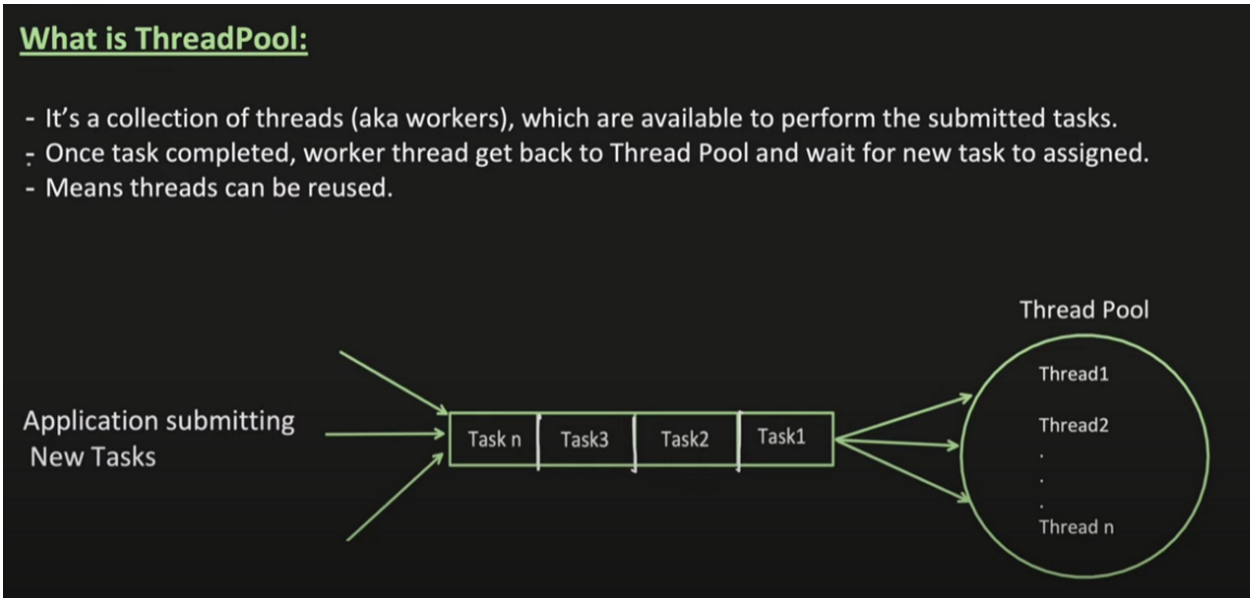
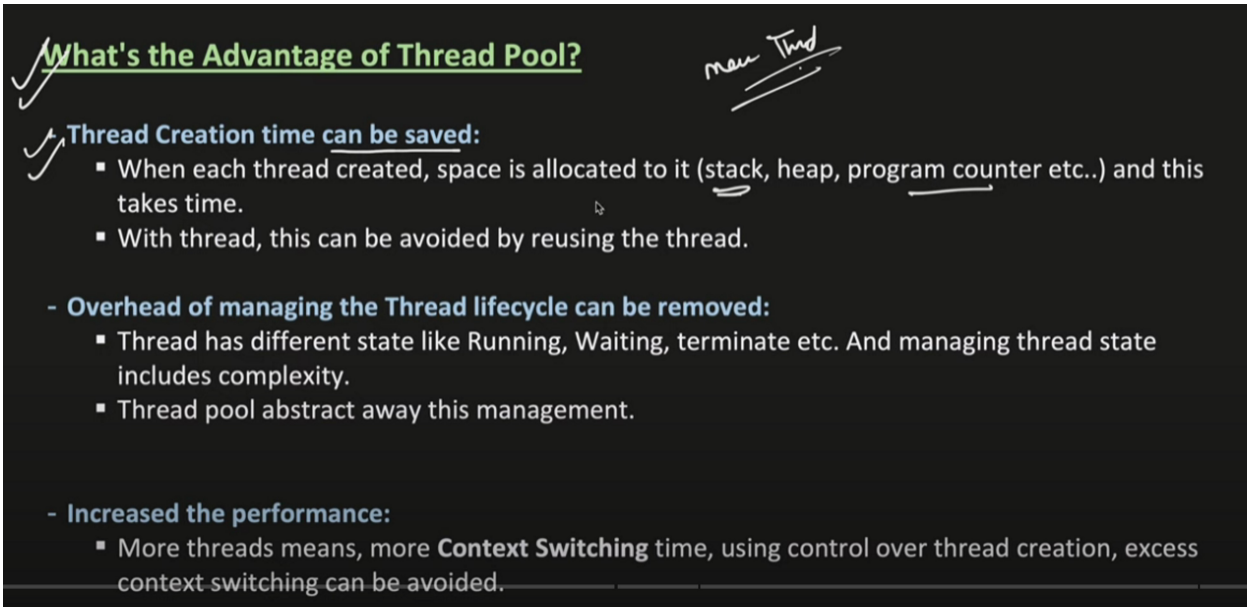
