Java Barrier Synchronizers: Usage Considerations

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Learning Objectives in this Lesson

• Appreciate Java barrier synchronizer usage considerations
Java Barrier
Usage Considerations
Java Barrier Usage Considerations

• Java’s barrier synchronizers can be used for several purposes

See stackoverflow.com/questions/6830904/java-tutorials-explanations-of-jsr166y-phaser/6831171#6831171
Java Barrier Usage Considerations

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- CountDownLatch focuses on actions
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  - CountDownLatch focuses on actions
    - It can be used an on/off latch for an entry barrier
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  - CountDownLatch focuses on actions
    - It can be used an on/off latch for an entry barrier

  e.g., all video rendering threads invoking await() block at the latch until the main thread invokes countDown()
Java’s barrier synchronizers can be used for several purposes

- **CountDownLatch** focuses on actions
  - It can be used as an on/off latch for an entry barrier
  - It can also be used for more sophisticated exit barrier use cases
Java Barrier Usage Considerations

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  - CountDownLatch focuses on actions
    - It can be used an on/off latch for an entry barrier
    - It can also be used for more sophisticated exit barrier use cases, e.g.
      - 1 thread waits until \( N \) threads have completed an action

  e.g., the main thread waits until the worker threads are finished rendering the video
Java Barrier Usage Considerations

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  - CountDownLatch focuses on actions
    - It can be used an on/off latch for an entry barrier
    - It can also be used for more sophisticated exit barrier use cases, e.g.
      - 1 thread waits until $N$ threads have completed an action
      - 1 thread waits until an action has completed $N$ times, irrespective of which thread(s) were responsible
Java Barrier Usage Considerations

• Java’s barrier synchronizers can be used for several purposes
  • **CountDownLatch** focuses on actions
    • It can be used an on/off latch for an entry barrier
    • It can also be used for more sophisticated exit barrier use cases
  • Most appropriate/optimized for relatively simple use cases
Java Barrier Usage Considerations

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  - CountDownLatch focuses on actions
  - CyclicBarrier focuses on threads
Java Barrier Usage Considerations

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  - CountDownLatch focuses on actions
  - CyclicBarrier focuses on threads
    - It enables a set of threads to all wait for each other to reach a common barrier point
Java Barrier Usage Considerations

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  - `CountDownLatch` focuses on actions
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*Example*: a barrier can be used to wait for one or more algorithm iterations to finish before deciding to move on to the next cycle.
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  - CyclicBarrier focuses on threads
    - It enables a set of threads to all wait for each other to reach a common barrier point
    - It requires a fixed # of threads
Java's barrier synchronizers can be used for several purposes:

- **CountDownLatch** focuses on actions
- **CyclicBarrier** focuses on threads
  - It enables a set of threads to all wait for each other to reach a common barrier point
  - It requires a fixed number of threads
  - This may be overly limited

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**Java Barrier Usage Considerations**

- **Worker Threads**
  - ![Traffic Lights](traffic_lights.png)
  - ![Cyclic Barrier](cyclic_barrier.png)

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**LIMITED**
Java’s barrier synchronizers can be used for several purposes:

- CountDownLatch focuses on actions
- CyclicBarrier focuses on threads
- Phaser focuses on a variable (or fixed) # of threads
- It enables threads to wait for each other to complete processing in cycles
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Using Phasers for a fixed # of threads is typically overkill!
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  - CyclicBarrier focuses on threads
  - Phaser focuses on a variable (or fixed) # of threads
    - It enables threads to wait for each other to complete processing in cycles
    - It’s more flexible than the two other types of Java barrier synchronizers
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  - CountDownLatch focuses on actions
  - CyclicBarrier focuses on threads
  - Phaser focuses on a variable (or fixed) number of threads
    - It enables threads to wait for each other to complete processing in cycles
    - It’s more flexible than the two other types of Java barrier synchronizers
  - However, they are also more complex to program
End of Java Barrier Synchronizers: Usage Considerations