Assignment 1 (6p)

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1. Setting Up C Programming Environment on Linux

A. Install the GCC Compiler

Most Linux distributions come with the GCC (GNU Compiler Collection) pre-installed. To check if GCC is installed, run:

- gcc --version

If it's not installed, install it using:

Ubuntu/Debian:

- sudo apt update

- sudo apt install gcc

Once installed, verify by running:

- gcc --version

Since we already have installed gcc compiler we do not need to install the compiler again.

```
azuredineth@linux-lab:~$ gcc --version
gcc (Ubuntu 13.3.0-6ubuntu2~24.04) 13.3.0
Copyright (C) 2023 Free Software Foundation, Inc.
This is free software; see the source for copying conditions.  There is NO
warranty; not even for MERCHANTABILITY or FITNESS FOR A PARTICULAR PURPOSE.
```

B. Make a small C program "mycalc.c" to ask user 2 numbers, and print the sum

1. For ease of use I created a directory called calculator and Im gonna use this folder to write my c program.

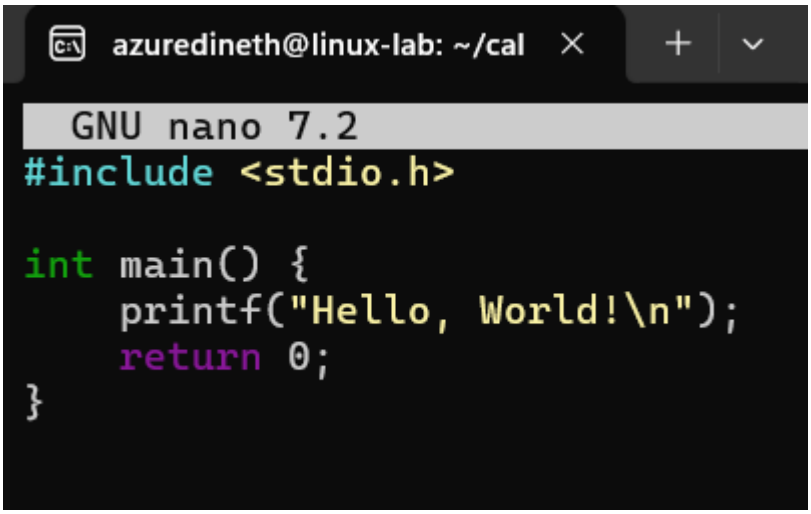
```
azuredineth@linux-lab:~$ mkdir calculator
azuredineth@linux-lab:~$ ls
calcit.sh   data.txt       first.sh  hello.c   input    markdown_linux_harjoitus  node-basics  pipes.txt  sample.sh  test.sh
calculator  diskspace.txt  hello     hello.c~  input.c  mytext.txt                opt          print.sh   server     test2.sh
azuredineth@linux-lab:~$ cd calculator
azuredineth@linux-lab:~/calculator$ ls
azuredineth@linux-lab:~/calculator$
```

2. Create mycalc.c using nano editor.

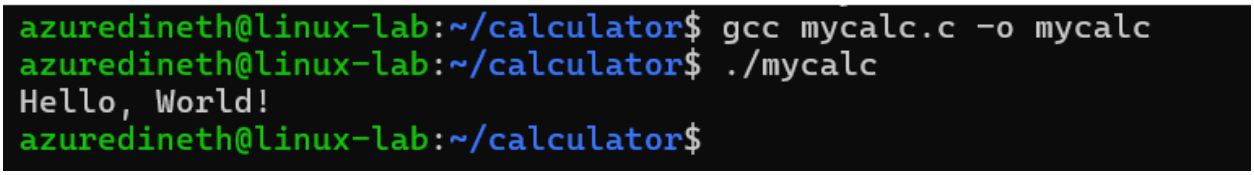
```
azuredineth@linux-lab:~/calculator$ nano mycalc.c
```

3. Inorder to check our env & other setting, first try to run Hello world app,

- Update the file
- Save the file (Ctrl + s)
- Exit from nano editor (Ctrl + x)



4. Compile the file and make mycalc program. (-o mycalc : Output will be mycalc)
   - gcc mycalc.c -o mycalc
5. Now Run the app and check if its working with no issues.



