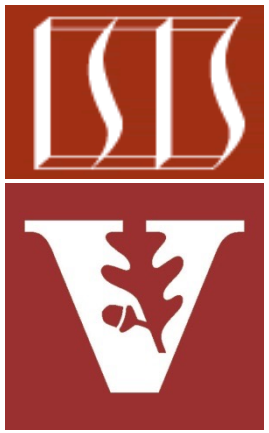
Java Platform Threads vs. Virtual Threads (Part 2)



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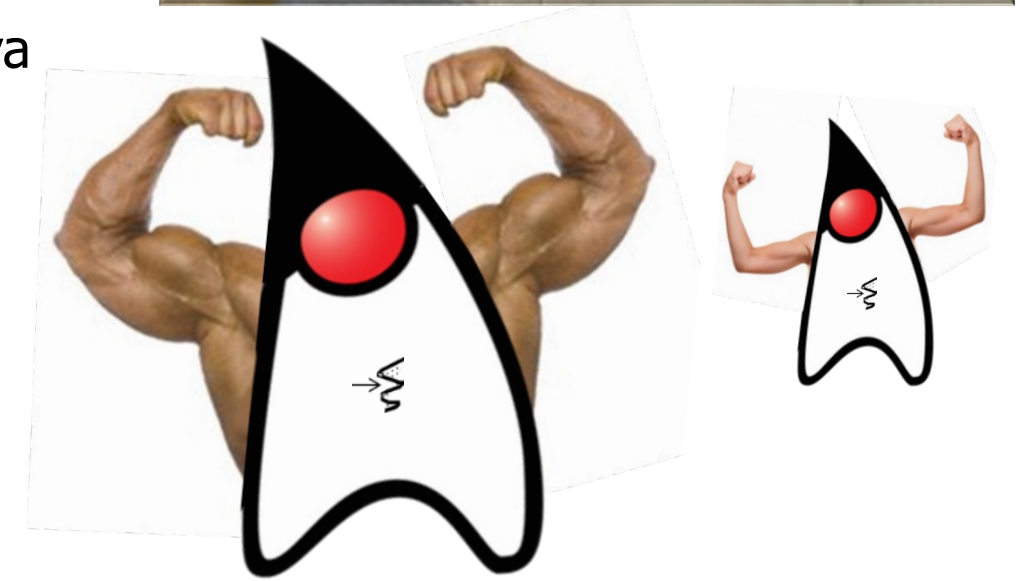
Learning Objectives in this Part of the Lesson

- Understand how Java threads support concurrency
- Learn how our case study app works
- Know alternative ways of giving code to a thread
- Learn how to pass parameters to a Java thread
- Know the differences between Java platform & virtual threads
  - Be aware of how to create Java platform & virtual threads



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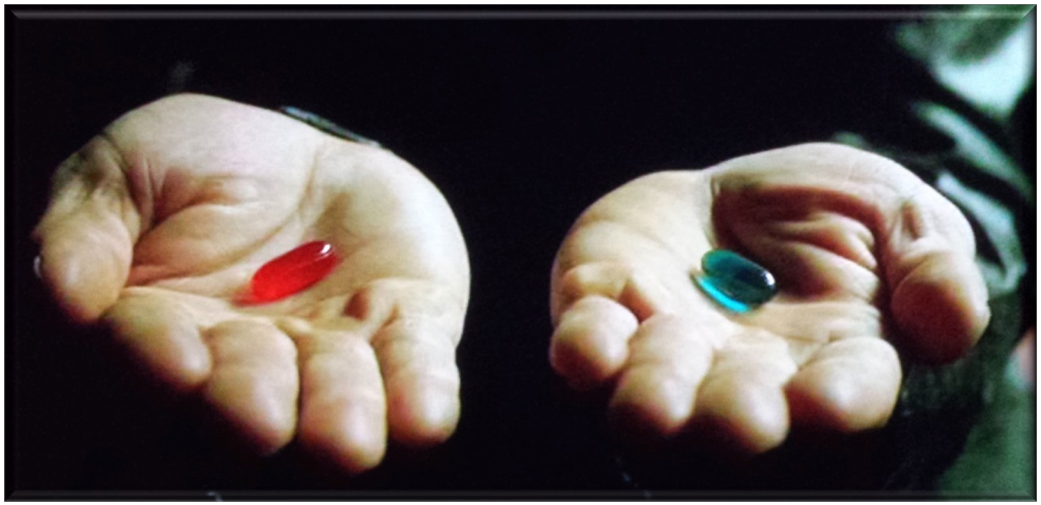
  - Be aware of how to create Java platform & virtual threads
  - Recognize virtual Thread best practices