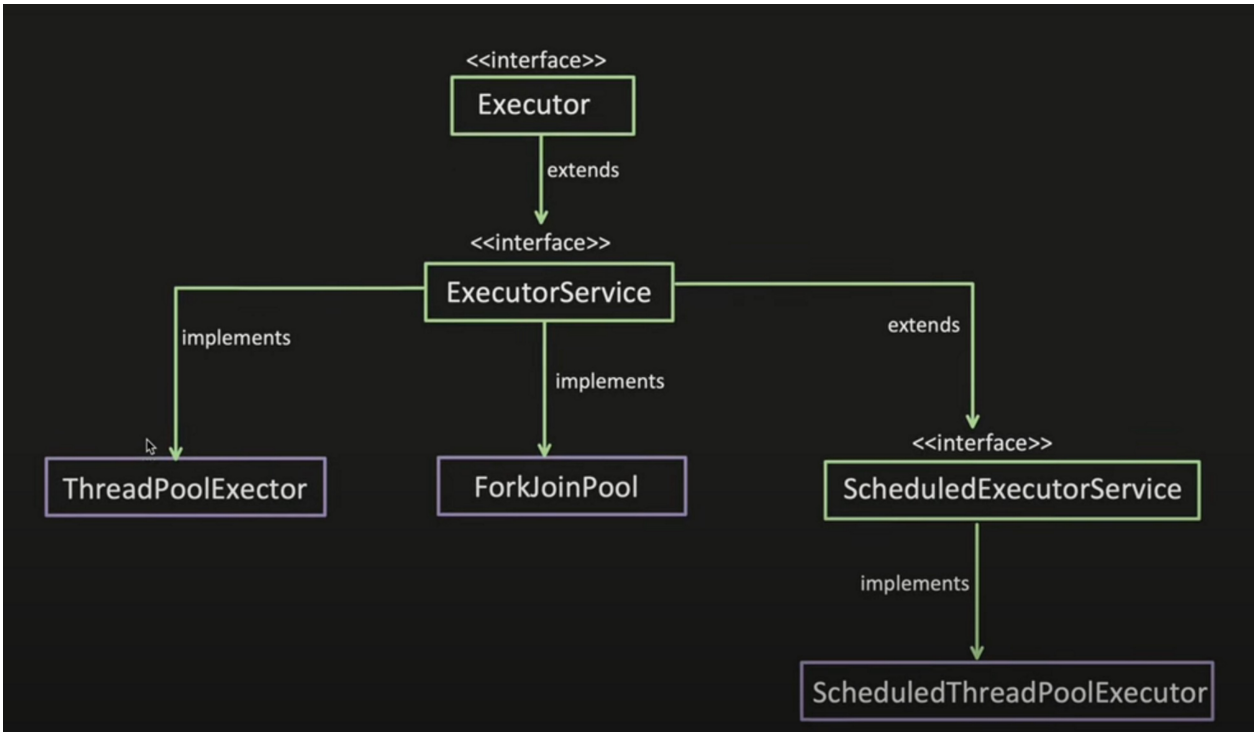
Lesson 6 : ThreadPool and ThreadPoolExecutor

