The Java ExecutorService Interface (Part 1)

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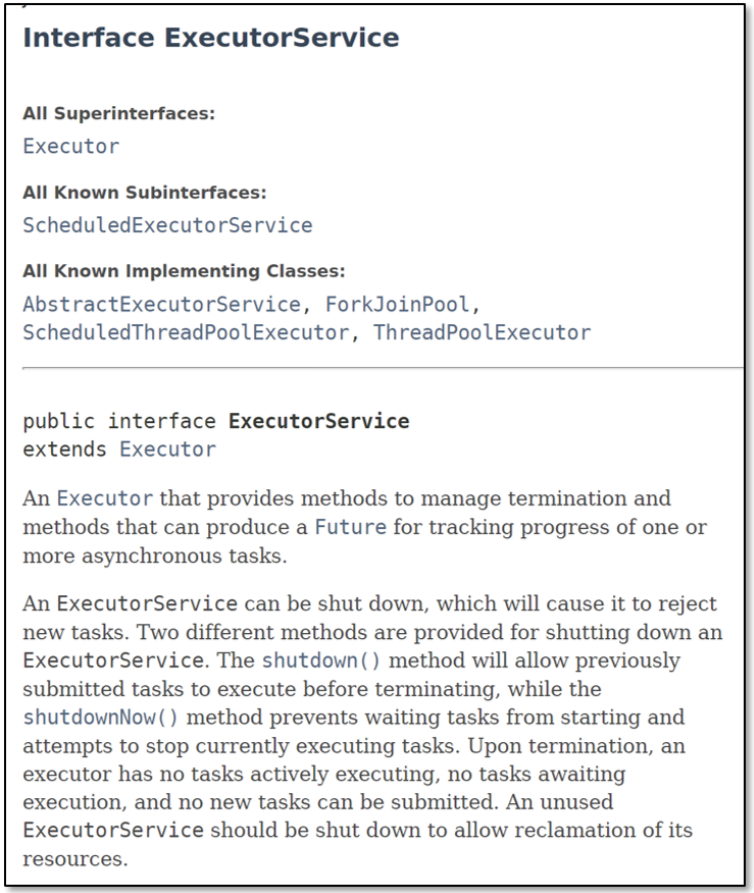
Learning Objectives in this Part of the Lesson

- Recognize the powerful features defined in the Java ExecutorService interface & related interfaces/classes



Interface ExecutorService

All Superinterfaces:

`Executor`

All Known Subinterfaces:

`ScheduledExecutorService`

All Known Implementing Classes:

`AbstractExecutorService`, `ForkJoinPool`, `ScheduledThreadPoolExecutor`, `ThreadPoolExecutor`

```
public interface ExecutorService
extends Executor
```

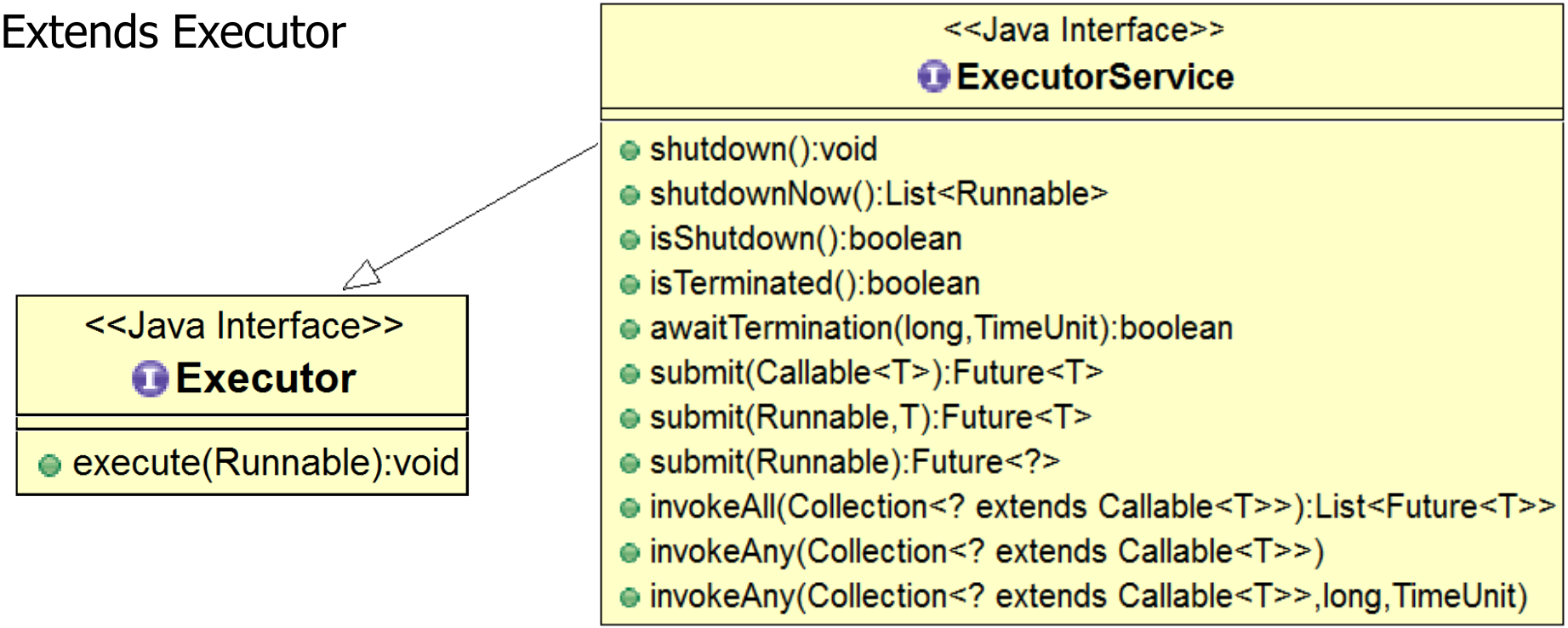
An `Executor` that provides methods to manage termination and methods that can produce a `Future` for tracking progress of one or more asynchronous tasks.

