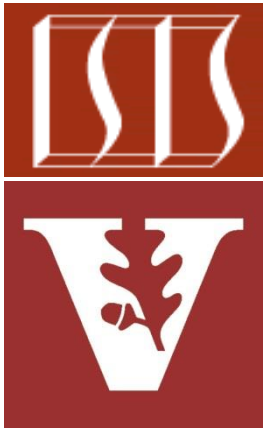
Java ReentrantReadWriteLock: Key Methods



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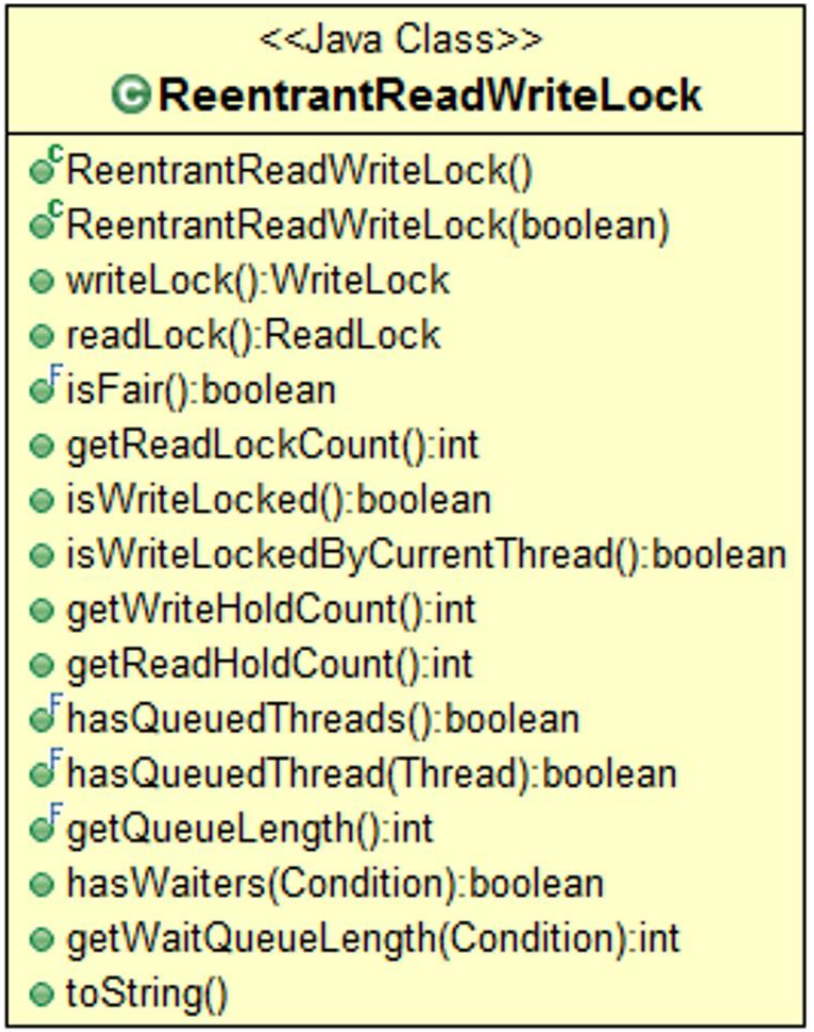
Learning Objectives in this Part of the Lesson

- Understand the structure & functionality of the Java ReentrantReadWriteLock class
- Know the key methods in Java ReentrantReadWriteLock



Key Methods in Java ReentrantReadWriteLock

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public class ReentrantReadWriteLock
     implements ReadWriteLock ... {
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  public ReentrantReadWriteLock.
                              WriteLock
    writeLock() {
      return writerLock;
    }

