

**Name : Zuha Irfan**

**Roll\_No : 2023-BSE-073**

**Subject: Cloud Computing**

**Semester & Section : V-B**

**Lab :07**

### Task 1 — Print & filter environment variables

- task1\_printenv\_all.png

```
zuha@zuha:~$ printenv
SHELL=/bin/bash
CREDENTIALS_DIRECTORY=/run/credentials/getty@tty1.service
MEMORY_PRESSURE_WRITE=c29tZSAYMDAwMDAgMjAwMDAwMAA=
XDG_SEAT=seat0
PKD=/home/zuha
LOGNAME=zuha
XDG_SESSION_TYPE=tty
SYSTEMD_EXEC_PID=1526
HOME=/home/zuha
LANG=en_US.UTF-8
LS_COLORS=rs=0:di=01;34:ln=01;36:mh=00:pi=40;33:so=01;35:do=01;35:bd=40;33:01:cd=40;33:01:or=40;31:01:mi=00:su=37;41:sg=30;43:ca=00:tw=30;42:ow=34;42:st=37;44:e
x=01;32:*.tar=01;31:*.tgz=01;31:*.arc=01;31:*.arj=01;31:*.taz=01;31:*.lha=01;31:*.lzh=01;31:*.lzm=01;31:*.tlz=01;31:*.txz=01;31:*.tzo=01;31:*.t7z=0
1;31:*.zip=01;31:*.z=01;31:*.dz=01;31:*.gz=01;31:*.lrz=01;31:*.lzh=01;31:*.lzo=01;31:*.xz=01;31:*.zst=01;31:*.tzt=01;31:*.bz2=01;31:*.bz=01;31:*.tbz=0
2=01;31:*.t2=01;31:*.deb=01;31:*.rpm=01;31:*.jar=01;31:*.war=01;31:*.ear=01;31:*.sar=01;31:*.rar=01;31:*.alz=01;31:*.ace=01;31:*.zoo=01;31:*.cpio=01;31:*.7z=01;
31:*.rz=01;31:*.cab=01;31:*.wim=01;31:*.sum=01;31:*.dmg=01;31:*.esd=01;31:*.avif=01;35:*.jpg=01;35:*.jpeg=01;35:*.mjpg=01;35:*.mjpeg=01;35:*.gif=01;35:*.bmp=01;
35:*.pbm=01;35:*.pgm=01;35:*.ppm=01;35:*.tga=01;35:*.xbm=01;35:*.xpm=01;35:*.tif=01;35:*.tiff=01;35:*.png=01;35:*.svg=01;35:*.svgz=01;35:*.mng=01;35:*.pcx=01;35
:*.mov=01;35:*.mog=01;35:*.mpeg=01;35:*.m2v=01;35:*.mkv=01;35:*.webm=01;35:*.webp=01;35:*.ogm=01;35:*.mp4=01;35:*.m4v=01;35:*.mp4v=01;35:*.vob=01;35:*.qt=01;35
:*.nuv=01;35:*.umv=01;35:*.asf=01;35:*.rm=01;35:*.rmvb=01;35:*.flc=01;35:*.avi=01;35:*.fli=01;35:*.flv=01;35:*.gl=01;35:*.dl=01;35:*.xcf=01;35:*.xwd=01;35:*.yuv=
01;35:*.cgm=01;35:*.emf=01;35:*.ogv=01;35:*.ogx=01;35:*.aac=00;36:*.au=00;36:*.flac=00;36:*.m4a=00;36:*.mid=00;36:*.midi=00;36:*.mka=00;36:*.mp3=00;36:*.mpc=00;
36:*.ogg=00;36:*.ra=00;36:*.wav=00;36:*.oga=00;36:*.opus=00;36:*.spx=00;36:*.xspf=00;36:*.#*=00;90:*.bak=00;90:*.crdownload=00;90:*.dpg=00;90:*.dist=00;90:*.dpg
g-new=00;90:*.dpg-old=00;90:*.dpg-tmp=00;90:*.old=00;90:*.orig=00;90:*.part=00;90:*.rej=00;90:*.rpmnew=00;90:*.rpmorig=00;90:*.rpmsave=00;90:*.sup=00;90:*.tmp
=00;90:*.ucf-dist=00;90:*.ucf-new=00;90:*.ucf-old=00;90:
MEMORY_PRESSURE_WATCH=/sys/fs/cgroup/system.slice/system-getty.slice/getty@tty1.service/memory.pressure
INVOCATION_ID=34ea8369687841b798513f7650fc2705
LESSCLOSE=/usr/bin/lesspipe %s %s
XDG_SESSION_CLASS=user
TERM=linux
LESSOPEN=| /usr/bin/lesspipe %s
USER=zuha
SHLVL=1
XDG_VTNR=1
XDG_SESSION_ID=1
XDG_RUNTIME_DIR=/run/user/1000
XDG_DATA_DIRS=/usr/share/xdg:/usr/local/share:/usr/share:/var/lib/containers/desktop
HUSHLOGIN=FALSE
PATH=/usr/local/sbin:/usr/local/bin:/usr/sbin:/usr/bin:/sbin:/bin:/usr/games:/usr/local/games:/snap/bin
DBUS_SESSION_BUS_ADDRESS=unix:path=/run/user/1000/bus
MAIL=/var/mail/zuha
_=/usr/bin/printenv
```

- task1\_grep\_shell\_home\_user.png

```
zuha@zuha:~$ printenv | grep SHELL
SHELL=/bin/bash
zuha@zuha:~$ printenv | grep HOME
HOME=/home/zuha
zuha@zuha:~$ printenv | grep USER
USER=zuha
```

