



BICOL UNIVERSITY
POLANGUI
Polangui, Albay



IT 123 – System Administration and Maintenance

1st Semester 2025-2026

Week 13 Laboratory – *Virtualization and Cloud Computing*

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Task 1 – Setting Up a Virtual Machine (VirtualBox)

1. Installation of VirtualBox

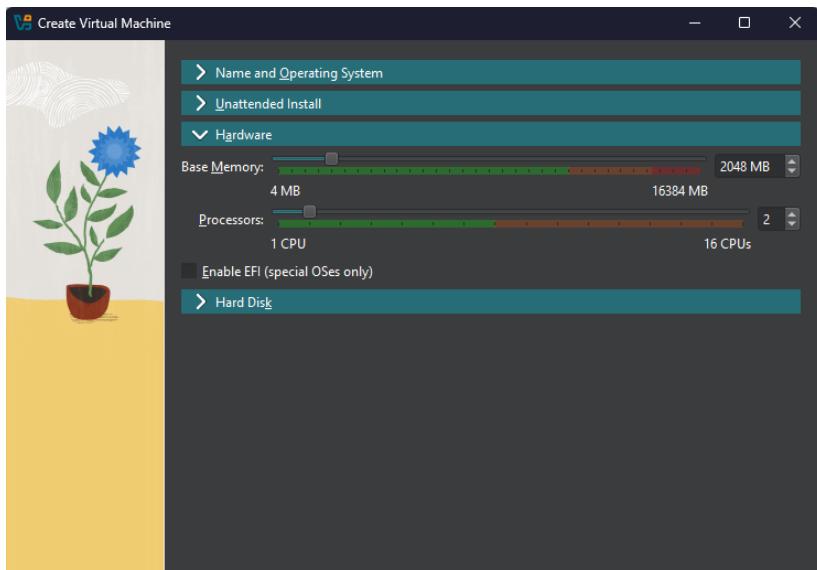
Description: Downloaded and installed VirtualBox from the official website.

The screenshot shows the official VirtualBox website. At the top, there's a navigation bar with links for Home, Download, Documentation, Community, and a search bar. Below the header, there's a main banner with the text "Powerful open source virtualization" and "For personal and enterprise use". A large blue button labeled "Get Started" with a "Download" button inside it is prominently displayed. To the right of the download button, there's a link to "Download VirtualBox binaries and platform packages". Below the main banner, there are three sections: "Community", "Documentation", and "Training". Each section has a small icon and a brief description.

2. Creating the Virtual Machine

Steps Performed:

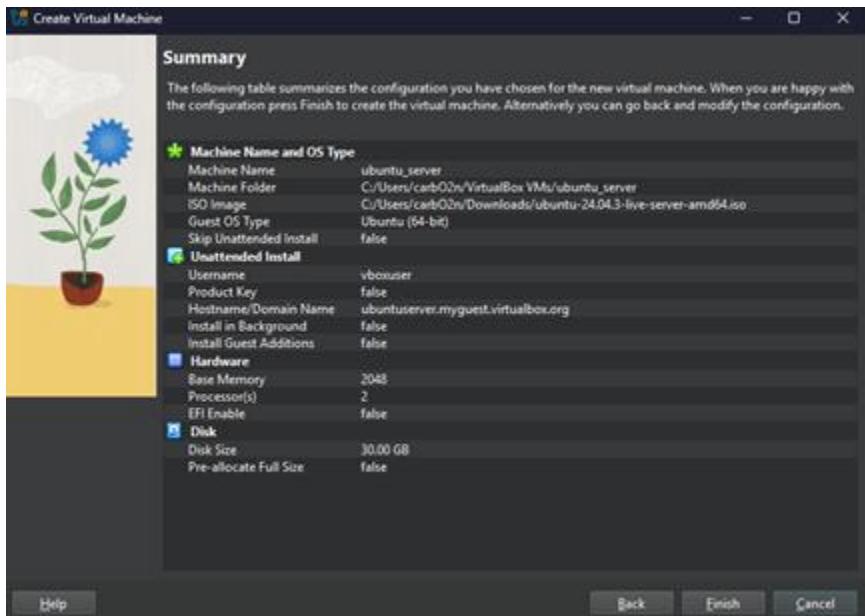
- Clicked New and created VM named *Week13_VM*
- Selected operating system: **(Linux/Windows)**
- Allocated RAM: **MB**
- Created virtual disk: **VDI → Dynamically Allocated → GB**



