



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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- [4. https://www.youtube.com/watch?v=3CIO5NQVSPQ](https://www.youtube.com/watch?v=3CIO5NQVSPQ)
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