Managing the Java Thread Lifecycle: Layers Involved in Starting a Thread

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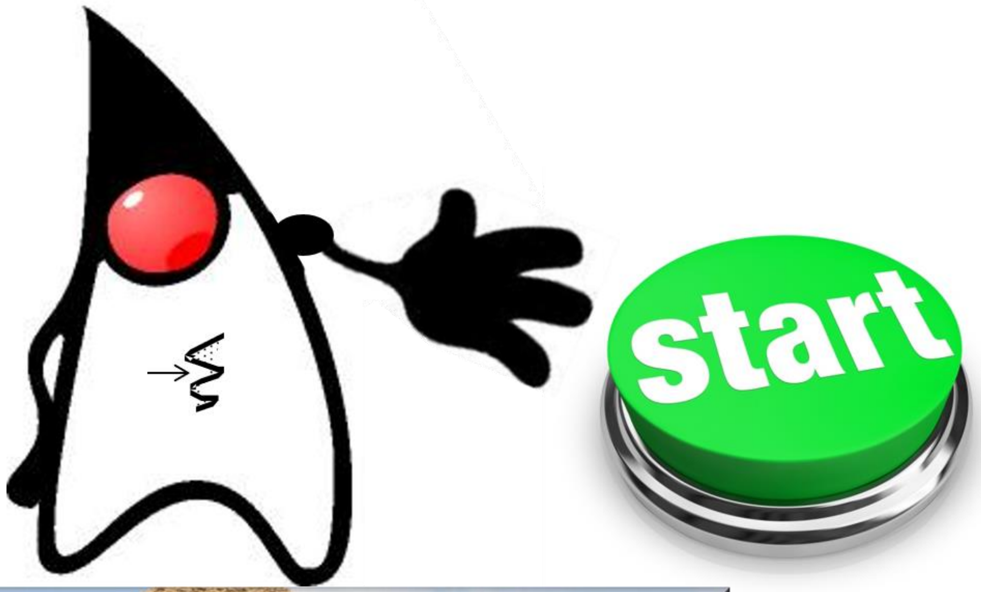
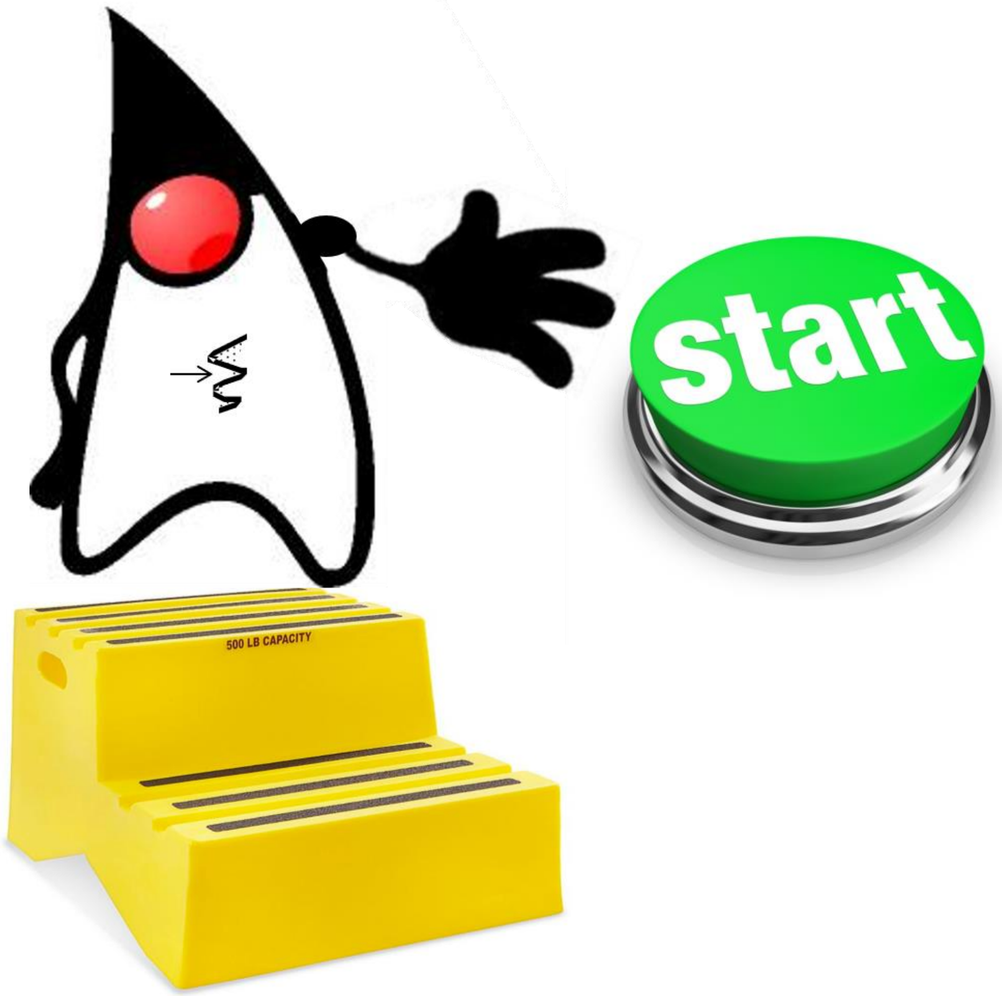
Learning Objectives in this Lesson