3. Installing the Operating System

Actions:

- Started VM and selected ISO
- Followed the OS installation wizard
- Completed setup and logged into the OS



4. Verifying VM Functionality

Actions performed inside the VM:

- Checked internet connection
- Created folders/files
- Installed basic packages or apps

IP Check

```
ftp> exit
admin@ubuntu:~$ ip a
1: lo: <LOOPBACK,UP,LOWER_UP> mtu 65536 qdisc noqueue state UNKNOWN group default qlen 1000
    link/loopback 00:00:00:00:00:00 brd 00:00:00:00:00:00
        inet 127.0.0.1/8 scope host lo
            valid_lft forever preferred_lft forever
        inet6 ::1/128 scope host noprefixroute
            valid_lft forever preferred_lft forever
2: enp0s3: <BROADCAST,MULTICAST,UP,LOWER_UP> mtu 1500 qdisc fq_codel state UP group default qlen 1000
    link/ether 08:00:27:d1:9f:10 brd ff:ff:ff:ff:ff:ff
        inet 192.168.1.51/24 scope global enp0s3
            valid_lft forever preferred_lft forever
admin@ubuntu:~$
```

Ping Test (google.com)

```
admin@ubuntu:~$ ping google.com
PING google.com (142.251.221.14) 56(84) bytes of data.
64 bytes from mn108s02-in-f14.1e100.net (142.251.221.14): icmp_seq=1 ttl=116 time=15.8 ms
64 bytes from mn108s02-in-f14.1e100.net (142.251.221.14): icmp_seq=2 ttl=116 time=13.8 ms
64 bytes from mn108s02-in-f14.1e100.net (142.251.221.14): icmp_seq=3 ttl=116 time=14.1 ms
64 bytes from mn108s02-in-f14.1e100.net (142.251.221.14): icmp_seq=4 ttl=116 time=14.0 ms
^TS64 bytes from mn108s02-in-f14.1e100.net (142.251.221.14): icmp_seq=5 ttl=116 time=15.3 ms
64 bytes from mn108s02-in-f14.1e100.net (142.251.221.14): icmp_seq=6 ttl=116 time=13.8 ms
64 bytes from mn108s02-in-f14.1e100.net (142.251.221.14): icmp_seq=7 ttl=116 time=12.9 ms
64 bytes from mn108s02-in-f14.1e100.net (142.251.221.14): icmp_seq=8 ttl=116 time=11.1 ms
```

Ping Test (8.8.8.8)

```
admin@ubuntu:~$ ping 8.8.8.8
PING 8.8.8.8 (8.8.8.8) 56(84) bytes of data.
64 bytes from 8.8.8.8: icmp_seq=1 ttl=116 time=19.6 ms
64 bytes from 8.8.8.8: icmp_seq=2 ttl=116 time=9.91 ms
64 bytes from 8.8.8.8: icmp_seq=3 ttl=116 time=16.8 ms
64 bytes from 8.8.8.8: icmp_seq=4 ttl=116 time=13.9 ms
^C
--- 8.8.8.8 ping statistics ---
4 packets transmitted, 4 received, 0% packet loss, time 3005ms
rtt min/avg/max/mdev = 9.905/15.068/19.635/3.595 ms
admin@ubuntu:~$
```