An `ExecutorService` can be shut down, which will cause it to reject new tasks. Two different methods are provided for shutting down an `ExecutorService`. The `shutdown()` method will allow previously submitted tasks to execute before terminating, while the `shutdownNow()` method prevents waiting tasks from starting and attempts to stop currently executing tasks. Upon termination, an executor has no tasks actively executing, no tasks awaiting execution, and no new tasks can be submitted. An unused `ExecutorService` should be shut down to allow reclamation of its resources.

Overview of the ExecutorService Interface

Overview of the ExecutorService Interface

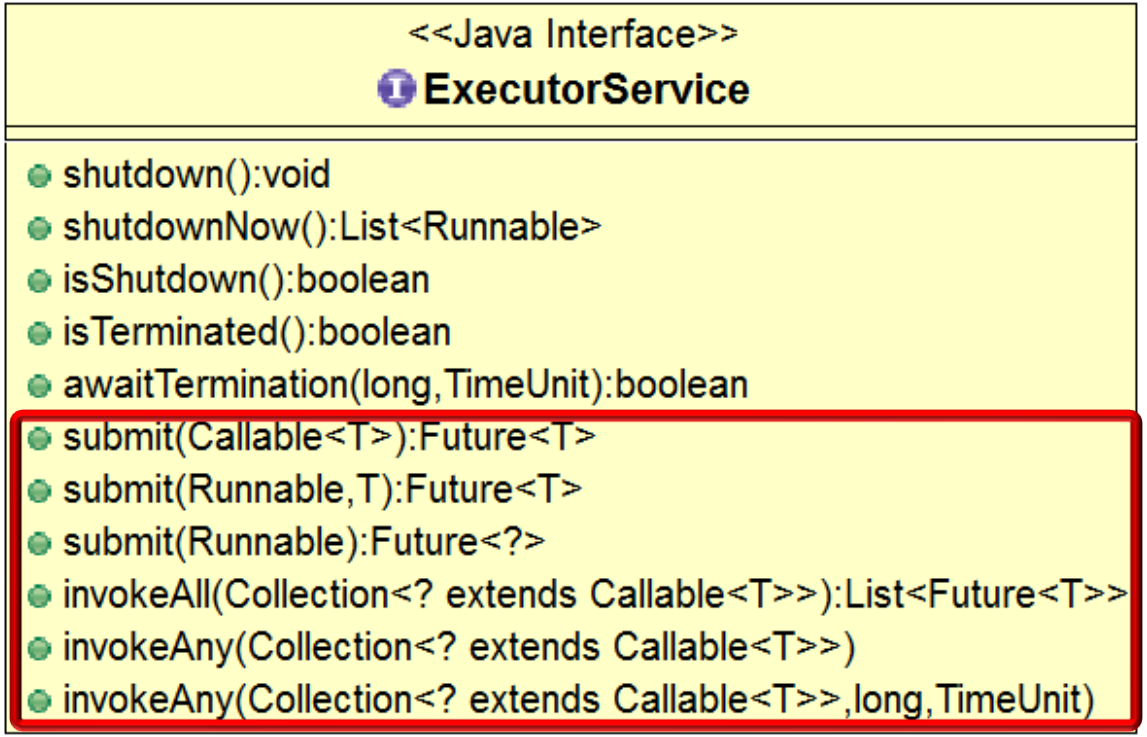
- Extends Executor



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

Overview of the ExecutorService Interface

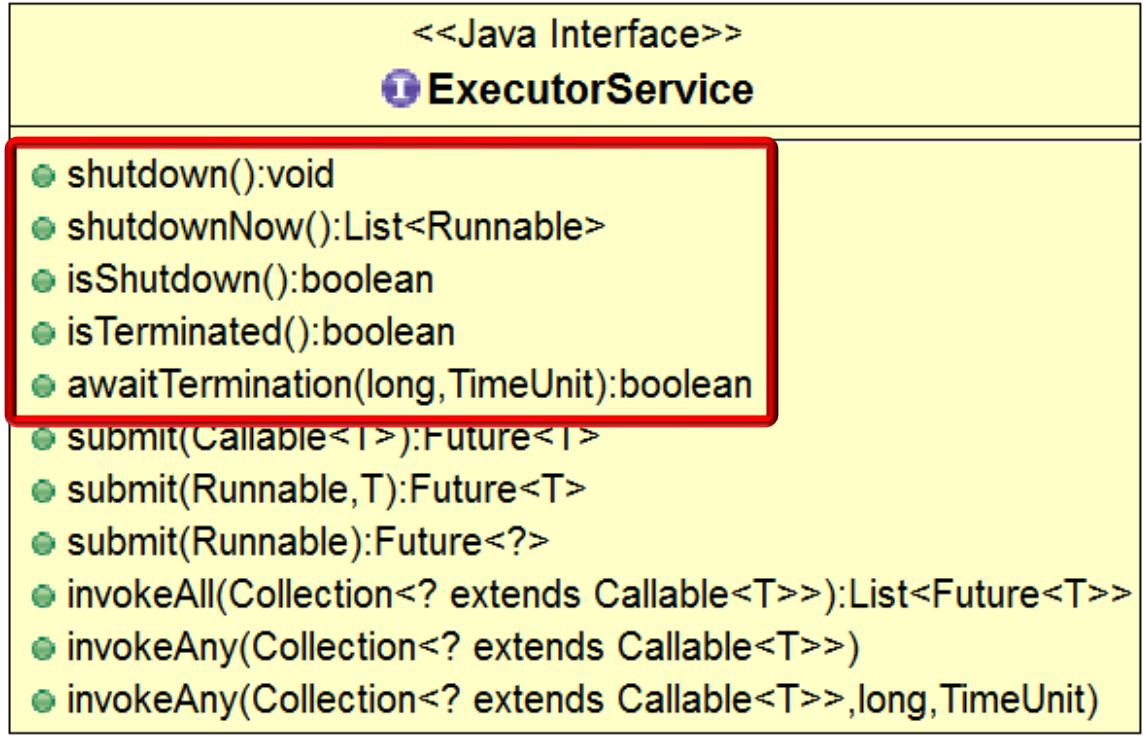
- Extends Executor
  - Submit tasks & return futures for these tasks



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

Overview of the ExecutorService Interface

- Extends Executor
  - Submit tasks & return futures for these tasks
  - Manage lifecycle of tasks & worker threads



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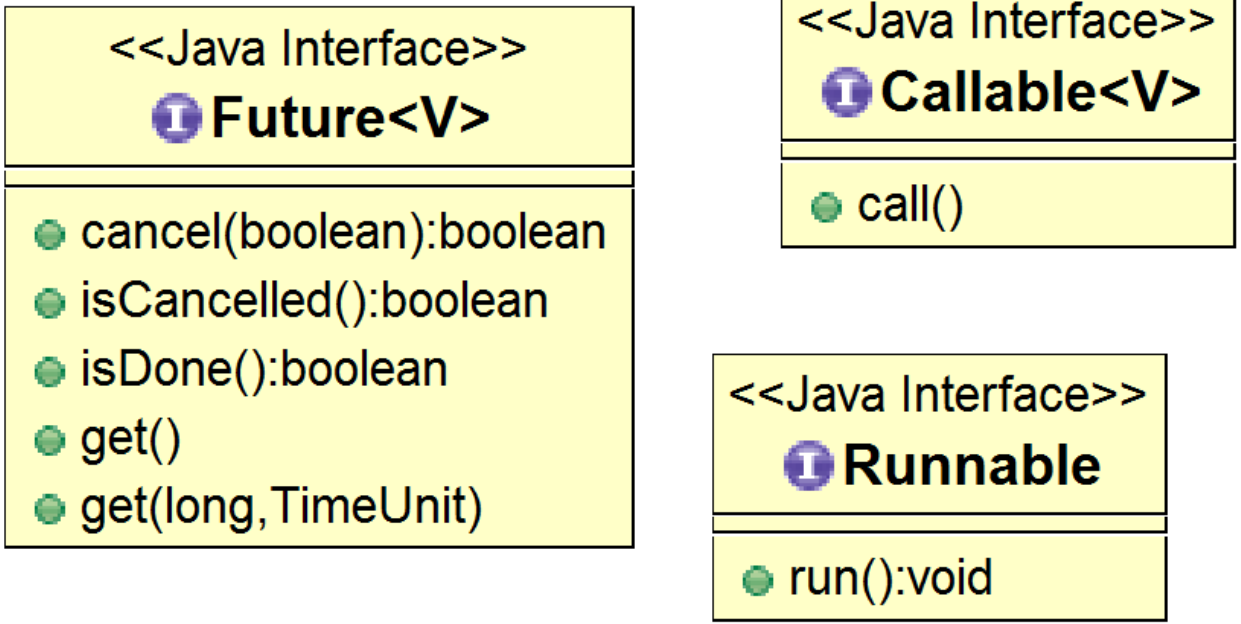
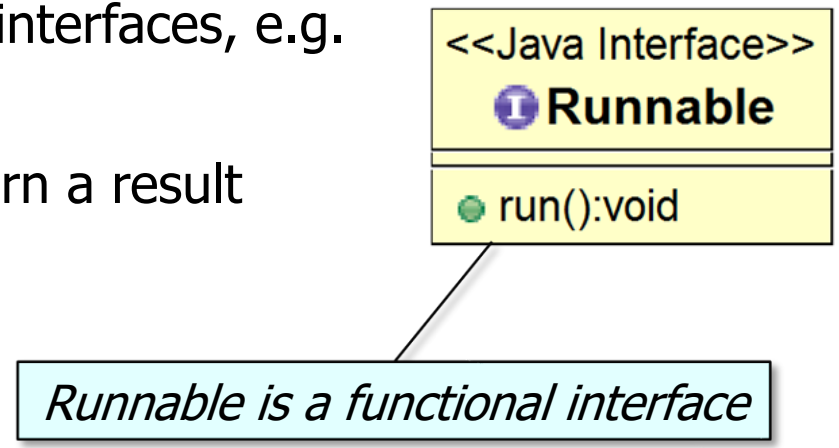
Overview of the ExecutorService Interface