- Understand the layers involved in starting a Java thread



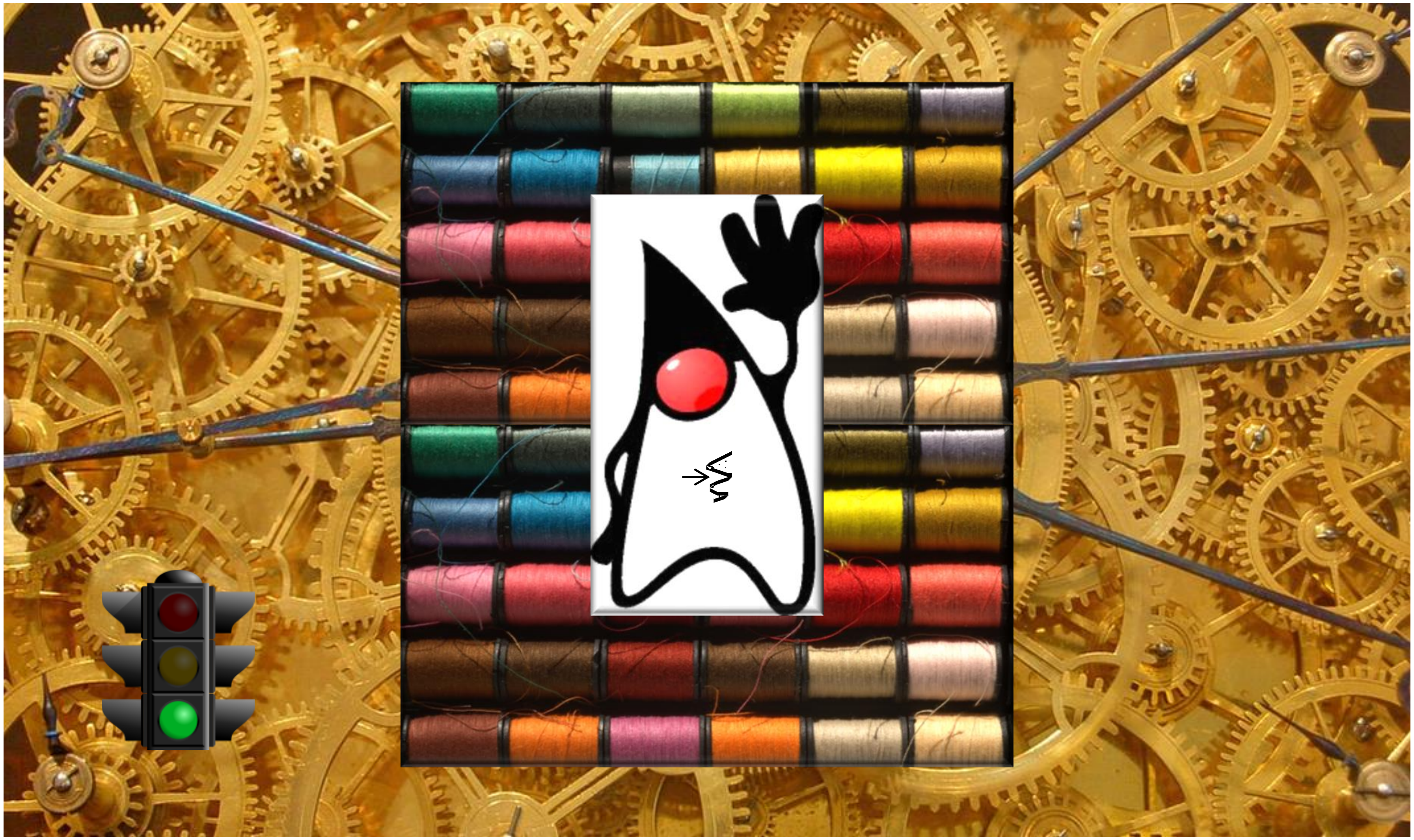
Learning Objectives in this Lesson

- Understand the layers involved in start a Java thread
- Recognize the steps involved in starting a Java thread



Layers Involved in Starting a Java Thread

- Starting a Java thread involves interesting design & implementation issues



Layers Involved in Starting a Java Thread

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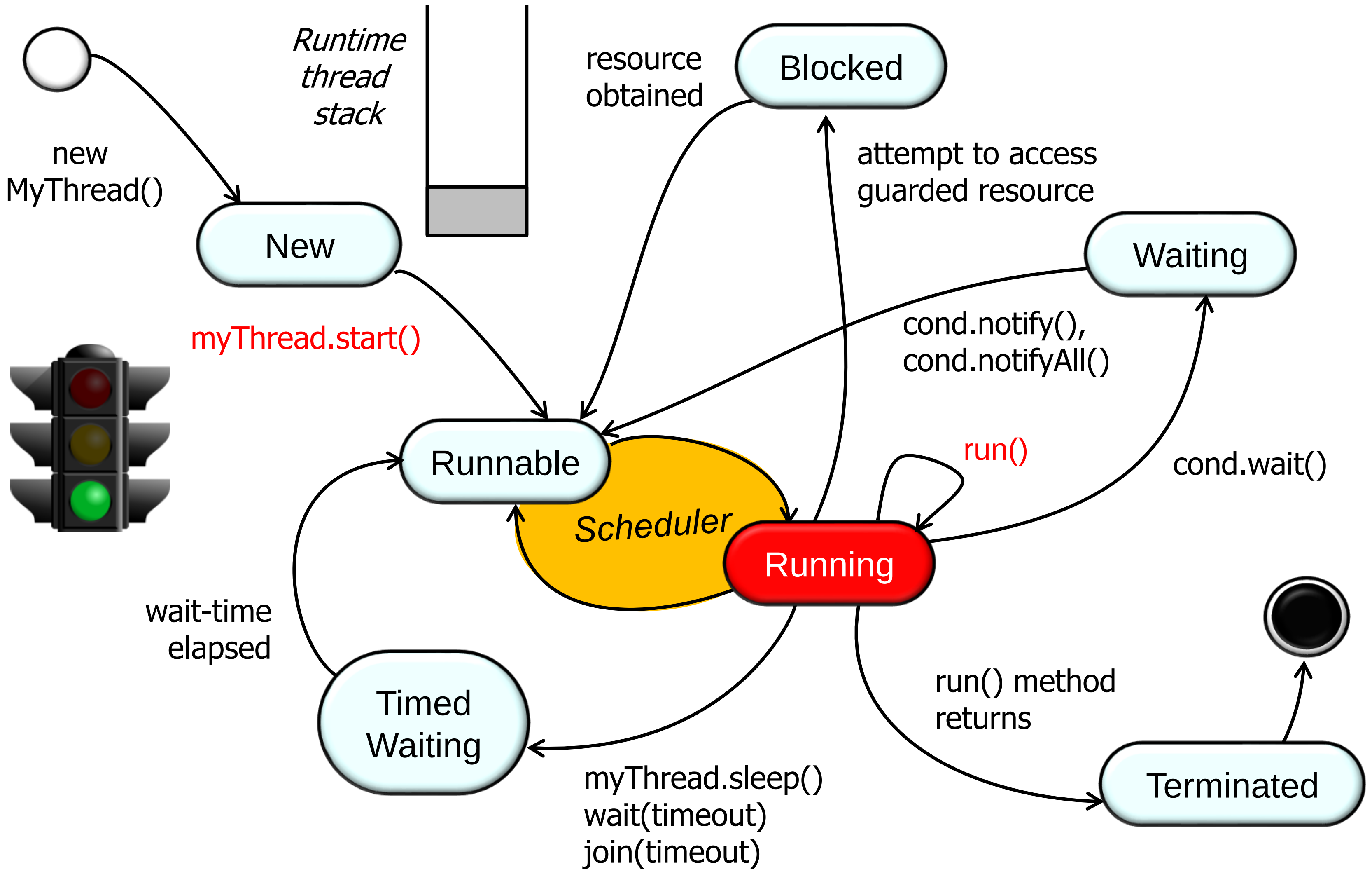
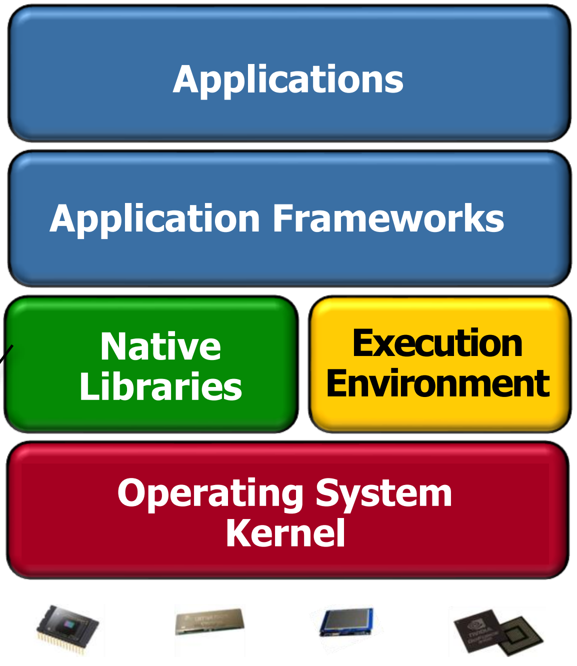
- Calling start() on a thread triggers the execution of its run() hook method



Layers Involved in Starting a Java Thread

- The Java platform provides a stack of layers that define various mechanisms for running concurrent programs on a wide range of computing devices