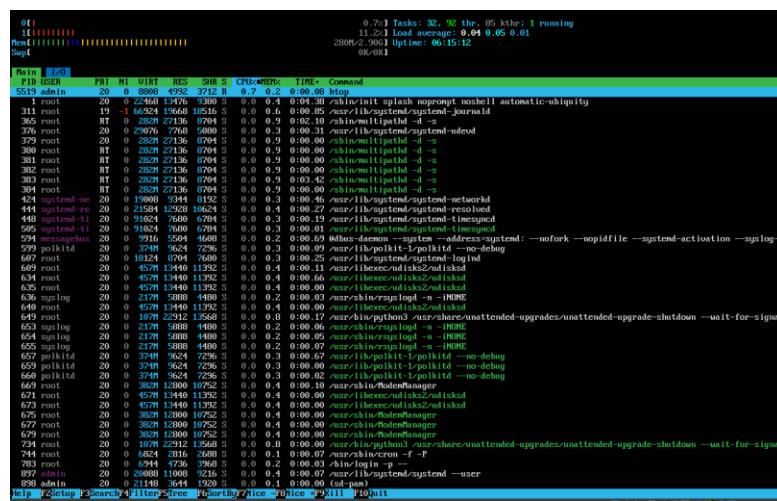
Creating a Folder (Week13_Test)

```
admin@ubuntu:~$ mkdir Week13_Test
admin@ubuntu:~$ ls
Week13_Test
admin@ubuntu:~$
```

Installing Update Packages

```
admin@ubuntu:~$ sudo apt update
[...]
Get:1 http://ph.archive.ubuntu.com/ubuntu noble InRelease [126 kB]
Get:2 http://ph.archive.ubuntu.com/ubuntu noble-updates/main amd64 Packages [1,573 kB]
Get:3 http://ph.archive.ubuntu.com/ubuntu noble-updates/main Translation-en [297 kB]
Get:4 http://ph.archive.ubuntu.com/ubuntu noble-updates/main arm64 Packages [1,175 kB]
Get:5 http://ph.archive.ubuntu.com/ubuntu noble-updates/main Translation-en [297 kB]
Get:6 http://ph.archive.ubuntu.com/ubuntu noble-updates/main Translation-en [297 kB]
Get:7 http://ph.archive.ubuntu.com/ubuntu noble-updates/restricted amd64 Packages [2,226 kB]
Get:8 http://ph.archive.ubuntu.com/ubuntu noble-updates/restricted arm64 Packages [1,544 kB]
Get:9 http://ph.archive.ubuntu.com/ubuntu noble-updates/restricted amd64 Packages [2,226 kB]
Get:10 http://ph.archive.ubuntu.com/ubuntu noble-updates/restricted arm64 Packages [1,544 kB]
Get:11 http://ph.archive.ubuntu.com/ubuntu noble-updates/restricted amd64 Components [212 kB]
Get:12 http://ph.archive.ubuntu.com/ubuntu noble-updates/restricted arm64 Components [116 kB]
Get:13 http://ph.archive.ubuntu.com/ubuntu noble-updates/universe amd64 Packages [1,299 kB]
Get:14 http://ph.archive.ubuntu.com/ubuntu noble-updates/universe Translation-en [303 kB]
Get:15 http://ph.archive.ubuntu.com/ubuntu noble-updates/universe arm64 Packages [1,299 kB]
Get:16 http://ph.archive.ubuntu.com/ubuntu noble-updates/universe amd64 c-n-f Metadata [131 kB]
Get:17 http://ph.archive.ubuntu.com/ubuntu noble-updates/universe arm64 c-n-f Metadata [131 kB]
Get:18 http://ph.archive.ubuntu.com/ubuntu noble-updates/universe Translation-en [122 kB]
Get:19 http://ph.archive.ubuntu.com/ubuntu noble-updates/multiverse amd64 Components [194 kB]
Get:20 http://ph.archive.ubuntu.com/ubuntu noble-updates/multiverse arm64 Components [104 kB]
Get:21 http://ph.archive.ubuntu.com/ubuntu noble-backports/main amd64 Components [17,140 kB]
Get:22 http://ph.archive.ubuntu.com/ubuntu noble-backports/restricted amd64 Components [216 kB]
Get:23 http://ph.archive.ubuntu.com/ubuntu noble-backports/restricted arm64 Components [113 kB]
Get:24 http://ph.archive.ubuntu.com/ubuntu noble-backports/multiverse amd64 Components [121 kB]
Get:25 http://security.ubuntu.com/ubuntu noble-security/main amd64 Components [211 kB]
Get:26 http://security.ubuntu.com/ubuntu noble-security/main arm64 Components [121 kB]
Get:27 http://security.ubuntu.com/ubuntu noble-security/restricted amd64 Packages [1,248 kB]
Get:28 http://security.ubuntu.com/ubuntu noble-security/restricted arm64 Packages [1,205 kB]
Get:29 http://security.ubuntu.com/ubuntu noble-security/universe amd64 Packages [1,248 kB]
Get:30 http://security.ubuntu.com/ubuntu noble-security/universe arm64 Packages [1,205 kB]
Get:31 http://security.ubuntu.com/ubuntu noble-security/restricted amd64 Components [1212 kB]
Get:32 http://security.ubuntu.com/ubuntu noble-security/restricted arm64 c-n-f Metadata [1500 kB]
Get:33 http://security.ubuntu.com/ubuntu noble-security/universe Translation-en [296 kB]
Get:34 http://security.ubuntu.com/ubuntu noble-security/universe Translation-en [296 kB]
Get:35 http://security.ubuntu.com/ubuntu noble-security/universe amd64 Components [1194 kB]
Get:36 http://security.ubuntu.com/ubuntu noble-security/universe arm64 c-n-f Metadata [1194 kB]
Get:37 http://security.ubuntu.com/ubuntu noble-security/multiverse amd64 Packages [274 kB]
Get:38 http://security.ubuntu.com/ubuntu noble-security/multiverse arm64 Packages [159 kB]
Get:39 http://security.ubuntu.com/ubuntu noble-security/multiverse amd64 Components [1206 kB]
Get:40 http://security.ubuntu.com/ubuntu noble-security/multiverse arm64 c-n-f Metadata [384 kB]
Fetched 13.0 MB in 4s (3,109 kB/s)
^C
```

```
admin@ubuntu:~$ sudo apt install htop -y
Reading package lists... Done
Building dependency tree... Done
Reading state information... Done
htop is already the newest version (3.3.0-4build1).
htop set to manually installed.
0 upgraded, 0 newly installed, 0 to remove and 54 not upgraded.
admin@ubuntu:~$
```



