How Java Completable Futures Overcome Limitations of Java Futures

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

• Recognize how Java completable futures overcome limitations with Java futures

See earlier lesson on “Overview of the Java Completable Futures Framework”
Overcoming Limitations with Java Futures
Overcoming Limitations with Java Futures

- The completable futures framework overcomes Java future limitations

See docs.oracle.com/javase/8/docs/api/java/util/concurrent/CompletableFuture.html
Overcoming Limitations with Java Futures

- The completable futures framework overcomes Java future limitations
  - *Can be completed explicitly*

```java
CompletableFuture<...> future = new CompletableFuture<>();
new Thread (() -> {
  ...  
  future.complete(...);
}).start();

System.out.println(future.join());
```

After `complete()` is done, calls to `join()` will unblock.

See [github.com/douglascraigschmidt/LiveLessons/tree/master/Java8/ex8](https://github.com/douglascraigschmidt/LiveLessons/tree/master/Java8/ex8)
The completable futures framework `CompletableFuture` overcomes Java future limitations:

- *Can* be completed explicitly
- *Can* be chained fluently to handle async results efficiently & cleanly

```java
CompletableFuture.supplyAsync(reduceFraction)
  .thenApply(BigFraction::toMixedString)
  .thenAccept(System.out::println);
```

The action of each “completion stage” is triggered when the previous stage’s future completes asynchronously.

See [en.wikipedia.org/wiki/Fluent_interface](en.wikipedia.org/wiki/Fluent_interface)
Overcoming Limitations with Java Futures

- The completable futures framework overcomes Java future limitations
  - *Can* be completed explicitly
  - *Can* be chained fluently to handle async results efficiently & cleanly
  - Async programming thus looks more like sync programming!

```java
CompletableFuture.supplyAsync(reduceFraction)
  .thenApply(BigFraction::toMixedString)
  .thenAccept(System.out::println);
```
Overcoming Limitations with Java Futures

- The completable futures framework overcomes Java future limitations
  - *Can* be completed explicitly
  - *Can* be chained fluently to handle async results efficiently & cleanly
  - *Can* be triggered reactively/efficiently as a *collection* of futures w/out undue overhead

```java
CompletableFuture<List<BigFraction>> futureToList = Stream
                     .generate(generator)
                     .limit(sMAX_FRACTIONS)
                     .map(reduceFractions)
                     .collect(FuturesCollector
                                  .toFutures());

futureToList.thenAccept(printList);
```

Create a single future that will be triggered when a group of other futures all complete

See [github.com/douglasraigslistchmidt/LiveLessons/tree/master/Java8/ex8](https://github.com/douglasraelligentchmidt/LiveLessons/tree/master/Java8/ex8)
Overcoming Limitations with Java Futures

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    .generate(generator)
    .limit(sMAX_FRACTIONS)
    .map(reduceFractions)
    .collect(FuturesCollector.toFutures());

futureToList.thenAccept(printList);
```

Print out the results after all async fraction reductions have completed
Overcoming Limitations with Java Futures

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```java
CompletableFuture<List<BigFraction>> futureToList = Stream
  .generate(generator)
  .limit(sMAX_FRACTIONS)
  .map(reduceFractions)
  .collect(FuturesCollector
    .toFutures());
futureToList
  .thenAccept(printList);
```

Java completable futures can also be combined with Java sequential streams
End of How Java Completable Futures Overcome Limitations of Java Futures