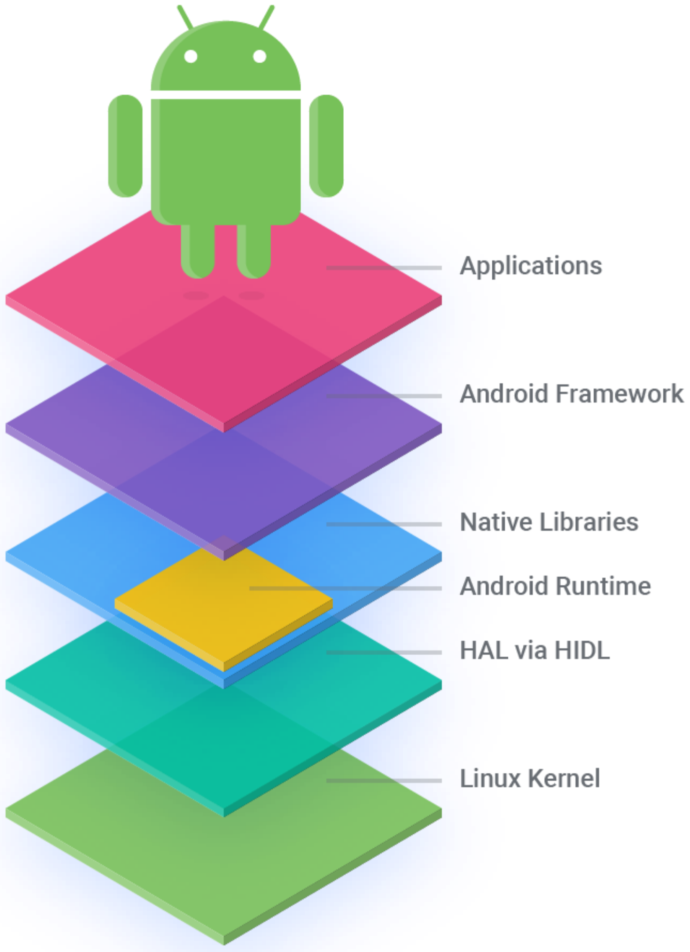


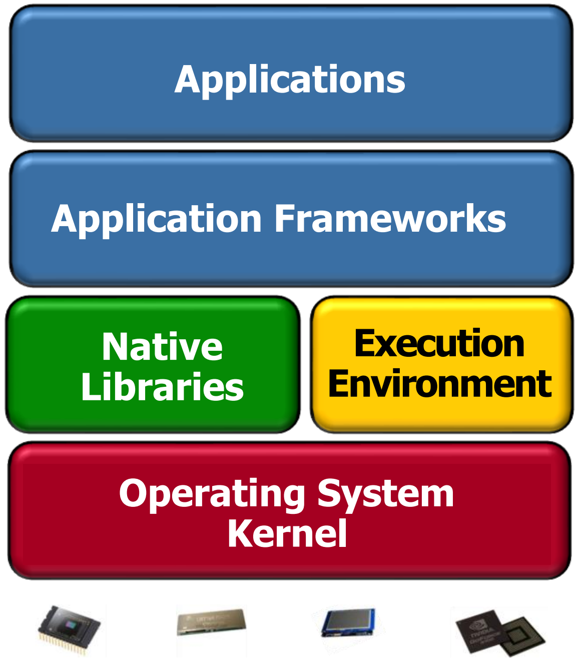
Different versions of Android & Java implement these layers differently, though key levels of abstraction are often similar

See en.wikibooks.org/wiki/Java_Programming/The_Java_Platform

Layers Involved in Starting a Java Thread

- Likewise, the Android platform provides a stack of layers that define various mechanisms for running concurrent programs on mobile computing devices

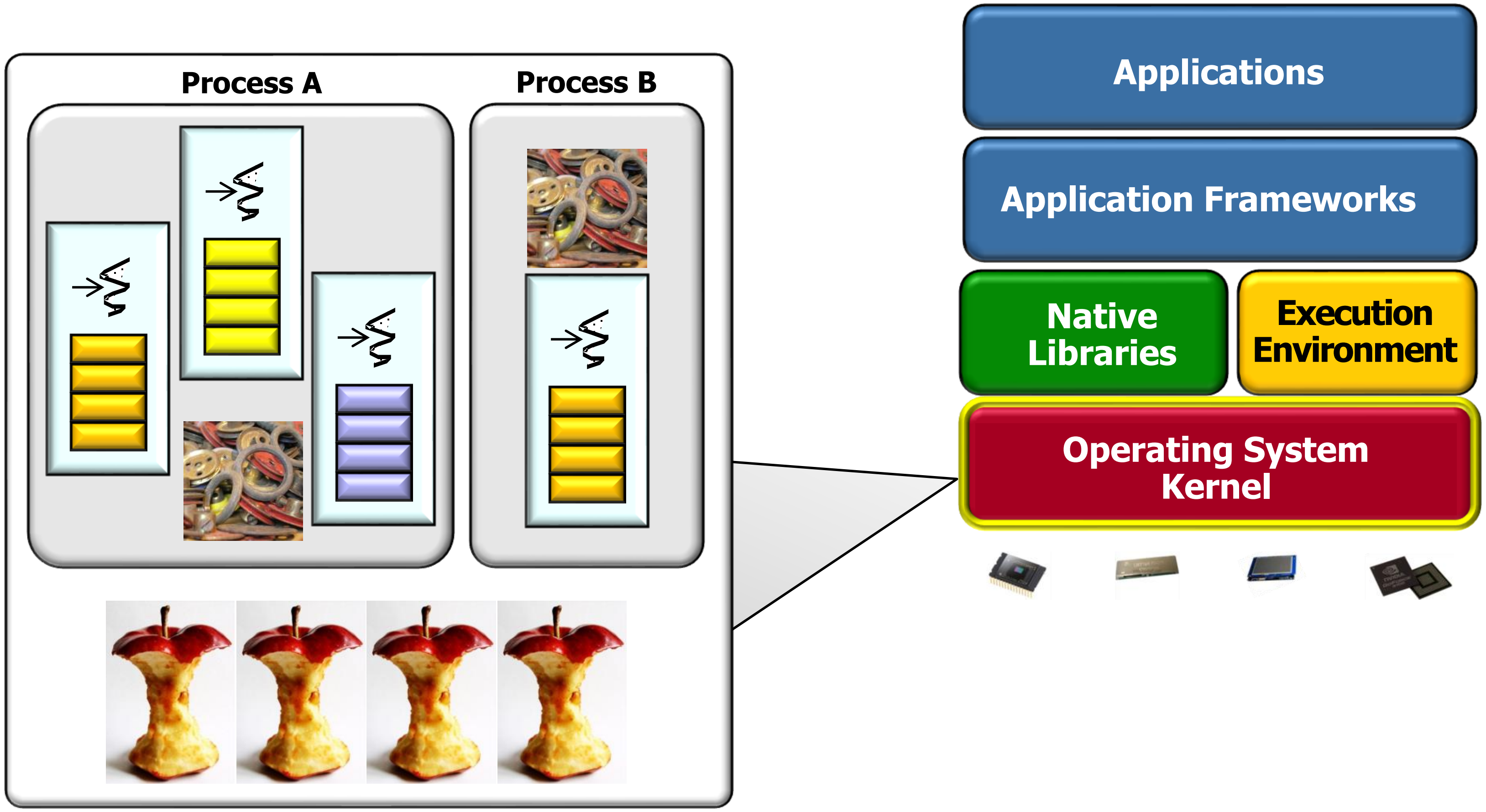




See developer.android.com/guide/platform

Layers Involved in Starting a Java Thread

- Likewise, the Android platform provides a stack of layers that define various mechanisms for running concurrent programs on mobile computing devices



