



ExecutorService runs tasks in Async or in Parallel ?

The `ExecutorService` runs tasks **asynchronously**. Whether they run in **parallel** depends on the configuration (thread pool size) and the hardware (CPU cores). ^[1] ^[2]

Here is the precise distinction:

1. **Asynchronous**: Yes, always.

- When you call `submit()` or `execute()`, the method returns immediately (or returns a `Future`). The calling thread continues its own work without waiting for the task to finish. The task runs in the "background." ^[3] ^[2]

2. **Parallel**: It depends.

- **Single Thread Pool** (`newSingleThreadExecutor`): Tasks run **asynchronously** (background) but **sequentially** (one after another). NO parallelism here.
- **Fixed/Cached Thread Pool** (`newFixedThreadPool(n)`): If $n > 1$ and you have multiple CPU cores, tasks run **asynchronously AND in parallel** (at the same time). ^[4] ^[1]

Interview Answer Summary:

"Technically, `ExecutorService` provides **asynchronous** execution by decoupling task submission from execution. However, true **parallelism** is achieved only if the underlying thread pool has **more than one thread** and the machine has **multiple CPU cores** to execute them simultaneously." ^[5] ^[6]

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