Understand Advanced Java Completable Future Features: Arbitrary-Arity Methods

Douglas C. Schmidt
d.schmidt@vanderbilt.edu
www.dre.vanderbilt.edu/~schmidt

Professor of Computer Science
Institute for Software Integrated Systems
Vanderbilt University
Nashville, Tennessee, USA
Learning Objectives in this Part of the Lesson

• Understand advanced features of completable futures, e.g.
  • Factory methods initiate async computations
  • Completion stage methods chain together actions to perform async result processing & composition
  • Arbitrary-arity methods that process futures in bulk

See docs.oracle.com/javase/8/docs/api/java/util/concurrent/CompletableFuture.html
Arbitrary-Arity Methods
Process Futures in Bulk
Arbitrary-Arity Methods Process Futures in Bulk

- Arbitrary-arity methods return futures that are triggered after completion of any/all futures

<table>
<thead>
<tr>
<th>Methods</th>
<th>Params</th>
<th>Returns</th>
<th>Behavior</th>
</tr>
</thead>
<tbody>
<tr>
<td>allOf</td>
<td>Varargs</td>
<td>Completable Future(&lt;\Void&gt;)</td>
<td>Return a future that completes when all futures in params complete</td>
</tr>
<tr>
<td>anyOf</td>
<td>Varargs</td>
<td>Completable Future(&lt;\Void&gt;)</td>
<td>Return a future that completes when any future in params complete</td>
</tr>
</tbody>
</table>

See [en.wikipedia.org/wiki/Arity](en.wikipedia.org/wiki/Arity)
Arbitrary-Arity Methods Process Futures in Bulk

- Arbitrary-arity methods return futures that are triggered after completion of any/all futures
- The returned future can be used to wait for any or all of \( N \) completable futures in an array to complete
Arbitrary-Arity Methods Process Futures in Bulk

- Arbitrary-arity methods return futures that are triggered after completion of any/all futures.
- The returned future can be used to wait for any or all of \( N \) completable futures in an array to complete.
- This “wait” usually doesn’t block, but instead uses completion stage methods.

Help make programs more responsive by not blocking caller code.
Arbitrary-Arity Methods Process Futures in Bulk

- Arbitrary-arity methods return futures that are triggered after completion of any/all futures.
  - The returned future can be used to wait for any or all of \( N \) completable futures in an array to complete.
- We focus on `allOf()`, which is like `thenCombine()` on steroids!

See `docs.oracle.com/javase/8/docs/api/java/util/concurrent/CompletableFuture.html#allOf`
These arbitrary-arity methods are hard to program directly.

See en.wikipedia.org/wiki/Gordian_Knot
Arbitrary-Arity Methods Process Futures in Bulk

- These arbitrary-arity methods are hard to program directly
- Instead, program them via wrappers

See next lesson on "Advanced Java CompletableFuture Features: Arbitrary-Arity Methods"