The Android Linux kernel controls hardware & manages system resources

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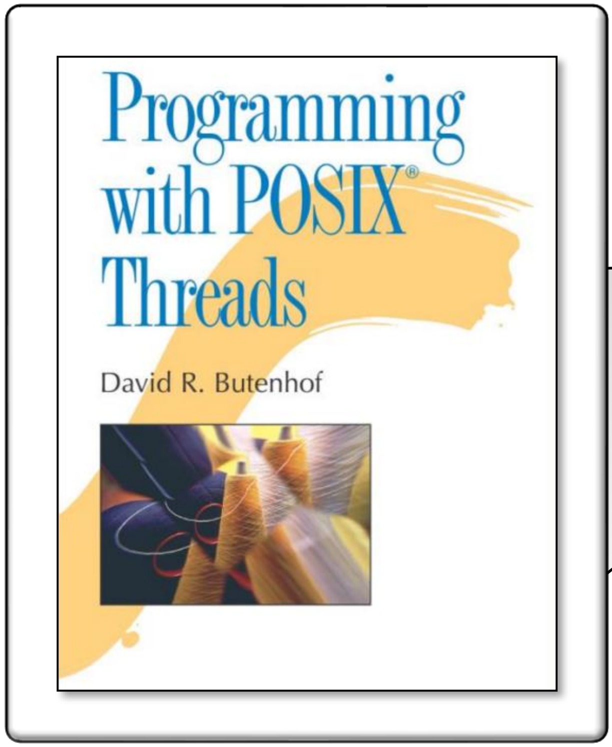

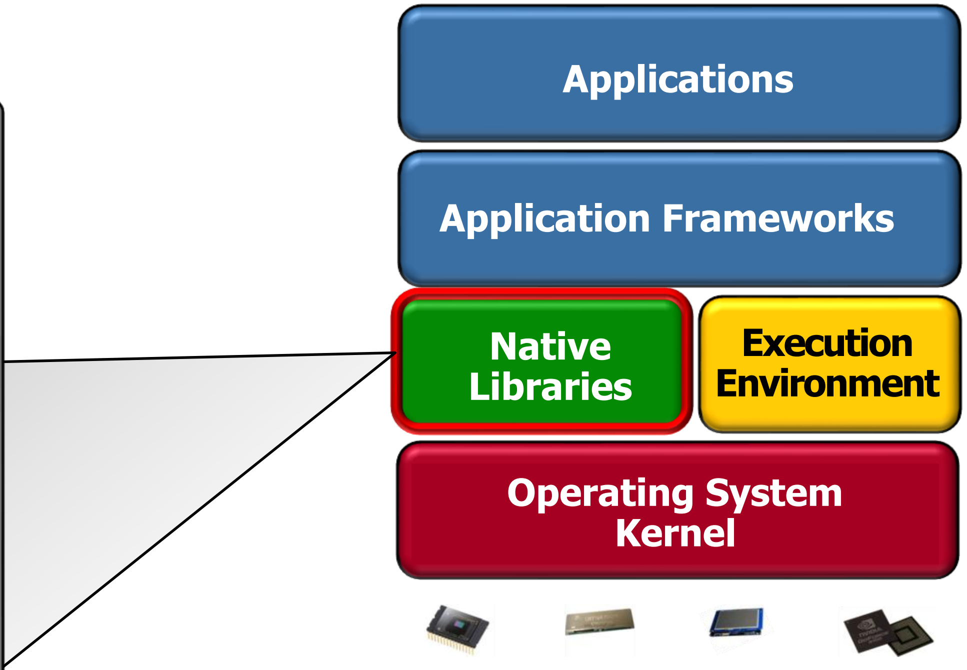

The Bionic LibC library supports the Pthreads C programming APIs

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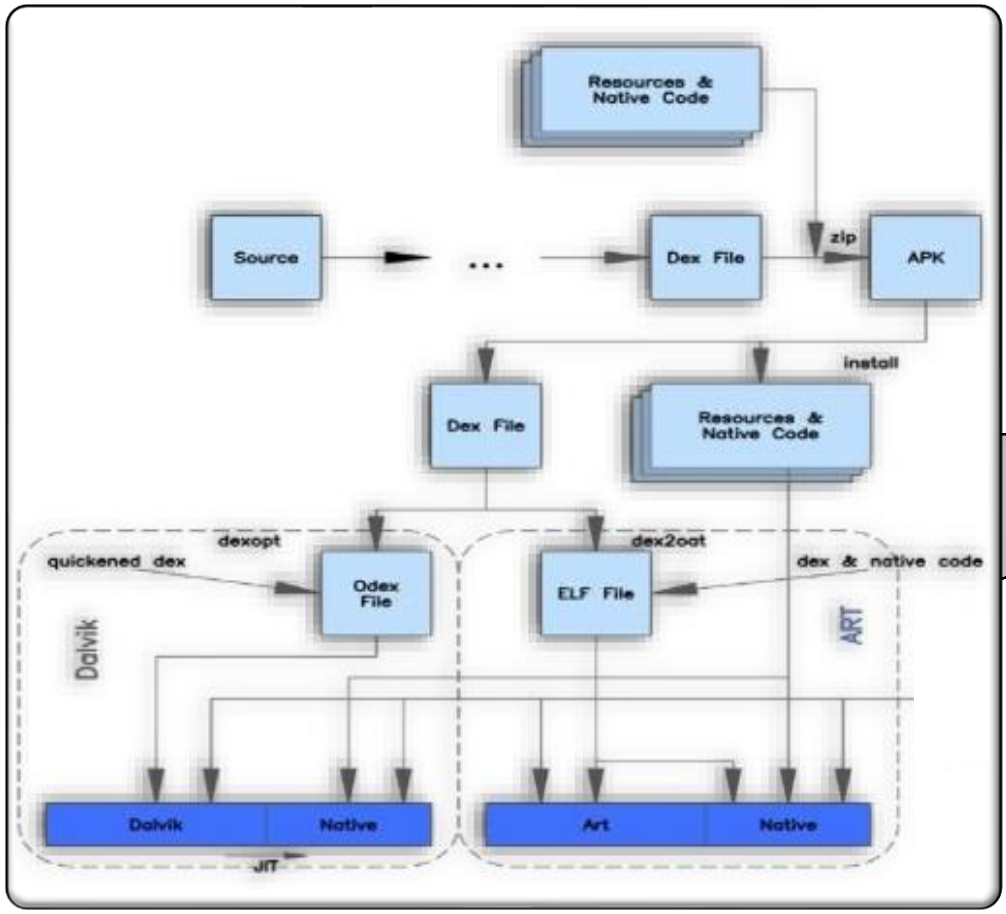