Creating Java Platform Threads vs. Virtual Threads

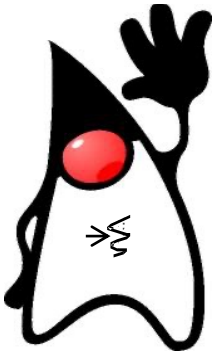
Creating Java Platform Threads vs. Virtual Threads

- Java platform threads can be created in two different ways



Creating Java Platform Threads vs. Virtual Threads

- Java platform threads can be created in two different ways
  - The traditional way



```
public class GCDThread
                extends Thread {
    public void run() {
        // code to run goes here
    }
}

Thread gcdThread = new GCDThread();
gcdThread.start();
```

Create & start a thread using GCDThread, which is a named subclass of Thread

Creating Java Platform Threads vs. Virtual Threads

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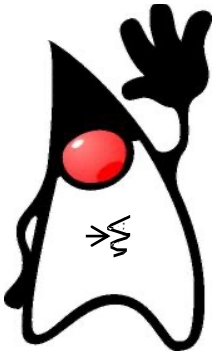

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gcdThread.start();
```

Pass runnable to a new Thread object & start it

```
public class GCDRunnable
        implements Runnable {
  public void run() {
    // code to run goes here
  }
}

Runnable gcdRunnable =
  new GCDRunnable();
new Thread(gcdRunnable).start();
```

See en.wikipedia.org/wiki/Thread_(computing)#User_threads

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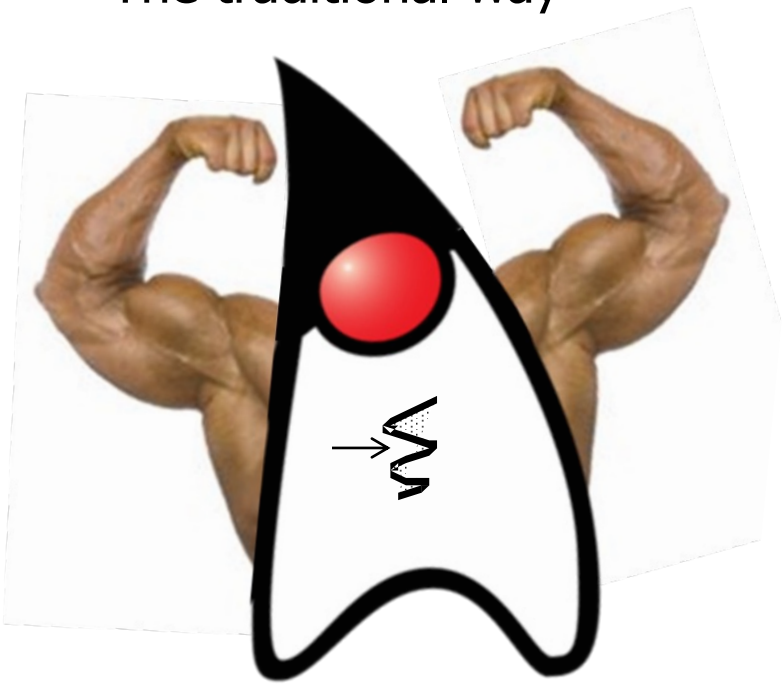

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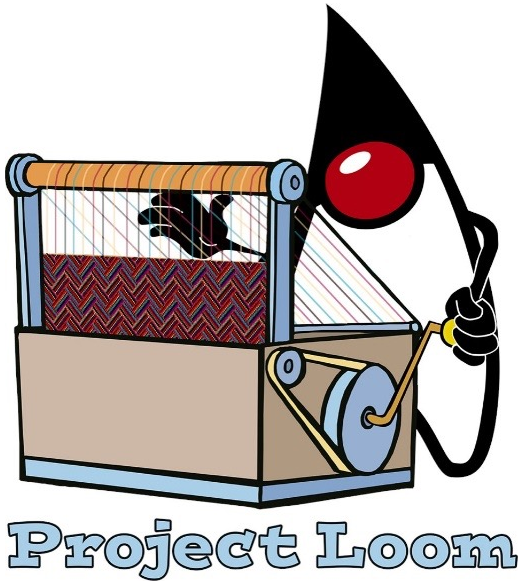
```

