Java Parallel Streams Internals: Configuring the Common Fork-Join Pool

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Learning Objectives in this Part of the Lesson

- Understand parallel stream internals, e.g.
  - Know what can change & what can't
  - Partition a data source into "chunks"
  - Process chunks in parallel via the common fork-join pool
  - Configure the Java parallel stream common fork-join pool

```
String desiredThreads = "8";
System.setProperty
   ("java.util.concurrent."
    + "ForkJoinPool.common."
    + "parallelism",
    desiredThreads);
```

Configuring the Parallel Stream Common Fork-Join Pool

Configuring the Parallel Stream Common Fork-Join Pool

- By default the common ForkJoinPool has one less thread than the # of cores

```
System.out.println
   ("The parallelism in the"
    + "common fork-join pool is "
    + ForkJoinPool
        .getCommonPoolParallelism());
```

e.g., returns 3 on a quad-core processor

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

Configuring the Parallel Stream Common Fork-Join Pool

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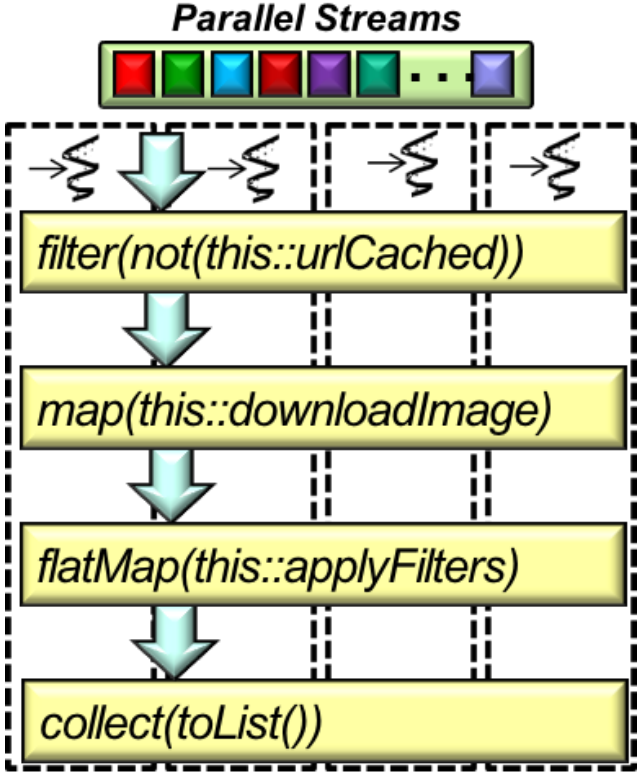
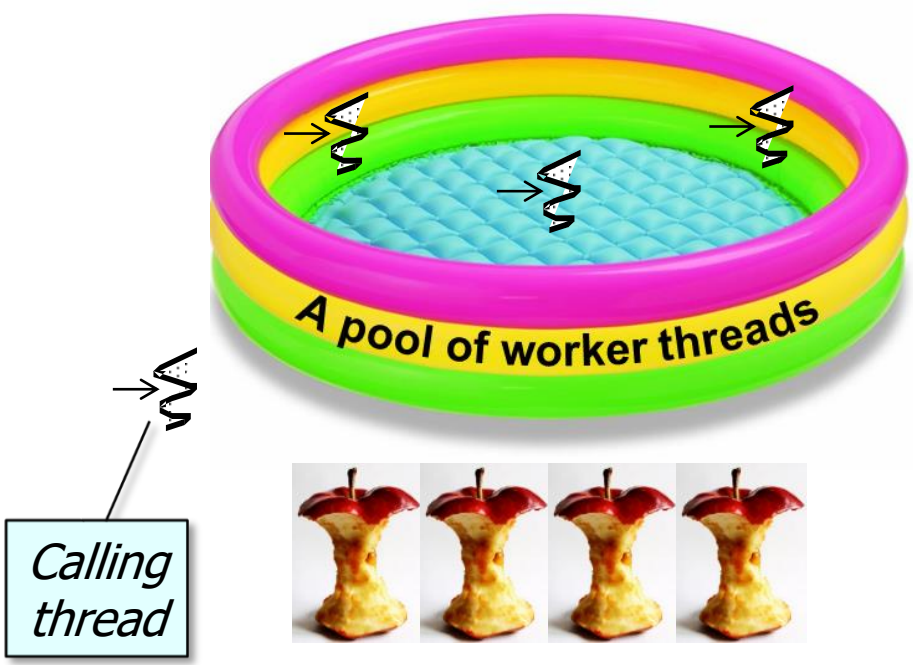
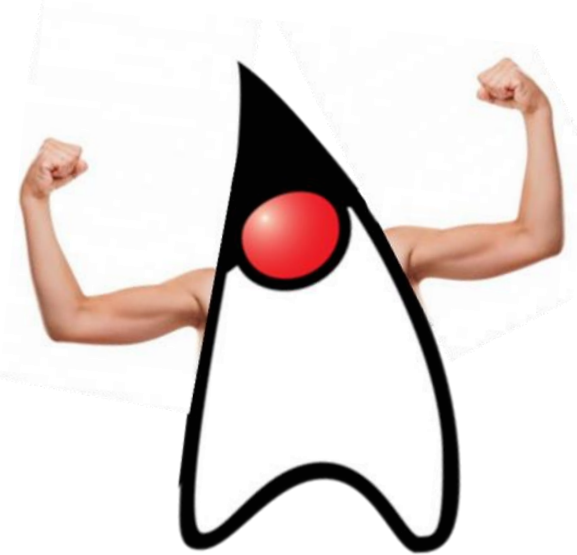