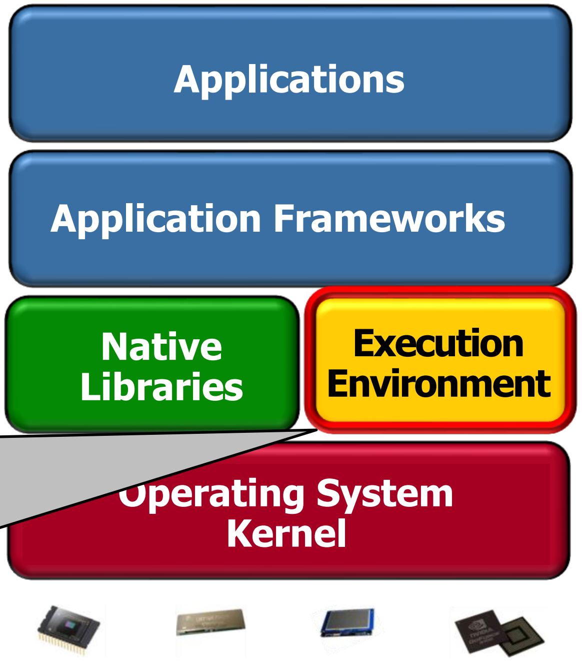

Dalvik & ART provide a managed execution environment for Java apps

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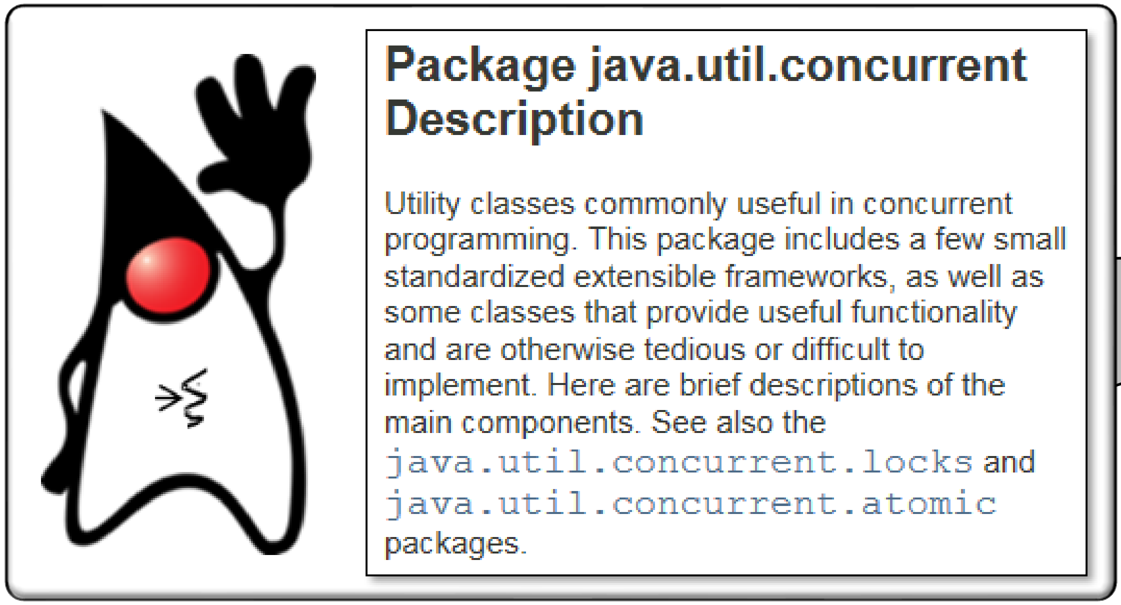
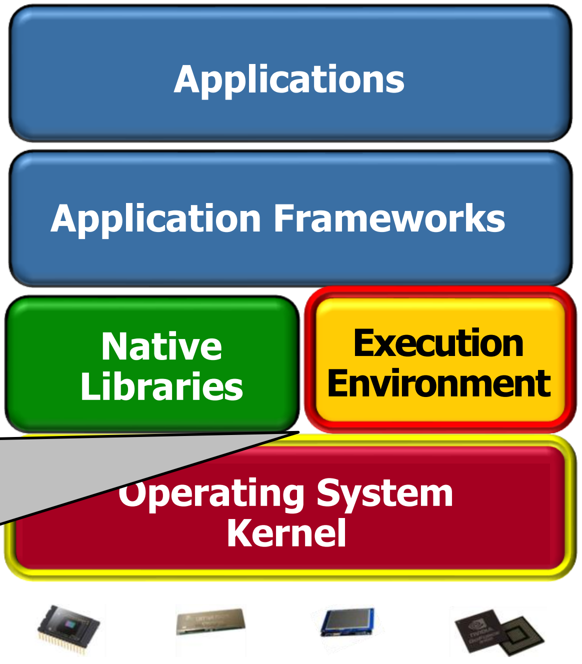


Package java.util.concurrent Description

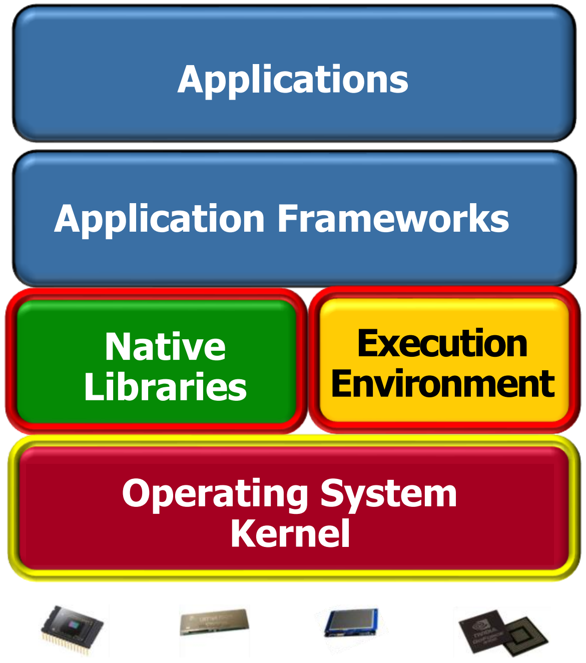
Utility classes commonly useful in concurrent programming. This package includes a few small standardized extensible frameworks, as well as some classes that provide useful functionality and are otherwise tedious or difficult to implement. Here are brief descriptions of the main components. See also the `java.util.concurrent.locks` and `java.util.concurrent.atomic` packages.



Android's runtime contains the classes in the java.util.concurrent packages

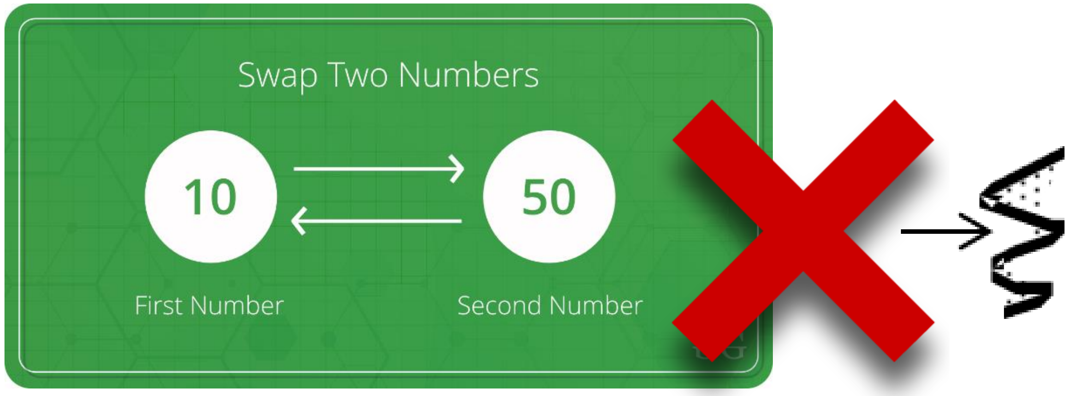
Layers Involved in Starting a Java Thread