Java threads are relatively "heavyweight"

Creating Java Platform Threads vs. Virtual Threads

- Java platform threads can be created in two different ways
  - The traditional way
  - The Java 19 way

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Runnable gcdRunnable =
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```

A familiar way to create & start a Java platform thread so it executes gcdRunnable

By default, a traditional Java Thread *is* a platform thread!

Creating Java Platform Threads vs. Virtual Threads

- Java platform threads can be created in two different ways
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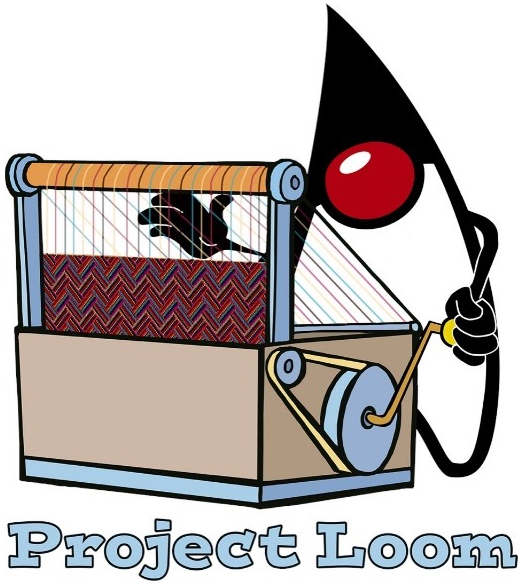


```
public class GCDRunnable
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}

Runnable gcdRunnable =
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Thread.ofPlatform()
      .start(gcdRunnable);
```

A more flexible way to create & start a platform thread so it executes gcdRunnable

See docs.oracle.com/en/java/javase/19/docs/api/java.base/java/lang/Thread.html#ofPlatform()

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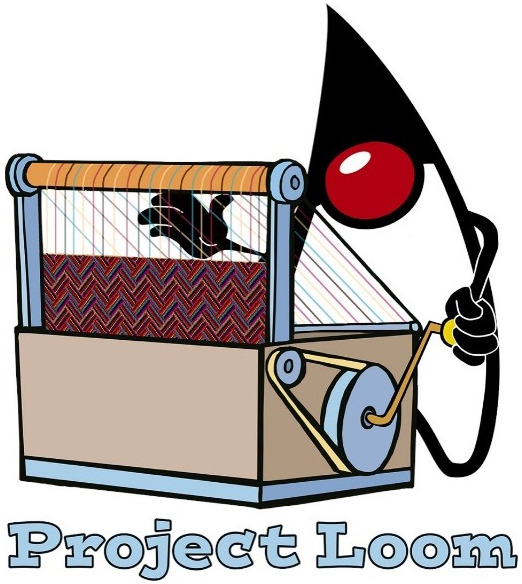