Task 2 – Exploring Cloud Computing Services

1. Creating a Cloud Account

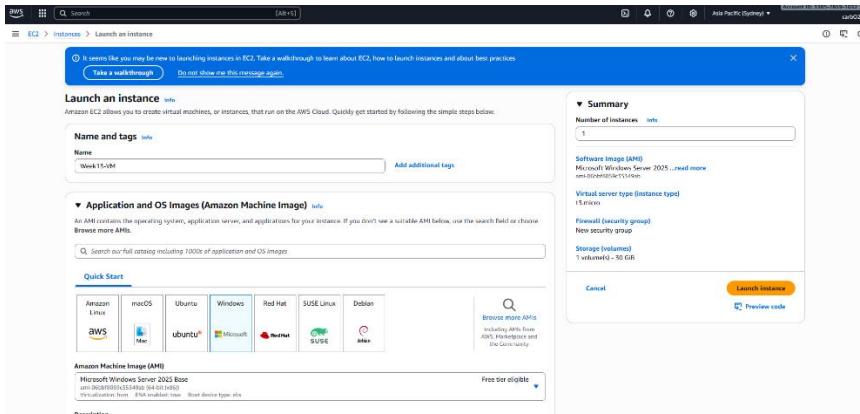
Cloud provider used: **AWS / Azure / Google Cloud**

The screenshot shows the AWS EC2 'Launch an instance' wizard. At the top, there's a navigation bar with the AWS logo, a search bar containing 'Search [Alt+S]', and a 'Instances' section. Below the navigation, a blue header bar contains a message: 'It seems like you may be new to launching instances in EC2. Take a walkthrough to learn about EC2, how to launch instances and about best practices'. It includes two buttons: 'Take a walkthrough' and 'Do not show me this message again.' The main content area is titled 'Launch an instance' with an 'Info' link. It says, 'Amazon EC2 allows you to create virtual machines, or instances, that run on the AWS Cloud. Quickly get started by following the simple steps below.' A large input field is labeled 'Name and tags' with an 'Info' link. It has a 'Name' label and a text input box containing 'Week13-VM', with a 'Add additional tags' button next to it. Below this is a section titled 'Application and OS Images (Amazon Machine Image)' with an 'Info' link. It explains that an AMI contains the operating system, application server, and applications for your instance. It includes a search bar for 'Search our full catalog including 1000s of application and OS images' and a 'Quick Start' link. On the right side, there are vertical panels for 'Software Number' (with value 1), 'Virtual t3.micro', and 'Firewall New sec', and a 'Storage 1 volume' panel.

