Evaluating the Java Sequential SearchStreamGang Case Study

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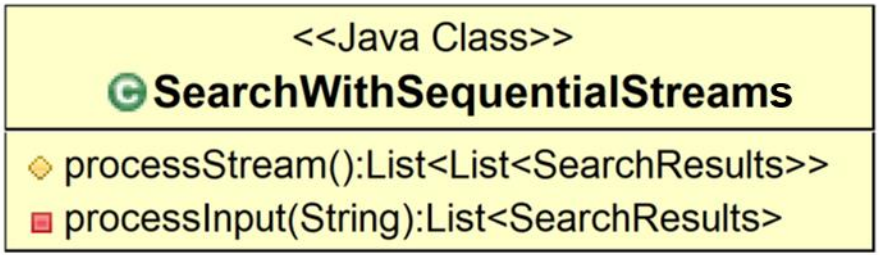
Learning Objectives in this Part of the Lesson

- Know how to apply sequential streams to the SearchStreamGang program
- Recognize how a Spliterator is used in SearchWithSequentialStreams
- Understand the pros & cons of the SearchWithSequentialStreams class



See livelessons/streamgangs/SearchWithSequentialStreams.java

Pros of the SearchWith SequentialStreams Class

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- There are several benefits with this sequential streams implementation

```
List<SearchResults> processInput(CharSequence inputSeq) {
  String title = getTitle(inputString);
  CharSequence input = inputSeq.subSequence(...);

  List<SearchResults> results = mPhrasesToFind
    .stream()
    .map(phrase -> searchForPhrase
           (phrase, input, title, false))

    .filter(not(SearchResults::isEmpty))

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Java streams use "internal" iterators vs. "external" iterators used by collections.

See www.javabrahman.com/java-8/java-8-internal-iterators-vs-external-iterators

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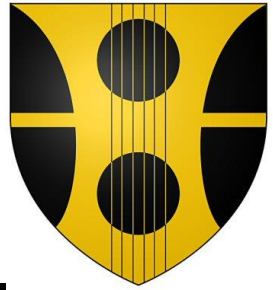

Internal iterators shield programs from streams processing implementation details

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This code is declarative since it is a pipeline of transformations performed by aggregate operations

There are no explicit control constructs or memory allocations in this pipeline!

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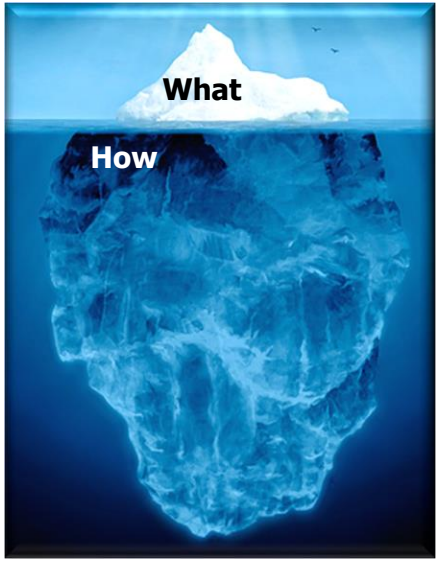

