Java ExecutorService: Introduction

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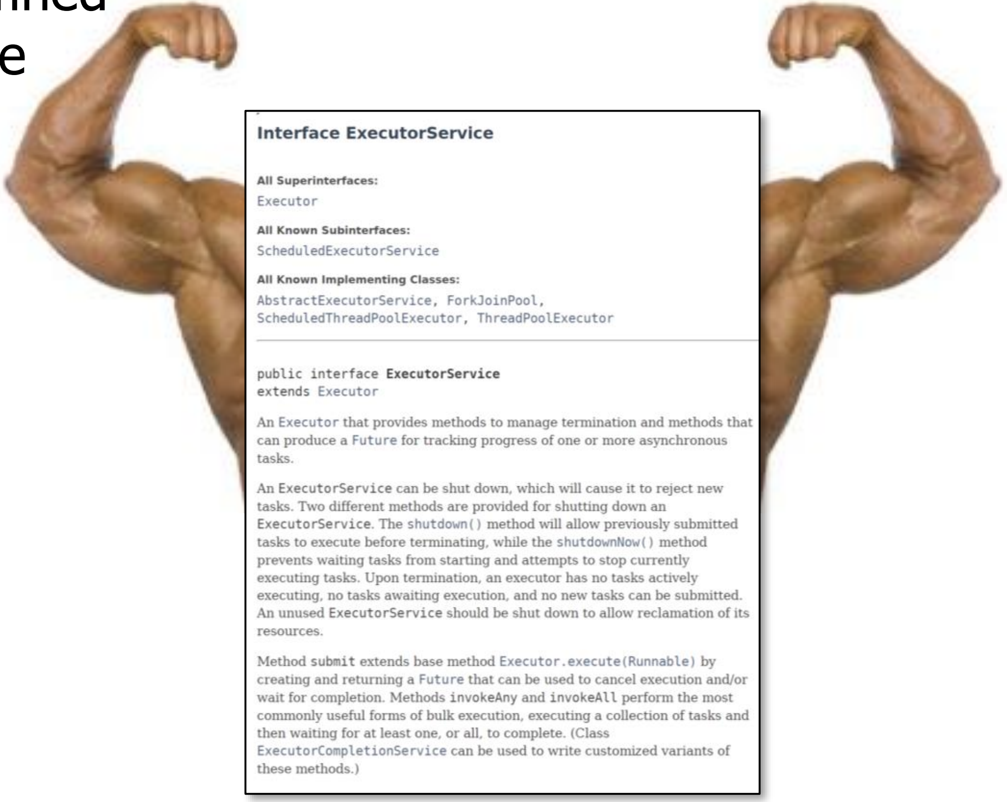
Learning Objectives in this Part of the Lesson

- Recognize the powerful features defined in the Java ExecutorService interface



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.

Method submit extends base method Executor.execute(Runnable) by creating and returning a Future that can be used to cancel execution and/or wait for completion. Methods invokeAny and invokeAll perform the most commonly useful forms of bulk execution, executing a collection of tasks and then waiting for at least one, or all, to complete. (Class ExecutorCompletionService can be used to write customized variants of these methods.)