2. Exploring Available Cloud Services

Actions:

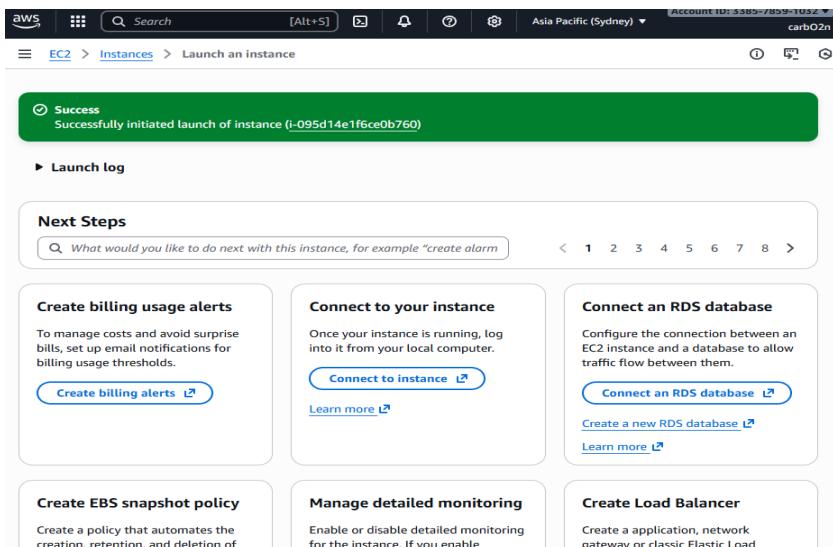
- Opened dashboard
- Viewed compute services (EC2 / Azure VM)
- Explored storage (S3/Blob) and databases (RDS/SQL DB)



3. Launching a Cloud Virtual Machine

Configuration used:

- OS Used: _____
- Instance Type: **t2.micro / free-tier**
- Security Group: **SSH allowed (Linux) / RDP allowed (Windows)**



The screenshot shows the AWS EC2 Instances page. On the left, there's a sidebar with navigation links like EC2, Dashboard, AWS Global View, Events, Instances, Instance Types, Launch Templates, Spot Requests, Savings Plans, Reserved Instances, Dedicated Hosts, Capacity Reservations, Capacity Manager, Images, AMIs, AM Catalog, Elastic Block Store, Volumes, Snapshots, Lifecycle Manager, Network & Security, Security Groups, Elastic IPs, Placement Groups, Key Pairs. The main area shows a table with one row for 'Week13-VM'. The table columns include Name, Instance ID, Instance state, Status check, Alarm status, Availability Zone, Public IPv4 DNS, Public IPv4 IP, and Elastic IP. Below the table, a detailed view for 'i-095d14e1f6ce0b760 (Week13-VM)' is shown with tabs for Details, Status alarms, Monitoring, Security, Networking, Storage, and Tags. The Details tab displays information such as Instance ID, Public IPv4 address (3.25.209.72), Private IPv4 addresses (172.31.27.147), Instance type (t3.micro), and Hostname type (ip-172-31-27-147.ap-southeast-2.compute.internal).