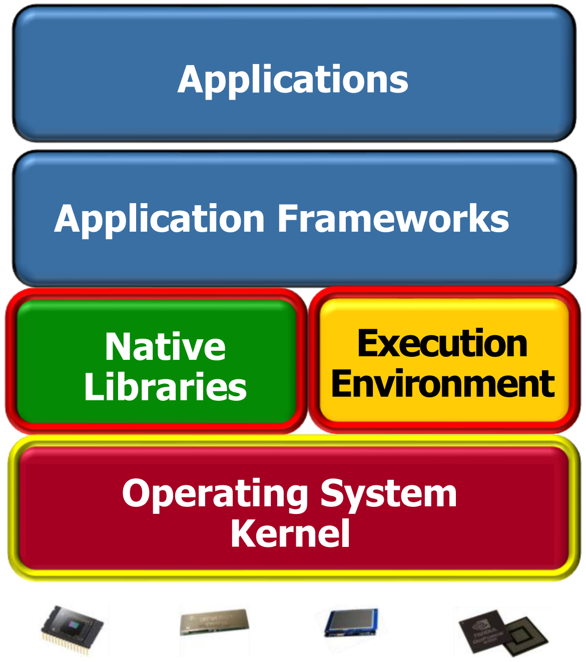
- Creating & starting new threads on any Java platform consumes a non-trivial amount of system resources, so use them judiciously!



Layers Involved in Starting a Java Thread

- Creating & starting new threads on any Java platform consumes a non-trivial amount of system resources, so use them judiciously!
  - e.g., only create threads for computations that run much longer than the time needed to spawn them!





Steps Involved in Starting a Java Thread

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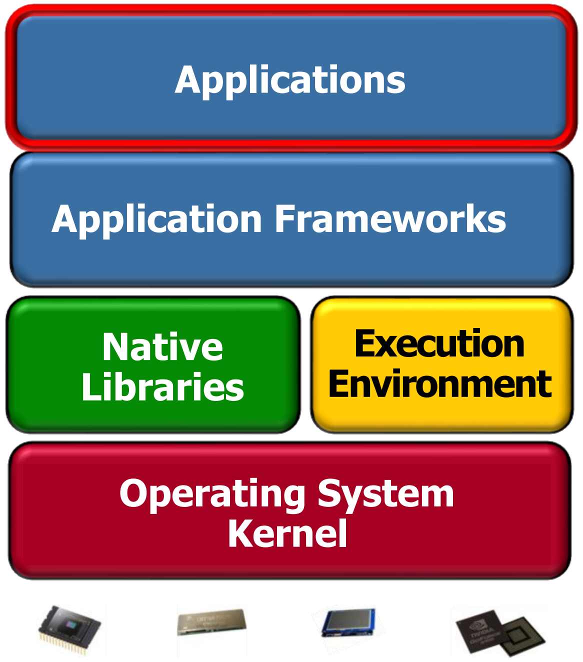
- The following steps are involved when starting a Java thread on the Android open-source platform



See source.android.com

Steps Involved in Starting a Java Thread

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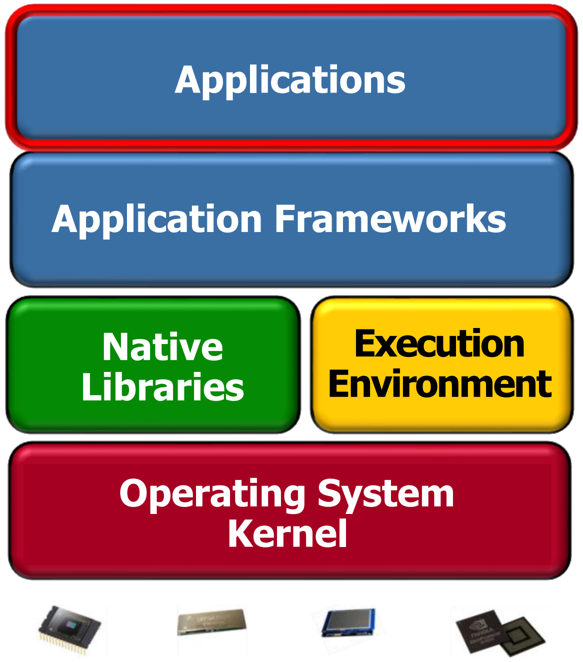
1. `myThread.start()`



Steps Involved in Starting a Java Thread

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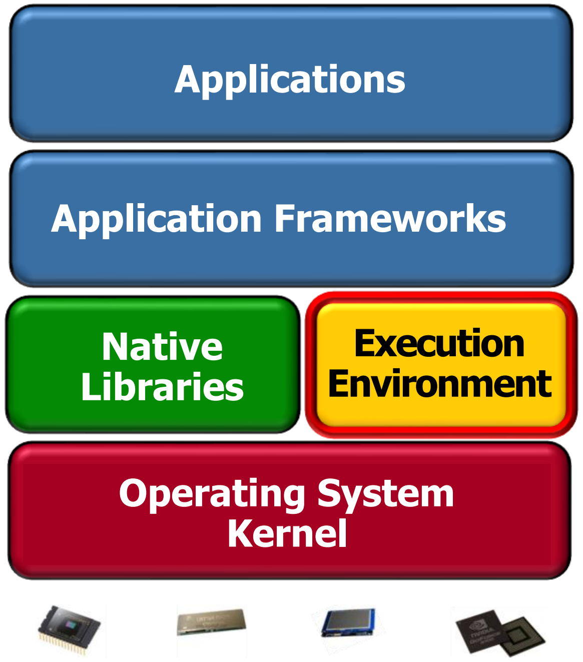
```
1. myThread.start()
2. Thread.start() // Java method
```



See libcore/luni/src/main/java/java/lang/Thread.java

Steps Involved in Starting a Java Thread

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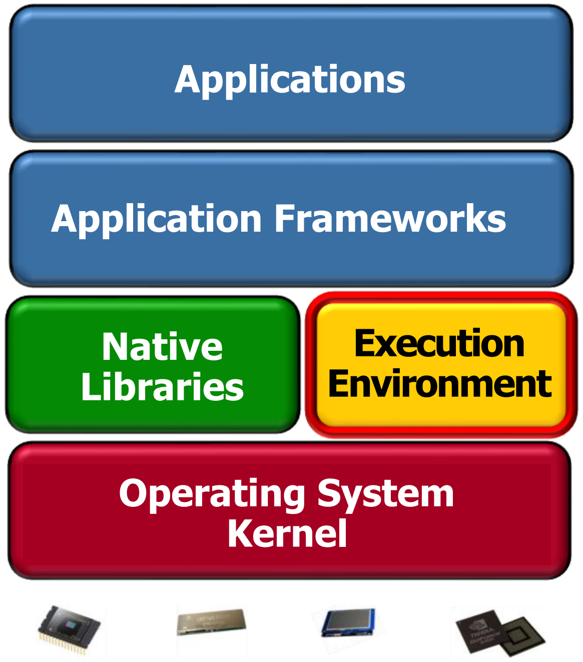
```
1. myThread.start()
2. Thread.start()
3. VMThread.create() // Native method
```



