The Pros & Cons of Asynchrony



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Learning Objectives in this Part of the Lesson

- Motivate the need for Java futures by understanding the pros & cons of synchrony
- Motivate the need for Java futures by understanding the pros & cons of asynchrony



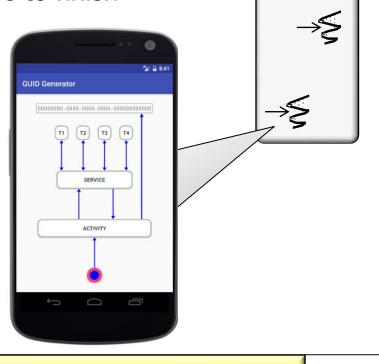
· Asynchronous operations can alleviate limitations with synchronous operations



See en.wikipedia.org/wiki/Asynchrony_(computer_programming)

· Asynchronous operations can alleviate limitations with synchronous operations

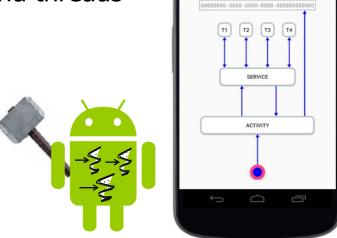
 Asynchrony is a means of concurrent programming where the caller does not block while waiting for the called code to finish

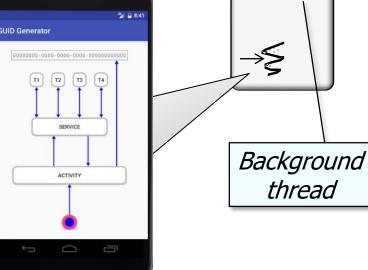


Asynchronous operations can alleviate limitations with synchronous operations

• Asynchrony is a means of concurrent programming where the caller does not block while waiting for the called code to finish, e.g.

 Android AsyncTasks execute longduration operations asynchronously in one or more background threads





See <u>developer.android.com/reference/android/os/AsyncTask</u>

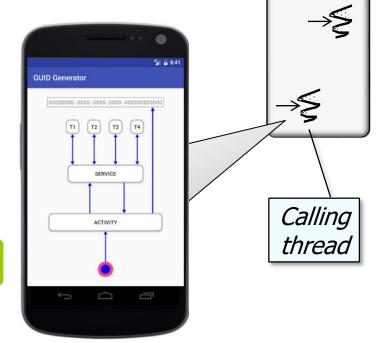
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Asynchrony is a means of concurrent programming where the caller does

not block while waiting for the called code to finish, e.g.

 Android AsyncTasks execute longduration operations asynchronously in one or more background threads

 The caller (UI) thread can be notified upon completion, failure, or progress of the background task



See developer.android.com/reference/android/os/AsyncTask

• Pros of asynchronous operations

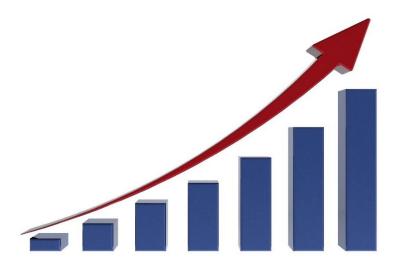


- Pros of asynchronous operations
 - Responsiveness

 A calling thread needn't block waiting for the async request to complete



- Pros of asynchronous operations
 - Responsiveness
 - Elasticity
 - Multiple requests can run scalably & concurrently on multiple cores





See en.wikipedia.org/wiki/Elasticity (cloud computing)

- Pros of asynchronous operations
 - Responsiveness
 - Elasticity
 - Multiple requests can run scalably & concurrently on multiple cores
 - Elasticity is particularly useful to auto-scale computations in cloud environments



Cons of asynchronous operations

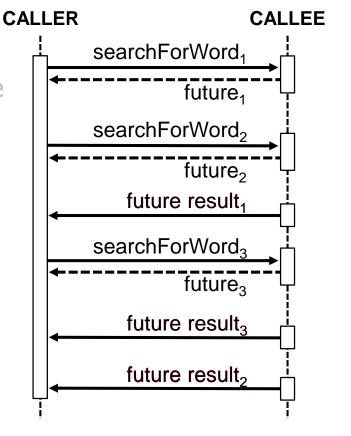


- Cons of asynchronous operations
 - Unpredictability
 - Response times may not unpredictable due to non-determinism of async operations