Sunday, May 5, 2024 10:42 AM



Tasks are added to the queue and picked up by the threads as they get free.





ThreadPoolExecutor

It helps to create a customizable ThreadPool.

ThreadPool is the collection of threads that are ready to pick up tasks from queue (diag above). ThreadPoolExecutor accepts params like corePoolSize, maxPoolSize. So if all the threads in the thread pool are busy and even the queue is full then thread pool assigns one more thread upto maxPoolSize limit and assigns the new task to it. If both threadPool and Queue have reached max limit then unfortunately task will have to be rejected.

ThreadPoolExecutor Constructor

```
public ThreadPoolExecutor
                    ( int corePoolSize
                      int maximumPoolSize,
                      long keepAliveTime,
                      TimeUnit unit,
                      BlockingQueue<Runnable> workQueue,
                      ThreadFactory threadFactory,
                    RejectedExecutionHandler handler)
```

- ***corePoolSize***:
  Number of threads are initially created and keep in the pool, even if they are idle.

- **allowCoreThreadTimeOut**:
  If this property is set to TRUE (by default its FLASE), idle thread kept Alive till time specifie
  by 'KeepAliveTime'.

As carPoolSize has threads even if they are idle, so if we want to terminate those threads to save memory, we can set allowCoreThreadTimeOut as true, by default it is false. keepAliveTime is set that terminates the thread if it is idle for that time.

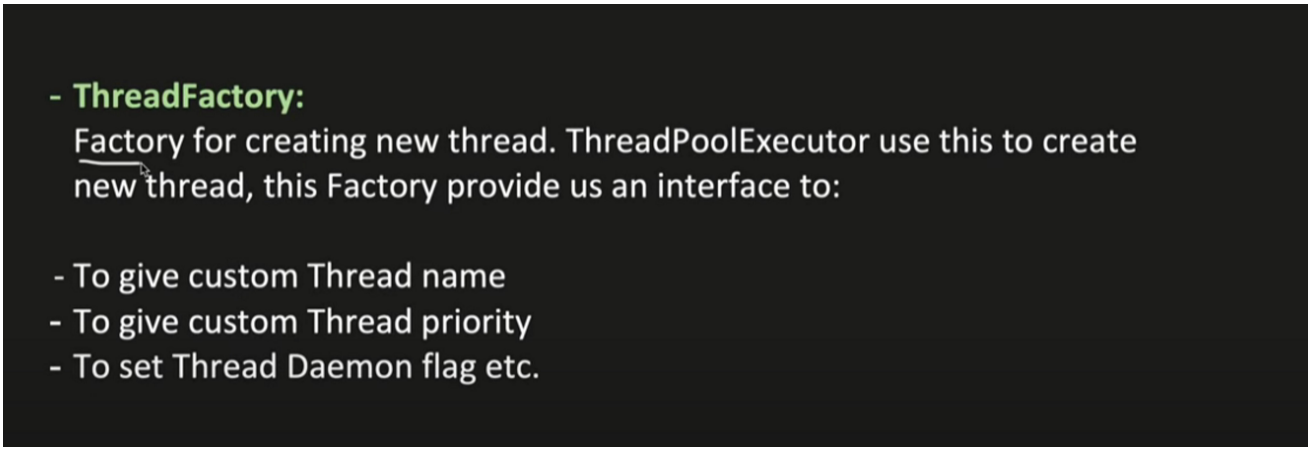
- **maxPoolSize**:
  Maximum number of thread allowed in a pool.
  If no. of thread are == corePoolSize and queue is also full, then new threads are created (till its less than 'maxPoolSize').

Excess thread, will remain in pool, this pool is not shutdown or if *allowCoreThreadTimeOu* set to true, then excess thread get terminated after remain idle for *KeepAliveTime*.

- **TimeUnit:**
  TimeUnit for the keepAliveTime, whether ***Millisecond*** or ***Second*** or ***Hours*** etc.

