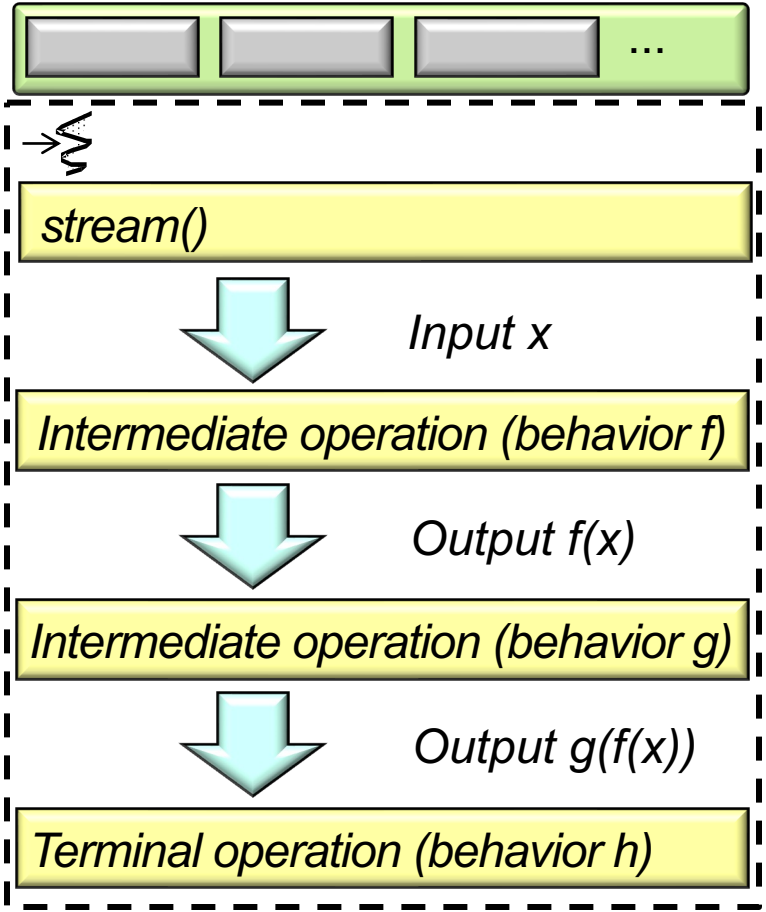
print(countries.stream()
    .noneMatch(country -> country
    .contains("z")));
```

These terminal operations are "short-circuiting"

Overview of the collect() Terminal Operation

- A terminal operation also triggers all the ("lazy") intermediate operation processing



End of Overview of Java Streams Terminal Operations