- The ExecutorService is used with other interfaces



Overview of the ExecutorService Interface

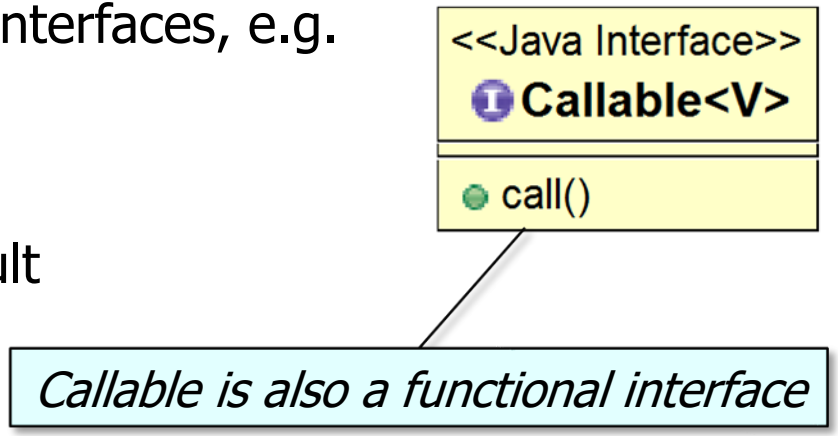
- The ExecutorService is used with other interfaces, e.g.
  - **Runnable**
    - A "one-way" task that does not return a result



See docs.oracle.com/javase/8/docs/api/java/lang/Runnable.html

Overview of the ExecutorService Interface

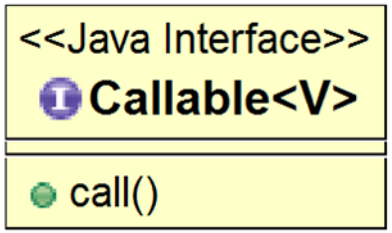
- The ExecutorService is used with other interfaces, e.g.
  - Runnable
  - **Callable**
    - A "two-way" task that returns a result



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

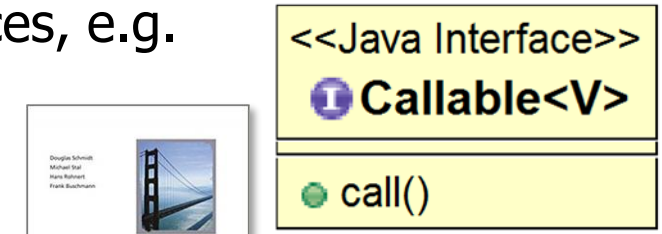
Overview of the ExecutorService Interface

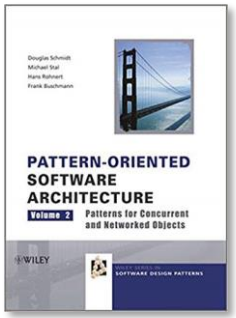
- The ExecutorService is used with other interfaces, e.g.
  - Runnable
  - **Callable**
    - A "two-way" task that returns a result
    - Typically used to run two-way async tasks

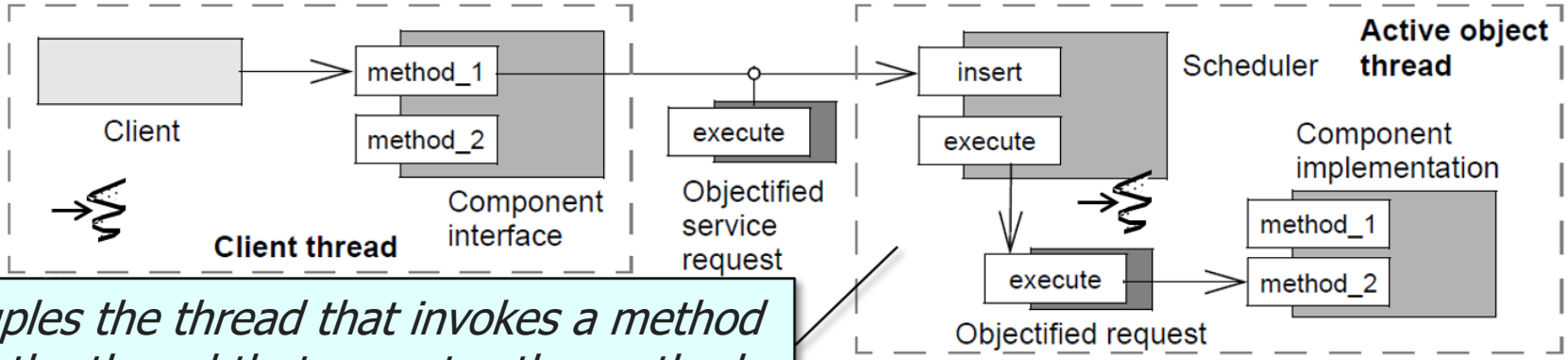


Overview of the ExecutorService Interface

- The ExecutorService is used with other interfaces, e.g.
  - Runnable
  - **Callable**
    - A "two-way" task that returns a result
    - Typically used to run two-way async tasks
    - Implements the *Active Object* pattern