Focus on "what" operations to perform, rather than on "how" they're implemented

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These behaviors have no side-effects

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No side-effects makes it easier to reason about behavior & enables optimization

Cons of the SearchWith SequentialStreams Class

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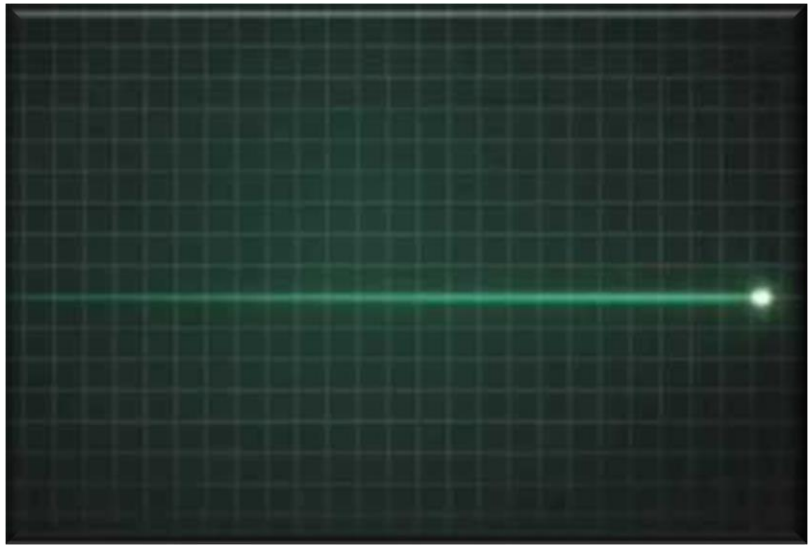
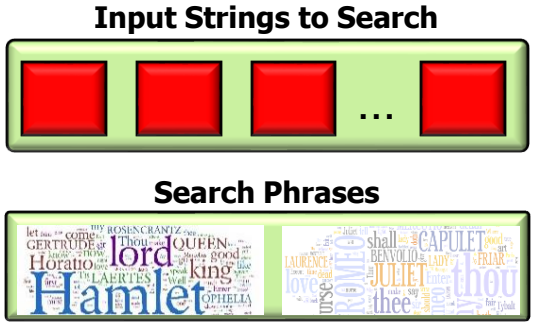
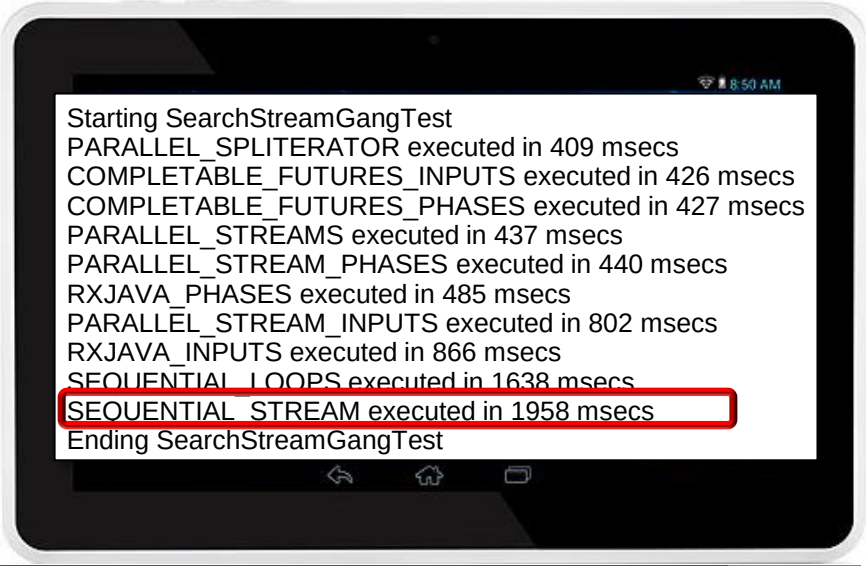
- The sequential implementation can't take advantage of multi-core processors



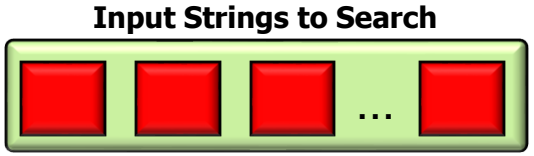


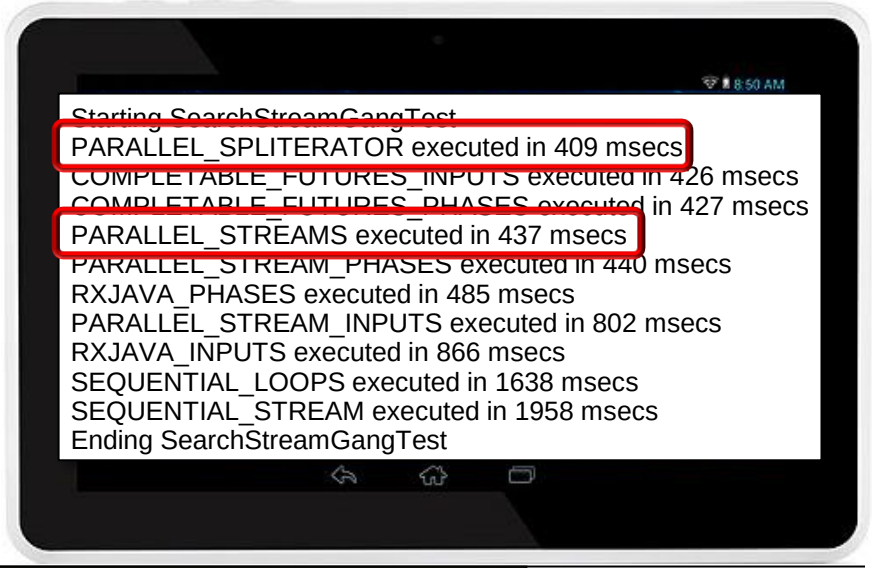


Tests conducted on a quad-core Lenovo P50 with 32 Gbytes of RAM

Cons of the SearchWithSequentialStreams Class

- The sequential implementation can't take advantage of multi-core processors
  - Parallel streams can often provide a significant performance boost!





See upcoming lessons on "*Java Parallel Streams*"

Cons of the SearchWithSequentialStreams Class

- This class only used a few Java aggregate operations

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```

However, these aggregate operations are also useful for parallel streams

Cons of the SearchWithSequentialStreams Class

- *Many* other aggregate operations are part of the Java stream API

Modifier and Type	Method and Description
boolean	`allMatch(Predicate<? super T> predicate)` Returns whether all elements of this stream match the provided predicate.
boolean	`anyMatch(Predicate<? super T> predicate)` Returns whether any elements of this stream match the provided predicate.
static <T> Stream.Builder<T>	`builder()` Returns a builder for a Stream.