Overview of the ExecutorService Interface

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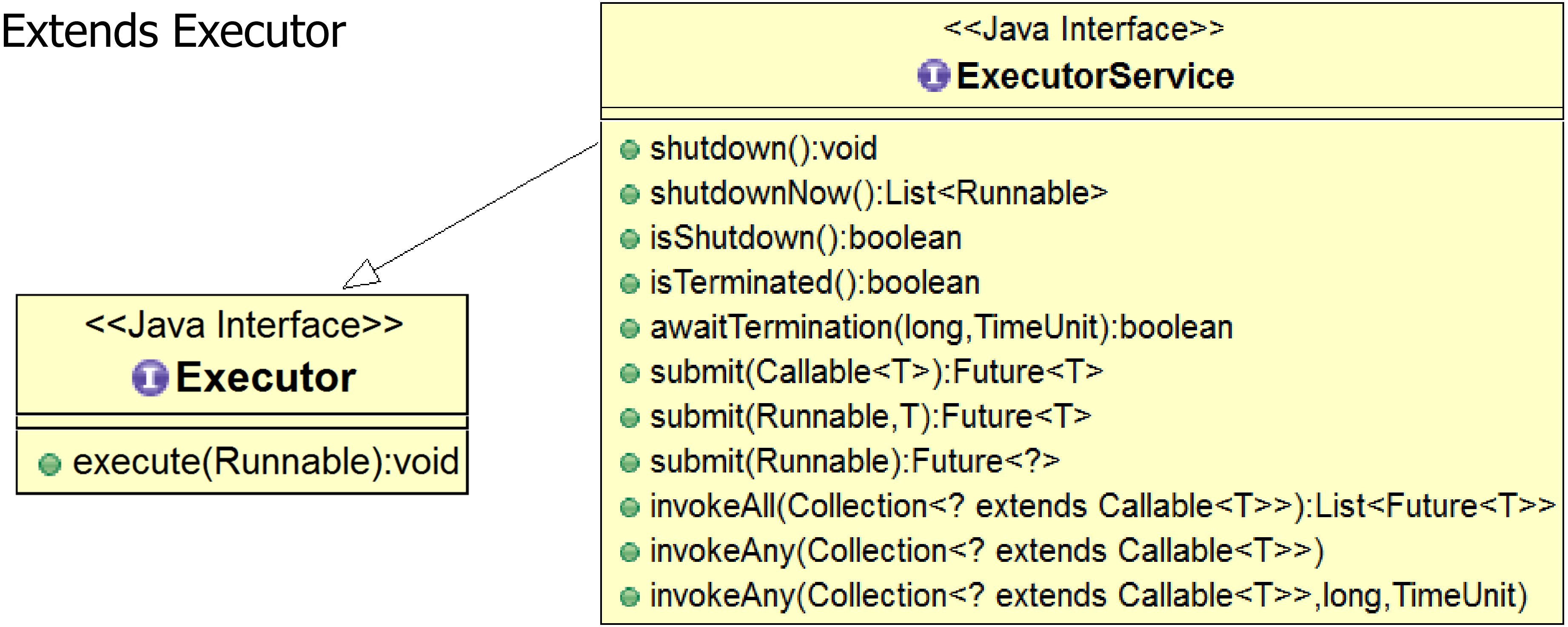
- Extends Executor

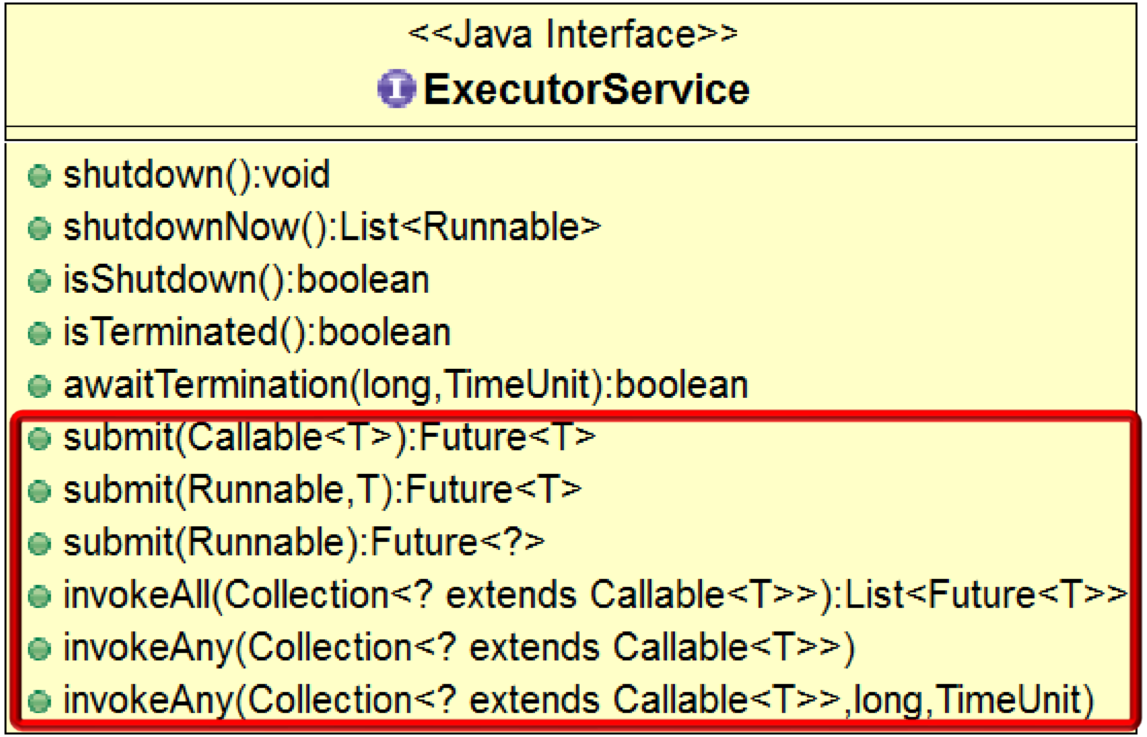


<<Java Interface>>
ExecutorService
shutdown():void
shutdownNow():List<Runnable>
isShutdown():boolean
isTerminated():boolean
awaitTermination(long,TimeUnit):boolean
submit(Callable<T>):Future<T>
submit(Runnable,T):Future<T>
submit(Runnable):Future<?>
invokeAll(Collection<? extends Callable<T>>):List<Future<T>>
invokeAny(Collection<? extends Callable<T>>)
invokeAny(Collection<? extends Callable<T>>,long,TimeUnit)
<<Java Interface>>
Executor
execute(Runnable):void