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Runnable gcdRunnable =
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Thread thread = Thread
       .ofPlatform()
       .unstarted(gcdRunnable);
...
thread.start();
```

Create an "unstarted" platform thread & then start it so it executes gcdRunnable

Creating Java Platform Threads vs. Virtual Threads

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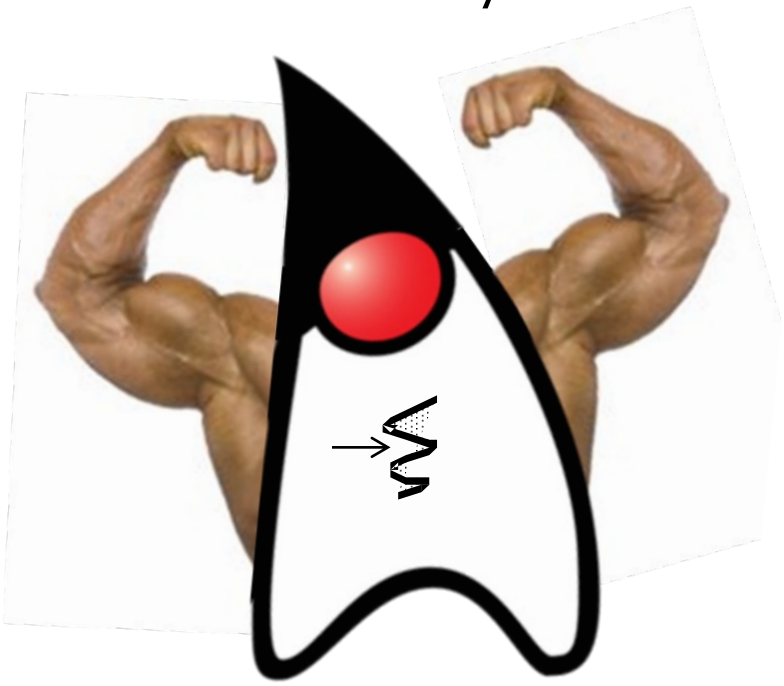

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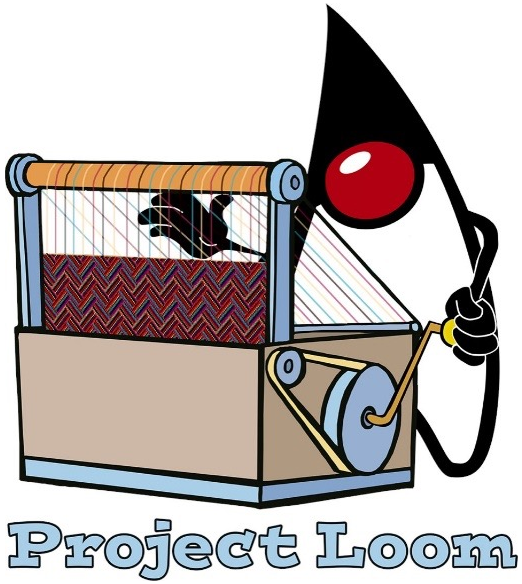
Java platform threads are also relatively "heavyweight"

Creating Java Platform Threads vs. Virtual Threads

- Java virtual threads can also be created in Java 19

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Runnable gcdRunnable =
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Thread.startVirtualThread
                (gcdRunnable);
```

A concise way to create & start a Java virtual thread so it executes gcdRunnable

See docs.oracle.com/en/java/javase/19/docs/api/java.base/java/lang/Thread.html#startVirtualThread

Creating Java Platform Threads vs. Virtual Threads

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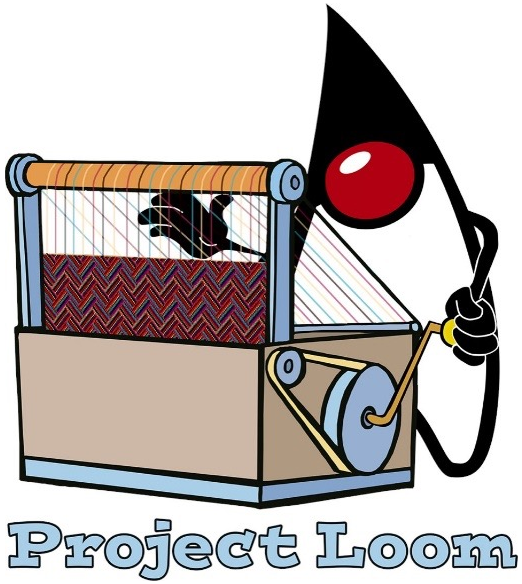


