Scheduler Assignment

Design:

The scheduler we chose to implement is the FIFO scheduler. It works by always running the first thread to arrive to completion before starting the next thread. Its overall running time should be roughly the same as round robin, as well as the other scheduling algorithms. However, its average turnaround time (the time between a thread's arrival and completion) will be much higher than the others if the earliest threads to arrive take longer. The average response time (the time between a thread's arrival and first run) is also higher for FIFO than for round robin, since round robin ensures that each thread begins as early as possible, while in FIFO, threads must run sequentially.

If response time needs to be reduced, round robin should be used; for turnaround time, SJF or STCF will work best. However, since running time is all we are measuring, FIFO will be sufficient. In practice, FIFO is actually slightly faster than round robin due to the reduced cost of context switching.
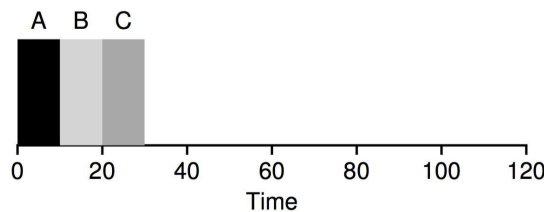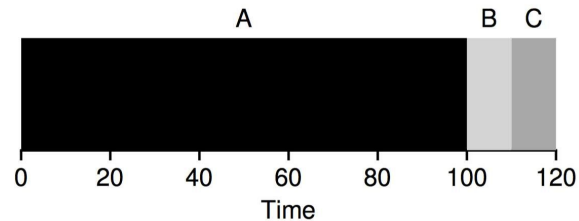

Figure 7.1: **FIFO Simple Example**
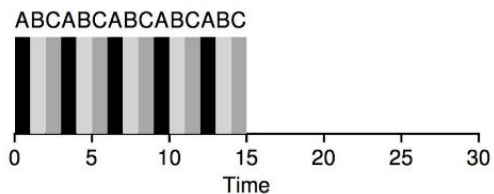

Figure 7.2: **Why FIFO Is Not That Great**

Figure 7.7: **Round Robin (Good for Response Time)**

(note: the workloads for the above diagrams are all different, so they do not reflect the differences in running time over a single workload)

Implementation:

The FIFO implementation is a simple adjustment to the already existing round robin scheduler. The default scheduler rotates the threads in the order that they arrived, so implementing FIFO scheduling only requires removing the code that rotates the threads. This code is found in clock.c, where a thread is scheduled every set number of hardclocks. The lines

are removed so that each thread arrives and runs to completion without any interruption. No additional code or data structures are needed for this implementation.

Benchmark:

Schedpong - round robin

```
OS/161 kernel [? for menu]: p testbin/schedpong
Running with 2 thinkers, 0 grinders, and 1 pong groups of size 6 each.
Forking done; starting the workload.
................................................................
................................................................
................................................................
--- Timings ---
Thinkers: 49.463069960
Pong group 0: 58.303165560
Program (pid 2) exited with status 0
Operation took 59.059436771 seconds
```

Schedpong - FIFO

```
OS/161 kernel [? for menu]: p testbin/schedpong
Running with 2 thinkers, 0 grinders, and 1 pong groups of size 6 each.
Forking done; starting the workload.
................................................................
................................................................
................................................................
--- Timings ---
Thinkers: 47.665685560
Pong group 0: 57.598533640
Program (pid 3) exited with status 0
Operation took 58.319541574 seconds
```

Hog - round robin

```
OS/161 kernel [? for menu]: p testbin/hog
Program (pid 2) exited with status 0
Operation took 8.550960599 seconds
```

Hog - FIFO

```
OS/161 kernel [? for menu]: p testbin/hog
Program (pid 2) exited with status 0
Operation took 8.540900906 seconds
```

Farm - round robin

```
OS/161 kernel [? for menu]: p testbin/farm
cat: catfile: No such file or directory
testbin/farm: pid 7: exit 1
Program (pid 3) exited with status 0
Operation took 25.952242854 seconds
```

Farm - FIFO

```
OS/161 kernel [? for menu]: p testbin/farm
cat: catfile: No such file or directory
testbin/farm: pid 7: exit 1
Program (pid 3) exited with status 0
Operation took 25.809345807 seconds
```