

# Analyze Jetson processor and memory usage

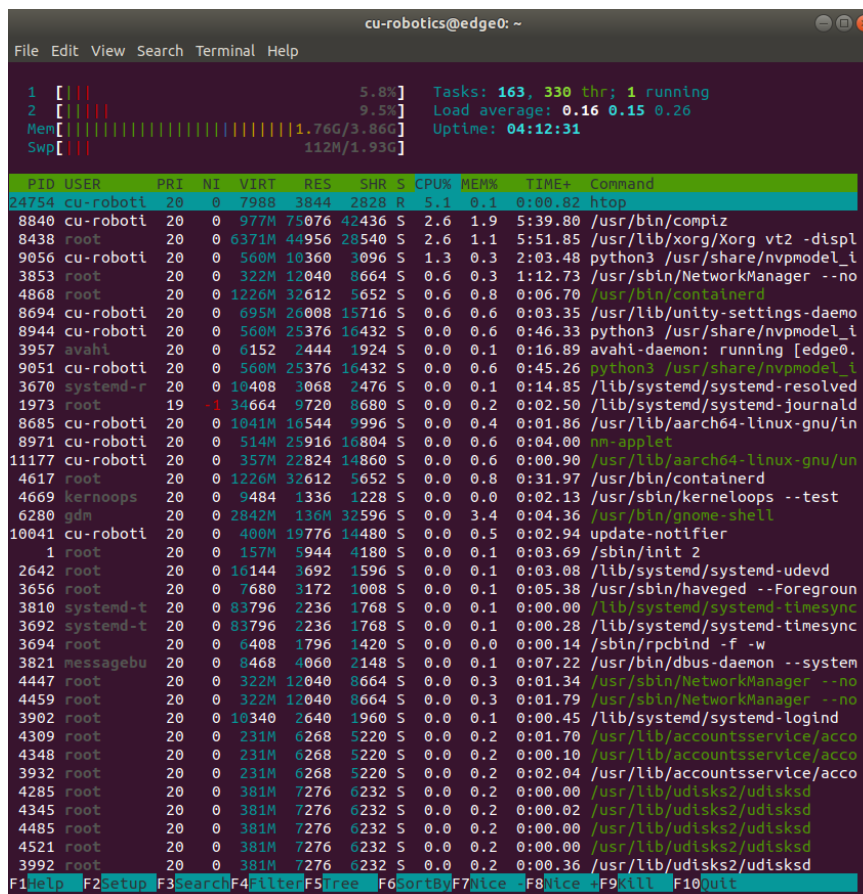
An important part of edge computing is optimizing our programs to get the most out of our processor. This document gives an overview of how to monitor your processor and memory usage.

## Viewing processor stats

In this example we will be working with a 4GB Jetson nano. This device has 4 cores in max power mode (10W) and 2 in 5W mode. The Jetson also has 4GB of RAM (hence the name 4GB) and a 2GB swapfile (usually half the size of RAM). To view the processor usage we will use the command `htop`. Open a terminal and run:

`htop`

You should now see the below output:



The screenshot shows the htop interface in a terminal window. At the top, system statistics are displayed: Tasks: 163, 330 thr; 1 running; Load average: 0.16 0.15 0.26; Uptime: 04:12:31. Below this, a table lists running processes with columns for PID, USER, PRI, NI, VIRT, RES, SHR, S, CPU%, MEM%, TIME+, and Command. The processes are sorted by CPU usage, with 'htop' at the top.

