mpich-sorter

In this program we use three machines for sorting an array. First the master node splits the array into 2 parts and sends each to a machine. Each machine starts its job and sorts that subset of the initial array. Finally it returns the result and the master node merges them.

I have used **insertion sort** for simplicity.

The result looks like this:

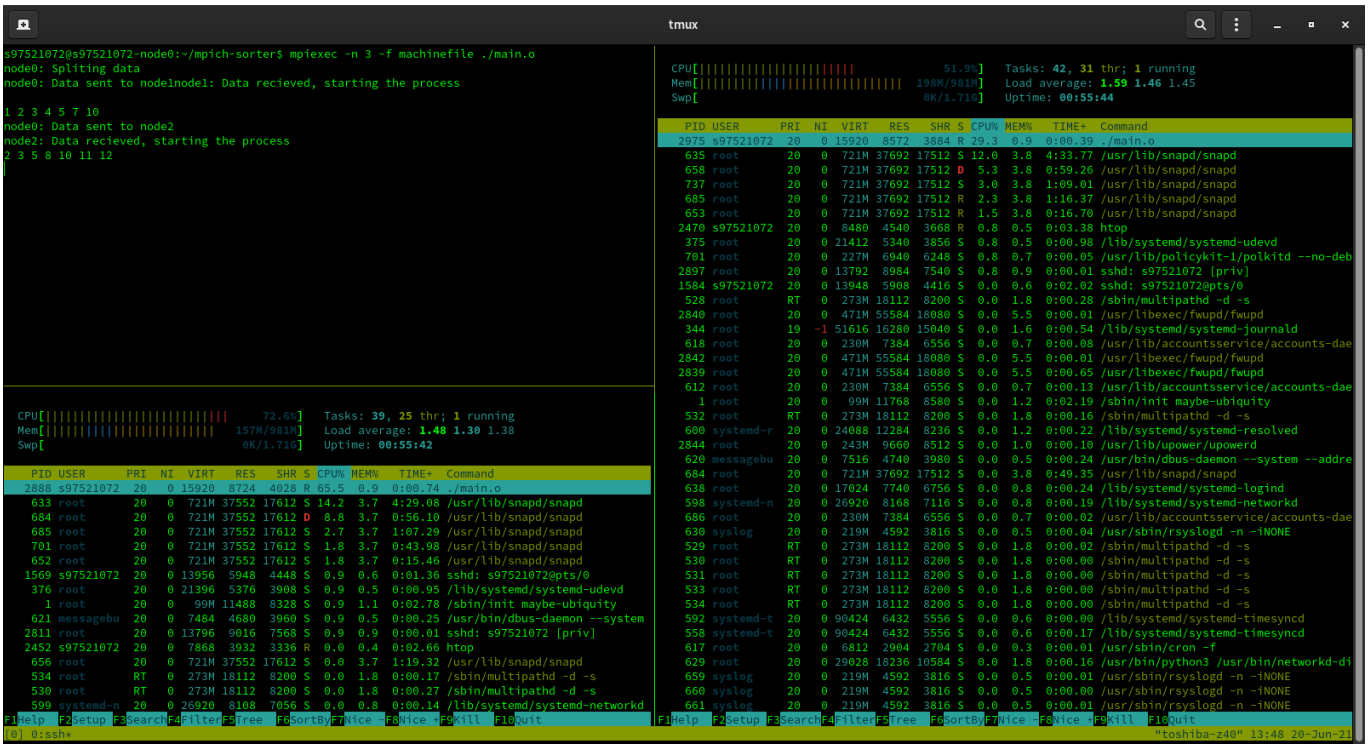
```
s97521072@s97521072-node0:~/mpich-sorter$ cat machinefile
s97521072-node0
s97521072-node1
s97521072-node2
s97521072@s97521072-node0:~/mpich-sorter$ mpiexec -n 3 -f machinefile ./main.o
node0: Spliting data
node0: Data sent to node1
node1: Data recieved, starting the process
1 2 3 4 5 7 10
node0: Data sent to node2
node2: Data recieved, starting the process
2 3 5 8 10 11 12
node1: Data returned to master!node0: Data recieved from node1

node2: Data returned to master!node0: Data recieved from node2

node0: Final result: 1 2 2 3 3 4 5 5 7 8 10 10 11 12
s97521072@s97521072-node0:~/mpich-sorter$
```

Check other systems too!!

