Evaluating the Java Parallel ImageStreamGang Case Study

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Learning Objectives in this Part of the Lesson

- Understand the structure/functionality of the ImageStreamGang app
- Visualize how Java parallel streams are applied to the ImageStreamGang app
- Learn how to implement parallel streams behaviors of ImageStreamGang
- Be aware of the pros & cons of the parallel streams solution

See github.com/douglascraigschmidt/LiveLessons/blob/master/ImageStreamGang

Pros of the Java Parallel Streams Solution

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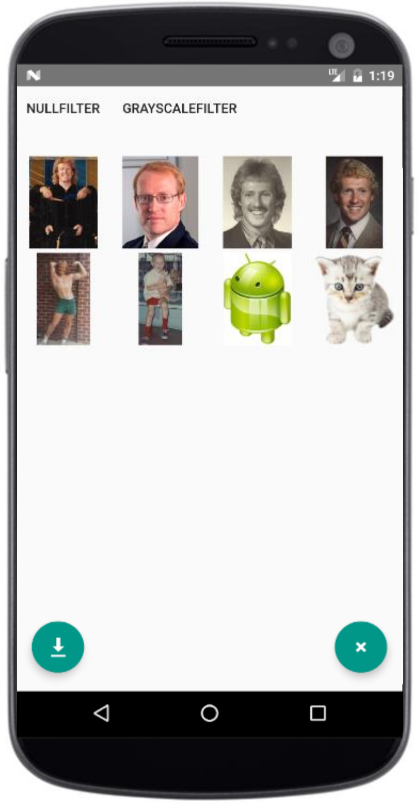
- The parallel stream version is faster than the sequential streams version

```
Starting ImageStreamGangTest
Printing 4 results for input file 1 from fastest to slowest
COMPLETABLE_FUTURES_1 executed in 312 msecs
COMPLETABLE_FUTURES_2 executed in 335 msecs
PARALLEL_STREAM executed in 428 msecs
SEQUENTIAL_STREAM executed in 981 msecs

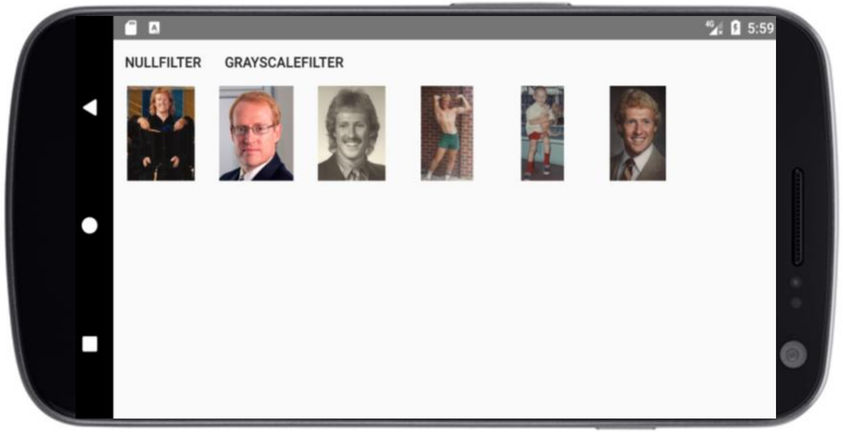
Printing 4 results for input file 2 from fastest to slowest
COMPLETABLE_FUTURES_2 executed in 82 msecs
COMPLETABLE_FUTURES_1 executed in 83 msecs
PARALLEL_STREAM executed in 102 msecs
SEQUENTIAL_STREAM executed in 251 msecs
Ending ImageStreamGangTest
```

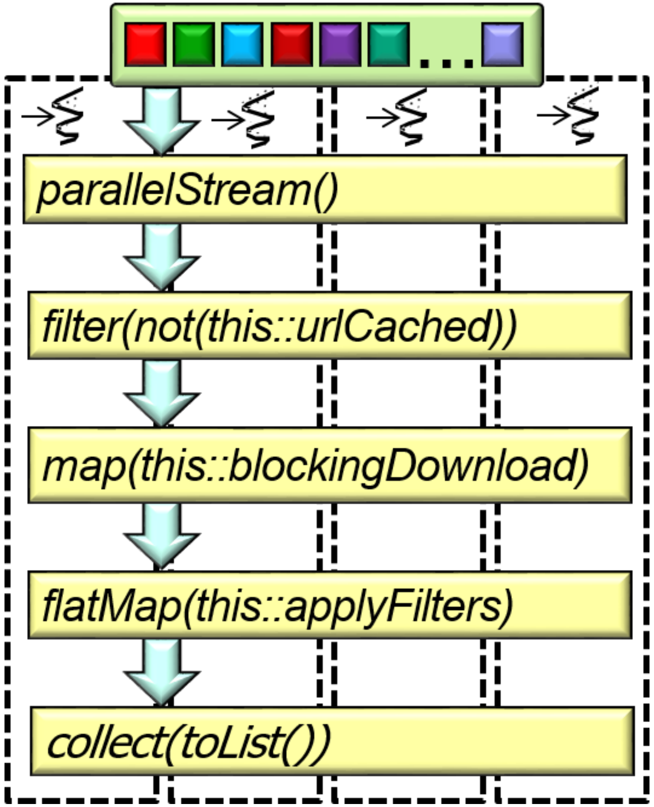


Six-core 2.6 Ghz Windows Intel computer with 64 GB RAM

Pros of the Java Parallel Streams Solution

- The parallel stream version is faster than the sequential streams version
  - e.g., images are downloaded & processed in parallel on multiple cores




parallelStream()
filter(not(this::urlCached))
map(this::blockingDownload)
flatMap(this::applyFilters)
collect(toList())