PID	USER	PRI	NI	VIRT	RES	SHR	S	CPU%	MEM%	TIME+	Command
24754	cu-roboti	20	0	7988	3844	2828	R	5.1	0.1	0:00.82	htop
8840	cu-roboti	20	0	977M	75076	42436	S	2.6	1.9	5:39.80	/usr/bin/complz
8438	root	20	0	6371M	44956	28540	S	2.6	1.1	5:51.85	/usr/lib/xorg/Xorg vt2 -displ
9056	cu-roboti	20	0	560M	10360	3096	S	1.3	0.3	2:03.48	python3 /usr/share/nvmodel_i
3853	root	20	0	322M	12040	8664	S	0.6	0.3	1:12.73	/usr/sbin/NetworkManager --no
4868	root	20	0	1226M	32612	5652	S	0.6	0.8	0:06.70	/usr/bin/containerd
8694	cu-roboti	20	0	695M	26008	15716	S	0.6	0.6	0:03.35	/usr/lib/unity-settings-daemo
8944	cu-roboti	20	0	560M	25376	16432	S	0.0	0.6	0:46.33	python3 /usr/share/nvmodel_i
3957	avahi	20	0	6152	2444	1924	S	0.0	0.1	0:16.89	avahi-daemon: running [edge0.
9051	cu-roboti	20	0	560M	25376	16432	S	0.0	0.6	0:45.26	python3 /usr/share/nvmodel_i
3670	systemd-r	20	0	10408	3068	2476	S	0.0	0.1	0:14.85	/lib/systemd/systemd-resolved
1973	root	19	-1	34664	9720	8680	S	0.0	0.2	0:02.50	/lib/systemd/systemd-journald
8685	cu-roboti	20	0	1041M	16544	9996	S	0.0	0.4	0:01.86	/usr/lib/aarch64-linux-gnu/in
8971	cu-roboti	20	0	514M	25916	16804	S	0.0	0.6	0:04.00	nm-applet
11177	cu-roboti	20	0	357M	22824	14860	S	0.0	0.6	0:00.90	/usr/lib/aarch64-linux-gnu/un
4617	root	20	0	1226M	32612	5652	S	0.0	0.8	0:31.97	/usr/bin/containerd
4669	kernoops	20	0	9484	1336	1228	S	0.0	0.0	0:02.13	/usr/sbin/kerneloops --test
6280	gdm	20	0	2842M	136M	32596	S	0.0	3.4	0:04.36	/usr/bin/gnome-shell
10041	cu-roboti	20	0	400M	19776	14480	S	0.0	0.5	0:02.94	update-notifier
1	root	20	0	157M	5944	4180	S	0.0	0.1	0:03.69	/sbin/init 2
2642	root	20	0	16144	3692	1596	S	0.0	0.1	0:03.08	/lib/systemd/systemd-udev
3656	root	20	0	7680	3172	1008	S	0.0	0.1	0:05.38	/usr/sbin/haveged --Foreground
3810	systemd-t	20	0	83796	2236	1768	S	0.0	0.1	0:00.00	/lib/systemd/systemd-timesync
3692	systemd-t	20	0	83796	2236	1768	S	0.0	0.1	0:00.28	/lib/systemd/systemd-timesync
3694	root	20	0	6408	1796	1420	S	0.0	0.0	0:00.14	/sbin/rpcbind -f -w
3821	messagebu	20	0	8468	4060	2148	S	0.0	0.1	0:07.22	/usr/bin/dbus-daemon --system
4447	root	20	0	322M	12040	8664	S	0.0	0.3	0:01.34	/usr/sbin/NetworkManager --no
4459	root	20	0	322M	12040	8664	S	0.0	0.3	0:01.79	/usr/sbin/NetworkManager --no
3902	root	20	0	10340	2640	1960	S	0.0	0.1	0:00.45	/lib/systemd/systemd-logind
4309	root	20	0	231M	6268	5220	S	0.0	0.2	0:01.70	/usr/lib/accountsservice/acco
4348	root	20	0	231M	6268	5220	S	0.0	0.2	0:00.10	/usr/lib/accountsservice/acco
3932	root	20	0	231M	6268	5220	S	0.0	0.2	0:02.04	/usr/lib/accountsservice/acco
4285	root	20	0	381M	7276	6232	S	0.0	0.2	0:00.00	/usr/lib/udisks2/udisksd
4345	root	20	0	381M	7276	6232	S	0.0	0.2	0:00.02	/usr/lib/udisks2/udisksd
4485	root	20	0	381M	7276	6232	S	0.0	0.2	0:00.00	/usr/lib/udisks2/udisksd
4521	root	20	0	381M	7276	6232	S	0.0	0.2	0:00.00	/usr/lib/udisks2/udisksd
3992	root	20	0	381M	7276	6232	S	0.0	0.2	0:00.36	/usr/lib/udisks2/udisksd

This window shows all of the running process and the resources they are consuming. At the top there are some overall stats on the processor. You can see that we have two cores that are hardly being utilized and we are using 1.76GB of RAM (out of 3.86GB, not truly 4GB). This window also shows our swapfile usage (swapfiles are used to help with context switching).

Now we can put our device into 10W mode and run htop again:

```
sudo nvpmodel -m0 1
```

```
htop
```

Now the output will show all four cores.

## **Running a compute intensive example**

For this example we will run a jetson inference object detection example. This part requires that jetson inference is installed. Change into the jetson-inference bin and run the example:

```
cd jetson-inference/build/aarch64/bin
```

```
./detectnet.py --network=ssd-mobilenet-v2 images/peds_0.jpg images/test/output.jpg
```

