Java CountDownLatch: Structure & Functionality

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Learning Objectives in this Part of the Lesson

- Understand the structure & functionality of Java CountDownLatch
Overview of Java CountDownLatch
Overview of Java CountDownLatch

- Implements one (of several) Java barrier synchronizers

```java
public class CountDownLatch {
    ...
}
```

Class CountDownLatch

```java
java.lang.Object
    java.util.concurrent.CountDownLatch

public class CountDownLatch
extends Object

A synchronization aid that allows one or more threads to wait until a set of operations being performed in other threads completes.

A CountDownLatch is initialized with a given count. The await methods block until the current count reaches zero due to invocations of the countDown () method, after which all waiting threads are released and any subsequent invocations of await return immediately. This is a one-shot phenomenon -- the count cannot be reset. If you need a version that resets the count, consider using a CyclicBarrier.
```

See [docs.oracle.com/javase/8/docs/api/java/util/concurrent/CountDownLatch.html](docs.oracle.com/javase/8/docs/api/java/util/concurrent/CountDownLatch.html)
Overview of Java CountDownLatch

- Implements one (of several) Java barrier synchronizers
- Allows one or more threads to wait for the completion of a set of operations being performed in other threads

```java
public class CountDownLatch {
    ...
}
```

One human known use is the starting gate at a horse race, which ensures all the horses are in position before the race begins.
Overview of Java CountDownLatch

- Implements one (of several) Java barrier synchronizers
- Allows one or more threads to wait for the completion of a set of operations being performed in other threads
- Well-suited for fixed-size, one-shot “entry” & “exit” barriers

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public class CountDownLatch {
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CountDownLatch is not designed for use as “cyclic” barriers
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Overview of Java CountDownLatch

- Applies a variant of *Bridge* pattern

```java
public class CountDownLatch {
    ...
}
```

Decouple the abstraction from the implementation hierarchy so the two can vary independently

See [en.wikipedia.org/wiki/Bridge_pattern](en.wikipedia.org/wiki/Bridge_pattern)
Overview of Java CountDownLatch

- Applies a variant of *Bridge* pattern
- Locking handled by Sync implementor hierarchy

```java
public class CountDownLatch {
    private final Sync sync;

    /** Performs sync mechanics */
    private final Sync sync;

    ...
Overview of Java CountDownLatch

- Applies a variant of *Bridge* pattern
- Locking handled by Sync implementor hierarchy
- Inherits functionality from the AbstractQueuedSynchronizer (AQS) class

```java
public class CountDownLatch {
    ...

    /** Performs sync mechanics */
    private final Sync sync;

    /**
     * Synchronization control or CountDownLatch.
     */
    private static final class Sync extends AbstractQueuedSynchronizer {
        ...
    }
}
```

See [docs.oracle.com/javase/8/docs/api/java/util/concurrent/locks/AbstractQueuedSynchronizer.html](docs.oracle.com/javase/8/docs/api/java/util/concurrent/locks/AbstractQueuedSynchronizer.html)
Overview of Java CountDownLatch

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See earlier lessons on “Java ReentrantLock’, “Java Semaphore’, & “Java ReentrantReadWriteLock’
Overview of Java CountDownLatch

• Applies a variant of *Bridge* pattern
  • Locking handled by Sync implementor hierarchy

• Inherits functionality from the AbstractQueuedSynchronizer (AQS) class
  • However, it doesn’t implement “fair” vs. “non-fair” semantics
  • Instead, it uses the AQS state to atomically represent the “count”

See [gee.cs.oswego.edu/dl/papers/aqs.pdf](gee.cs.oswego.edu/dl/papers/aqs.pdf)
End of Java CountDownLatch: Structure & Functionality