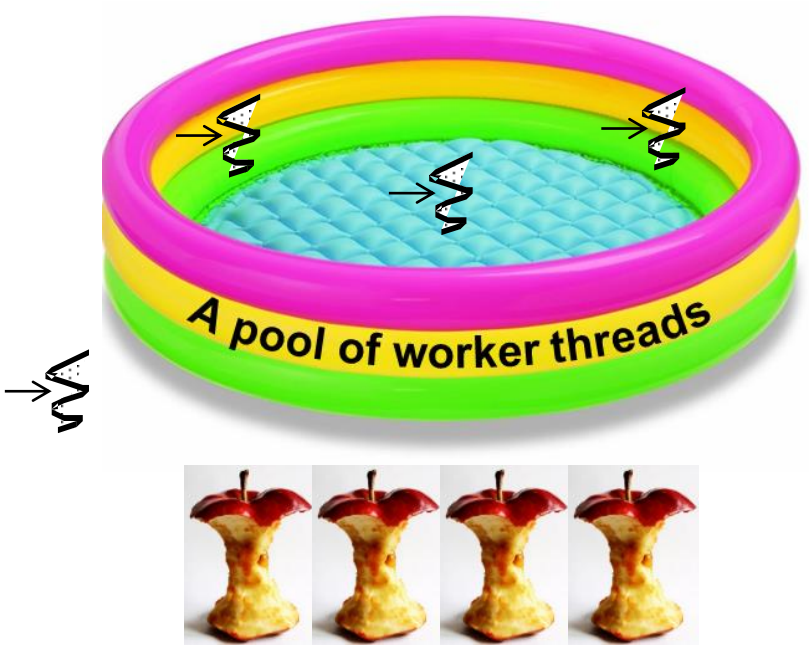


A parallel stream can use all cores since it uses the invoking thread, e.g., main thread

Configuring the Parallel Stream Common Fork-Join Pool

- However, the default # of fork-join pool threads may be inadequate





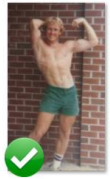
Configuring the Parallel Stream Common Fork-Join Pool

- However, the default # of fork-join pool threads may be inadequate, e.g.
  - Consider a parallel image downloading & processing app

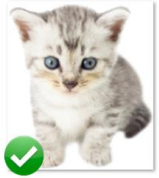

doug.jpg


doug-circle.png


dougs-small.jpg


ironbound.jpg


ka.png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lil_doug.jpg


robot.png


uci.png


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

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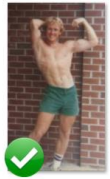
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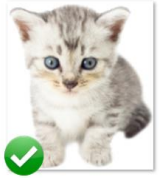
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Problems may occur when trying to download more images than # of cores

These problems may range from underutilization of processor cores to deadlock..

