Key Methods in Java

ConditionObject

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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
Key Methods of Java ConditionObject

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

```java
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()
    {
        ... }

    ...
```
• Its key methods allow threads to wait & notify each other

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Methods are implemented via the AbstractQueued Synchronizer framework

See [gee.cs.oswego.edu/dl/papers/aqs.pdf](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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public class ConditionObject
    implements Condition,
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    public final void await() ...
    { ... }
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}
```

See [docs.oracle.com/javase/8/docs/api/java/util/concurrent/locks/AbstractQueuedSynchronizer.ConditionObject.html#await](https://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

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public class ConditionObject
    implements Condition, java.io.Serializable {
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    public final void await() ...
    { ... }
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See [www.docjar.com/docs/api/sun/misc/Unsafe.html#park(boolean, long)](http://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)
- The thread is “parked” on the condition object’s queue
- If the associated lock is not held when `await()` is called an `IllegalMonitorStateException` is called

```
public class ConditionObject
    implements Condition, java.io.Serializable {

    ... // Code...

    /** Implement interruptible condition wait. */
    public final void await() {
        ... // Code...
    }

    ... // Code...

```

See [docs.oracle.com/javase/8/docs/api/java/util/concurrent/locks/Condition.html#await](https://docs.oracle.com/javase/8/docs/api/java/util/concurrent/locks/Condition.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)
  - `signal()`: moves the longest waiting thread from the queue for this condition object to the queue for the owning lock

```java
public class ConditionObject implements Condition, java.io.Serializable {
    ...
    /**< Wakeup longest waiting thread. */
    public final void signal() {
        ...
    }
    ...
```

See docs.oracle.com/javase/8/docs/api/java/util/concurrent/locks/AbstractQueuedSynchronizer.ConditionObject.html#signal
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 condition object’s queue to owning lock’s queue

public class ConditionObject implements Condition, java.io.Serializable {

    ... 
    /** Wakeup all waiting threads. */ */
    public final void signalAll() {
        ... 
    }
    ... 

See [docs.oracle.com/javase/8/docs/api/java/util/concurrent/locks/AbstractQueuedSynchronizer.ConditionObject.html#signalAll](https://docs.oracle.com/javase/8/docs/api/java/util/concurrent/locks/AbstractQueuedSynchronizer.ConditionObject.html#signalAll)
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 condition object’s queue to owning lock’s queue
  - `signalAll()` may cause the “thundering herd” problem, so use it sparingly!!

public class ConditionObject implements Condition, java.io.Serializable {
    ...
    /** Wakeup all waiting threads. */
    public final void signalAll() {
        ...
    }
    ...

See [en.wikipedia.org/wiki/Thundering_herd_problem](en.wikipedia.org/wiki/Thundering_herd_problem)
Other Methods of Java
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## Other Methods of Java ConditionObject

- **ConditionObject** has several `await()` methods

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### 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](https://stackoverflow.com/questions/3397722/how-to-differentiate-when-waitlong-timeout-exit-for-notify-or-timeout)
End of Key Methods in Java ConditionObject