4. Connecting and Testing the Cloud VM

For Linux (SSH) or Windows (RDP):

- Successfully connected
- Performed basic tasks
- Checked monitoring tools (CloudWatch / Azure Monitor)

```
ubuntu@ip-172-31-27-147:~$ 
System information as of Sun Dec 7 06:30:24 UTC 2025

System load: 0.02      Temperature:          -273.1 C
Usage of /: 25.8% of 6.71GB  Processes:           115
Memory usage: 22%        Users logged in:       0
Swap usage: 0%          IPv4 address for ens5: 172.31.27.147

Expanded Security Maintenance for Applications is not enabled.

0 updates can be applied immediately.

Enable ESM Apps to receive additional future security updates.
See https://ubuntu.com/esm or run: sudo pro status

The list of available updates is more than a week old.
To check for new updates run: sudo apt update

The programs included with the Ubuntu system are free software;
the exact distribution terms for each program are described in the
individual files in /usr/share/doc/*copyright.

Ubuntu comes with ABSOLUTELY NO WARRANTY, to the extent permitted by
applicable law.

To run a command as administrator (user "root"), use "sudo <command>".
See "man sudo_root" for details.

ubuntu@ip-172-31-27-147:~$ 
```

```
See "man sudo_root" for details.

ubuntu@ip-172-31-27-147:~$ touch cloud_test.txt
ubuntu@ip-172-31-27-147:~$ sudo apt update
Hit:1 http://ap-southeast-2.ec2.archive.ubuntu.com/ubuntu 
```

```
ubuntu@ip-172-31-27-147:~$ sudo apt install htop
Reading package lists... Done
Building dependency tree... Done
Reading state information... Done
htop is already the newest version (3.3.0-4build1).
htop set to manually installed.
0 upgraded, 0 newly installed, 0 to remove and 36 not upgraded.
ubuntu@ip-172-31-27-147:~$
```

Task 3 – Comparison of Virtualization vs. Cloud Computing

Comparison Table

Feature	Local VirtualBox VM	Cloud VM (AWS/Azure)
Performance	Depends on local hardware	Scalable, can choose instance sizes
Cost	Free (uses local resources)	Pay-as-you-go (Free tier available)
Setup Time	Quick installation	Requires cloud setup + configuration
Accessibility	Only available on host machine	Accessible from anywhere with internet
Storage	Uses local disk	Cloud storage; scalable
Best Use Case	Testing, offline use, learning OS	Deployment, hosting apps, remote servers

AWS (Cloud VM) Being monitored using CMD through a Windows machine

```
ubuntu@ip-172-31-27-147:~ 
System information as of Sun Dec 7 06:30:24 UTC 2025

System load: 0.02 Temperature: -273.1 C
Usage of /: 25.8% of 6.71GB Processes: 115
Memory usage: 22% Users logged in: 0
Swap usage: 0% IPv4 address for ens5: 172.31.27.147

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See "man sudo_root" for details.

ubuntu@ip-172-31-27-147:~$
```

Oracle Virtual Box (Ubuntu Server VM)