  public ReentrantReadWriteLock.
                              ReadLock
    readLock() {
      return readerLock;
    }
  ...
```

See en.wikipedia.org/wiki/Factory_method_pattern

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These objects are initialized by the class constructor

Key Methods in Java ReentrantReadWriteLock

- Locks returned by writeLock() & readLock() implement the Java Lock interface

void	**lock**() Acquires the lock.
void	**lockInterruptibly**() Acquires the lock unless the current thread is **interrupted**.
Condition	**newCondition**() Returns a new **Condition** instance that is bound to this Lock instance.
boolean	**tryLock**() Acquires the lock only if it is free at the time of invocation.
boolean	**tryLock**(long time, **TimeUnit** unit) Acquires the lock if it is free within the given waiting time and the current thread has not been **interrupted**.
void	**unlock**() Releases the lock.

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Readers vs. writer semantics are enforced internally by the class implementation using the Lock API

See docs.oracle.com/javase/8/docs/api/java/util/concurrent/locks/Lock.html

Key Methods in Java ReentrantReadWriteLock

- It's methods support a number of properties

- **Reentrancy**

  This lock allows both readers and writers to reacquire read or write locks in the style of a `ReentrantLock`. Non-reentrant readers are not allowed until all write locks held by the writing thread have been released.

  Additionally, a writer can acquire the read lock, but not vice-versa. Among other applications, reentrancy can be useful when write locks are held during calls or callbacks to methods that perform reads under read locks. If a reader tries to acquire the write lock it will never succeed.

- **Lock downgrading**

  Reentrancy also allows downgrading from the write lock to a read lock, by acquiring the write lock, then the read lock and then releasing the write lock. However, upgrading from a read lock to the write lock is **not** possible.

- **Interruption of lock acquisition**

  The read lock and write lock both support interruption during lock acquisition.

- `Condition` **support**

  The write lock provides a `Condition` implementation that behaves in the same way, with respect to the write lock, as the `Condition` implementation provided by `newCondition()` does for `ReentrantLock`. This `Condition` can, of course, only be used with the write lock.

  The read lock does not support a `Condition` and `readLock().newCondition()` throws `UnsupportedOperationException`.

Key Methods in Java ReentrantReadWriteLock

- It's methods support a number of properties
  - Reentrancy
    - Enables "recursive lock" semantics for readers-writer locks

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This property is not supported by Java StampedLock

Key Methods in Java ReentrantReadWriteLock

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  - Reentrancy
  - Lock downgrading
    - Enables atomic downgrading of a write lock to a read lock

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This property (& more!) is supported by Java StampedLock

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- It's methods support a number of properties
  - Reentrancy
  - Lock downgrading
  - Interruption of lock acquisition
    - Conventional Java interrupt requests are supported

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- It's methods support a number of properties
  - Reentrancy
  - Lock downgrading
  - Interruption of lock acquisition
  - Condition support
    - Enables the use of Java ReentrantReadWriteLocks with Java ConditionObjects *only* for write locks

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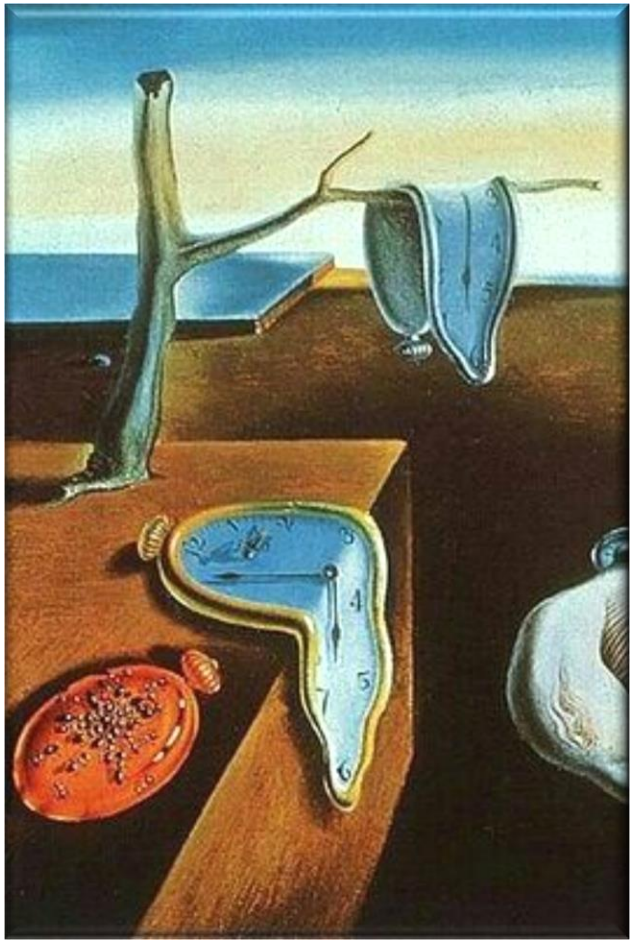

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These properties make optimizing ReentrantReadWriteLock hard (& motivates the need for Java StampedLock)

End of Java ReentrantReadWriteLock: Key Methods