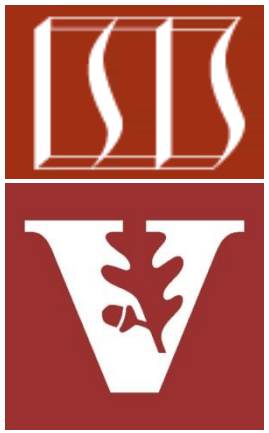
Java ConditionObject: Key Class Methods

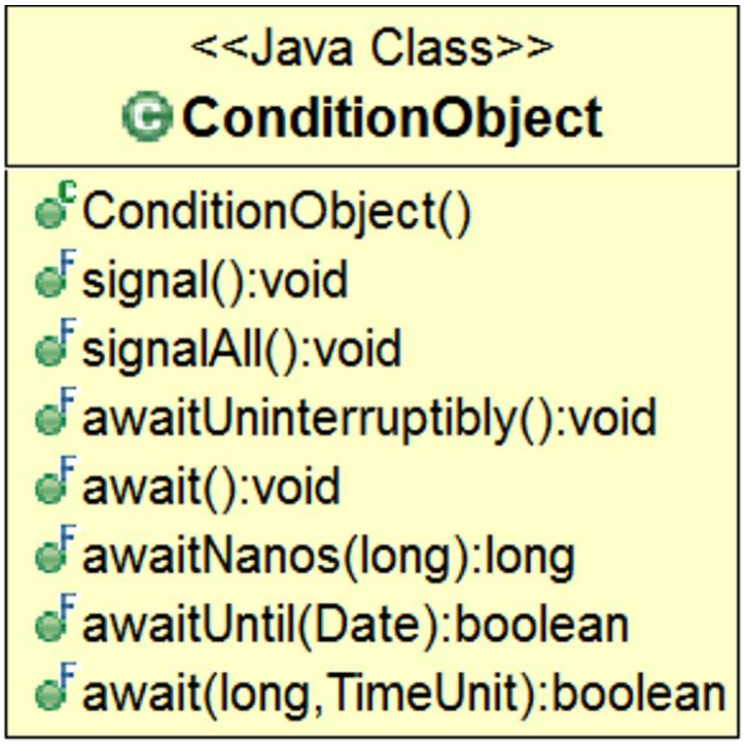


Douglas C. Schmidt
d.schmidt@vanderbilt.edu
www.dre.vanderbilt.edu/~schmidt

Institute for Software Integrated Systems
Vanderbilt University
Nashville, Tennessee, USA

Learning Objectives in this Part of the Lesson

- Understand what condition variables are
- Note a human known use of condition variables
- Know what pattern they implement
- Recognize common use cases where condition variables are applied
- Recognize the structure & functionality of Java ConditionObject
- Know the key methods defined by the Java ConditionObject class



Key Methods of Java ConditionObject

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- Its key methods allow threads to wait & notify each other

```
public class ConditionObject
             implements Condition,
             java.io.Serializable {
  ...
  /** Implement interruptible
      condition wait. */
  public final void await()
    throws InterruptedException
  { ... }

  /** Wakeup the longest waiting
      thread. */
  public final void signal()
  { ... }

  /** Wakeup all waiting threads. */
  public final void signalAll()
  { ... }
  ...
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Method names are similar to Java's built-in monitor object methods, but these Java Object final methods can't be overriden

See lesson on "*Java Built-in Monitor Objects*"

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Methods are implemented via the AbstractQueued Synchronizer framework

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

Key Methods of Java ConditionObject

- Its key methods allow threads to wait & notify each other
  - await() suspends the calling thread until it's signaled (or interrupted)

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See docs.oracle.com/javase/8/docs/api/java/util/concurrent/locks/AbstractQueuedSynchronizer.ConditionObject.html#await

Key Methods of Java ConditionObject

- Its key methods allow threads to wait & notify each other
  - await() suspends the calling thread until it's signaled (or interrupted)
    - The thread is "parked" on the condition object's queue

```
public class ConditionObject
             implements Condition,
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      condition wait. */
  public final void await() ...
  { ... }
  ...
```

See www.docjar.com/docs/api/sun/misc/Unsafe.html#park(boolean, long)

Key Methods of Java ConditionObject

- Its key methods allow threads to wait & notify each other
  - await() suspends the calling thread until it's signaled (or interrupted)
  - signal() moves the longest waiting thread from the queue for this condition object to the queue for the owning lock

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public class ConditionObject
             implements Condition,
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See docs.oracle.com/javase/8/docs/api/java/util/concurrent/locks/AbstractQueuedSynchronizer.ConditionObject.html#signal

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  - await() suspends the calling thread until it's signaled (or interrupted)
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  - signalAll() moves *all* threads from the ConditionObject's queue to owning lock's queue

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public class ConditionObject
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Key Methods of Java ConditionObject

- Its key methods allow threads to wait & notify each other
  - await() suspends the calling thread until it's signaled (or interrupted)
  - signal() moves the longest waiting thread from the queue for this condition object to the queue for the owning lock
  - signalAll() moves *all* threads from the ConditionObject's queue to owning lock's queue
    - signalAll() may cause the "thundering herd" problem, so use it sparingly!!

```
public class ConditionObject
             implements Condition,
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  ...
  /** Wakeup all waiting threads. */
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See en.wikipedia.org/wiki/Thundering_herd_problem

Other Methods of Java ConditionObject

Other Methods of Java ConditionObject

- ConditionObject has several await() methods

void	await() – Causes the current thread to wait until it is signalled or interrupted
boolean	await(long time, TimeUnit unit) – Causes the current thread to wait until it is signalled or interrupted, or the specified waiting time elapses
long	awaitNanos(long nanosTimeout) – Causes the current thread to wait until it is signalled or interrupted, or the specified waiting time elapses
void	awaitUninterruptibly() – Causes the current thread to wait until it is signalled
boolean	awaitUntil(Date deadline) – Causes the current thread to wait until it is signalled or interrupted, or the specified deadline elapses

Other Methods of Java ConditionObject

- ConditionObject has several await() methods
  - e.g., interruptible, non-interruptible, & timed operations

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Unlike Java's built-in monitor object timed wait() calls, these timed await() calls gives a sensible return value..*

See stackoverflow.com/questions/3397722/how-to-differentiate-when-waitlong-timeout-exit-for-notify-or-timeout

End of Java ConditionObject: Key Class Methods