<R,A> R	`collect(Collector<? super T,A,R> collector)` Performs a **mutable reduction** operation on the elements of this stream using a Collector.
<R> R	`collect(Supplier<R> supplier, BiConsumer<R,? super T> accumulator, BiConsumer<R,R> combiner)` Performs a **mutable reduction** operation on the elements of this stream.
static <T> Stream<T>	`concat(Stream<? extends T> a, Stream<? extends T> b)` Creates a lazily concatenated stream whose elements are all the elements of the first stream followed by all the elements of the second stream.
long	`count()` Returns the count of elements in this stream.
Stream<T>	`distinct()` Returns a stream consisting of the distinct elements (according to `Object.equals(Object)`) of this stream.
static <T> Stream<T>	`empty()` Returns an empty sequential Stream.
Stream<T>	`filter(Predicate<? super T> predicate)` Returns a stream consisting of the elements of this stream that match the given predicate.
Optional<T>	`findAny()` Returns an Optional describing some element of the stream, or an empty Optional if the stream is empty.
Optional<T>	`findFirst()` Returns an Optional describing the first element of this stream, or an empty Optional if the stream is empty.
<R> Stream<R>	`flatMap(Function<? super T,? extends Stream<? extends R>> mapper)` Returns a stream consisting of the results of replacing each element of this stream with the contents of a mapped stream produced by applying the provided mapping function to each element.

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

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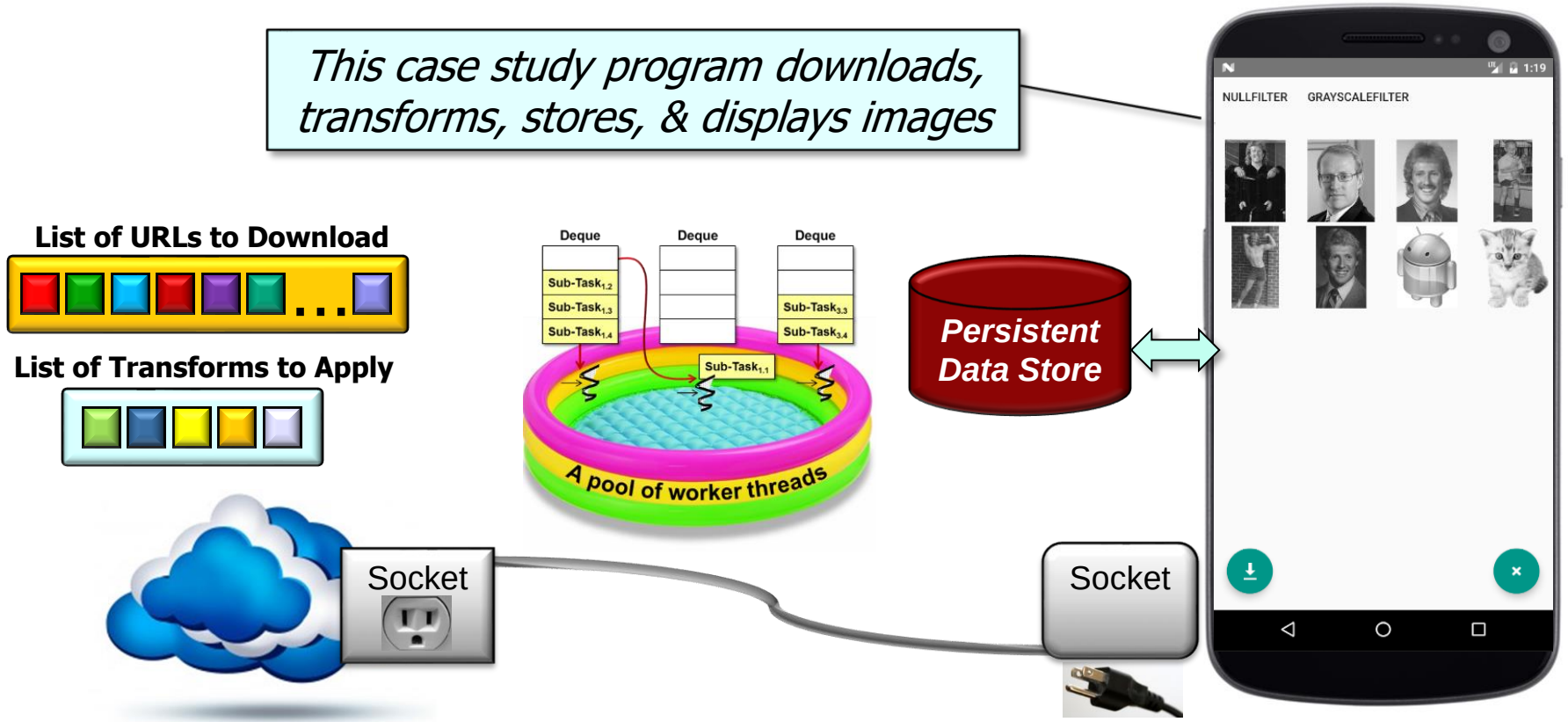
- *Many* other aggregate operations are part of the Java stream API, e.g.



See *"Java Parallel ImageStreamGang Example"*

End of Evaluating the Java Sequential SearchStreamGang Case Study