

Overview of Basic Java 8

CompletableFuture Features (Part 1)

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Learning Objectives in this Part of the Lesson

- Understand the basic completable futures features



Class `CompletableFuture<T>`

```
java.lang.Object  
    java.util.concurrent.CompletableFuture<T>
```

All Implemented Interfaces:

```
CompletionStage<T>, Future<T>
```

```
public class CompletableFuture<T>  
    extends Object  
    implements Future<T>, CompletionStage<T>
```

A `Future` that may be explicitly completed (setting its value and status), and may be used as a `CompletionStage`, supporting dependent functions and actions that trigger upon its completion.

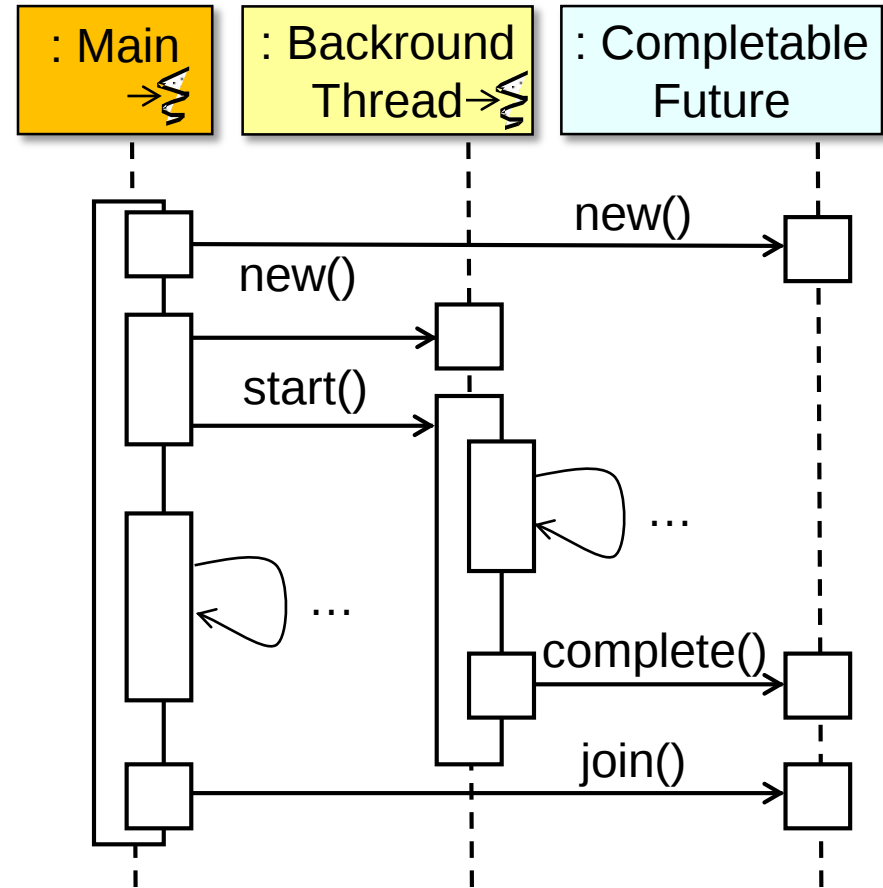
When two or more threads attempt to `complete`, `completeExceptionally`, or `cancel` a `CompletableFuture`, only one of them succeeds.

In addition to these and related methods for directly manipulating status and results, `CompletableFuture` implements interface `CompletionStage` with the following policies:

Basic Completable Future Features

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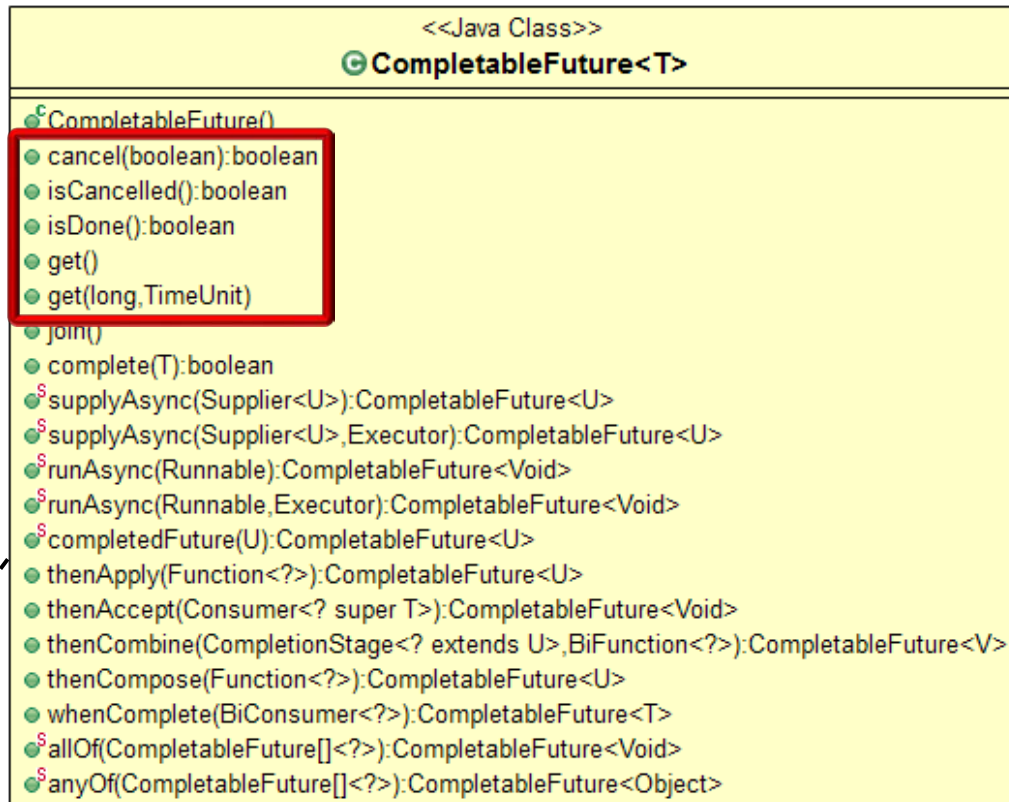
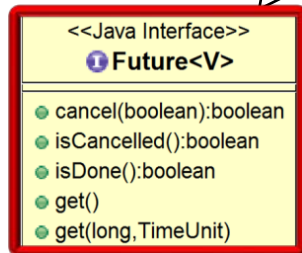
- Basic completable future features



See github.com/douglasraigschmidt/LiveLessons/tree/master/Java8/ex8

Basic Completable Future Features

- Basic completable future features
 - Support the Future API



See docs.oracle.com/javase/8/docs/api/java/util/concurrent/Future.html

Basic Completable Future Features

- Basic completable future features
 - Support the Future API
 - Can (time-) block & poll

```
String f1 = "62675744/15668936";  
String f2 = "609136/913704";
```

```
CompletableFuture<BigFraction>  
    f = commonPool().submit(() -> {  
        BigFraction bf1 =  
            new BigFraction(f1);  
        BigFraction bf2 =  
            new BigFraction(f2);  
        return bf1.multiply(bf2);  
    });  
...  
BigFraction result = f.get();  
// f.get(10, MILLISECONDS);  
// f.get(0, 0);
```

Basic Completable Future Features

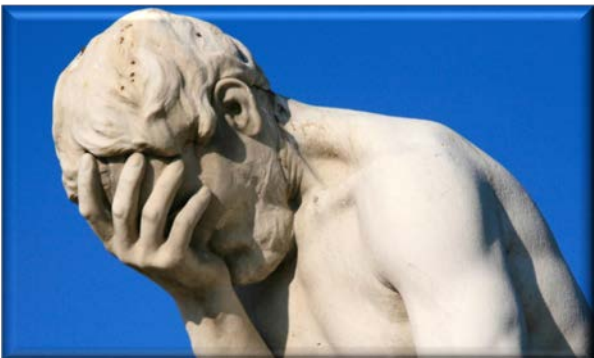
- Basic completable future features
- Support the Future API
 - Can (time-) block & poll
 - Can be cancelled & tested if canceled/done

```
String f1 = "62675744/15668936";  
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CompletableFuture<BigFraction>  
    f = commonPool().submit(() -> {  
        BigFraction bf1 =  
            new BigFraction(f1);  
        BigFraction bf2 =  
            new BigFraction(f2);  
        return bf1.multiply(bf2);  
    });  
...  
if (!(f.isDone()  
    || f.isCancelled()))  
    f.cancel();
```