6. Now we can modify to add our calculator codes.

azuredineth@linux-lab: ~/cal

GNU nano 7.2 mycalc.c

```c
#include <stdio.h>

int main() {
  // Create an integer variable that will store the number we get from the user
  float a;
  float b;
  float c;

  // Ask the user to type a number 1
  printf("Type a number 1 and press enter: \n");
  // Get and save the number 1 the user types
  scanf("%f", &a);
   // Ask the user to type a number 2
  printf("Type a number 1 and press enter: \n");
  // Get and save the number 2 the user types
  scanf("%f", &b);

  c = a+b;

  // Print the number the user typed
  printf("Sum of the value is: %f", c);

  return 0;
}
```

7. Compile and run the program

```
azuredineth@linux-lab:~/calc$ gcc mycalc.c -o mycalc
azuredineth@linux-lab:~/calc$ ./mycalc
Type a number 1 and press enter:
23
Type a number 1 and press enter:
34
Sum of the value is: 57.000000azuredineth@linux-lab:~/calc$
```

2. Part 2 - Setting up node JS server on Linux VM

1. Make the directory myserver and go inside the folder, get the latest update of apt updates,

```
azuredineth@linux-lab:~$ mkdir myserver
azuredineth@linux-lab:~$ cd myserver
azuredineth@linux-lab:~/myserver$ sudo apt update
Hit:1 http://azure.archive.ubuntu.com/ubuntu noble InRelease
Get:2 http://azure.archive.ubuntu.com/ubuntu noble-updates InRelease [126 kB]
Get:3 http://azure.archive.ubuntu.com/ubuntu noble-backports InRelease [126 kB]
Get:4 http://azure.archive.ubuntu.com/ubuntu noble-security InRelease [126 kB]
Get:5 http://azure.archive.ubuntu.com/ubuntu noble-updates/main amd64 Packages [890 kB]
Get:6 http://azure.archive.ubuntu.com/ubuntu noble-updates/main Translation-en [201 kB]
Get:7 http://azure.archive.ubuntu.com/ubuntu noble-updates/main amd64 Components [151 kB]
Get:8 http://azure.archive.ubuntu.com/ubuntu noble-updates/universe amd64 Packages [1028 kB]
Get:9 http://azure.archive.ubuntu.com/ubuntu noble-updates/universe Translation-en [257 kB]
Get:10 http://azure.archive.ubuntu.com/ubuntu noble-updates/universe amd64 Components [363 kB]
Get:11 http://azure.archive.ubuntu.com/ubuntu noble-updates/restricted amd64 Packages [695 kB]
Get:12 http://azure.archive.ubuntu.com/ubuntu noble-updates/restricted Translation-en [138 kB]
Get:13 http://azure.archive.ubuntu.com/ubuntu noble-updates/restricted amd64 Components [212 B]
Get:14 http://azure.archive.ubuntu.com/ubuntu noble-updates/multiverse amd64 Packages [23.4 kB]
Get:15 http://azure.archive.ubuntu.com/ubuntu noble-updates/multiverse Translation-en [5308 B]
Get:16 http://azure.archive.ubuntu.com/ubuntu noble-updates/multiverse amd64 Components [940 B]
Get:17 http://azure.archive.ubuntu.com/ubuntu noble-backports/main amd64 Components [208 B]
Get:18 http://azure.archive.ubuntu.com/ubuntu noble-backports/universe amd64 Packages [14.2 kB]
Get:19 http://azure.archive.ubuntu.com/ubuntu noble-backports/universe Translation-en [12.1 kB]
Get:20 http://azure.archive.ubuntu.com/ubuntu noble-backports/universe amd64 Components [20.0 kB]
Get:21 http://azure.archive.ubuntu.com/ubuntu noble-backports/restricted amd64 Components [216 B]
Get:22 http://azure.archive.ubuntu.com/ubuntu noble-backports/multiverse amd64 Components [212 B]
Get:23 http://azure.archive.ubuntu.com/ubuntu noble-security/main amd64 Packages [641 kB]
Get:24 http://azure.archive.ubuntu.com/ubuntu noble-security/main Translation-en [122 kB]
Get:25 http://azure.archive.ubuntu.com/ubuntu noble-security/main amd64 Components [8984 B]
Get:26 http://azure.archive.ubuntu.com/ubuntu noble-security/universe amd64 Packages [815 kB]
Get:27 http://azure.archive.ubuntu.com/ubuntu noble-security/universe Translation-en [174 kB]
Get:28 http://azure.archive.ubuntu.com/ubuntu noble-security/universe amd64 Components [52.0 kB]
Get:29 http://azure.archive.ubuntu.com/ubuntu noble-security/restricted amd64 Packages [667 kB]
Get:30 http://azure.archive.ubuntu.com/ubuntu noble-security/restricted Translation-en [131 kB]
Get:31 http://azure.archive.ubuntu.com/ubuntu noble-security/restricted amd64 Components [212 B]
Get:32 http://azure.archive.ubuntu.com/ubuntu noble-security/multiverse amd64 Packages [19.4 kB]
Get:33 http://azure.archive.ubuntu.com/ubuntu noble-security/multiverse Translation-en [4308 B]
Get:34 http://azure.archive.ubuntu.com/ubuntu noble-security/multiverse amd64 Components [212 B]
Fetched 6815 kB in 1s (6776 kB/s)
Reading package lists... Done
Building dependency tree... Done
Reading state information... Done
```

