The Java Fork-Join Pool: the ManagedBlocker Interface

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Learning Objectives in this Part of the Lesson

- Understand the common fork-join pool
- Recognize how the ManagedBlocker interface helps avoid starvation & improve performance

Interface ForkJoinPool.ManagedBlocker

Enclosing class:

ForkJoinPool

```
public static interface ForkJoinPool.ManagedBlocker
```

Interface for extending managed parallelism for tasks running in ForkJoinPools.

A ManagedBlocker provides two methods. Method isReleasable() must return true if blocking is not necessary. Method block() blocks the current thread if necessary (perhaps internally invoking isReleasable before actually blocking). These actions are performed by any thread invoking ForkJoinPool.managedBlock(ManagedBlocker). The unusual methods in this API accommodate synchronizers that may, but don't usually, block for long periods. Similarly, they allow more efficient internal handling of cases in which additional workers may be, but usually are not, needed to ensure sufficient parallelism. Toward this end, implementations of method isReleasable must be amenable to repeated invocation.

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

Overview of the ManagedBlocker Interface

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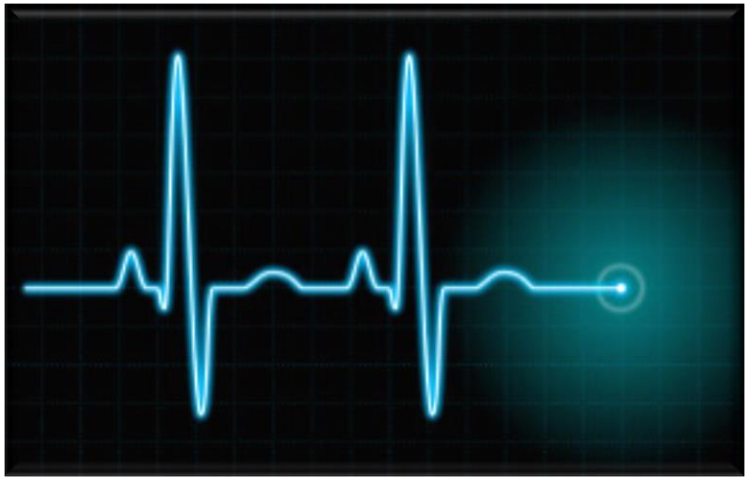
- The Java fork-join framework is largely designed for tasks that "run to completion" without blocking

See en.wikipedia.org/wiki/Run_to_completion_scheduling

Overview of the ManagedBlocker Interface

- ManagedBlocker handles cases where more worker threads may be needed to ensure liveness/responsiveness for blocking operations



Interface ForkJoinPool.ManagedBlocker

Enclosing class:

`ForkJoinPool`

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Overview of the ManagedBlocker Interface

- ManagedBlocker handles cases where more worker threads may be needed to ensure liveness/responsiveness for blocking operations
  - e.g., to automatically/temporarily increase common fork/join pool size

Interface ForkJoinPool.ManagedBlocker

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Overview of the ManagedBlocker Interface

- ForkJoinPool reclaims threads during periods of non-use & reinstates them on later use

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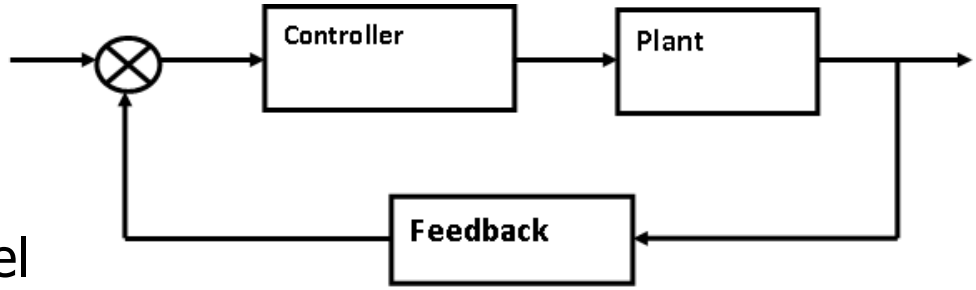
- ForkJoinPool reclaims threads during periods of non-use & reinstates them on later use
  - It also tries to create or activate threads to ensure the target level of parallelism is met



Overview of the ManagedBlocker Interface

- ManagedBlocker defines two methods


```
interface ManagedBlocker {
  boolean isReleasable();

  boolean block();
}
```

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Overview of the ManagedBlocker Interface

- ManagedBlocker defines two methods
  - Returns true if blocking is unnecessary

```
interface ManagedBlocker {
  boolean isReleasable();

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```

e.g., was able to acquire a lock or a message without blocking

Overview of the ManagedBlocker Interface

- ManagedBlocker defines two methods
  - Returns true if blocking is unnecessary
  - Possibly blocks the calling thread

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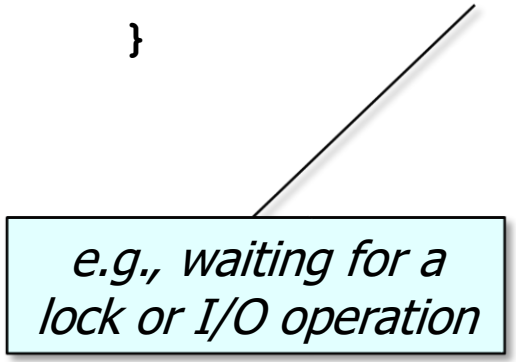

Overview of the ManagedBlocker Interface

- ManagedBlocker defines two methods
  - Returns true if blocking is unnecessary
  - Possibly blocks the calling thread
    - Returns true if no additional blocking is necessary

```
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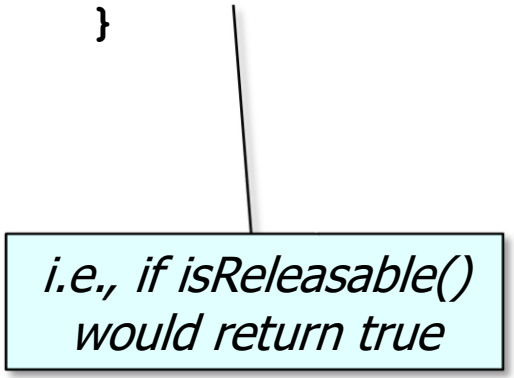

How the Java Fork-Join Pool Applies ManagedBlocker

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- The ForkJoinPool class uses a ManagedBlocker internally

```
class ForkJoinPool extends AbstractExecutorService {
  ...
  static void managedBlock(ManagedBlocker blocker) {
    ...
    while (!blocker.isReleasable()) {
      if (p.tryCompensate(p.ctl)) {
        ...
        do {}
        while (!blocker.isReleasable()
               && !blocker.block());
        ...
}
...
```

See openjdk/7-b147/java/util/concurrent/ForkJoinPool.java

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```

This method activates a spare thread to ensure sufficient parallelism while calling thread is blocked

See openjdk/7-b147/java/util/concurrent/ForkJoinPool.java

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  }
  ...
```

If there aren't enough live threads, create or re-activate a spare thread to compensate for blocked joiners 'til they unblock

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}
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```

Potentially block the calling thread

End of the Java Fork-Join Pool: the Managed Blocker Interface