Modified xv6 README

[Kunwar Shaanjeet Singh - 2019101059]

Modification of xv6

Features added

- waitx syscall
- ps user process
- FCFS scheduler
- Priority based scheduler
- MLFQ scheduler

Changes made

- Added more members to the proc structure for implementation of other features, time of creation, runtime of each process.
- Adding system call waitx which returns the runtime and the wait time of the child process.
- Creation time is initialized to ticks when the process is started.

Waitx

- Waitx works like the standard wait syscall, but also returns additional info based on runtime.
- Using waitx, time command was implemented as a user process which takes argument as a program to run and returns its waiting time and runtime.

ps

- Modified procdump to run ps when ^P is pressed. also ps table can be displayed using ps command.

- The suitable values are just accessed from the ptable and printed sequentially.

Scheduler

For each scheduler there is a separate call which has the scheduler function and the trap funciton.

FCFS

- Create time is initialized in allocproc, based on which our scheduler determines what process to run.
- Everytime there is a context switch, we pass through the whole table and find the (runnable)process which has the least creation time and runs it.
- Yielding is disabled for the timer interrupt in trap function.

PBS

- Priority of each process is initialized to 60 when the process is created based on which the scheduler runs.
- The scheduler runs over the whole list and then finds the process with minimum priority and stores it.
- Then does a round robin over all the processes which have the priority found before.
- But since the priority can change while the round robin is happening, we also find the minimum priority after every context switch.

MLFQ

- Each process is put into the 0th queue, and then based on the fraction of the time slot it uses, we choose to move it to the queue below it, and for each process we perform ageing where if the process has waited for too long we push it to the queue above.
- Finds the highest queue with a process in it and runs round robin on all the process presents in the queue. Also, this round robin is based on the insertion time into the queue.

- Each queue has a different size of time slice and different time of ageing. they are exponentially dependent on the queue level.

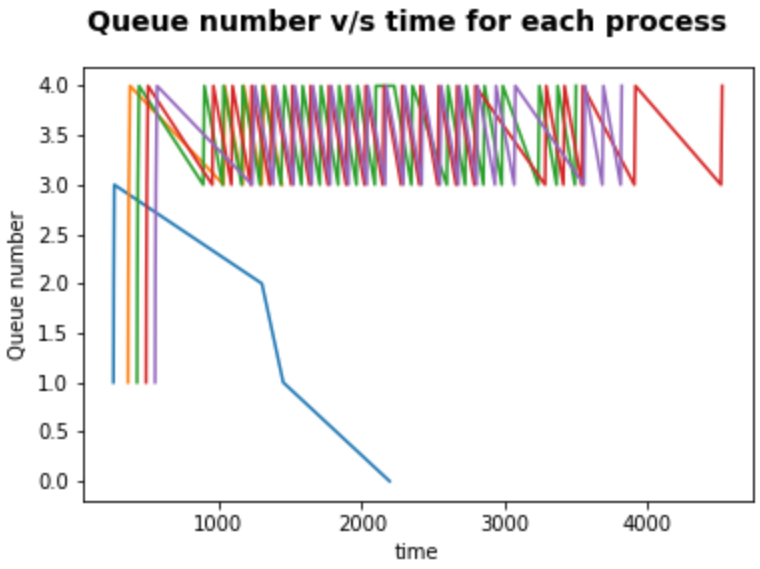
Testing

Running a benchmark process that uses cput time as well as does blocking sys calls:

- **MLFQ** - 1300
- **FCFS** - 1149
- **PBS** - 1174
- **RR** - 1265

The difference is expected as FCFS does not spend much time checking for process to run while MLFQ spends a lot of time doing that.

Bonus



Different Colors represent different processes. All processes were mainly CPU bound processes.