2. Install the Node JS and check the version of node and npm, then initiate the node js program,

```
azuredineth@linux-lab:~/myserver$ sudo apt install nodejs npm
Reading package lists... Done
Building dependency tree... Done
Reading state information... Done
nodejs is already the newest version (18.19.1+dfsg-6ubuntu5).
npm is already the newest version (9.2.0~ds1-2).
0 upgraded, 0 newly installed, 0 to remove and 57 not upgraded.
azuredineth@linux-lab:~/myserver$ node -v
3v18.19.1
azuredineth@linux-lab:~/myserver$ npm -v
9.2.0
azuredineth@linux-lab:~/myserver$ npm init -y
Wrote to /home/azuredineth/myserver/package.json:

{
  "name": "myserver",
  "version": "1.0.0",
  "description": "",
  "main": "index.js",
  "scripts": {
    "test": "echo \"Error: no test specified\" && exit 1"
  },
  "keywords": [],
  "author": "",
  "license": "ISC"
}
```

3. Install the node package express and update the index.js package (After this you can run index.js)

```
azuredineth@linux-lab:~/myserver$ npm install express

added 69 packages, and audited 70 packages in 2s

14 packages are looking for funding
  run `npm fund` for details

found 0 vulnerabilities
azuredineth@linux-lab:~/myserver$ nano index.js
azuredineth@linux-lab:~/myserver$ azuredineth@linux-lab:~/myserver$ node index.js
Server running at http://localhost:3000
```

4. Following is the basic code of node js server

```
const express = require('express');
const app = express();
const PORT = 3000;

app.get('/', (req, res) => {
    res.send('Hello, Node.js Server is running!');
});

app.listen(PORT, () => {
    console.log(`Server running at http://localhost:${PORT}`);
});
```