Decouples the thread that invokes a method from the thread that executes the method

See en.wikipedia.org/wiki/Active_object

Overview of the ExecutorService Interface

- The ExecutorService is used with other interfaces, e.g.
  - Runnable
  - Callable
  - **Future**
    - Represents async two-way task result

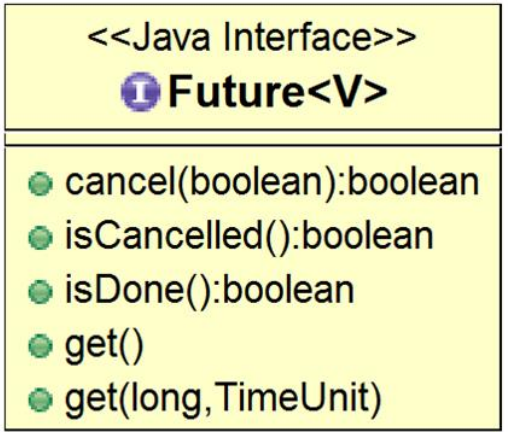
<<Java Interface>>
Future<V>

- cancel(boolean):boolean
- isCancelled():boolean
- isDone():boolean
- get()
- get(long,TimeUnit)

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

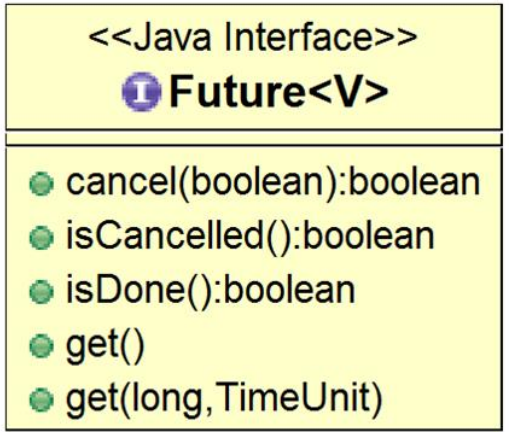
Overview of the ExecutorService Interface

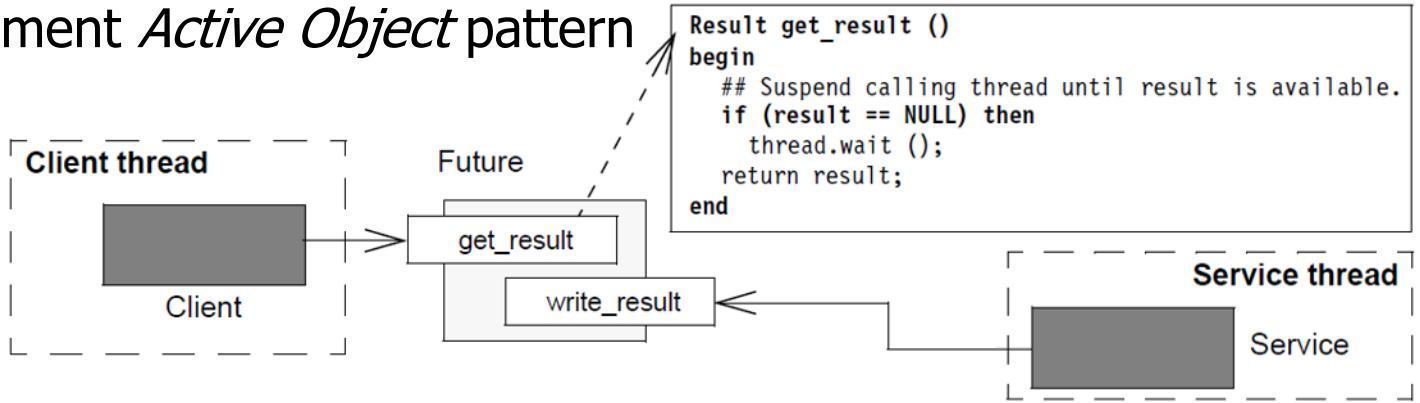
- The ExecutorService is used with other interfaces, e.g.
  - Runnable
  - Callable
  - **Future**
    - Represents async two-way task result
      - Can be canceled & tested for completion



Overview of the ExecutorService Interface

- The ExecutorService is used with other interfaces, e.g.
  - Runnable
  - Callable
  - **Future**
    - Represents async two-way task result
      - Can be canceled & tested for completion
      - Can implement *Active Object* pattern

