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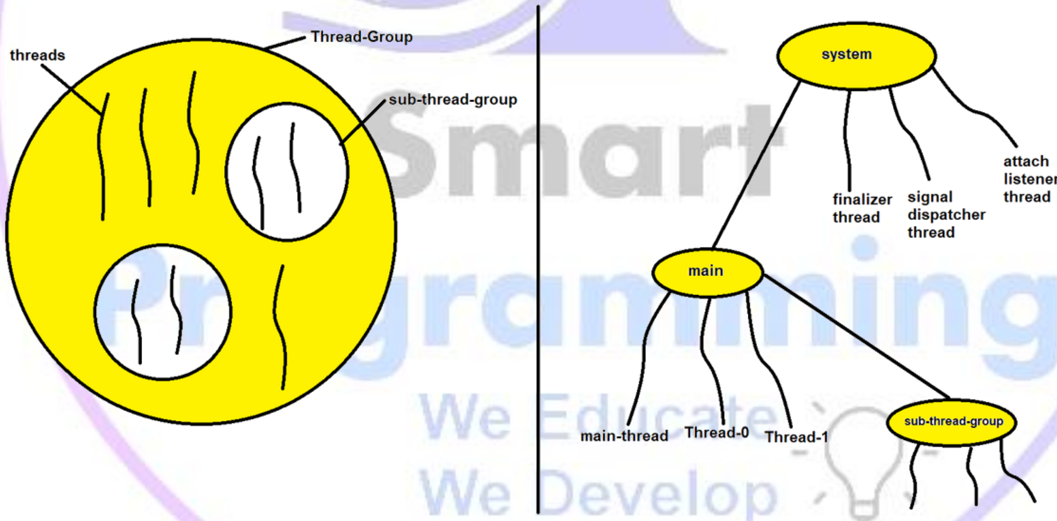
ThreadGroup class & Thread-Pool Framework

=> ThreadGroup :-

- ➔ It is the group of several threads into a single unit or object
- ➔ A thread-group can contain multiple thread-group
- ➔ The thread-group creates a tree in which every thread-group will a single parent thread-group



- ➔ Every thread-group belongs to some thread-group except system thread-group
- ➔ "system" thread-group is the root group of all the thread-groups in java

➔ Main thread belongs to the "main" thread-group

➔ The main advantage of thread-group is we can perform several common operations very easily in order to improve our application performance

➔ For example : creating groups in messenger or mails and sending message

➔ ThreadGroup is the class which is present in java.lang package

➔ Constructors of ThreadGroup :-

1. public ThreadGroup(String name);
2. public ThreadGroup(ThreadGroup groupname, String name)

➔ Methods of ThreadGroup :-

1. activeCount()
2. activeGroupCount()
3. getMaxPriority()
4. getName()
5. getParent()

6. setMaxPriority()
7. list()
8. isDaemon()
9. setDaemon()
10. interrupt()
11. suspend()
12. destroy()

➔ A current running thread can only get the information about current thread-group but not the parent/child thread-group

---

=> ThreadPool :-

➔ ThreadPool represents a group of worker threads that are waiting for the job and can be reused many times

- ➔ "ThreadPool framework" is also known as "Executor framework"
- ➔ ThreadPool was introduced in JDK 1.5 version

- ➔ Advantage : It saves a lot of time in creating threads and providing jobs to them which leads to the better performance of our application

- ➔ ThreadPool is already implemented in Servlet & JSP containers which each request is processed by thread which comes from thread-pool

- ➔ ThreadPool framework contains following classes and interfaces :-

1. Executors (class) (important)
2. ExecutorService (interface) (important)
3. Executor (interface)
4. ExecutorCompletionService (class)

=> Executors class :-

- ➔ Executors class provides factory and utility methods for ExecutorService, Executor, ThreadFactory, ScheduledExecutor Service & Callable.
- ➔ Methods of Executors class :

1. Executors.newFixedThreadPool(int no_of_threads)
2. Executors.newSingleThreadExecutor()
3. Executors.newCachedThreadPool()
4. Executors.newScheduledThreadPool()
5. Executors.newSingleThreadScheduledExecutor()

=> ExecutorService interface :-

- ➔ ExecutorService interface allows us to execute the thread task asynchronously.
- ➔ ExecutorService helps in maintaining a pool of threads and assign them tasks. It also provides the facility to queue up the tasks until there is any free thread available.