5. Update the firewall settings so that the port can be viewed from outside connections,

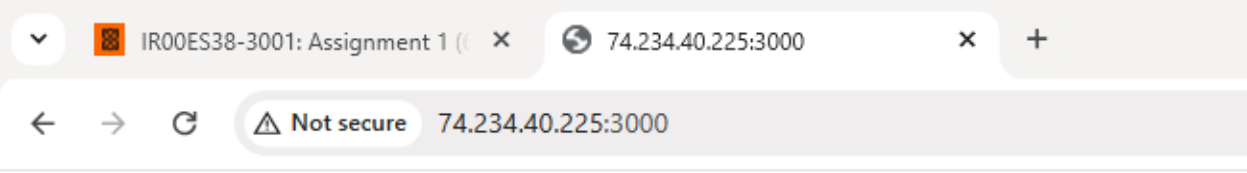
```
azuredineth@linux-lab:~/myserver$ sudo ufw allow 3000
Rules updated
Rules updated (v6)
azuredineth@linux-lab:~/myserver$ sudo ufw enable
Command may disrupt existing ssh connections. Proceed with operation (y|n)? y
Firewall is active and enabled on system startup
azuredineth@linux-lab:~/myserver$ sudo ufw status
Status: active

To                         Action      From
--                         ------      ----
22/tcp                     ALLOW       Anywhere                  # allow openssh server connection.
8080/tcp                   ALLOW       Anywhere
3000                       ALLOW       Anywhere
22/tcp (v6)                ALLOW       Anywhere (v6)             # allow openssh server connection.
8080/tcp (v6)              ALLOW       Anywhere (v6)
3000 (v6)                  ALLOW       Anywhere (v6)
```

6. Run the server and check its working with the public ip address and your port id ('http://74.234.40.225:3000/')

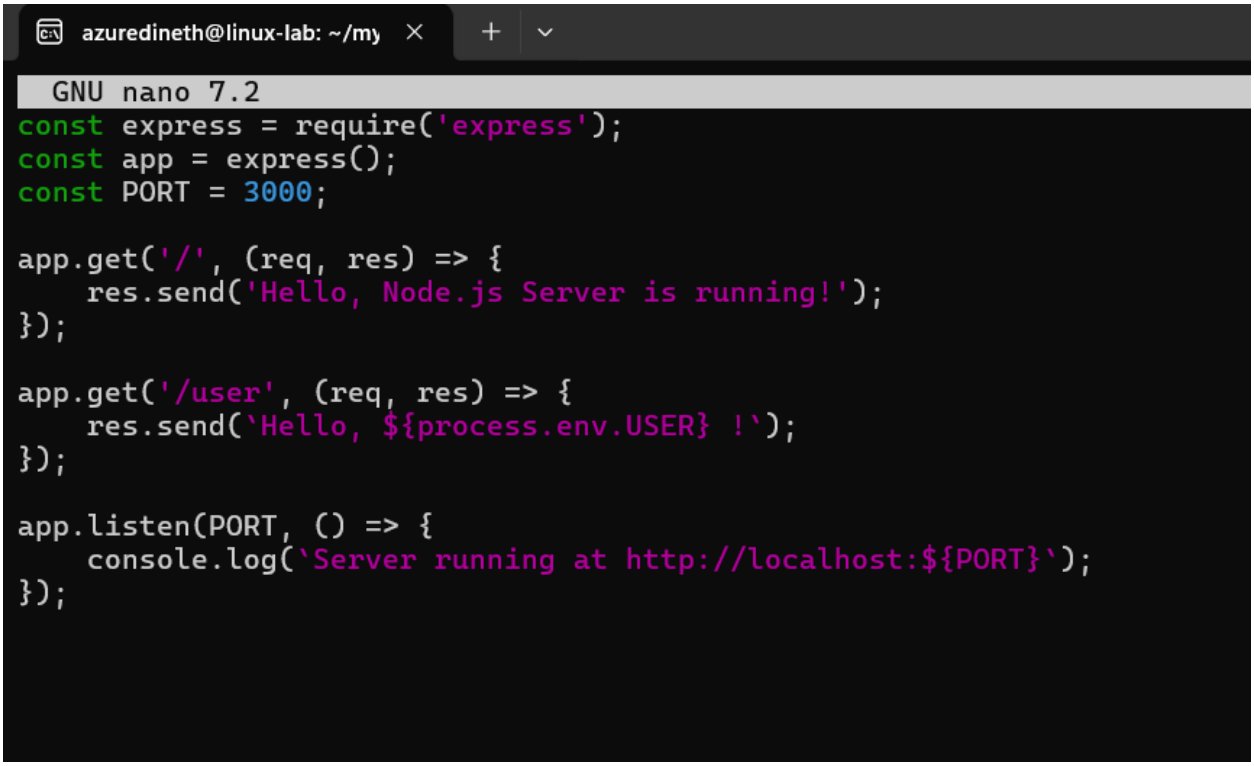
```
azuredineth@linux-lab:~/myserver$ node index.js
Server running at http://localhost:3000
^C
azuredineth@linux-lab:~/myserver$ nano index.js
```