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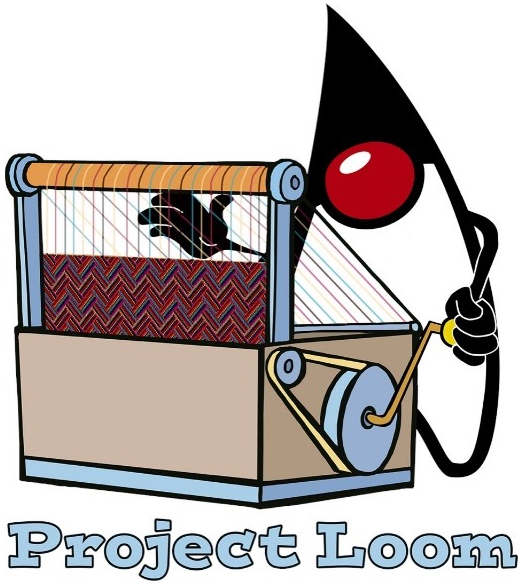


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Creating Java Platform Threads vs. Virtual Threads

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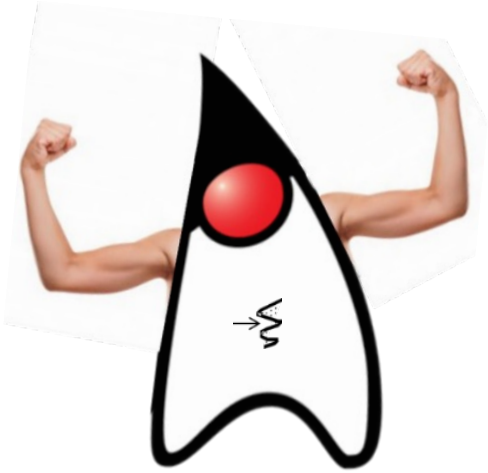

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Java virtual threads are relatively "lightweight"