Pros of the Java Parallel Streams Solution

- The solution is relatively straight forward to understand

```
void processStream() {
  List<URL> urls = getInput();

  List<Image> filteredImages = urls
    .parallelStream()
    .filter(not(this::urlCached))
    .map(this::blockingDownload)
    .flatMap(this::applyFilters)
    .collect(toList());

  System.out.println(TAG
        + "Image(s) filtered = "
        + filteredImages.size());
}
```

Pros of the Java Parallel Streams Solution

- The solution is relatively straight forward to understand, e.g.
  - The behaviors map cleanly onto the domain intent

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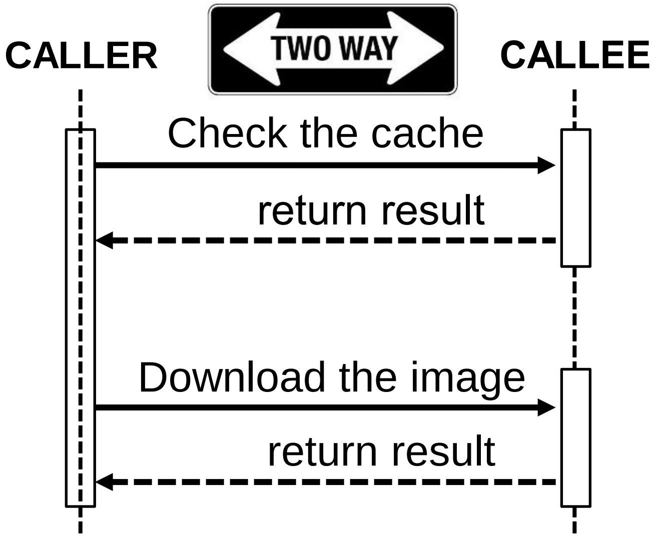
Pros of the Java Parallel Streams Solution

- The solution is relatively straight forward to understand, e.g.
  - The behaviors map cleanly onto the domain intent
  - Behaviors are all synchronous



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See

Pros of the Java Parallel Streams Solution

- The solution is relatively straight forward to understand, e.g.
  - The behaviors map cleanly onto the domain intent
  - Behaviors are all synchronous
  - The flow of control can be read “linearly”
    - Parallel programming thus closely resembles sequential programming

```
void processStream() {
  List<URL> urls = getInput();

  List<Image> filteredImages = urls
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Cons of the Java Parallel Streams Solution

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- The completable futures versions are faster than the parallel streams version

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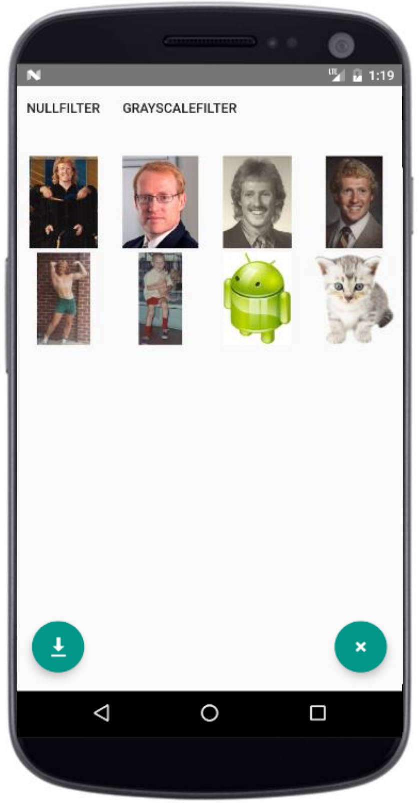
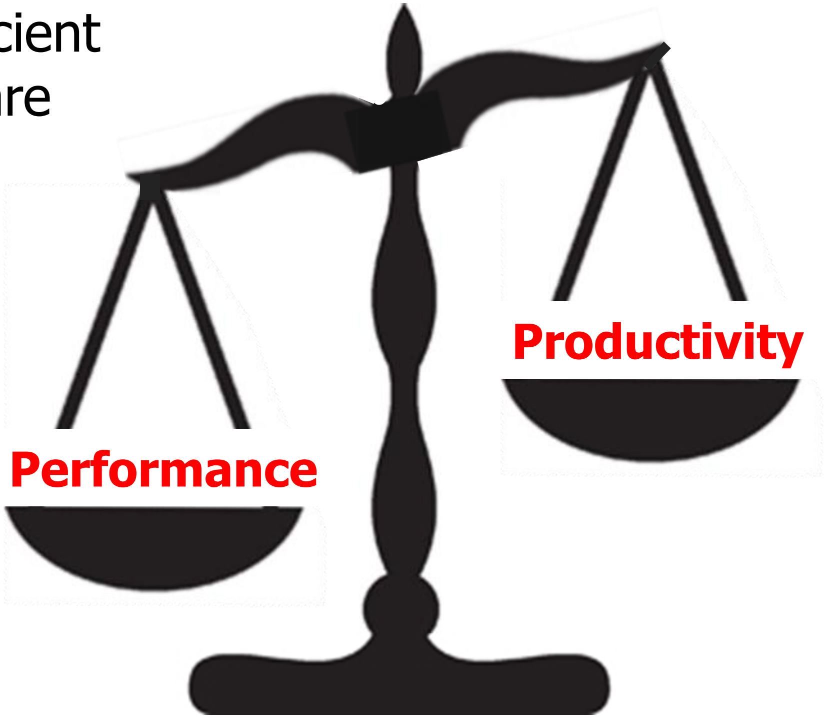


Cons of the Java Parallel Streams Solution

- In general, there's a tradeoff between computing performance & programmer productivity when choosing amongst Java parallelism frameworks
  - i.e., completable futures are more efficient & scalable than parallel streams, but are somewhat harder to program



End of Evaluating the Java Parallel ImageStreamGang Case Study