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

Overview of the ExecutorService Interface

- Extends Executor
  - Submit 1+ tasks & return futures for these tasks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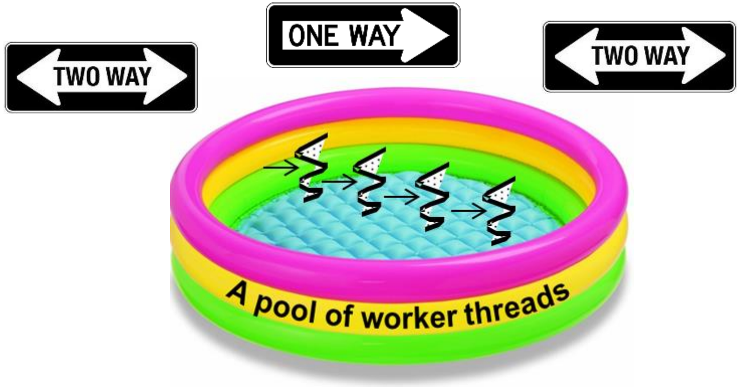
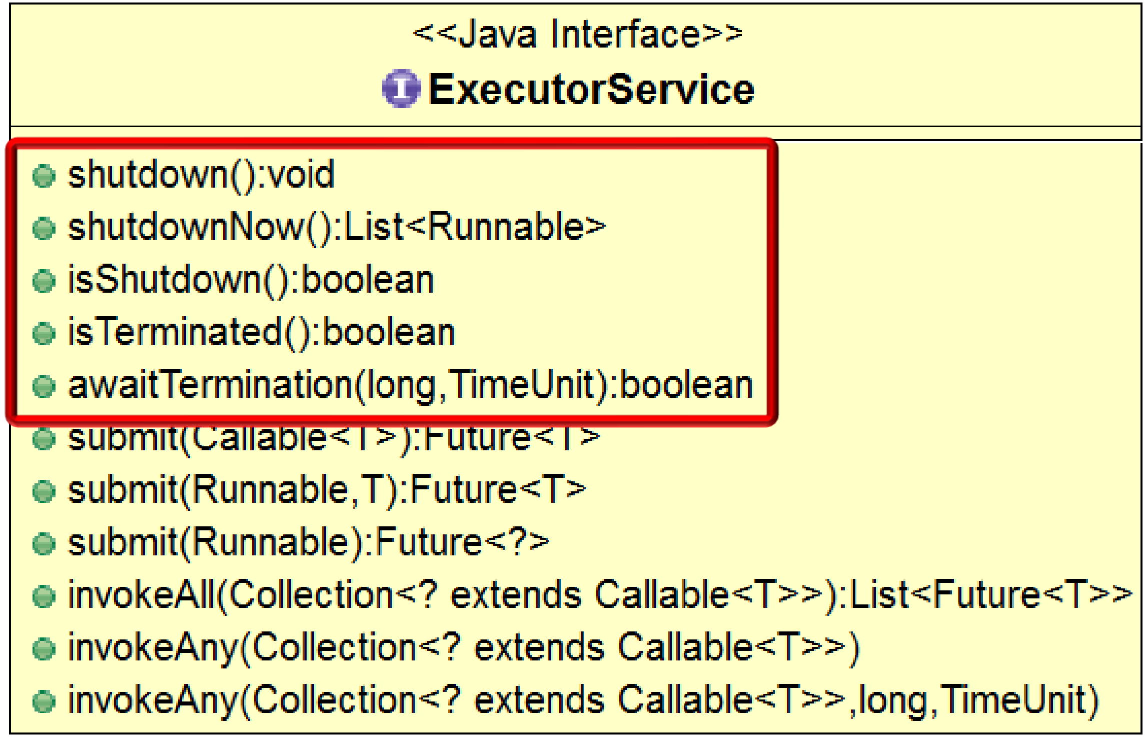
- isShutdown():boolean
- isTerminated():boolean
- awaitTermination(long,TimeUnit):boolean
- submit(Callable<T>):Future<T>
- submit(Runnable,T):Future<T>
- submit(Runnable):Future<?>
- invokeAll(Collection<? extends Callable<T>>):List<Future<T>>
- invokeAny(Collection<? extends Callable<T>>)
- invokeAny(Collection<? extends Callable<T>>,long,TimeUnit)