In order to make sure that this program is running on all of the machines I added a long **for** statemenet to check the process on the other machines.

```
for (long i=0; i < 10000000000; i++);
```

The above code placed inside node section and using **htop** the process is visible.
As you can see, three different nodes are shown in the picture and the first process in **node1** and **node2** is the **./main.o** file.


tmux
s97521072@s97521072-node0:~/mpich-sorter$ mpiexec -n 3 -f machinefile ./main.o
node0: Spliting data
node0: Data sent to node1node1: Data recieved, starting the process
1 2 3 4 5 7 10
node0: Data sent to node2
node2: Data recieved, starting the process
2 3 5 8 10 11 12
CPU[72.6%] Tasks: 39, 25 thr; 1 running
Mem[157M/981M] Load average: 1.48 1.30 1.38
Swp[0K/1.71G] Uptime: 00:55:42
PID USER PRI NI VIRT RES SHR S CPU% MEM% TIME+ Command
2888 s97521072 20 0 15920 8724 4028 R 65.5 0.9 0:00.74 ./main.o
633 root 20 0 721M 37552 17612 S 14.2 3.7 4:29.08 /usr/lib/snapd/snapd
684 root 20 0 721M 37552 17612 D 8.8 3.7 0:56.10 /usr/lib/snapd/snapd
685 root 20 0 721M 37552 17612 S 2.7 3.7 1:07.29 /usr/lib/snapd/snapd
701 root 20 0 721M 37552 17612 S 1.8 3.7 0:43.98 /usr/lib/snapd/snapd
652 root 20 0 721M 37552 17612 S 1.8 3.7 0:15.46 /usr/lib/snapd/snapd
1569 s97521072 20 0 13956 5948 4448 S 0.9 0.6 0:01.36 sshd: s97521072@pts/0
376 root 20 0 21396 5376 3908 S 0.9 0.5 0:00.95 /lib/systemd/systemd-udevd
1 root 20 0 99M 11488 8328 S 0.9 1.1 0:02.78 /sbin/init maybe-ubiquity
621 messagebu 20 0 7484 4680 3960 S 0.9 0.5 0:00.25 /usr/bin/dbus-daemon --system
2811 root 20 0 13796 9016 7568 S 0.9 0.9 0:00.01 sshd: s97521072 [priv]
2452 s97521072 20 0 7868 3932 3336 R 0.0 0.4 0:02.66 htop
656 root 20 0 721M 37552 17612 S 0.0 3.7 1:19.32 /usr/lib/snapd/snapd
534 root RT 0 273M 18112 8200 S 0.0 1.8 0:00.17 /sbin/multipathd -d -s
530 root RT 0 273M 18112 8200 S 0.0 1.8 0:00.27 /sbin/multipathd -d -s
599 systemd-n 20 0 26920 8108 7056 S 0.0 0.8 0:00.14 /lib/systemd/systemd-networkd
F1Help F2Setup F3Search F4Filter F5Tree F6SortBy F7Nice -F8Nice +F9Kill F10Quit
[0] 0:ssh*
CPU[51.9%] Tasks: 42, 31 thr; 1 running
Mem[198M/981M] Load average: 1.59 1.46 1.45
Swp[0K/1.71G] Uptime: 00:55:44
PID USER PRI NI VIRT RES SHR S CPU% MEM% TIME+ Command
2975 s97521072 20 0 15920 8572 3884 R 29.3 0.9 0:00.39 ./main.o
635 root 20 0 721M 37692 17512 S 12.0 3.8 4:33.77 /usr/lib/snapd/snapd
658 root 20 0 721M 37692 17512 D 5.3 3.8 0:59.26 /usr/lib/snapd/snapd
737 root 20 0 721M 37692 17512 S 3.0 3.8 1:09.01 /usr/lib/snapd/snapd
685 root 20 0 721M 37692 17512 R 2.3 3.8 1:16.37 /usr/lib/snapd/snapd
653 root 20 0 721M 37692 17512 R 1.5 3.8 0:16.70 /usr/lib/snapd/snapd