See libcore/luni/src/main/java/java/lang/VMThread.java

Steps Involved in Starting a Java Thread

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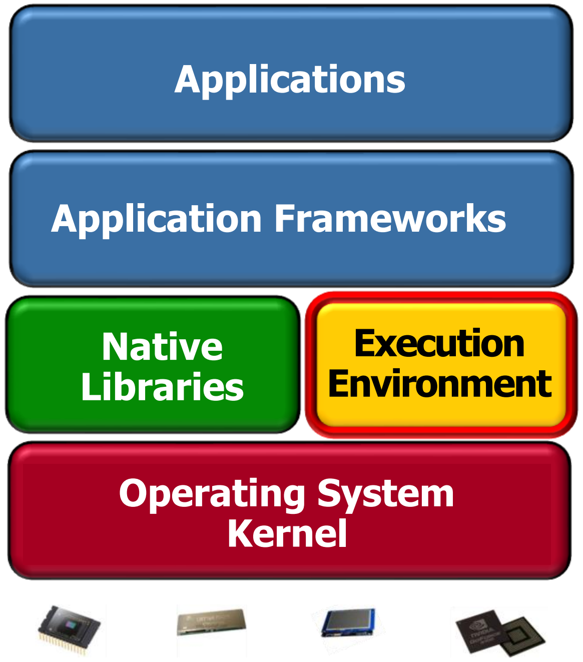
```
1. myThread.start()
2. Thread.start()
3. VMThread.create()
4. Dalvik_java_lang_VMThread_create()
   // JNI method
```



See dalvik/vm/native/java_lang_VMThread.cpp

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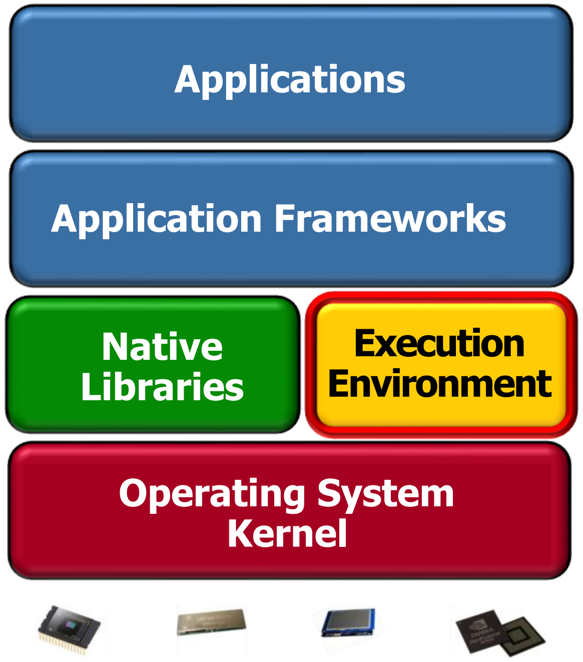
```
1. myThread.start()
2. Thread.start()
3. VMThread.create()
4. Dalvik_java_lang_VMThread_create(
5. dvmCreateInterpThread() // Dalvik method
```



See dalvik/vm/Thread.cpp

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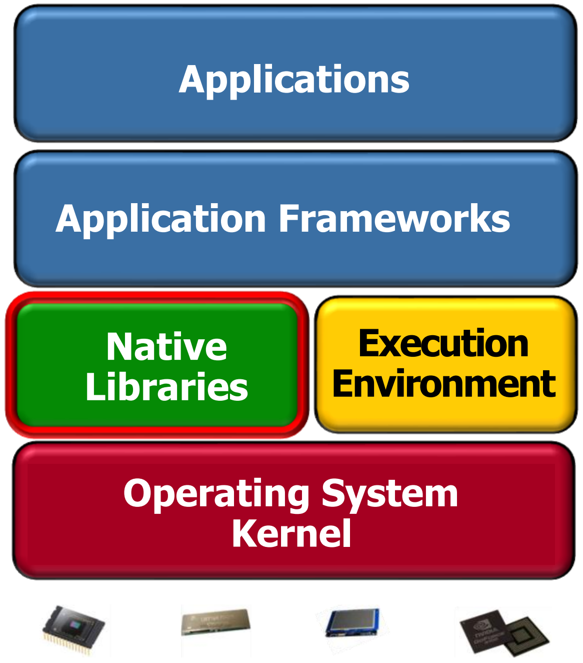
```
1. myThread.start()
2. Thread.start()
3. VMThread.create()
4. Dalvik_java_lang_VMThread_create()
5. dvmCreateInterpThread()
6. pthread_create(..., interpThreadStart)
   // Pthreads method
```



See bionic/libc/bionic/pthread.c

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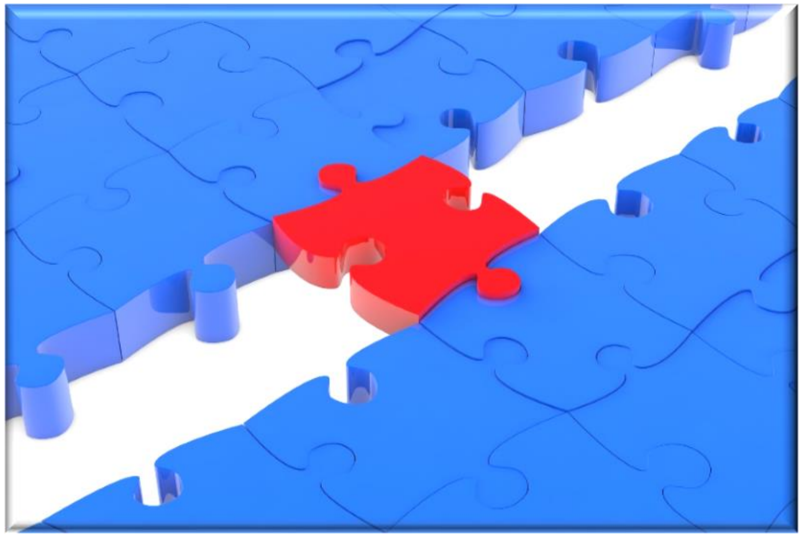