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

Overview of the ExecutorService Interface

- Extends Executor
  - Submit 1+ tasks & return futures for these tasks
  - Manage lifecycle of tasks & executor service itself
    - e.g., interrupts worker threads in a pool





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

Overview of the ExecutorService Interface

- A task is a unit of computation that (ideally) does not depend on the state, result, or side effects of other tasks

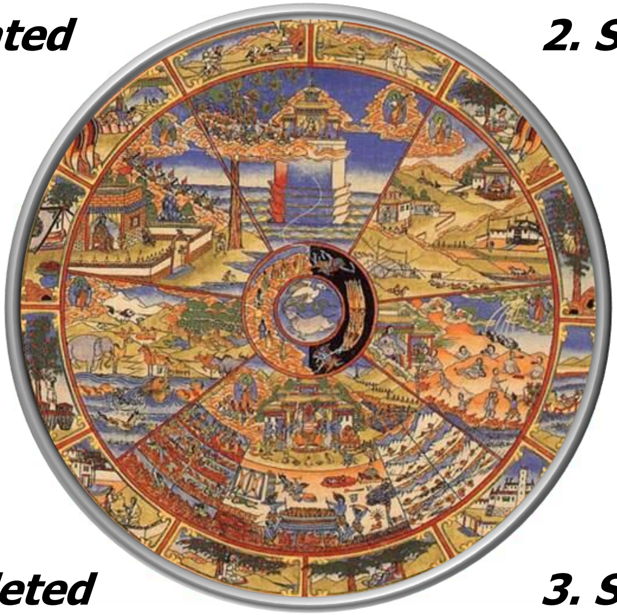
See www.javaworld.com/article/2071822/book-excerpt--executing-tasks-in-threads.html

Overview of the ExecutorService Interface

- A task is a unit of computation that (ideally) does not depend on the state, result, or side effects of other tasks
  - A task has four phases in its lifecycle

1. Created

2. Submitted



3. Started

4. Completed

Overview of the ExecutorService Interface

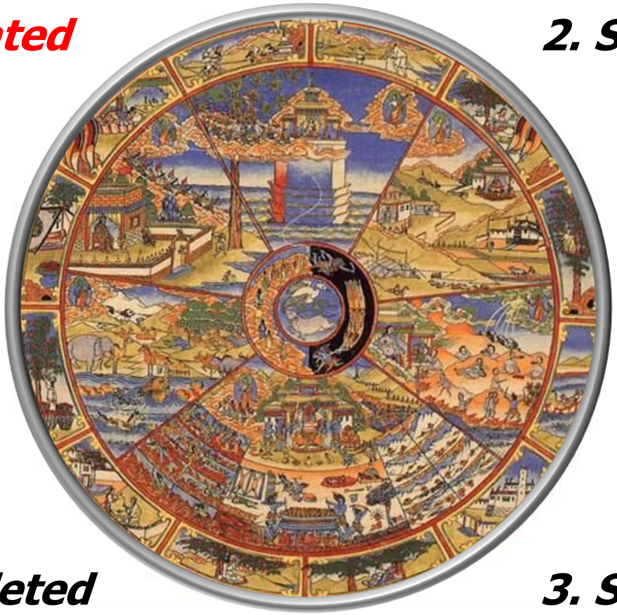
- A task is a unit of computation that (ideally) does not depend on the state, result, or side effects of other tasks
  - A task has four phases in its lifecycle

