Evaluating the Concurrency & Parallelism Mechanisms in Java

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Learning Objectives in this Lesson

• Know which Java concurrency & parallelism mechanism(s) to understand & apply based on the context in which they are being considered
Which Java Mechanism(s) to Understand & Apply
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- Java’s concurrency & parallelism mechanisms span multiple layers in the software stack
Which Java Mechanism(s) to Understand & Apply

- Java’s concurrency & parallelism mechanisms span multiple layers in the software stack
- Choosing best mechanism(s) depend on various factors
Which Java Mechanism(s) to Understand & Apply

- Developers of low-level classes & performance-sensitive apps may prefer shared object mechanisms.

**Package java.util.concurrent**

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.

**E.g., java.util.concurrent as per** [www.youtube.com/watch?v=sq0MX3fHkro](https://www.youtube.com/watch?v=sq0MX3fHkro)
Which Java Mechanism(s) to Understand & Apply

- Developers of low-level classes & performance-sensitive apps may prefer shared object mechanisms
  - **Pros**: Efficient & lightweight
  - **Cons**: Tedious & error-prone

Shared objects are often best used by infrastructure vs. app developers
Which Java Mechanism(s) to Understand & Apply

- Framework developers may want to use the Java message passing mechanisms

- e.g., Android HaMeR or Java ExecutorService & ExecutorCompetitionService frameworks
Which Java Mechanism(s) to Understand & Apply

- Framework developers may want to use the Java message passing mechanisms

  - **Pros**: Flexible & decoupled
  - **Cons**: Time/space overhead

May incur higher context switching, synchronization, & data movement overhead
Which Java Mechanism(s) to Understand & Apply

- App developers most likely want to program with higher-level frameworks.

- Concurrency/Parallelism Frameworks
  - Java Threads & Synchronizers

- Execution Environment (JVM, Dalvik/ART, etc.)

- System Libraries

- Operating System Kernel

- Additional Application Frameworks

- Applications

- e.g., Java parallel streams, completable futures, RxJava, Project Reactor, etc.
Which Java Mechanism(s) to Understand & Apply

- App developers most likely want to program with higher-level frameworks
- **Pros**: Productivity & robustness
- **Cons**: Time/space overhead & overly prescriptive
Which Java Mechanism(s) to Understand & Apply

“Full stack” developers should be fluent with every layer!!

See en.everybodywiki.com/Full_Stack_Web_Development
Which Java Mechanism(s) to Understand & Apply

• Regardless of which Java mechanisms you select, be prepared to master the accidental & inherent complexities of concurrent & parallel programming!

“Whoever said ‘the definition of insanity is doing the same thing over & over again, but expecting different results’ wasn’t debugging concurrency issues”

CHANGE MY MIND
End of Evaluating the Concurrency & Parallelism Mechanisms in Java