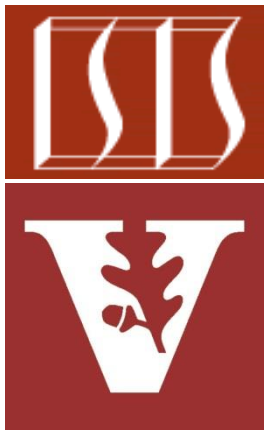
Java CountDownLatch: Structure & Functionality



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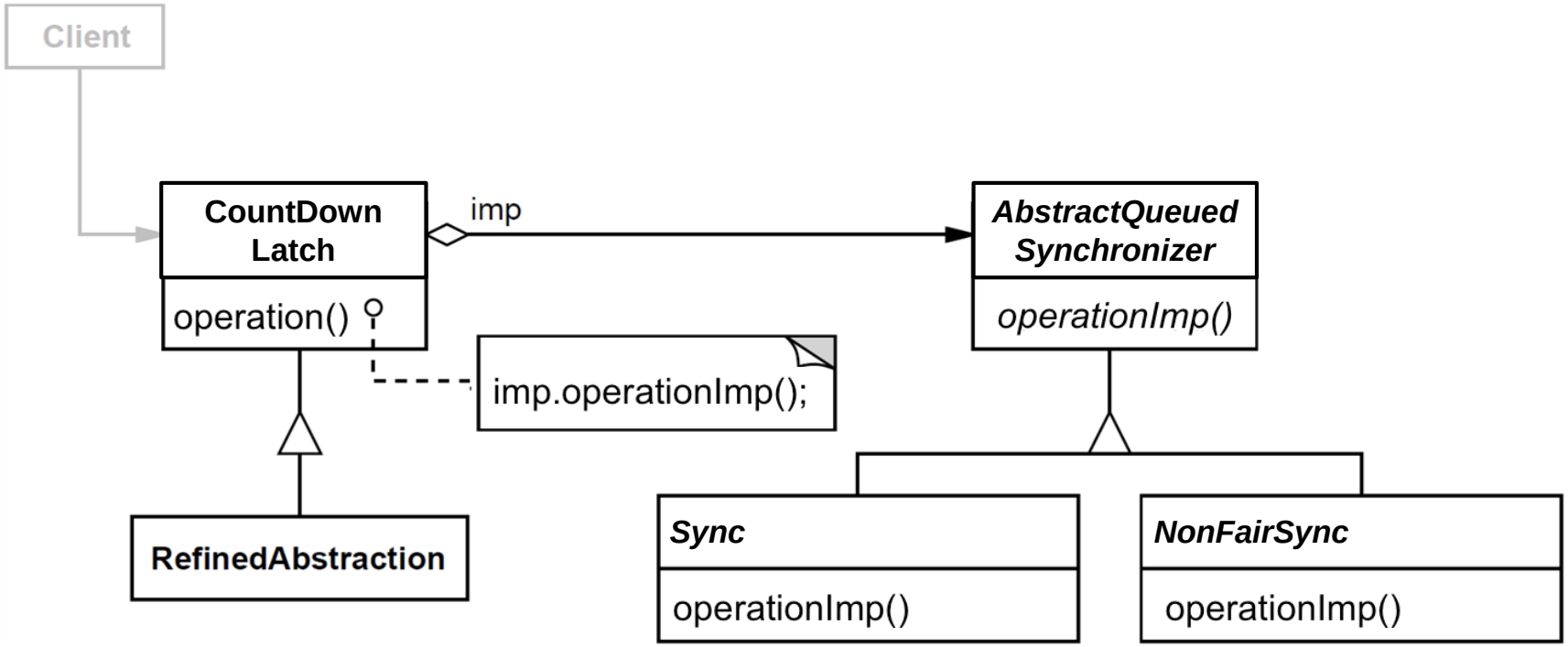
Learning Objectives in this Part of the Lesson

- Understand the structure & functionality of Java CountDownLatch



Overview of Java CountDownLatch

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- Implements one (of several) Java barrier synchronizers

```
public class CountDownLatch {
   ...
```

Class CountDownLatch

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

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

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  - 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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CountDownLatch is not designed for use as "cyclic" barriers

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public class CountDownLatch {
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Does not implement an interface

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Overview of Java CountDownLatch

