Java StampedLock:
Structure & Functionality

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Learning Objectives in this Part of the Lesson

• Understand the structure & functionality of the Java Stamped Lock class

```java
public class StampedLock
extends Object
implements Serializable

A capability-based lock with three modes for controlling read/write access. The state of a StampedLock consists of a version and mode. Lock acquisition methods return a stamp that represents and controls access with respect to a lock state; "try" versions of these methods may instead return the special value zero to represent failure to acquire access. Lock release and conversion methods require stamps as arguments, and fail if they do not match the state of the lock. The three modes are:

• **Writing.** Method writeLock() possibly blocks waiting for exclusive access, returning a stamp that can be used in method unlockWrite(long) to release the lock. Untimed and timed versions of tryWriteLock are also provided. When the lock is held in write mode, no read locks may be obtained, and all optimistic read validations will fail.

• **Reading.** Method readLock() possibly blocks waiting for non-exclusive access, returning a stamp that can be used in method unlockRead(long) to release the lock. Untimed and timed versions of tryReadLock are also provided.

• **Optimistic Reading.** Method tryOptimisticRead() returns a non-zero stamp only if the lock is not currently held in write mode. Method validate(long) returns true if the lock has not been acquired in write mode since obtaining a given stamp. This mode can be thought of as an extremely weak version of a read-lock, that can be broken by a writer at any time. The use of optimistic mode for short read-only code segments often
```
Overview of Java
StampedLock
Overview of Java StampedLock

- Provides a readers-writer implementation in Java 8+

Class StampedLock

```java
java.lang.Object
java.util.concurrent.locks.StampedLock
```

**All Implemented Interfaces:**

Serializable

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

• Provides a readers-writer implementation in Java 8+
• Much more efficient & scalable than ReentrantReadWriteLock

Class ReentrantReadWriteLock

java.lang.Object
does not extend Object
does not implement ReadWriteLock, Serializable

All Implemented Interfaces:
Serializable, ReadWriteLock

An implementation of ReadWriteLock supporting similar semantics to ReentrantLock.

This class has the following properties:

• Acquisition order

This class does not impose a reader or writer preference ordering for lock access. However, it does support an optional fairness policy.

Class StampedLock

java.lang.Object
java.util.concurrent.locks.StampedLock

All Implemented Interfaces:
Serializable

public class StampedLock
extends Object
implements Serializable

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Overview of Java StampedLock

• Provides a readers-writer implementation in Java 8+  

```java
public class StampedLock implements java.io.Serializable {

Does not implement ReadWriteLock interface, does not use the AbstractQueuedSynchronizer framework, & does not apply Bridge pattern
```
Overview of Java StampedLock

- Provides three locking modes

```java
public class StampedLock implements java.io.Serializable {
...
```

These modes go above & beyond what’s supported in ReentrantReadWriteLock
Overview of Java StampedLock

- Provides three locking modes
- Writing

```
public class StampedLock
    implements java.io.Serializable {
    ...
    public long writeLock() { ... }
    public long tryWriteLock() { ... }
    public long tryWriteLock(long time, TimeUnit unit) {...}
    ...
```

Writing mode is “pessimistic” since it assumes contention may occur, so no other thread can acquire the lock while it’s held, i.e., a write lock is “exclusive”
Overview of Java StampedLock

- Provides three locking modes
  - Writing
  - Reading

```java
public class StampedLock
    implements java.io.Serializable {

    public long readLock() { ... }

    public long tryReadLock() { ... }

    public long tryReadLock(
        long time,
        TimeUnit unit) {...}

    ...

Reading mode is “pessimistic” since it assumes contention may occur, though other threads can acquire the lock for reading, i.e., a read lock is “shared”
```
Overview of Java StampedLock

- Provides three locking modes
  - Writing
  - Reading
  - Optimistic reading

This reading mode is “optimistic” since it assumes contention will not occur, so other threads can obtain the lock optimistically, i.e., the lock is “probabilistic”

```
public class StampedLock
    implements java.io.Serializable {
    ...
    public long tryOptimisticRead() {
        ...
    }

    public boolean validate (long stamp) {
        ...
    }
    ...
```
It’s also possible to convert a lock from one mode to another.

```java
public class StampedLock
    implements java.io.Serializable {
    ...
    public long
        tryToConvertToWriteLock
        (long stamp) { ... }

    public long
        tryToConvertToReadLock
        (long stamp) { ... }

    public long
        tryToConvertToOptimisticRead
        (long stamp) { ... }
    ...
```

Overview of Java StampedLock

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End of Java StampedLock: Structure & Functionality