Virtual Thread Best Practices

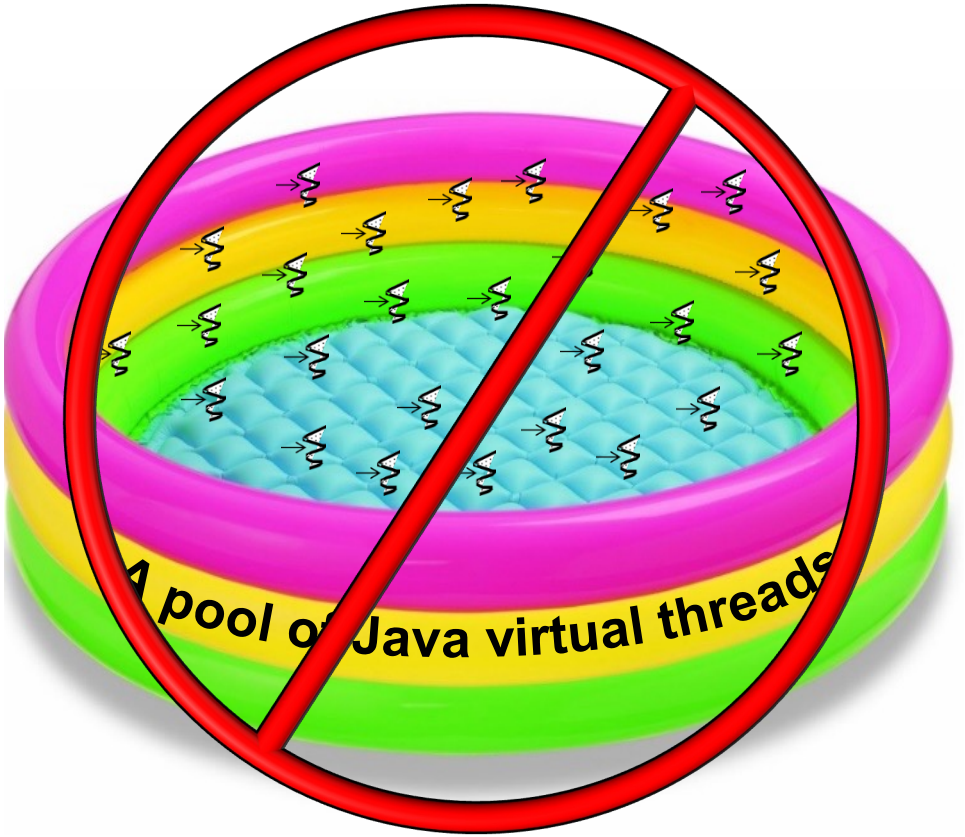
Virtual Thread Best Practices

- Follow certain "best practices" when using Java virtual threads

See howtodoinjava.com/java/multi-threading/virtual-threads/#5-best-practices

Virtual Thread Best Practices

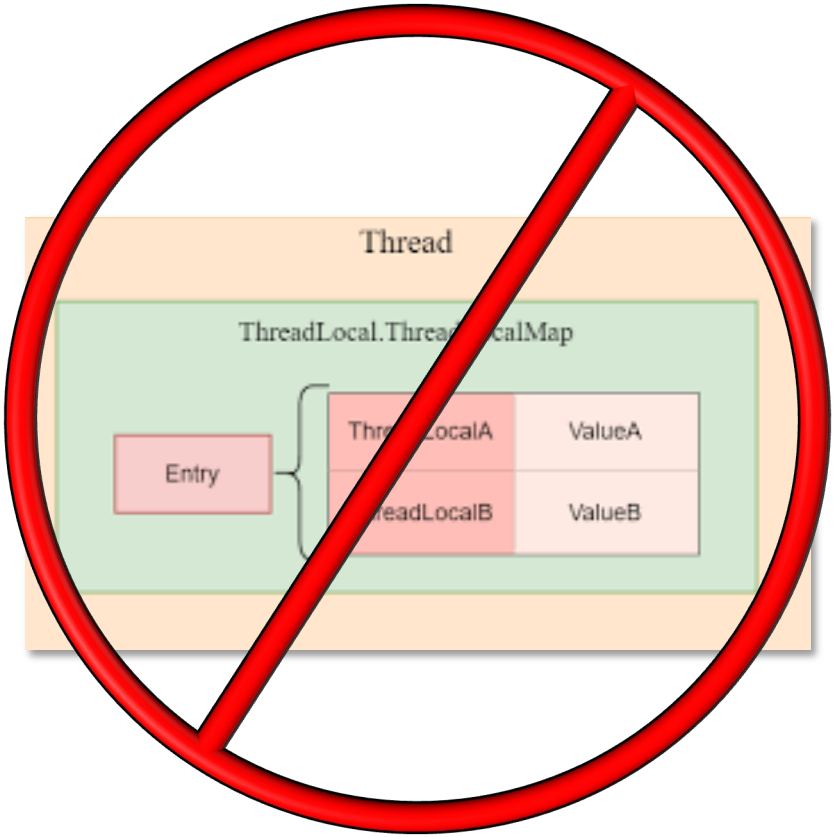
- Follow certain "best practices" when using Java virtual threads
  - Do not pool virtual threads!
    - Creating virtual threads is inexpensive, so there is never a need to pool them



See howtodoinjava.com/java/multi-threading/virtual-threads/#51-do-not-pool-the-virtual-threads

Virtual Thread Best Practices

- Follow certain "best practices" when using Java virtual threads
  - Do not pool virtual threads!
  - Avoid using thread-local variables
    - If an app uses ThreadLocal & creates 1 million virtual threads then 1 million Thread Local instances are created!

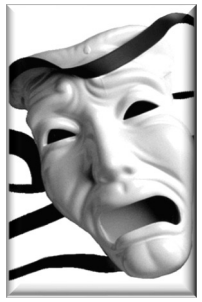


See howtodoinjava.com/java/multi-threading/virtual-threads/#52-avoid-using-thread-local-variables

Virtual Thread Best Practices

- Follow certain "best practices" when using Java virtual threads
  - Do not pool virtual threads!
  - Avoid using thread-local variables
  - Use ReentrantLock instead of synchronized blocks
    - Synchronized blocks "pin" a virtual thread to a platform thread..

```
public synchronized void m() {
   try {
      // ... access resource
   } finally {
      //
   }
}
...
```



```
private final ReentrantLock lock
   = new ReentrantLock();

public void m() {
   lock.lock();
   try {
      // ... access resource
   } finally {
      lock.unlock();
   }
}
```

See howtodoinjava.com/java/multi-threading/virtual-threads/#53-use-reentrantlock-instead-of-synchronized-blocks

End of Java Platform Threads vs. Virtual Threads (Part 2)