- Applies a variant of *Bridge* pattern

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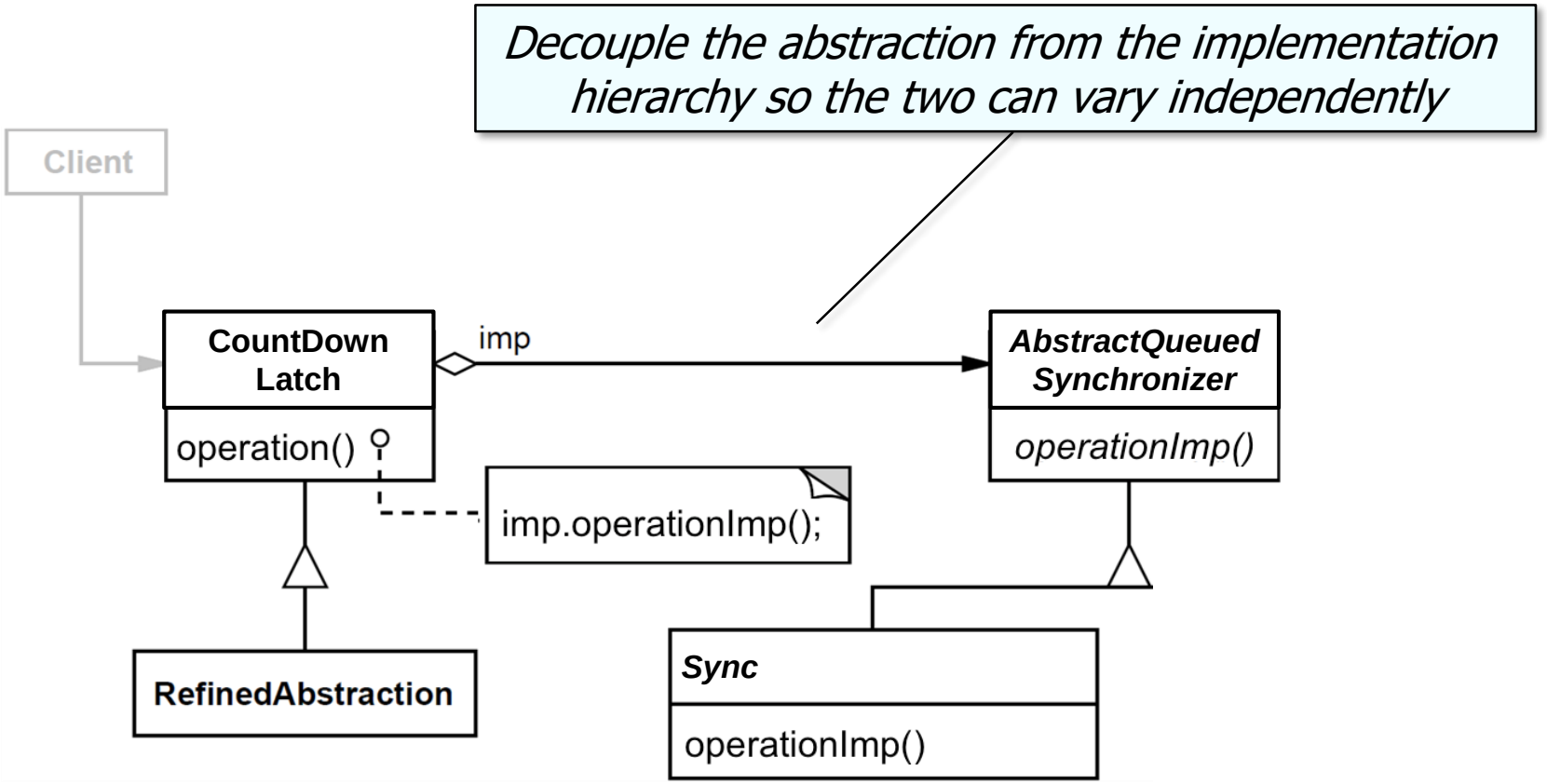

See en.wikipedia.org/wiki/Bridge_pattern

Overview of Java CountDownLatch

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

```
public class CountDownLatch {
  ...
  /** 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

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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

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

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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"

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public class CountDownLatch {
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  private final Sync sync;

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See gee.cs.oswego.edu/dl/papers/aqs.pdf

End of Java CountDownLatch: Structure & Functionality