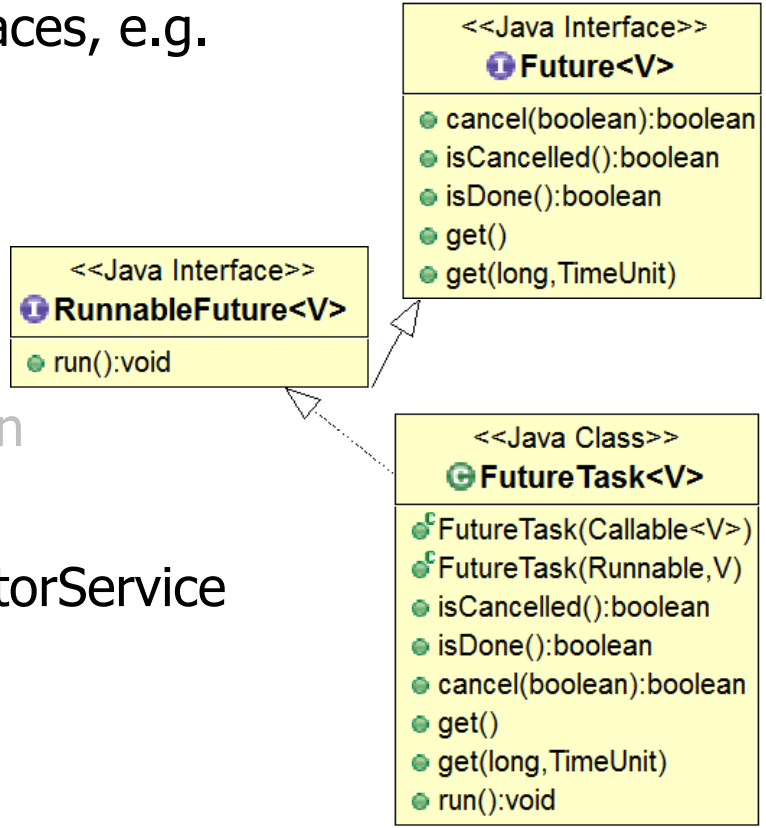




See en.wikipedia.org/wiki/Active_object

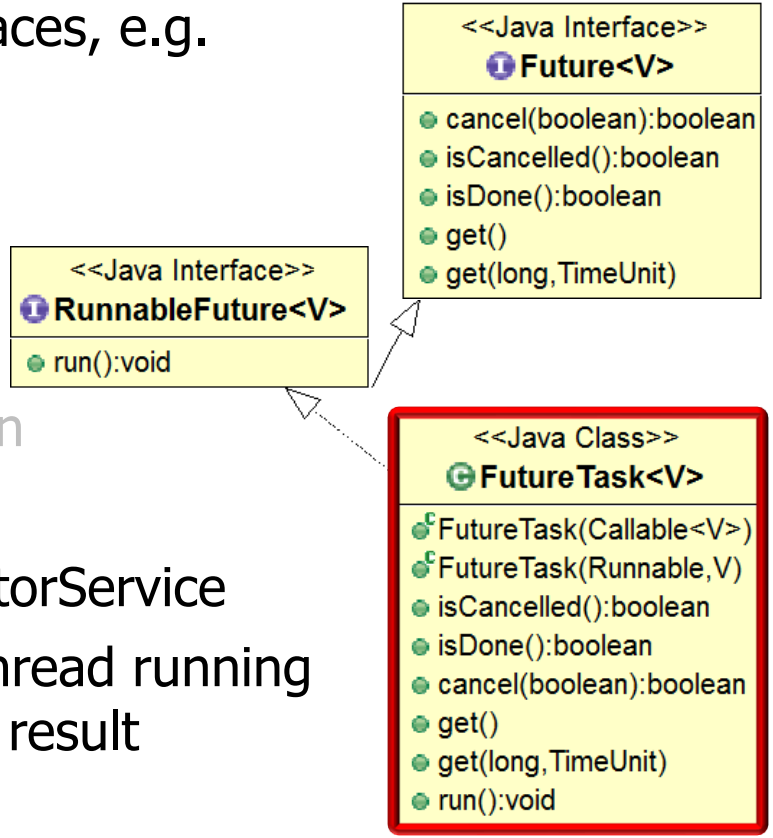
Overview of the ExecutorService Interface

- The ExecutorService is used with other interfaces, e.g.
  - Runnable
  - Callable
  - **Future**
    - Represents async two-way task result
      - Can be canceled & tested for completion
      - Can implement *Active Object* pattern
      - Other Future variants implement ExecutorService