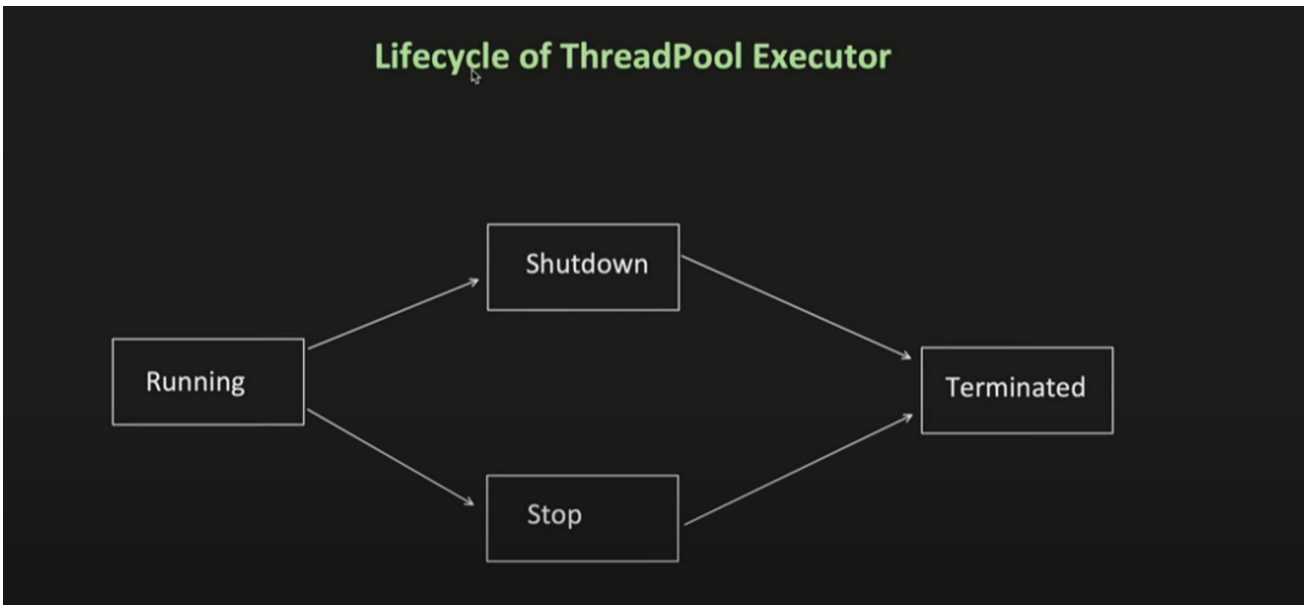
- **BlockingQueue:**
  Queue used to hold task, before they got picked by the worker thread.

  - **Bounded Queue:** Queue with FIXED capacity.
    - Like: *ArrayBlockingQueue*
  - **Unbounded Queue:** Queue with NO FIXED capacity.
    - Like: *LinkedBlockingQueue*



Whenever all the threads in threadPool are busy and even the queue is full, the upcoming tasks will fail. RejectedExecutionHandler is the handler for tasks that can not be accepted by thread pool. Generally logging logic can be put here for debugging purpose.

Lifecycle of a ThreadPoolExecutor



Running:

Executor is in running state and submit() method will be used to add new task.

Shutdown:

- Executor do not accept new tasks, but continue to process existing tasks, once existing tasks finished, executor moves to terminate state.
- Method used shutdown()

Stop (force shutdown):

- Executor do not accept new tasks.
- Executor forcefully stops all the tasks which are currently executing.
- And once fully shutdown, moves to terminate state.
- Method used shutdownNow()

Terminated:

- End of life for particular ThreadPoolExecutor.
- isTerminated() method can be used to check if particular thread pool executor is terminated or not.

Stop (force shutdown):

- Executor do not accept new tasks.
- Executor forcefully stops all the tasks which are currently executing.
- And once fully shutdown, moves to terminate state.
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Formula to find the no. of thread:

Max No of thread = No. of CUP Core * (1 + Request waiting time/processing time)

But this formula, do not consider Memory yet, which need to be consider...

JVM : 2 GB
(Heap space : 1GB
Code Cache space: 128MB
per Thread space: 5MB * N no. of threads (includes Thread Stack space)
JVM Overhead: 256MB
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