Java Parallel Stream Internals: Demo’ing How to Configure the Common Fork-Join Pool

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

- 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
  - Know the performance impact of configuring the common fork-join pool

Entering the test program with 12 cores
ex20: testDefaultDownloadBehavior() downloaded and stored 42 images using 12 threads in the pool
ex20: testAdaptiveMBDownloadBehavior() downloaded and stored 42 images using 43 threads in the pool
ex20: testAdaptiveBTDownloadBehavior() downloaded and stored 42 images using 43 threads in the pool

Printing 3 results from fastest to slowest
- testAdaptiveBTDownloadBehavior() executed in 3598 msecs
- testAdaptiveMBDownloadBehavior() executed in 3910 msecs
- testDefaultDownloadBehavior() executed in 4104 msecs

Leaving the test program

See github.com/douglascraigschmidt/LiveLessons/tree/master/Java8/ex20
Demo’ing Impact of Configuring Common Fork-Join Pool
Demo'ing Impact of Configuring Common Fork-Join Pool

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

See prior lesson on “Java Parallel Stream Internals: Configuring the Common Fork-Join Pool”
Demo’ing Impact of Configuring Common Fork-Join Pool

- The common fork-join pool size can be controlled programmatically
- This demo applies ManagedBlocker to add new worker threads to the common fork-join pool

```java
File downloadAndStoreImageMB(URL url) {
    final Image[] image = new Image[1];
    ...
    ForkJoinPool
        .managedBlock(new ForkJoinPool
            .ManagedBlocker() {
            public boolean block() {
                image[0] = downloadImage(url);
                return true;
            }
        })
        .managedBlock(
            new ForkJoinPool
                .ManagedBlocker() {
                public boolean block() {
                    image[0] = downloadImage(url);
                    return true;
                }
            })
        .managedBlock(
            new ForkJoinPool
                .ManagedBlocker() {
                public boolean block() {
                    image[0] = downloadImage(url);
                    return true;
                }
            })
            ...
        }

    return image[0].store(); ...
```

• This program shows the performance difference of using ManagedBlocker versus not using ManagedBlocker for an I/O-intensive app

```java
void testDownloadBehavior(Function<URL, File> downloadAndStoreImage,
                          String testName) {
  ...
  List<File> imageFiles = Options.instance()
                          .getUrlList()
                          .parallelStream()
                          .map(downloadAndStoreImage)
                          .collect(Collectors.toList());
  printStats(testName, imageFiles.size()); ...
```
This program shows the performance difference of using ManagedBlocker versus not using ManagedBlocker for an I/O-intensive app.

```java
void testDownloadBehavior(Function<URL, File> downloadAndStoreImage,
                          String testName) {
    ...
    List<File> imageFiles = Options.instance()
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                          .parallelStream()
                          .map(downloadAndStoreImage)
                          .collect(Collectors.toList());
    printStats(testName, imageFiles.size()); ...
}
```

This function param is used to pass different strategies for downloading & storing images from remote websites.

Demo'ing Impact of Configuring Common Fork-Join Pool

- Results show increasing worker threads in the pool improves performance

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Leaving the test program

See upcoming lessons on “The Java Fork-Join Pool: the ManagedBlocker Interface”
Demo'ing Impact of Configuring Common Fork-Join Pool

```java
// Warm up the common fork-join pool.
warmUpThreadPool();

// Runs the tests using the Java fork-join framework's default behavior, which does not add new worker threads to the pool when blocking occurs.
runTest(this::downloadAndStoreImage,
        testName: "testDefaultDownloadBehavior()");

// Run the tests using the Java fork-join framework's ManagedBlocker mechanism, which adds new worker threads to the pool adaptively when blocking occurs.
runTest(this::downloadAndStoreImageMB,
        testName: "testAdaptiveMBDownloadBehavior()");

// Run the tests using the BlockingTask wrapper for the Java fork-join framework's ManagedBlocker mechanism, which adds new worker threads to the pool adaptively when blocking occurs.
runTest(this::downloadAndStoreImageBT,
        testName: "testAdaptiveBTDownloadBehavior()");

// Print the results.
```

See [github.com/douglascaigschmidt/LiveLessons/tree/master/Java8/ex20](https://github.com/douglascaigschmidt/LiveLessons/tree/master/Java8/ex20)
End of Java Parallel Stream Internals: Demo’ing How to Configure the Common Fork-Join Pool