7. If you get the following msg then the server is running with no issues,

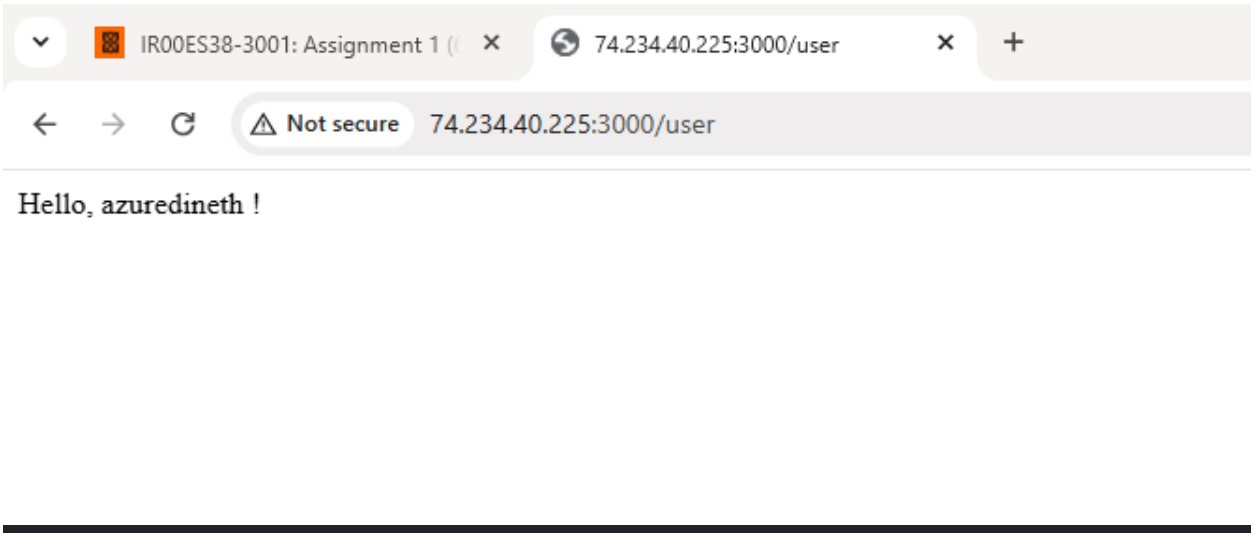


Hello, Node.js Server is running!