Configuring the Parallel Stream Common Fork-Join Pool

- The common fork-join pool size can be controlled programmatically

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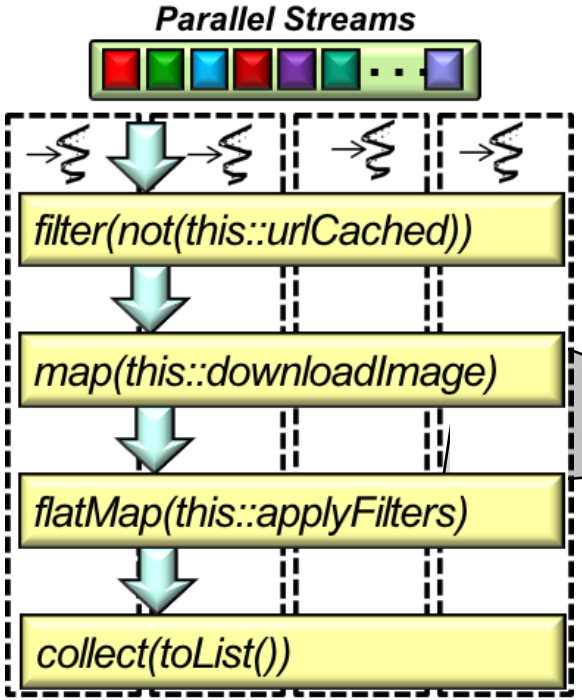

It's hard to estimate the total # of threads to set in the common fork-join pool

Configuring the Parallel Stream Common Fork-Join Pool

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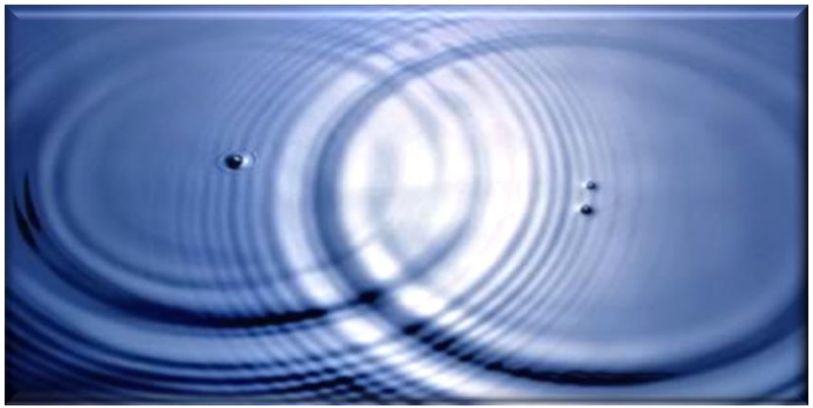
  - Setting this property affects all parallel streams in a process



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Configuring the Parallel Stream Common Fork-Join Pool

- The common fork-join pool size can be controlled programmatically
  - Setting this property affects all parallel streams in a process
    - This property can be changed only before the common fork-join pool is initialized
      - i.e., it's initialized "on-demand" the first time it's used

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See en.wikipedia.org/wiki/Lazy_initialization

Configuring the Parallel Stream Common Fork-Join Pool

- The common fork-join pool size can be controlled programmatically
  - Setting this property affects all parallel streams in a process
  - The ManagedBlocker interface can also be used to add worker threads to common fork-join pool temporarily


```
SupplierManagedBlocker<T> mb =
  new SupplierManagedBlocker<>
   (supplier);
...
ForkJoinPool.managedBlock(mb);
...
return mb.getResult();
```

See docs.oracle.com/javase/8/docs/api/java/util/concurrent/ForkJoinPool.ManagedBlocker.html

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  - The ManagedBlocker interface can also be used to add worker threads to common fork-join pool temporarily
    - This is useful for behaviors that block on I/O and/or synchronizers
    - This interface can only be used with the common fork-join pool..

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See lessons on "*The Java Fork-Join Pool: the ManagedBlocker Interface*"

End of Understand Java Parallel Streams Internals: Configuring the Common Fork-Join Pool