Basic Completable Future Features

- Basic completable future features
 - Support the Future API
 - Can (time-) block & poll
 - Can be cancelled & tested if canceled/done
 - `cancel()` doesn't interrupt the computation by default..



```
String f1 = "62675744/15668936";  
String f2 = "609136/913704";
```

```
CompletableFuture<BigFraction>  
    f = commonPool().submit(() -> {  
        BigFraction bf1 =  
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            new BigFraction(f2);  
        return bf1.multiply(bf2);  
    });  
...  
if (!(f.isDone()  
    || f.isCancelled()))  
    f.cancel();
```

Basic Completable Future Features

- Basic completable future features
 - Support the Future API
 - Define a join() method

<<Java Class>>	
CompletableFuture<T>	
CompletableFuture()	
cancel(boolean): boolean	
isCancelled(): boolean	
isDone(): boolean	
get()	
get(long, TimeUnit)	
join()	
complete(T): boolean	
supplyAsync(Supplier<U>): CompletableFuture<U>	
supplyAsync(Supplier<U>, Executor): CompletableFuture<U>	
runAsync(Runnable): CompletableFuture<Void>	
runAsync(Runnable, Executor): CompletableFuture<Void>	
completedFuture(U): CompletableFuture<U>	
thenApply(Function<?>): CompletableFuture<U>	
thenAccept(Consumer<? super T>): CompletableFuture<Void>	
thenCombine(CompletionStage<? extends U>, BiFunction<?>): CompletableFuture<V>	
thenCompose(Function<?>): CompletableFuture<U>	
whenComplete(BiConsumer<?>): CompletableFuture<T>	
allOf(CompletableFuture[]<?>): CompletableFuture<Void>	
anyOf(CompletableFuture[]<?>): CompletableFuture<Object>	

See docs.oracle.com/javase/8/docs/api/java/util/concurrent/CompletableFuture.html#join

Basic Completable Future Features

- Basic completable future features
 - Support the Future API
 - Define a join() method
 - Behaves like get() *without* using checked exceptions

futures

```
.stream()  
.map(Future::join)  
.collect(toList())
```

<<Java Class>>	
CompletableFuture<T>	
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isCancelled():boolean	
isDone():boolean	
get()	
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Basic Completable Future Features

- Basic completable future features
 - Support the Future API
 - Define a join() method
 - Behaves like get() *without* using checked exceptions

futures

```
.stream()  
.map(future  
-> try { future.get();  
} catch (Exception e){  
})  
.collect(toList())
```

<<Java Class>>	
CompletableFuture<T>	
CompletableFuture()	
cancel(boolean):boolean	
isCancelled():boolean	
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allOf(CompletableFuture[]<?>):CompletableFuture<Void>	
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Mixing checked exceptions & Java 8 streams is ugly..

Basic Completable Future Features

- Basic completable future features
 - Support the Future API
 - Define a join() method
 - Can be completed explicitly

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CompletableFuture<T>	
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See docs.oracle.com/javase/8/docs/api/java/util/concurrent/CompletableFuture.html#complete

Basic Completable Future Features

- Basic completable future features
 - Support the Future API
 - Define a join() method
 - Can be completed explicitly
 - i.e., sets result returned by get()/join() to a given value

```
CompletableFuture<...> future =  
    new CompletableFuture<>();
```

```
new Thread (() -> {
```

```
    ...
```

```
    future.complete(...);
```

```
}).start();
```

```
    ...
```

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

*After complete() is done
calls to join() will unblock*

Basic Completable Future Features

- Basic completable future features
 - Support the Future API
 - Define a join() method
 - Can be completed explicitly
 - i.e., sets result returned by get()/join() to a given value

A completable future can be initialized to a value/constant

```
CompletableFuture<...> future =  
    new CompletableFuture<>();
```

```
CompletableFuture<Long> zero =  
    CompletableFuture  
        .completedFuture(0L);
```

```
new Thread (() -> {  
    ...  
    future.complete(zero.join());  
}).start();  
  
...  
System.out.println(future.join());
```

End of Overview of Basic Java 8 Completable Future Features (Part 1)