Java CyclicBarrier: Structure & Functionality

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Learning Objectives in this Part of the Lesson

• Understand the structure & functionality of Java CountDownLatch

Class CyclicBarrier

```java
java.lang.Object
    java.util.concurrent.CyclicBarrier
```

public class CyclicBarrier extends Object

A synchronization aid that allows a set of threads to all wait for each other to reach a common barrier point. CyclicBarriers are useful in programs involving a fixed sized party of threads that must occasionally wait for each other. The barrier is called cyclic because it can be re-used after the waiting threads are released.

A CyclicBarrier supports an optional Runnable command that is run once per barrier point, after the last thread in the party arrives, but before any threads are released. This barrier action is useful for updating shared-state before any of the parties continue.

Sample usage: Here is an example of using a barrier in a parallel decomposition design:
Overview of Java CyclicBarrier
Overview of Java CyclicBarrier

- Implements another Java barrier synchronizer

```java
public class CyclicBarrier {
    ...
}
```

**Class CyclicBarrier**

text:

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See [docs.oracle.com/javase/8/docs/api/java/util/concurrent/CyclicBarrier.html](http://docs.oracle.com/javase/8/docs/api/java/util/concurrent/CyclicBarrier.html)
Overview of Java CyclicBarrier

- Implements another Java barrier synchronizer
- Allows a set of threads to wait for each other to reach a common barrier point

```
public class CyclicBarrier {
  ...
}
```

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One human known use is an assembly line where fixed-sized groups of workers coordinate to build various parts of cars moving by in phases.
Overview of Java CyclicBarrier

• Implements another Java barrier synchronizer
• Allows a set of threads to wait for each other to reach a common barrier point
• Well-suited for fixed-size “cyclic”, “entry”, and/or “exit” barriers

Class CyclicBarrier

java.lang.Object
    java.util.concurrent.CyclicBarrier

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  extends Object

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- Implements another Java barrier synchronizer
- Allows a set of threads to wait for each other to reach a common barrier point
- Well-suited for fixed-size “cyclic”, “entry”, and/or “exit” barriers
- Enables the count to be manually reset at any point

Class CyclicBarrier

```java
public class CyclicBarrier {
    ...
}
```

In contrast, Java CountDownLatch does *not* enable the count to be reset!
Overview of Java CyclicBarrier

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Does not implement an interface

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Overview of Java CyclicBarrier

- Does not apply the *Bridge* pattern

```java
public class CyclicBarrier {
    ...
}
```
Overview of Java CyclicBarrier

- Does not apply the *Bridge* pattern
- Nor does it use the Abstract QueuedSynchronizer framework

Unlike the Java ReentrantLock, ReentrantReadWriteLock, Semaphore, ConditionObject, & CountDownLatch classes
Overview of Java CyclicBarrier

• Instead, it defines a # of fields that implement a cyclic barrier

```java
public class CyclicBarrier {
    private final ReentrantLock lock = new ReentrantLock();

    private final Condition trip = lock.newCondition();

    private final int parties;

    private int count;

    private final Runnable barrierCommand;

    ...

See src/share/classes/java/util/concurrent/CyclicBarrier.java
```
• Instead, it defines a # of fields that implement a cyclic barrier
• Lock that protects critical sections

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public class CyclicBarrier {
    private final ReentrantLock lock = new ReentrantLock();
    private final Condition trip = lock.newCondition();
    private final int parties;
    private int count;
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    ...
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Overview of Java CyclicBarrier

• Instead, it defines a # of fields that implement a cyclic barrier
  • Lock that protects critical sections
  • Condition to wait on until tripped

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    private final ReentrantLock lock = new ReentrantLock();

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Overview of Java CyclicBarrier

- Instead, it defines a # of fields that implement a cyclic barrier
  - Lock that protects critical sections
  - Condition to wait on until tripped
  - The total # of parties

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Overview of Java CyclicBarrier

- Instead, it defines a # of fields that implement a cyclic barrier
  - Lock that protects critical sections
  - Condition to wait on until tripped
  - The total # of parties
  - # of parties that haven’t called await() yet
  - Barrier action (optional)

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End of Java CyclicBarrier: Structure & Functionality