Main [CPU]										Command	
PID	USER	PRI	NI	UIRT	RES	SHR	S%	CPU#	MEM%	TIME+	
1	root	20	0	22468	13476	9380	S	0.0	0.4	0:04.39	/sbin/init splash noprompt noshell automatic-ubiquity
311	root	19	-1	66924	19668	18516	S	0.0	0.6	0:00.85	/usr/lib/systemd/systemd-journald
365	root	RT	0	282H	27136	8704	S	0.0	0.9	0:02.10	/sbin/multipathd -d -s
376	root	20	0	29076	2768	5880	S	0.0	0.3	0:00.00	/usr/lib/systemd/systemd-udevd
379	root	20	0	282H	27136	8704	S	0.0	0.9	0:00.00	/sbin/multipathd -d -s
380	root	RT	0	282H	27136	8704	S	0.0	0.9	0:00.00	/sbin/multipathd -d -s
381	root	RT	0	282H	27136	8704	S	0.0	0.9	0:00.00	/sbin/multipathd -d -s
382	root	RT	0	282H	27136	8704	S	0.0	0.9	0:00.00	/sbin/multipathd -d -s
383	root	RT	0	282H	27136	8704	S	0.0	0.9	0:03.42	/sbin/multipathd -d -s
384	root	RT	0	282H	27136	8704	S	0.0	0.9	0:00.00	/sbin/multipathd -d -s
424	systemd-me	20	0	19008	9344	8192	S	0.0	0.3	0:00.46	/usr/lib/systemd/systemd-networkd
444	systemd-re	20	0	21584	12928	10624	S	0.0	0.4	0:00.27	/usr/lib/systemd/systemd-resolved
448	systemd-ti	20	0	91024	7680	6784	S	0.0	0.3	0:00.19	/usr/lib/systemd/systemd-timesyncd
505	systemd-ti	20	0	91024	7680	6784	S	0.0	0.3	0:00.01	/usr/lib/systemd/systemd-timesyncd
594	messagesibus	20	0	9916	5504	4608	S	0.0	0.2	0:00.69	Ribus-dæmon --system --address=systemd --nofork --nopidfile --systemd-activation --syslog-o
599	polkitd	20	0	374H	9624	7296	S	0.0	0.3	0:00.09	/usr/lib/polkit-1/polkitd --no-debug
607	root	20	0	18124	8704	7680	S	0.0	0.3	0:00.25	/usr/lib/systemd/systemd-logind
609	root	20	0	457H	13440	11392	S	0.0	0.4	0:00.11	/usr/libexec/udisks2/udisksd
634	root	20	0	457H	13440	11392	S	0.0	0.4	0:00.66	/usr/libexec/udisks2/udisksd
635	root	20	0	457H	13440	11392	S	0.0	0.4	0:00.00	/usr/libexec/udisks2/udisksd
636	syslog	20	0	217H	5888	4480	S	0.0	0.2	0:00.03	/usr/sbin/rsyslog -n -INONE
640	root	20	0	457H	13440	11392	S	0.0	0.4	0:00.00	/usr/libexec/udisks2/udisksd
649	root	20	0	107H	22912	13568	S	0.0	0.8	0:00.17	/usr/bin/python3 /usr/share/unattended-upgrades/unattended-upgrade-shutdown --wait-for-signal
653	syslog	20	0	217H	5888	4480	S	0.0	0.2	0:00.06	/usr/sbin/rsyslog -n -INONE
654	syslog	20	0	217H	5888	4480	S	0.0	0.2	0:00.05	/usr/sbin/rsyslog -n -INONE
655	syslog	20	0	217H	5888	4480	S	0.0	0.2	0:00.07	/usr/sbin/rsyslog -n -INONE
657	polkitd	20	0	374H	9624	7296	S	0.0	0.3	0:00.67	/usr/lib/polkit-1/polkitd --no-debug
659	polkitd	20	0	374H	9624	7296	S	0.0	0.3	0:00.00	/usr/lib/polkit-1/polkitd --no-debug
660	polkitd	20	0	374H	9624	7296	S	0.0	0.3	0:00.02	/usr/lib/polkit-1/polkitd --no-debug
669	root	20	0	302H	12800	10752	S	0.0	0.4	0:00.10	/usr/sbin/ModemManager
671	root	20	0	457H	13440	11392	S	0.0	0.4	0:00.00	/usr/libexec/udisks2/udisksd
673	root	20	0	457H	13440	11392	S	0.0	0.4	0:00.00	/usr/libexec/udisks2/udisksd
675	root	20	0	382H	12800	10752	S	0.0	0.4	0:00.00	/usr/sbin/ModemManager
677	root	20	0	382H	12800	10752	S	0.0	0.4	0:00.00	/usr/sbin/ModemManager
679	root	20	0	382H	12800	10752	S	0.0	0.4	0:00.00	/usr/sbin/ModemManager
734	root	20	0	107H	22912	13568	S	0.0	0.8	0:00.00	/usr/bin/python3 /usr/share/unattended-upgrades/unattended-upgrade-shutdown --wait-for-signal
744	root	20	0	6824	2016	2688	S	0.0	0.1	0:00.07	/usr/sbin/cron -f -P
783	root	20	0	6944	4736	3968	S	0.0	0.2	0:00.03	/bin/login -p --
892	admin	20	0	20088	11008	9216	S	0.0	0.4	0:00.07	/usr/lib/systemd/systemd --user
898	admin	20	0	21148	3644	1920	S	0.0	0.1	0:00.00	(sd-pas)
907	admin	20	0	8652	5248	3712	S	0.0	0.2	0:00.42	-bash