➔ ExecutorService defines the methods that executes the threads and returns some results.

➔ Methods of ExecutorService interface :-

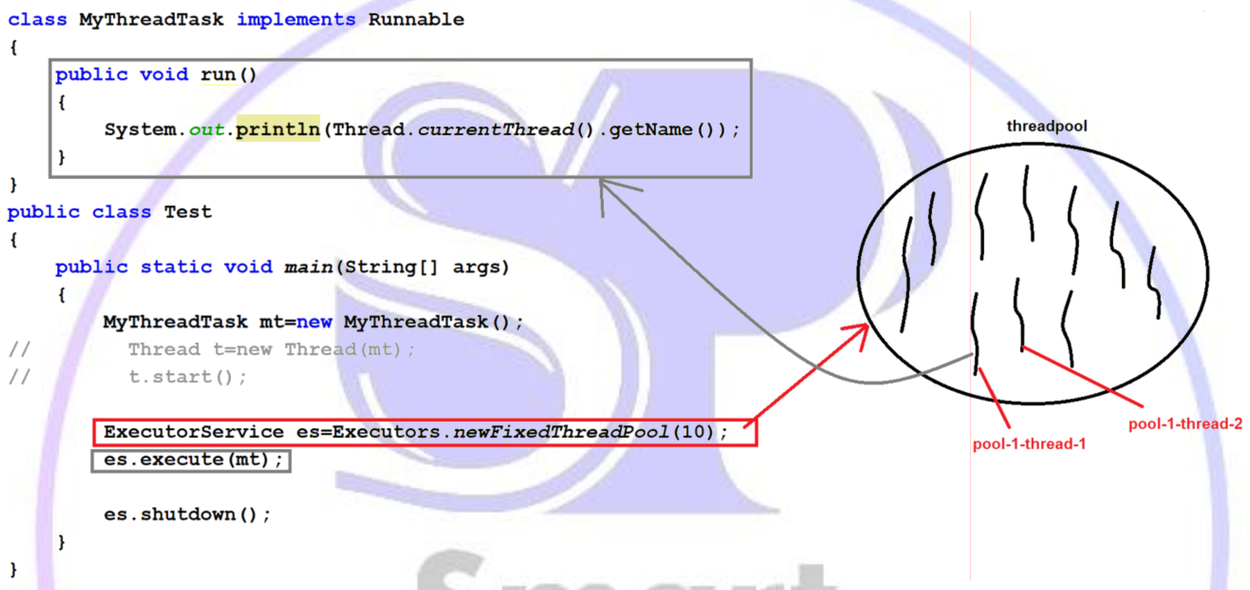
- Below methods will assign the task to ExecutorService :-

1. execute(Runnable r)
2. submit(Runnable/Callable r)
3. invokeAny(Collection c)
4. invokeAll(Collection c)

➔ Below method is used for shutdown the ExecutorService :-

5. shutdown()
6. shutdownNow()

=> Program :-



```
class MyThreadTask implements Runnable
{
    public void run()
    {
        System.out.println(Thread.currentThread().getName());
    }
}
public class Test
{
    public static void main(String[] args)
    {
        MyThreadTask mt=new MyThreadTask();
//        Thread t=new Thread(mt);
//        t.start();

        ExecutorService es=Executors.newFixedThreadPool(10);
        es.execute(mt);

        es.shutdown();
    }
}
```

=> ThreadPool have some risks which are as follows :-

1. Deadlock
2. Thread interference
3. Thread leakage : This risk can occur if any thread removed from the thread-pool but that thread didnt returned in the thread-pool
4. Resource thrashing : This risk can occur when there are lot of thread in the thread-pool, then time will be wasted in context-switching between the threads.

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