Now run htop in another terminal and watch the process take up the devices resources.

```
cu-robotics@edge0: ~  
File Edit View Search Terminal Help  
  
1 [|||||] 61.3% Tasks: 164, 335 thr; 2 running  
2 [|||||] 63.9% Load average: 0.33 0.18 0.19  
Mem [|||||] 2.33G/3.86G Uptime: 04:25:27  
Swp [|||] 112M/1.93G  
  
PID USER PRI NI VIRT RES SHR S CPU% MEM% TIME+ Command  
24754 cu-roboti 20 0 7988 3844 2828 R 5.1 0.1 0:37.36 htop  
8840 cu-roboti 20 0 977M 75076 42436 S 0.0 1.9 6:00.08 /usr/bin/compiz  
8438 root 20 0 6371M 44956 28540 S 0.0 1.1 6:04.98 /usr/lib/xorg/Xorg vt2 -displ  
9056 cu-roboti 20 0 560M 10360 3096 S 0.0 0.3 2:09.19 python3 /usr/share/nvmodel_i  
3853 root 20 0 322M 12040 8664 S 0.0 0.3 1:15.93 /usr/sbin/NetworkManager --no  
9051 cu-roboti 20 0 560M 25376 16432 S 0.0 0.6 0:47.22 python3 /usr/share/nvmodel_i  
4617 root 20 0 1226M 33216 5652 S 0.0 0.8 0:33.43 /usr/bin/containerd  
6634 gdm 20 0 479M 17048 12028 S 0.0 0.4 0:10.05 /usr/lib/gnome-settings-daemo  
5079 root 20 0 1226M 33216 5652 S 0.0 0.8 0:02.93 /usr/bin/containerd  
8944 cu-roboti 20 0 560M 25376 16432 S 0.0 0.6 0:48.28 python3 /usr/share/nvmodel_i  
4868 root 20 0 1226M 33216 5652 S 0.0 0.8 0:07.00 /usr/bin/containerd  
6280 gdm 20 0 2842M 138M 32596 S 0.0 3.5 0:04.54 /usr/bin/gnome-shell  
6322 rtkit 21 1 148M 1696 1432 S 0.0 0.0 0:01.04 /usr/lib/rtkit/rtkit-daemon  
3670 systemd-r 20 0 16408 3068 2476 S 0.0 0.1 0:15.51 /lib/systemd/systemd-resolved  
8971 cu-roboti 20 0 514M 25916 16804 S 0.0 0.6 0:04.17 nm-applet  
3821 messagebu 20 0 8468 4060 2148 S 0.0 0.1 0:07.40 /usr/bin/dbus-daemon --system  
10046 cu-roboti 20 0 400M 19776 14480 S 0.0 0.5 0:02.61 update-notifier  
3656 root 20 0 7680 3172 1008 S 0.0 0.1 0:05.49 /usr/sbin/haveged --Foreground  
3957 avahi 20 0 6152 2444 1924 S 0.0 0.1 0:18.50 avahi-daemon: running [edge0.  
5011 root 20 0 6616 2408 2124 S 0.0 0.1 0:00.26 /bin/bash /etc/systemd/nvmemw  
4939 root 20 0 1226M 33216 5652 S 0.0 0.8 0:02.20 /usr/bin/containerd  
23887 root 20 0 363M 8340 8076 S 0.0 0.2 0:00.48 /usr/lib/fwupd/fwupd  
9191 cu-roboti 20 0 586M 26356 15608 S 0.0 0.7 0:05.80 /usr/lib/gnome-terminal/gnome  
10044 cu-roboti 20 0 903M 147M 20156 S 0.0 3.7 0:22.43 /usr/bin/gnome-software --gap  
5077 root 20 0 1226M 33216 5652 S 0.0 0.8 0:03.00 /usr/bin/containerd  
23691 cu-roboti 20 0 12428 2340 1336 S 0.0 0.1 0:02.03 sshd: cu-robotics@pts/2  
10041 cu-roboti 20 0 400M 19776 14480 S 0.0 0.5 0:03.06 update-notifier  
6262 gdm 20 0 2842M 138M 32596 S 0.0 3.5 0:14.39 /usr/bin/gnome-shell  
4962 root 20 0 1226M 33216 5652 S 0.0 0.8 0:02.97 /usr/bin/containerd  
8934 cu-roboti 20 0 514M 25916 16804 S 0.0 0.6 0:06.63 nm-applet  
11166 cu-roboti 20 0 977M 75076 42436 S 0.0 1.9 0:02.23 /usr/bin/compiz  
23912 root 20 0 363M 8340 8076 S 0.0 0.2 0:00.20 /usr/lib/fwupd/fwupd  
10051 cu-roboti 20 0 903M 147M 20156 S 0.0 3.7 0:03.37 /usr/bin/gnome-software --gap  
5398 root 20 0 833M 52936 11320 S 0.0 1.3 0:01.82 /usr/bin/dockerd -H fd:// --c  
4447 root 20 0 322M 12040 8664 S 0.0 0.3 0:01.42 /usr/sbin/NetworkManager --no  
4669 kernoops 20 0 9484 1336 1228 S 0.0 0.0 0:02.21 /usr/sbin/kerneloops --test  
8694 cu-roboti 20 0 695M 26008 15716 S 0.0 0.6 0:03.47 /usr/lib/unity-settings-daemo  
F1 Help F2 Setup F3 Search F4 Filter F5 Tree F6 SortBy F7 Nice F8 Nice F9 Kill F10 Quit
```