The Java Fork-Join Pool: Worker Threads

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Learning Objectives in this Part of the Lesson

- Know how the fork-join framework implements worker threads
Worker Threads in a Java Fork-Join Pool
Worker Threads in a Java Fork-Join Pool

- Non-ForkJoinTask clients insert new tasks onto a fork-join pool's shared queue.
Worker Threads in a Java Fork-Join Pool

- Non-ForkJoinTask clients insert new tasks onto a fork-join pool’s shared queued
- This shared queue feeds “work-stealing” queues managed by worker threads

See upcoming lessons on “The Java Fork-Join Pool: Work Stealing”
Worker Threads in a Java Fork-Join Pool

- Each worker thread in a fork-join pool runs a loop that scans for (sub-)tasks to execute
Worker Threads in a Java Fork-Join Pool

• Each worker thread in a fork-join pool runs a loop that scans for (sub-)tasks to execute
• The goal is to keep the worker threads as busy as possible!
A worker thread has a “double-ended queue” (aka “deque”) that serves as its main source of tasks.

Worker Threads in a Java Fork-Join Pool

- A worker thread has a “double-ended queue” (aka “deque”) that serves as its main source of tasks
- Implemented by WorkQueue

```
<<Java Class>>

WorkQueue

queueSize():int
isEmpty():boolean
push(ForkJoinTask<?>):void
growArray():ForkJoinTask<?>
pop():ForkJoinTask<?>
pollAt(int):ForkJoinTask<?>
poll():ForkJoinTask<?>
peek():ForkJoinTask<?>
cancelAll():void
pollAndExecAll():void
runTask(ForkJoinTask<?>):void
tryRemoveAndExec(ForkJoinTask<?>):boolean
isApparentlyUnblocked():boolean
```

See [java8/util/concurrent/ForkJoinPool.java](https://example.com)
Worker Threads in a Java Fork-Join Pool

- If a task run by a worker thread calls fork() the new task is pushed on the head of the worker’s deque

See gee.cs.oswego.edu/dl/papers/fj.pdf
• If a task run by a worker thread calls fork() the new task is pushed on the head of the worker’s deque
• A worker thread processes its deque in LIFO order

See en.wikipedia.org/wiki/Stack_(abstract_data_type)
Worker Threads in a Java Fork-Join Pool

- If a task run by a worker thread calls fork() the new task is pushed on the head of the worker’s deque.
- A worker thread processes its deque in LIFO order, i.e.
- A task pop’d from the head of a deque is run to completion.

See [en.wikipedia.org/wiki/Run_to_completion_scheduling](en.wikipedia.org/wiki/Run_to_completion_scheduling)
Worker Threads in a Java Fork-Join Pool

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- join() “pitches in” to pop & execute (sub-)tasks
Worker Threads in a Java Fork-Join Pool

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  - A task pop’d from the head of a deque is run to completion.
- join() “pitches in” to pop & execute (sub-)tasks.

“Collaborative Jiffy Lube” model of processing!
Worker Threads in a Java Fork-Join Pool

- If a task run by a worker thread calls fork() the new task is pushed on the head of the worker’s deque
- A worker thread processes its deque in LIFO order
- LIFO order improves locality of reference & cache performance

End of the Java Fork-Join Pool Framework: Worker Threads