The Java Executor Framework: Overview of Thread Pools

Douglas C. Schmidt

d.schmidt@vanderbilt.edu

www.dre.vanderbilt.edu/~schmidt

Professor of Computer Science

Institute for Software Integrated Systems

Vanderbilt University

Nashville, Tennessee, USA

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

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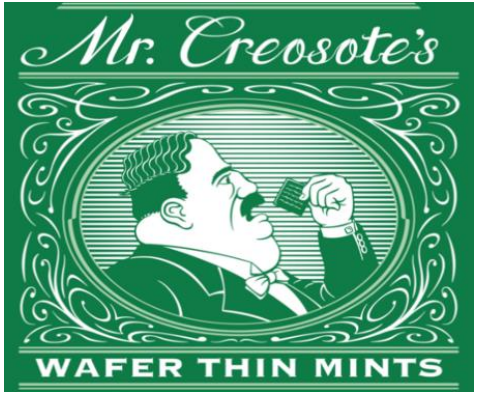
- However, spawning a thread per client doesn't scale
  - It often incurs excessive processing overhead

```
void handleClientRequest(Request request) {
  new Thread(makeRequestRunnable(request))
      .start();
  ...
```

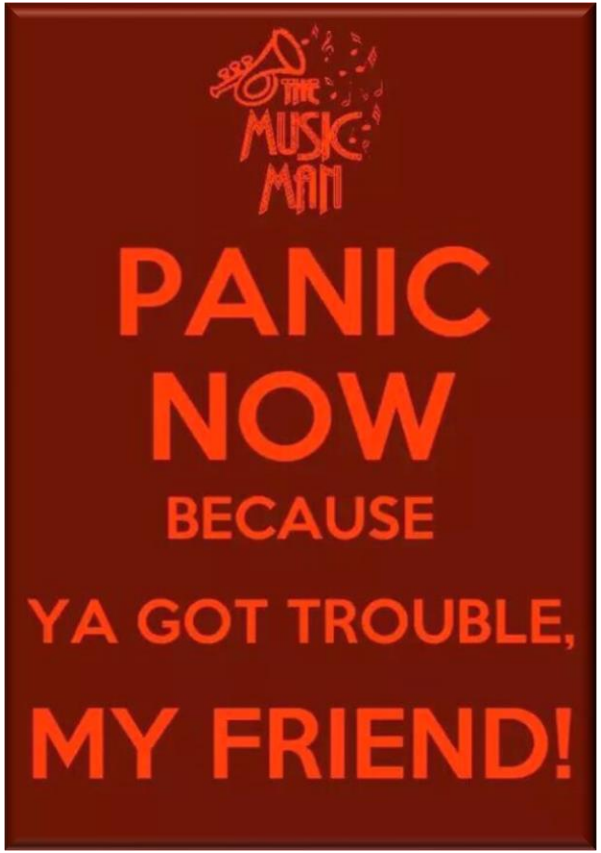
Overview of Thread Pools

- 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



Overview of Thread Pools

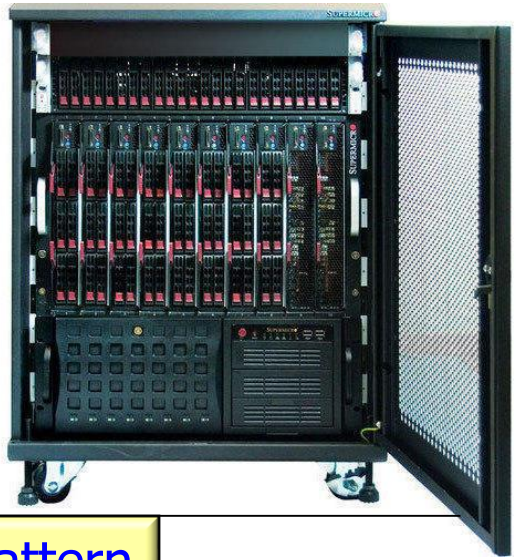
- However, spawning a thread per client doesn't scale
  - It often incurs excessive processing overhead
  - An excessive amount of memory is also needed to store all the threads
  - Even if it's possible to spawn many threads, it usually means that "ya got trouble"..



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

Overview of Thread Pools

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

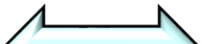
```
new Thread(makeRequestRunnable(request)).start();
```

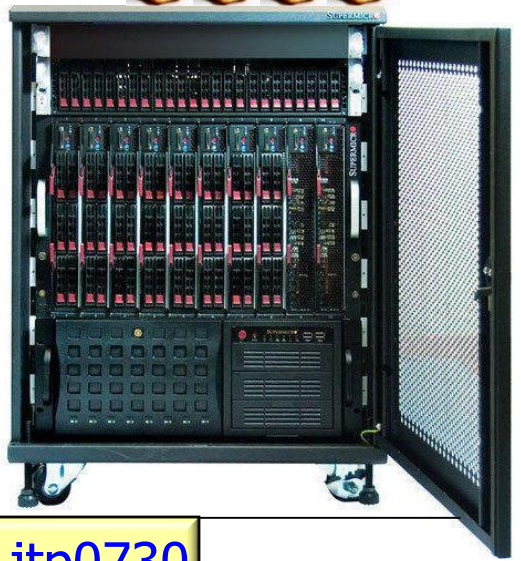
can often be replaced with a more efficient thread pool

```
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.





See www.ibm.com/developerworks/library/j-jtp0730

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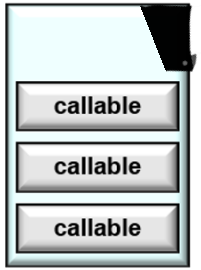
  - Pool size determined by various factors
  - A thread pool is tightly bound to a work queue of tasks awaiting execution



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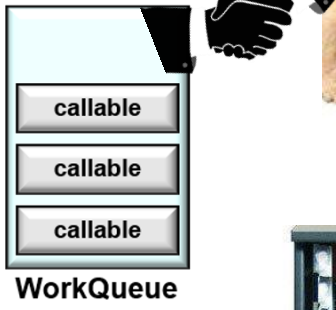
  - Amortizes thread memory/processing overhead
  - Pool size determined by various factors
  - A thread pool is tightly bound to a work queue of tasks awaiting execution
  - Worker threads are like "hungry puppies"



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

End of the Java Executor Framework: Overview of Thread Pools