2470 s97521072 20 0 8480 4540 3668 R 0.8 0.5 0:03.38 htop
375 root 20 0 21412 5340 3856 S 0.8 0.5 0:00.98 /lib/systemd/systemd-udevd
701 root 20 0 227M 6940 6248 S 0.8 0.7 0:00.05 /usr/lib/policykit-1/polkitd --no-deb
2897 root 20 0 13792 8984 7540 S 0.8 0.9 0:00.01 sshd: s97521072 [priv]
1584 s97521072 20 0 13948 5908 4416 S 0.0 0.6 0:02.02 sshd: s97521072@pts/0
528 root RT 0 273M 18112 8200 S 0.0 1.8 0:00.28 /sbin/multipathd -d -s
2840 root 20 0 471M 55584 18080 S 0.0 5.5 0:00.01 /usr/libexec/fwupd/fwupd
344 root 19 -1 51616 16280 15040 S 0.0 1.6 0:00.54 /lib/systemd/systemd-journald
618 root 20 0 230M 7384 6556 S 0.0 0.7 0:00.08 /usr/lib/accountsservice/accounts-dae
2842 root 20 0 471M 55584 18080 S 0.0 5.5 0:00.01 /usr/libexec/fwupd/fwupd
2839 root 20 0 471M 55584 18080 S 0.0 5.5 0:00.65 /usr/libexec/fwupd/fwupd
612 root 20 0 230M 7384 6556 S 0.0 0.7 0:00.13 /usr/lib/accountsservice/accounts-dae
1 root 20 0 99M 11768 8580 S 0.0 1.2 0:02.19 /sbin/init maybe-ubiquity
532 root RT 0 273M 18112 8200 S 0.0 1.8 0:00.16 /sbin/multipathd -d -s
600 systemd-r 20 0 24088 12284 8236 S 0.0 1.2 0:00.22 /lib/systemd/systemd-resolved
2844 root 20 0 243M 9660 8512 S 0.0 1.0 0:00.10 /usr/lib/upower/upowerd
620 messagebu 20 0 7516 4740 3980 S 0.0 0.5 0:00.24 /usr/bin/dbus-daemon --system --addre
684 root 20 0 721M 37692 17512 S 0.0 3.8 0:49.35 /usr/lib/snapd/snapd
638 root 20 0 17024 7740 6756 S 0.0 0.8 0:00.24 /lib/systemd/systemd-logind
598 systemd-n 20 0 26920 8168 7116 S 0.0 0.8 0:00.19 /lib/systemd/systemd-networkd
686 root 20 0 230M 7384 6556 S 0.0 0.7 0:00.02 /usr/lib/accountsservice/accounts-dae
630 syslog 20 0 219M 4592 3816 S 0.0 0.5 0:00.04 /usr/sbin/rsyslogd -n -iNONE
529 root RT 0 273M 18112 8200 S 0.0 1.8 0:00.02 /sbin/multipathd -d -s
530 root RT 0 273M 18112 8200 S 0.0 1.8 0:00.00 /sbin/multipathd -d -s
531 root RT 0 273M 18112 8200 S 0.0 1.8 0:00.00 /sbin/multipathd -d -s
533 root RT 0 273M 18112 8200 S 0.0 1.8 0:00.00 /sbin/multipathd -d -s
534 root RT 0 273M 18112 8200 S 0.0 1.8 0:00.00 /sbin/multipathd -d -s
592 systemd-t 20 0 90424 6432 5556 S 0.0 0.6 0:00.00 /lib/systemd/systemd-timesyncd
558 systemd-t 20 0 90424 6432 5556 S 0.0 0.6 0:00.17 /lib/systemd/systemd-timesyncd
617 root 20 0 6812 2904 2704 S 0.0 0.3 0:00.01 /usr/sbin/cron -f
629 root 20 0 29028 18236 10584 S 0.0 1.8 0:00.16 /usr/bin/python3 /usr/bin/networkd-di
659 syslog 20 0 219M 4592 3816 S 0.0 0.5 0:00.01 /usr/sbin/rsyslogd -n -iNONE
660 syslog 20 0 219M 4592 3816 S 0.0 0.5 0:00.00 /usr/sbin/rsyslogd -n -iNONE
661 syslog 20 0 219M 4592 3816 S 0.0 0.5 0:00.01 /usr/sbin/rsyslogd -n -iNONE
F1Help F2Setup F3Search F4Filter F5Tree F6SortBy F7Nice -F8Nice +F9Kill F10Quit
"toshiba-z40" 13:48 20-Jun-21