Java ConditionObject: Introduction

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Learning Objectives in this Part of the Lesson

- Understand what condition variables are

```java
Lock l = new Lock()
Condition cond = l.newCondition()
...
l.lock()
while (conditionNotSatisfied())
    cond.await()
doOperationProcessing()
```
Learning Objectives in this Part of the Lesson

• Understand what condition variables are

Condition variables can be tricky, so I recommend you rewatch this lesson & read the links carefully.

```java
Lock l = new Lock();
Condition cond = l.newCondition();
...
\[\text{l.lock()}
\]
\[\text{while (conditionNotSatisfied())}
\]
\[\text{cond.await()}
\]
\[\text{doOperationProcessing()}
```
Learning Objectives in this Part of the Lesson

- Understand what condition variables are
- Note a human known use of condition variables
Overview of Condition Variables
Overview of Condition Variables

- A CV is a synchronizer that allows a thread to (repeatedly) suspend its execution until a condition is satisfied.

See blog.dcoles.net/2012/02/understanding-how-to-use-condition.html

Wheel of Pain – Conan the Barbarian
Overview of Condition Variables

• A CV is a synchronizer that allows a thread to (repeatedly) suspend its execution until a condition is satisfied

• A thread whose execution is suspended on a CV is said to be “blocked” on the CV

Tree of Woe – Conan the Barbarian
Overview of Condition Variables

- CVs are often used when *mutual exclusion* alone is inadequate.
Overview of Condition Variables

• CVs are often used when mutual exclusion alone is inadequate, e.g.
  • Inefficient use of resources
    • e.g., due to excessive “busy waiting” incurred by spin locks

See en.wikipedia.org/wiki/Busy_waiting & en.wikipedia.org/wiki/Spinlock
Overview of Condition Variables

- CVs are often used when *mutual exclusion* alone is inadequate, e.g.
  - Inefficient use of resources
  - Insufficient to ensure *coordination*
    - e.g., what to do when a thread encounters shared state that it can't do any work upon (yet)
Overview of Condition Variables

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See [en.wikipedia.org/wiki/Waiting_for_Godot](en.wikipedia.org/wiki/Waiting_for_Godot)
Overview of Condition Variables

- To alleviate the inadequacies of mutual exclusion, a CV is implemented as a queue of threads.

See [en.wikipedia.org/wiki/Monitor_(synchronization)#Condition_variables](en.wikipedia.org/wiki/Monitor_(synchronization)#Condition_variables)
Overview of Condition Variables

• To alleviate the inadequacies of mutual exclusion, a CV is implemented as a queue of threads

• This queue of threads is known as the "wait set"

See docs.oracle.com/javase/specs/jls/se7/html/jls-17.html#jls-17.2
Overview of Condition Variables

• To alleviate the inadequacies of mutual exclusion, a CV is implemented as a queue of threads

• This queue of threads is known as the “wait set”

• Rather than “spinning,” threads can choose to wait for certain condition(s) to be satisfied

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Human Known Use of Condition Variables
A human known use is a pizza delivery protocol

- Must acquire both the pizza & the keys to deliver the pizza
End of Java ConditionObject: Introduction