Overview of the ExecutorService Interface

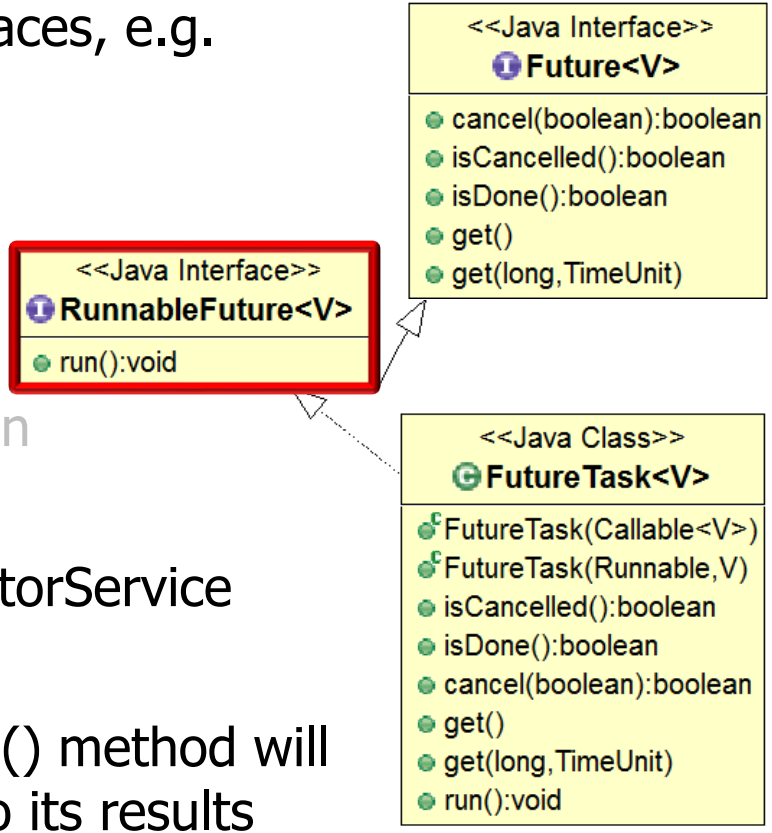
- The ExecutorService is used with other interfaces, e.g.
  - Runnable
  - Callable
  - **Future**
    - Represents async two-way task result
      - Can be canceled & tested for completion
      - Can implement *Active Object* pattern
    - Other Future variants implement ExecutorService
      - **FutureTask** – Conveys result from thread running a computation to thread(s) retrieving result



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

Overview of the ExecutorService Interface

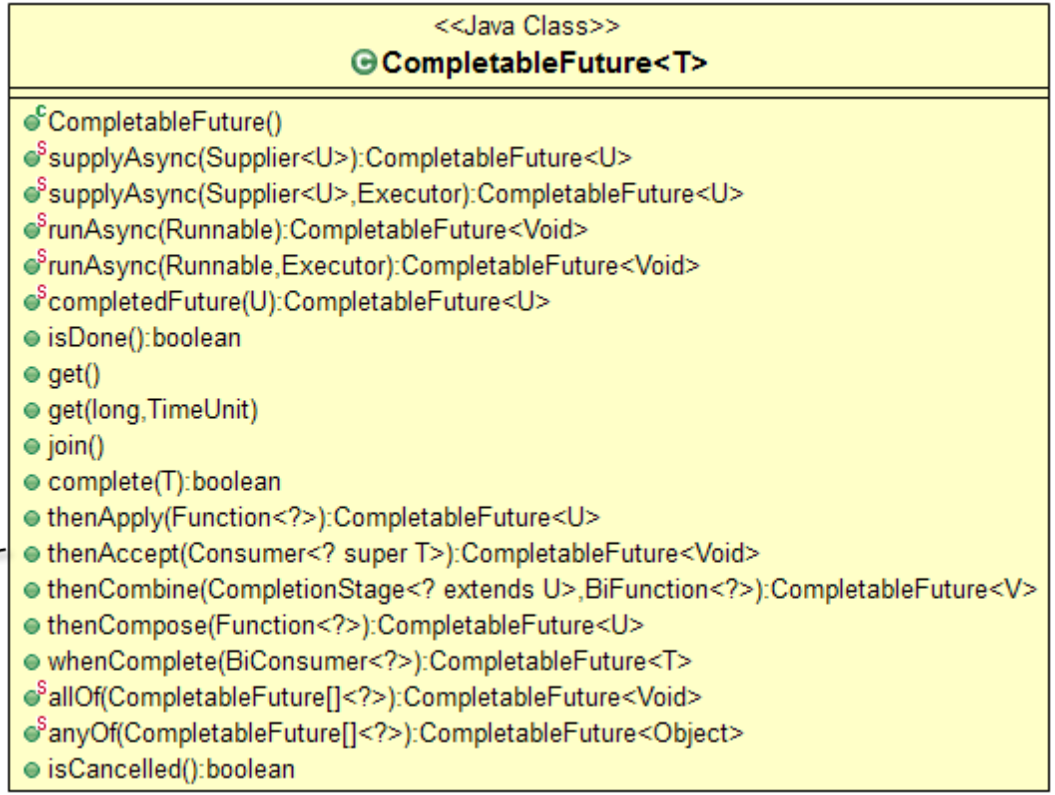
- The ExecutorService is used with other interfaces, e.g.
  - Runnable
  - Callable
  - **Future**
    - Represents async two-way task result
      - Can be canceled & tested for completion
      - Can implement *Active Object* pattern
    - Other Future variants implement ExecutorService
      - FutureTask
      - **RunnableFuture** – Execution of run() method will complete the future & allow access to its results



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

Overview of the ExecutorService Interface

- The ExecutorService is used with other interfaces, e.g.
  - Runnable
  - Callable
  - Future
  - **CompletableFuture**
    - This Future variant supports dependent actions that are trigger upon its completion