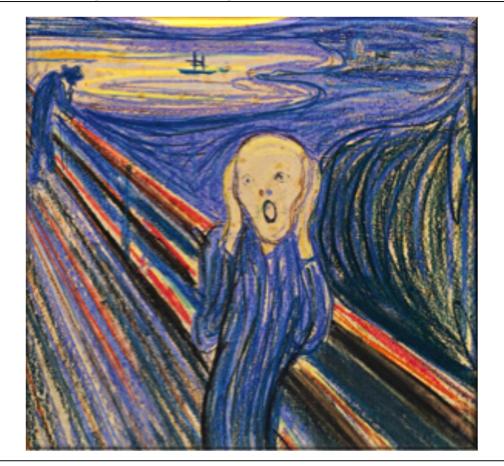
- Cons of asynchronous operations
 - Unpredictability
 - Response times may not unpredictable due to non-determinism of async operations
 - Results can occur in a different order than the original calls were made





Additional time & effort may be required if results must be ordered somehow

- Cons of asynchronous operations
 - Unpredictability
 - Complicated programming & debugging



- Cons of asynchronous operations
 - Unpredictability
 - Complicated programming & debugging
 - The patterns & best-practices of asynchronous programming are not well understood

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           If 10 POST( mer password new 1) (
               If 48_POSTE were persond now' | --- 8_POSTE nest pressured report 13 4
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   swines register_form();
                                                             icompile.eladkarako.com
```

- Cons of asynchronous operations
 - Unpredictability
 - Complicated programming & debugging
 - The patterns & best-practices of asynchronous programming are not well understood
 - Errors can be hard to track due to unpredictability



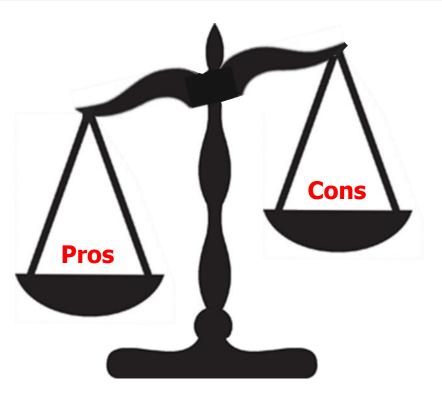
See www.jetbrains.com/help/idea/tutorial-java-debugging-deep-dive.html

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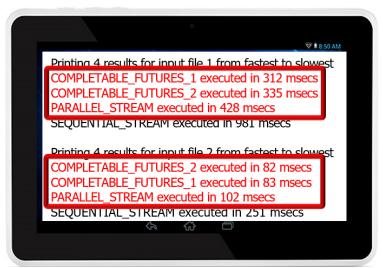


Again, this non-determinism is a general problem with concurrent processing

 Two things are necessary for the pros of asynchrony to outweigh the cons



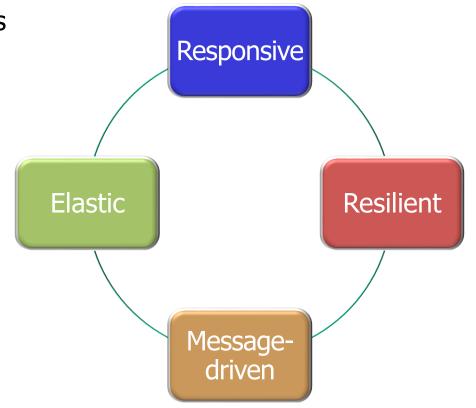
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 - Performance should improve to offset the increased complexity of programming & debugging





See upcoming lesson on "Java Completable Futures ImageStreamGang Example"

- Two things are necessary for the pros of asynchrony to outweigh the cons
 - Performance should improve to offset the increased complexity of programming & debugging
 - An asynchronous programming model should reflect the key principles of the reactive paradigm



End of the Pros & Cons of Asynchrony