    1. Created

    - A new task is instantiated

1. Created

2. Submitted



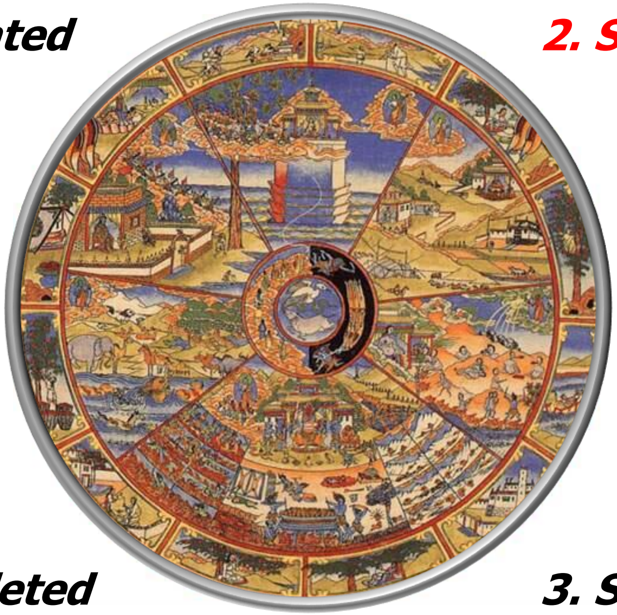
4. Completed

3. Started

Overview of the ExecutorService Interface

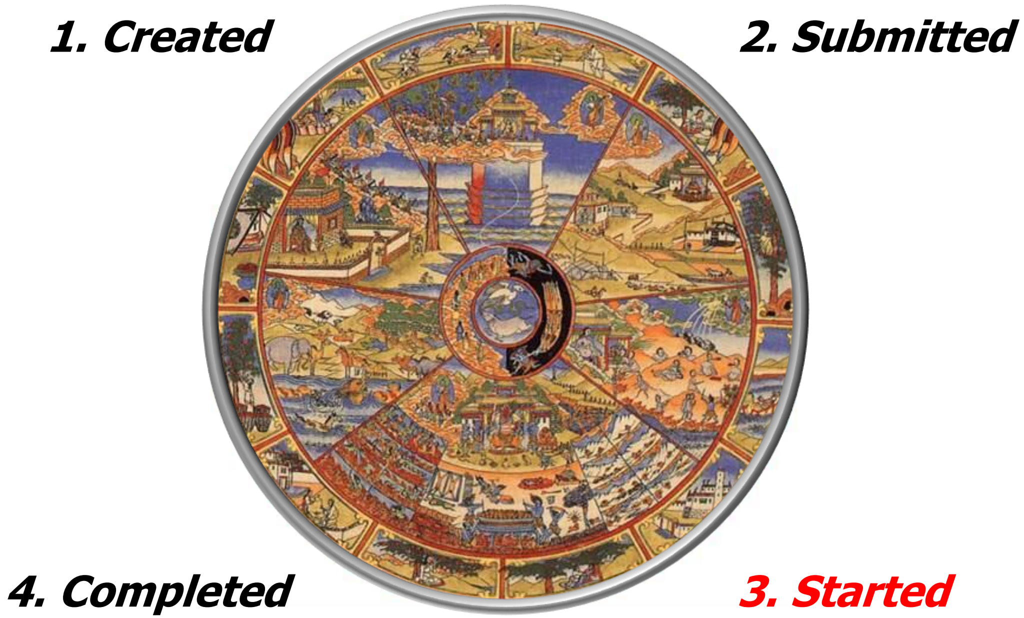
- A task is a unit of computation that (ideally) does not depend on the state, result, or side effects of other tasks
  - A task has four phases in its lifecycle

    1. *Created*
    2. ***Submitted***
       - A task is given to an executor service to run



Overview of the ExecutorService Interface

- A task is a unit of computation that (ideally) does not depend on the state, result, or side effects of other tasks
  - A task has four phases in its lifecycle
    1. *Created*
    2. *Submitted*
    3. ***Started***
       - A task is executed by a worker thread in the executor service



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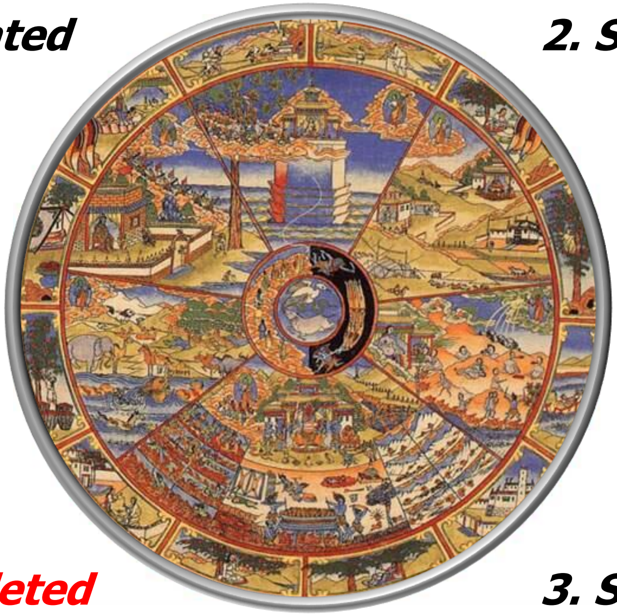
- A task is a unit of computation that (ideally) does not depend on the state, result, or side effects of other tasks
  - A task has four phases in its lifecycle

    1. *Created*
    2. *Submitted*
    3. *Started*
    4. ***Completed***
       - A task is finished (un)successfully or cancelled



End of Java Executor Service: Introduction