8. Update the index.js so the **/user** navigation can display user information by **process.env.USER**

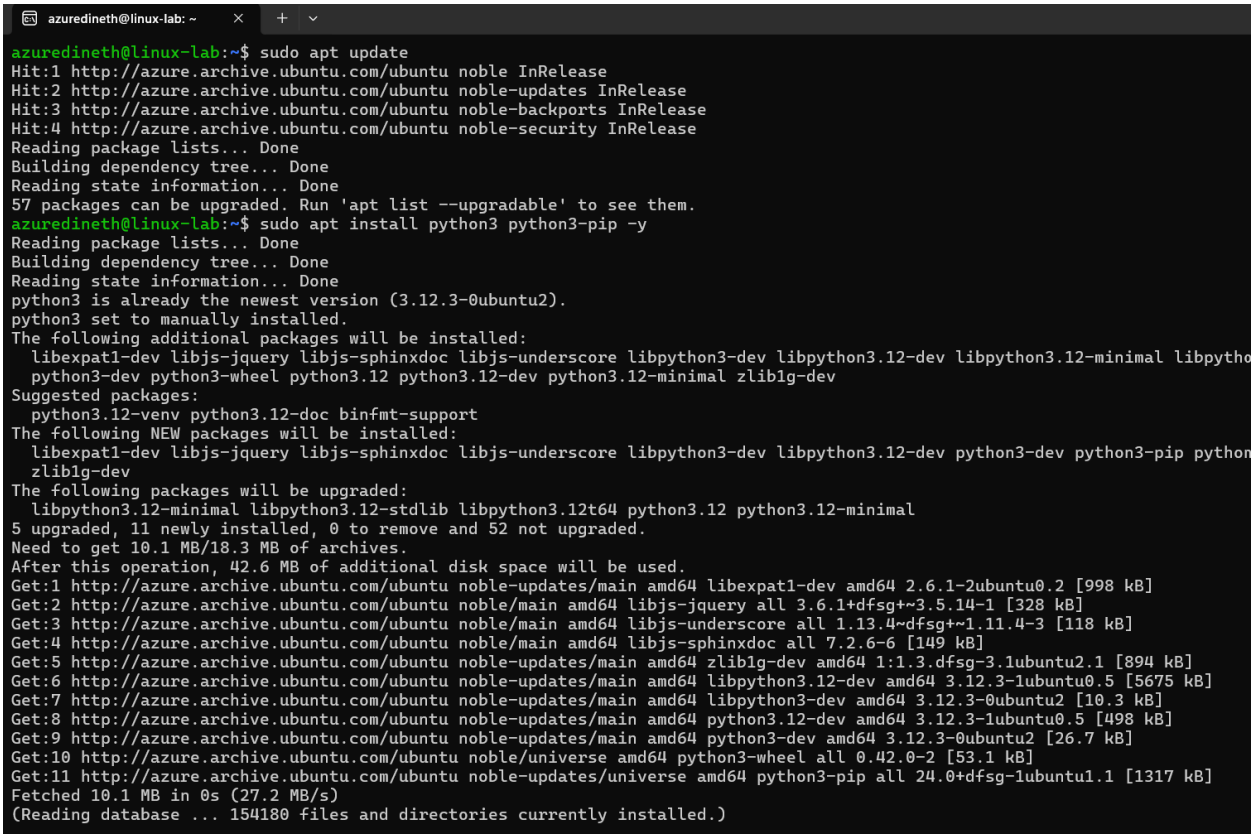


9. Check the result with **/user** navigation,

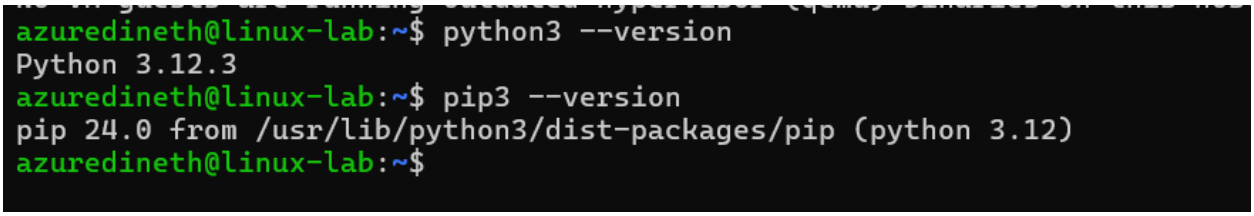

IR00ES38-3001: Assignment 1 (
74.234.40.225:3000/user
Not secure
74.234.40.225:3000/user
Hello, azuredineth !

3. Part 3 - Install Python 3, pip, and bpytop on a Linux VM

1. Get the updated apt list and install python



2. Check the python and pip version. (To make sure setup is success)



3. Install bpytop as a user, (not root user)
    - pip3 install bpytop --user

```
azuredineth@linux-lab: ~
azuredineth@linux-lab:~$ pip3 install bpytop --user
error: externally-managed-environment

× This environment is externally managed
╰─> To install Python packages system-wide, try apt install
    python3-xyz, where xyz is the package you are trying to
    install.

    If you wish to install a non-Debian-packaged Python package,
    create a virtual environment using python3 -m venv path/to/venv.
    Then use path/to/venv/bin/python and path/to/venv/bin/pip. Make
    sure you have python3-full installed.

    If you wish to install a non-Debian packaged Python application,
    it may be easiest to use pipx install xyz, which will manage a
    virtual environment for you. Make sure you have pipx installed.

    See /usr/share/doc/python3.12/README.venv for more information.

note: If you believe this is a mistake, please contact your Python installation or OS distribution provider. You can override this, at the risk of breaking
your Python installation or OS, by passing --break-system-packages.
hint: See PEP 668 for the detailed specification.
```

Humm!! .. Got an error...