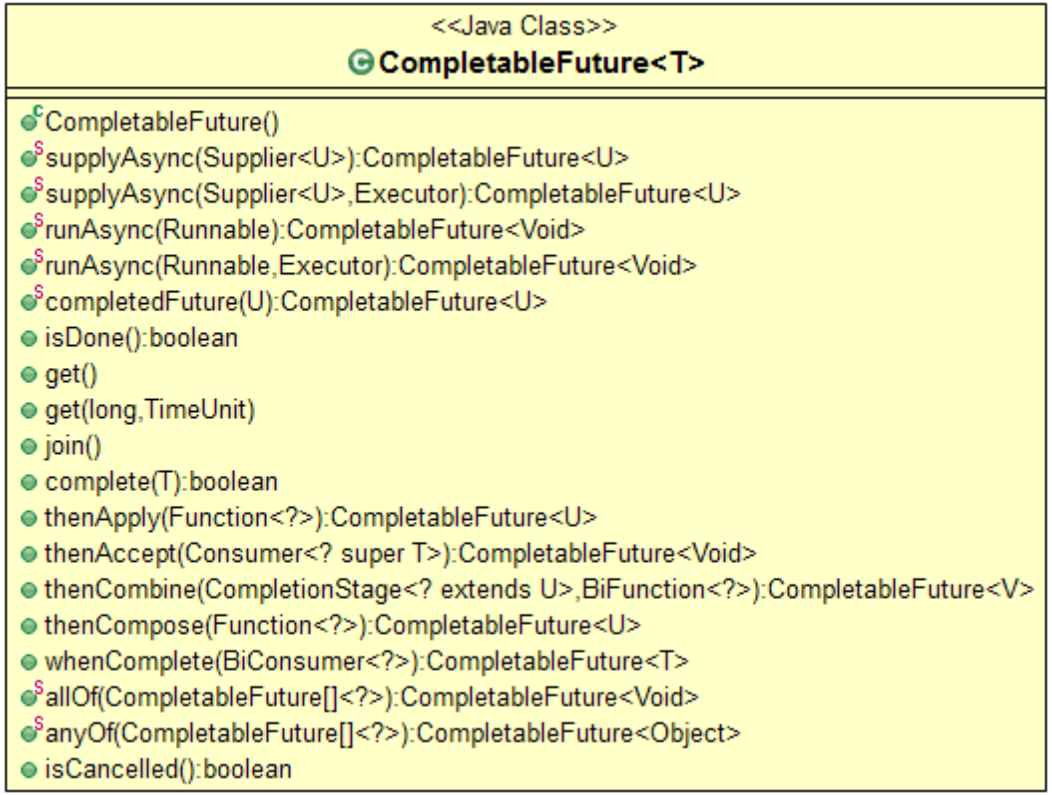


CompletableFuture isn't part of the Java Executor framework

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

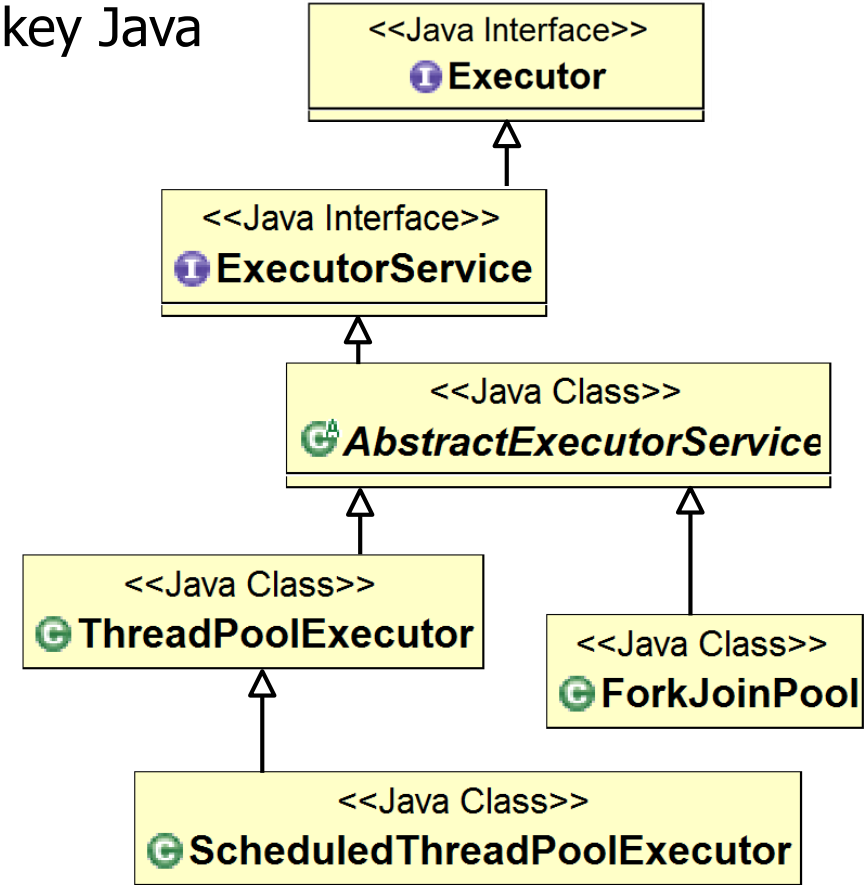
Overview of the ExecutorService Interface

- The ExecutorService is used with other interfaces, e.g.
  - **Runnable**
  - **Callable**
  - **Future**
  - **CompletableFuture**
    - This Future variant supports dependent actions that are trigger upon its completion
    - This topic is covered in other courses



Overview of the ExecutorService Interface

- ExecutorService also forms the basis for key Java Executor framework subclasses



See src/share/classes/java/util/concurrent

End of Overview of Java ExecutorService (Part 1)