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In this assignment we were assigned the task of creating a multi-threaded assignment that would use a shared variable amongst each thread. This shared variable stored a random integer. The final output of the program is a combination of the threads ID and the value that the current thread is seeing. Since this program does not contain any thread locks, the threads complete in an concurrent fashion.

The CPU can move execution resources across threads in a multi-threaded process running on a single processor, resulting in concurrent execution. Each thread in the same multi-threaded operation can execute on a distinct processor at the same time in a shared-memory multiprocessor environment, resulting in parallel processing. when a process has fewer or more threads than processors, the threads support system works with the operating environment to guarantee that each thread operates on a separate processor.

Make:

```
oslab@ubuntu:~/kernelbuild/Proj3/Pthreads-proj3/part1/step1$ make
gcc -o multithread pthread1.c -lpthread
oslab@ubuntu:~/kernelbuild/Proj3/Pthreads-proj3/part1/step1$ _
```

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OUTPUT:

```
*** thread 0 sees value 0
*** thread 3 sees value 0
*** thread 3 sees value 1
*** thread 3 sees value 2
*** thread 1 sees value 0
*** thread 1 sees value 1
*** thread 3 sees value 2
*** thread 3 sees value 3
*** thread 0 sees value 1
*** thread 0 sees value 2
*** thread 2 sees value 0
*** thread 1 sees value 3
*** thread 3 sees value 2
*** thread 0 sees value 3
*** thread 1 sees value 4
*** thread 1 sees value 5
*** thread 2 sees value 4
*** thread 2 sees value 5
*** thread 2 sees value 6
*** thread 2 sees value 7
*** thread 3 sees value 4
*** thread 3 sees value 5
*** thread 3 sees value 6
*** thread 3 sees value 7
*** thread 3 sees value 8
```

```
*** thread 3 sees value 2
*** thread 0 sees value 3
*** thread 1 sees value 4
*** thread 1 sees value 5
*** thread 2 sees value 4
*** thread 2 sees value 5
*** thread 2 sees value 6
*** thread 2 sees value 7
*** thread 3 sees value 4
*** thread 3 sees value 5
*** thread 3 sees value 6
*** thread 3 sees value 7
*** thread 3 sees value 8
*** thread 1 sees value 7
*** thread 1 sees value 8
*** thread 0 sees value 4
*** thread 1 sees value 5
*** thread 3 sees value 9
*** thread 3 sees value 10
*** thread 1 sees value 6
*** thread 0 sees value 6
*** thread 0 sees value 7
*** thread 1 sees value 8
*** thread 1 sees value 9
*** thread 1 sees value 10
```

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```
*** thread 3 sees value 8
*** thread 1 sees value 7
*** thread 1 sees value 8
*** thread 0 sees value 4
*** thread 1 sees value 5
*** thread 3 sees value 9
*** thread 3 sees value 10
*** thread 1 sees value 6
*** thread 0 sees value 6
*** thread 0 sees value 7
*** thread 1 sees value 8
*** thread 1 sees value 9
*** thread 1 sees value 10
*** thread 0 sees value 11
*** thread 1 sees value 12
*** thread 1 sees value 13
*** thread 3 sees value 11
*** thread 3 sees value 12
*** thread 3 sees value 13
*** thread 1 sees value 14
*** thread 1 sees value 15
*** thread 1 sees value 16
*** thread 1 sees value 17
*** thread 0 sees value 14
*** thread 0 sees value 15
```

```
*** thread 1 sees value 10
*** thread 0 sees value 11
*** thread 1 sees value 12
*** thread 1 sees value 13
*** thread 3 sees value 11
*** thread 3 sees value 12
*** thread 3 sees value 13
*** thread 1 sees value 14
*** thread 1 sees value 15
*** thread 1 sees value 16
*** thread 1 sees value 17
*** thread 0 sees value 14
*** thread 0 sees value 15
*** thread 0 sees value 16
*** thread 1 sees value 18
*** thread 1 sees value 19
Thread 1 see final value 20
*** thread 0 sees value 17
*** thread 0 sees value 18
*** thread 3 sees value 18
*** thread 0 sees value 19
*** thread 0 sees value 20
*** thread 0 sees value 21
*** thread 0 sees value 22
*** thread 3 sees value 19
```

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```
*** thread 0 sees value 15
*** thread 0 sees value 16
*** thread 1 sees value 18
*** thread 1 sees value 19
Thread 1 see final value 20
*** thread 0 sees value 17
*** thread 0 sees value 18
*** thread 3 sees value 18
*** thread 0 sees value 19
*** thread 0 sees value 20
*** thread 0 sees value 21
*** thread 0 sees value 22
*** thread 3 sees value 19
*** thread 3 sees value 20
*** thread 0 sees value 23
*** thread 0 sees value 24
*** thread 3 sees value 21
Thread 3 see final value 22
*** thread 0 sees value 25
Thread 0 see final value 26
*** thread 2 sees value 8
*** thread 2 sees value 9
*** thread 2 sees value 10
*** thread 2 sees value 11
*** thread 2 sees value 12
```

```
*** thread 3 sees value 19
*** thread 3 sees value 20
*** thread 0 sees value 23
*** thread 0 sees value 24
*** thread 3 sees value 21
Thread 3 see final value 22
*** thread 0 sees value 25
Thread 0 see final value 26
*** thread 2 sees value 8
*** thread 2 sees value 9
*** thread 2 sees value 10
*** thread 2 sees value 11
*** thread 2 sees value 12
*** thread 2 sees value 13
*** thread 2 sees value 14
*** thread 2 sees value 15
*** thread 2 sees value 16
*** thread 2 sees value 17
*** thread 2 sees value 18
*** thread 2 sees value 19
*** thread 2 sees value 20
*** thread 2 sees value 21
*** thread 2 sees value 22
Thread 2 see final value 23
oslab@ubuntu:~/kernelbuild/Proj3/Pthreads-proj3/part1/step1$
```