Overview of Thread Pools

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Learning Objectives in this Part of the Lesson

- Understand the purpose of the Java executor framework
- Recognize the features & benefits of thread pools
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- Understand the purpose of the Java executor framework
- Recognize the features & benefits of thread pools
- Note a human known use of thread pools
Overview of Thread Pools
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• Concurrent programs must often handle a large # of clients

e.g., consider a web server that must handle thousands of client requests simultaneously
Overview of Thread Pools

- However, spawning a thread per client doesn’t scale
Overview of Thread Pools

- However, spawning a thread per client doesn’t scale.
- It often incurs excessive processing overhead.

```java
void handleClientRequest(Request request) {
    new Thread(makeRequestRunnable(request)).start();
    ...
```
Overview of Thread Pools

- However, spawning a thread per client doesn’t scale
  - It often incurs excessive processing overhead
- An excessive amount of memory is also needed to store all the threads
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• However, spawning a thread per client doesn’t scale
  • It often incurs excessive processing overhead
  • An excessive amount of memory is also needed to store all the threads

• Even if it’s possible to spawn many threads, it usually means that “ya got trouble”..

See www.jstorimer.com/blogs/workingwithcode/7970125-how-many-threads-is-too-many
Overview of Thread Pools

- A thread pool is often a better way to scale performance

See en.wikipedia.org/wiki/Thread_pool_pattern
Overview of Thread Pools

- A thread pool is often a better way to scale performance
- Amortizes thread memory/processing overhead

See [cs.stackexchange.com/a/25899](cs.stackexchange.com/a/25899)
Overview of Thread Pools

• A thread pool is often a better way to scale performance
• Amortizes thread memory/processing overhead, e.g.
  
  ```java
  new Thread(makeRequestRunnable(request)).start();
  ```

  can often be replaced with a more efficient thread pool

  ```java
  Executor executor = makeExecutor(...);
  ...
  executor.execute(makeRequestRunnable(request));
  ```
Overview of Thread Pools

- A thread pool is often a better way to scale performance
- Amortizes thread memory/processing overhead
- Pool size determined by various factors
  - e.g., # of CPU cores, compute-bound vs. I/O-bound tasks, etc.

Overview of Thread Pools

- A thread pool is often a better way to scale performance
  - Amortizes thread memory/processing overhead
  - Pool size determined by various factors
- A thread pool is tightly bound to a work queue of tasks awaiting execution
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- A thread pool is often a better way to scale performance
  - Amortizes thread memory/processing overhead
  - Pool size determined by various factors
  - A thread pool is tightly bound to a work queue of tasks awaiting execution
- Worker threads are like “hungry puppies”
Human Known Uses of Thread Pools
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- A “call center” is a human known use of a thread pool

See [en.wikipedia.org/wiki/Call_centre](en.wikipedia.org/wiki/Call_centre)
End of Overview of Thread Pools