4. Redo using VM inside Linux, (Install the Virtual Environment Package:)
    - sudo apt install python3-venv

```
azuredineth@linux-lab:~$ sudo apt install python3-venv
Reading package lists... Done
Building dependency tree... Done
Reading state information... Done
The following additional packages will be installed:
  python3-pip-whl python3-setuptools-whl python3.12-venv
The following NEW packages will be installed:
  python3-pip-whl python3-setuptools-whl python3-venv python3.12-venv
0 upgraded, 4 newly installed, 0 to remove and 52 not upgraded.
Need to get 2425 kB of archives.
After this operation, 2777 kB of additional disk space will be used.
Do you want to continue? [Y/n] y
Get:1 http://azure.archive.ubuntu.com/ubuntu noble-updates/universe amd64 python3-pip-whl all 24.0+dfsg-1ubuntu1.1 [1703 kB]
Get:2 http://azure.archive.ubuntu.com/ubuntu noble-updates/universe amd64 python3-setuptools-whl all 68.1.2-2ubuntu1.1 [716 kB]
Get:3 http://azure.archive.ubuntu.com/ubuntu noble-updates/universe amd64 python3.12-venv amd64 3.12.3-1ubuntu0.5 [5678 B]
Get:4 http://azure.archive.ubuntu.com/ubuntu noble-updates/universe amd64 python3-venv amd64 3.12.3-0ubuntu2 [1034 B]
Fetched 2425 kB in 0s (39.8 MB/s)
Selecting previously unselected package python3-pip-whl.
(Reading database ... 155280 files and directories currently installed.)
Preparing to unpack .../python3-pip-whl_24.0+dfsg-1ubuntu1.1_all.deb ...
Unpacking python3-pip-whl (24.0+dfsg-1ubuntu1.1) ...
Selecting previously unselected package python3-setuptools-whl.
Preparing to unpack .../python3-setuptools-whl_68.1.2-2ubuntu1.1_all.deb ...
Unpacking python3-setuptools-whl (68.1.2-2ubuntu1.1) ...
Selecting previously unselected package python3.12-venv.
Preparing to unpack .../python3.12-venv_3.12.3-1ubuntu0.5_amd64.deb ...
Unpacking python3.12-venv (3.12.3-1ubuntu0.5) ...
Selecting previously unselected package python3-venv.
Preparing to unpack .../python3-venv_3.12.3-0ubuntu2_amd64.deb ...
Unpacking python3-venv (3.12.3-0ubuntu2) ...
```

5. Create and activate Virtual Environment:

```
azuredineth@linux-lab:~$ python3 -m venv myenv
azuredineth@linux-lab:~$ source myenv/bin/activate
```

6. Now install bpytop inside the VM and run it,

```
(myenv) azuredineth@linux-lab:~$ pip install bpytop
Collecting bpytop
  Downloading bpytop-1.0.68-py3-none-any.whl.metadata (19 kB)
Collecting psutil<6.0.0,>=5.7.0 (from bpytop)
  Downloading psutil-5.9.8-cp36-abi3-manylinux_2_12_x86_64.manylinux2010_x86_64.manylinux_2_17_x86_64.manylinux2014_x86_64.whl.metadata (21 kB)
Downloading bpytop-1.0.68-py3-none-any.whl (83 kB)
   ━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━ 83.8/83.8 kB 3.6 MB/s eta 0:00:00
Downloading psutil-5.9.8-cp36-abi3-manylinux_2_12_x86_64.manylinux2010_x86_64.manylinux_2_17_x86_64.manylinux2014_x86_64.whl (288 kB)
   ━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━ 288.2/288.2 kB 12.8 MB/s eta 0:00:00
Installing collected packages: psutil, bpytop
Successfully installed bpytop-1.0.68 psutil-5.9.8
(myenv) azuredineth@linux-lab:~$ bpytop
```