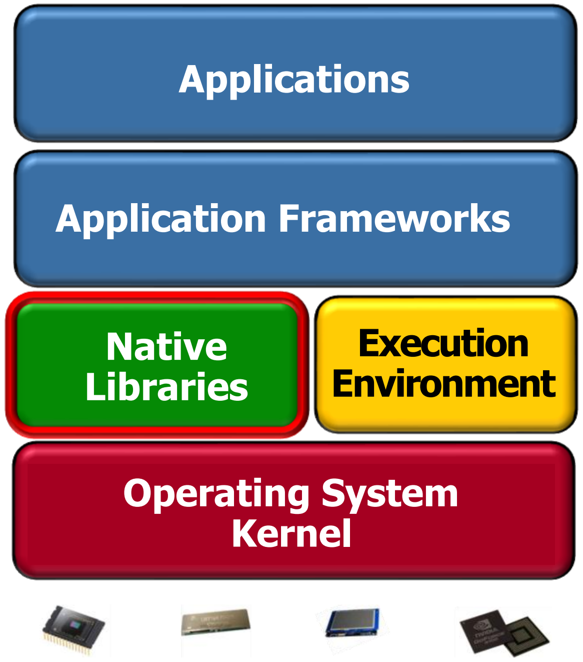

This is the entry point function used to transition between C & Java code

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3. VMThread.create()
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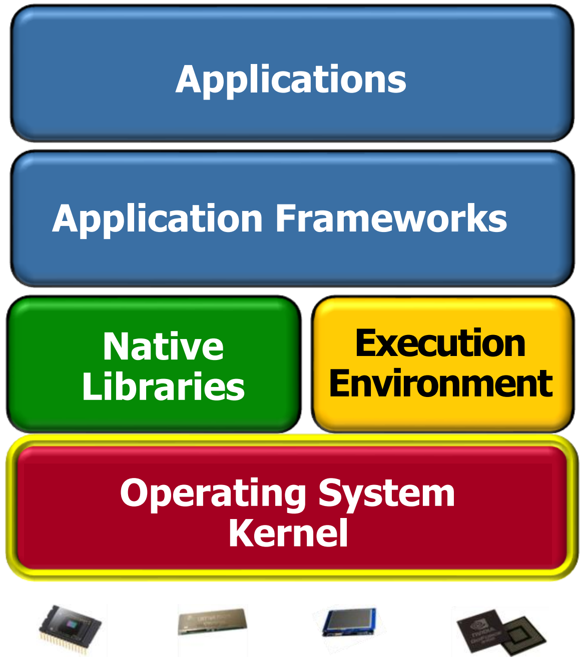
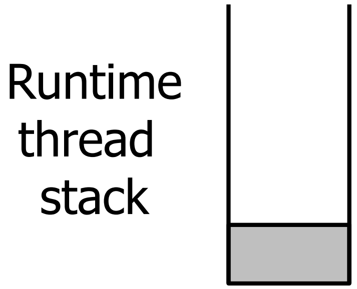
5. dvmCreateInterpThread()
6. pthread_create(..., interpThreadStart)
7. Android Linux kernel...
```





See source.android.com/source/building-kernels.html

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5. dvmCreateInterpThread()
6. pthread_create(..., interpThreadStart)
7. Android Linux kernel...
8. interpThreadStart(void* arg) // Adapter
```

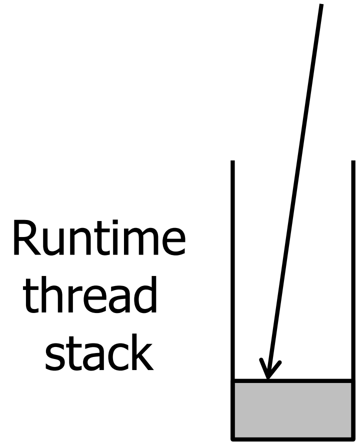

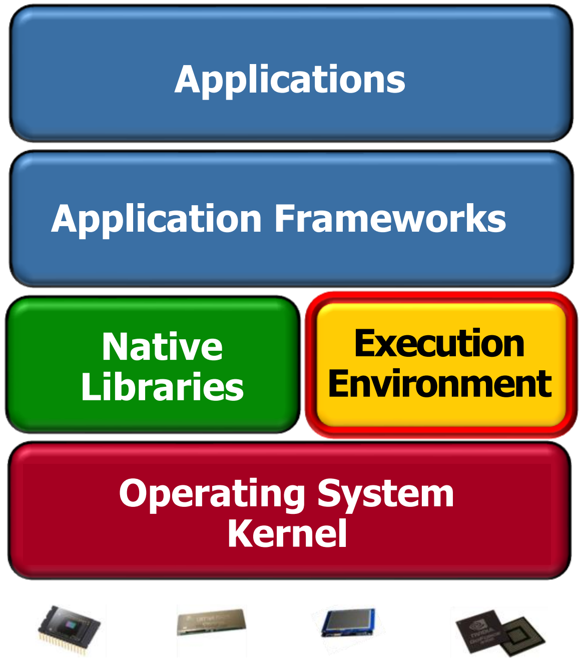

See dalvik/vm/Thread.cpp

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5. dvmCreateInterpThread()
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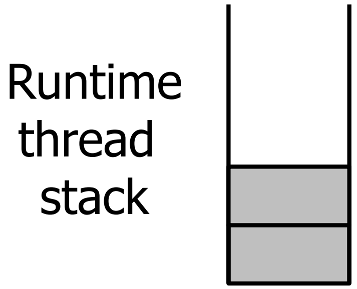
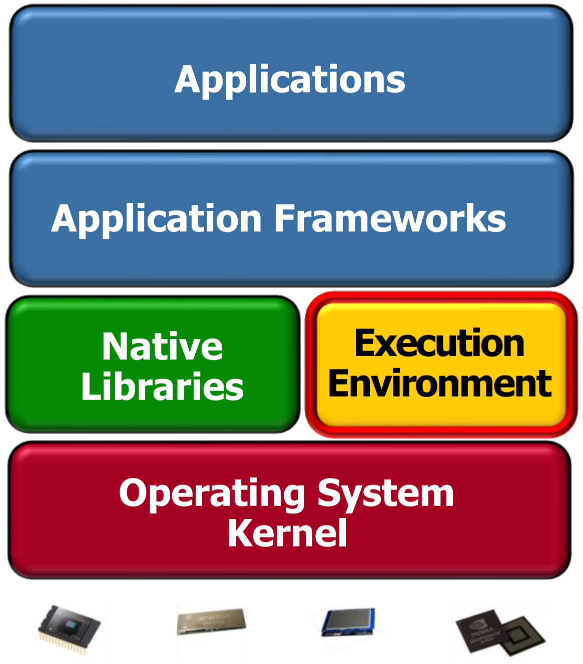
7. Android Linux kernel...
8. interpThreadStart(void* arg)
9. dvmCallMethod(self, run, self->threadObj)
   // Dalvik method
```





See dalvik/vm/interp/Stack.cpp

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5. dvmCreateInterpThread()
6. pthread_create(..., interpThreadStart)
7. Android Linux kernel...
8. interpThreadStart(void* arg)
9. dvmCallMethod(self, run, self->threadObj)
10.MyThread.run() // User-defined hook method
```

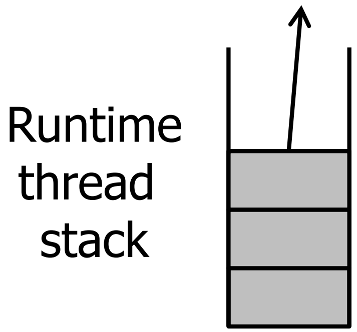

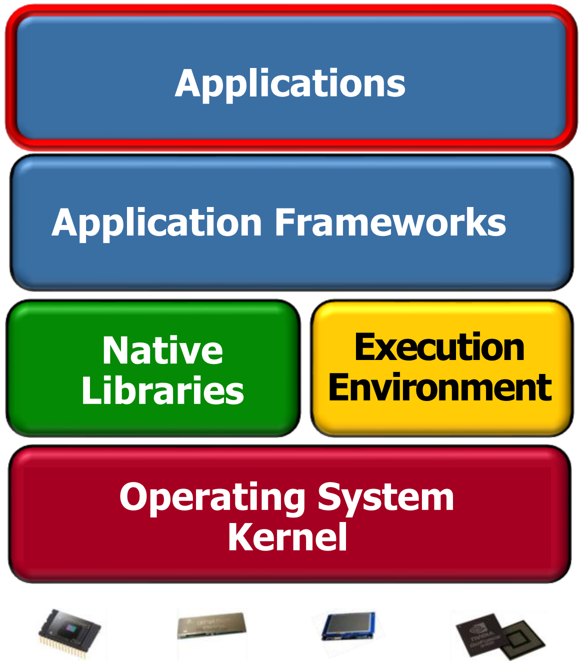

End of Managing the Java Thread Lifecycle: Layers Involved in Starting a Thread