7. Take a screenshot of the bpytop


BpyTOP
cpu Menu mode:full 18:54:19 + 2000ms -
8370C 3.2 GHz
CPU 1%
C1 1%
C2 1%
LAV: 0.14 0.07 0.02
up 1:03
mem graph
Total: 3.81 GiB
Used: 530 MiB
14%
Available: 3.30 GiB
86%
Cached: 895 MiB
23%
Free: 2.62 GiB
69%
disks io swap
root ▼2K 28.0 GiB
IO:
Used: 12% 3.46 GiB
Free: 88% 24.5 GiB
boot 880 MiB
IO:
Used: 13% 106 MiB
Free: 87% 712 MiB
datadrive 31.3 GiB
IO:
Used: 0% 28.0 KiB
Free:100% 29.7 GiB
efi 104 MiB
IO:
Used: 6% 6.09 GiB
net sync auto zero <b enP13405s1 n>
10K
37K
Download
▼ 1.98 KiB/s (15.8 Kibps)
▼ Top: (357 Kibps)
▼ Total: 50.0 MiB
▲ 12.3 KiB/s (98.4 Kibps)
▲ Top: (3.24 Mibps)
▲ Total: 5.92 MiB
Upload
proc filter per-core reverse tree < cpu lazy >
Pid: Program: Arguments: Threads: User: MemB Cpu%
4335 bpytop /home/azuredineth/myenv/bin/p 3 azuredin+ 27M 0.2
3971 python3 /usr/bin/python3 -u bin/WALin 5 root 34M 0.0
3919 python3 /usr/bin/python3 -u /usr/sbin 1 root 34M 0.0
1 systemd /sbin/init 1 root 13M 0.0
834 chronyd /usr/sbin/chronyd -F 1 1 _chrony 4M 0.0
1420 sshd sshd: azuredineth@pts/0 1 azuredin+ 7M 0.0
66 kworker/u4:3-e [kworker/u4:3-events_power_ef 1 root 0B 0.0
3873 kworker/1:1-mm [kworker/1:1-mm_percpu_wq] 1 root 0B 0.0
4246 packagekitd /usr/libexec/packagekitd 4 root 20M 0.0
139 systemd-journa /usr/lib/systemd/systemd-jour 1 root 17M 0.0
385 hv_kvp_daemon /usr/lib/linux-tools/6.8.0-10 1 root 2M 0.0
3373 kworker/0:0-ev [kworker/0:0-events] 1 root 0B 0.0
4130 kworker/0:1-ev [kworker/0:1-events] 1 root 0B 0.0
22 migration/1 [migration/1] 1 root 0B 0.0
2548 kworker/u4:2-e [kworker/u4:2-events_unbound] 1 root 0B 0.0
199 multipathd /sbin/multipathd -d -s 7 root 27M 0.0
2807 kworker/0:2-mm [kworker/0:2-mm_percpu_wq] 1 root 0B 0.0
3187 kworker/u4:0-f [kworker/u4:0-flush-8:16] 1 root 0B 0.0
2274 kworker/u4:4-e [kworker/u4:4-events_power_ef 1 root 0B 0.0
1037 agetty /sbin/agetty -o -p -- \u --no 1 root 2M 0.0
16 rcu_sched [rcu_sched] 1 root 0B 0.0
893 apache2 /usr/sbin/apache2 -k start 1 root 5M 0.0
714 dbus-daemon @dbus-daemon --system --addre 1 messageb+ 5M 0.0
722 polkitd /usr/lib/polkit-1/polkitd --n 4 polkitd 8M 0.0
500 systemd-resolv /usr/lib/systemd/systemd-reso 1 systemd-+ 12M 0.0
↑ select ↓ info ↵ Terminate Kill Interrupt 0/131