### Task 2 — Export DB\_\* variables temporarily and observe scope

- task2\_exports\_all.png

```
zuha@zuha:~$ export DB_URL="postgres://db.example.local:5432/mydb"
zuha@zuha:~$ export DB_USER="labuser"
zuha@zuha:~$ export DB_PASSWORD="labpass123"
zuha@zuha:~$
```

- task2\_echoes\_all.png

```
zuha@zuha:~$ echo "$DB_URL"
postgres://db.example.local:5432/mydb
zuha@zuha:~$ echo "$DB_USER"
labuser
zuha@zuha:~$ echo "$DB_PASSWORD"
labpass123
```

- task2\_printenv\_grep\_db.png

```
labpass123
zuha@zuha:~$ printenv | grep '^DB_'
DB_PASSWORD=labpass123
DB_USER=labuser
DB_URL=postgres://db.example.local:5432/mydb
zuha@zuha:~$
```

- task2\_after\_restart\_checks.png

```
zuha@zuha:~$ echo "$DB_URL"
postgres://db.example.local:5432/mydb
zuha@zuha:~$ printenv | grep '^DB_'
DB_PASSWORD=labpass123
DB_USER=labuser
DB_URL=postgres://db.example.local:5432/mydb
zuha@zuha:~$
```

### Task 3 — Make DB\_\* variables persistent in ~/.bashrc

- task3\_bashrc\_added.png

```
↑1
#add at the end:
#Lab 7 persistent DB variables
export DB_URL="postgres://db.example.local:5432/mydb"
export DB_USER="labuser"
export DB_PASSWORD="labpass123"
```

- task3\_source\_and\_verification.png

```

zuha@zuha:~$ source ~/.bashrc
zuha@zuha:~$ echo "$DB_URL"
postgres://db.example.local:5432/mydb
zuha@zuha:~$ echo "$DB_USER"
labuser
zuha@zuha:~$ echo "$DB_PASSWORD"
labpass123
zuha@zuha:~$ printenv | grep '^DB_'
DB_PASSWORD=labpass123
DB_USER=labuser
DB_URL=postgres://db.example.local:5432/mydb

```

- task3\_after\_restart\_persistent.png

```

zuha@zuha:~$ echo "$DB_URL"
postgres://db.example.local:5432/mydb
zuha@zuha:~$ printenv | grep '^DB_'
DB_PASSWORD=labpass123
DB_USER=labuser
DB_URL=postgres://db.example.local:5432/mydb

```

## Task 4 — System-wide environment variable, welcome script, and PATH

- task4\_etc\_environment\_before.png

```

zuha@zuha:~$ sudo cat /etc/environment
[sudo] password for zuha:
PATH="/usr/local/sbin:/usr/local/bin:/usr/sbin:/usr/bin:/sbin:/bin:/usr/games:/usr/local/games:/snap/bin"

```

- task4\_echo\_path\_before.png

```

zuha@zuha:~$ echo "$PATH"
/usr/local/sbin:/usr/local/bin:/usr/sbin:/usr/bin:/sbin:/bin:/usr/games:/usr/local/games:/snap/bin

```

- task4\_etc\_environment\_edit\_vim.png

```

PATH="/usr/local/sbin:/usr/local/bin:/usr/sbin:/usr/bin:/sbin:/bin:/usr/games:/usr/local/games:/snap/bin"
~
~

```

- task4\_etc\_environment\_after.png

```

# add line: Class="CC-<your_class_name>"

```

- task4\_echo\_class\_and\_path.png

```

zuha@zuha:~$ echo $Class

zuha@zuha:~$ echo "$PATH"
/usr/local/sbin:/usr/local/bin:/usr/sbin:/usr/bin:/sbin:/bin:/usr/games:/usr/local/games:/snap/bin

```

- task4\_welcome\_create\_and\_chmod.png

```
zuha@zuha:~$ cat > ~/welcome <<'EOF'
>
> #!/bin/bash
>
> echo "Welcome to Cloud Computing $USER"
>
> EOF

chmodzuha@zuha:~$
zuha@zuha:~$
zuha@zuha:~$
zuha@zuha:~$ chmod +x ~/welcome
zuha@zuha:~$
```

- task4\_welcome\_run\_dot.png

```
zuha@zuha:~$ chmod +x ~/welcome
zuha@zuha:~$ cd ~
./zuha@zuha:~$
zuha@zuha:~$ ./welcome
Welcome to Cloud Computing zuha
```

- task4\_bashrc\_path\_line.png

```
export PS1="zuha@zuha:~$ "
#add at end:
PATH=$PATH:~
1 change; before #3 5 seconds ago
```

- task4\_bashrc\_source\_and\_welcome.png

```
welcomezuha@zuha:~$
zuha@zuha:~$ cd ~
zuha@zuha:~$
zuha@zuha:~$ welcome
Welcome to Cloud Computing zuha
```

## Task 5 — Block and allow SSH using ufw (firewall)

- task5\_ufw\_enable\_and\_status.png

```
zuha@zuha:~$ sudo ufw enable
sudo ufw status verbose
sudo ufw status verboseFirewall is active and enabled on system startup
zuha@zuha:~$ sudo ufw enable
verbose
sudo ufw status verboseFirewall is active and enabled on system startup
zuha@zuha:~$
```

- task5\_ufw\_deny\_22\_and\_status.png

```
zuha@zuha:~$ sudo ufw deny 22/tcp
o ufw status numbered
sudo ufw status numberedRule added
Rule added (v6)
```

- task5\_ssh\_attempt\_blocked.png

```
valid_irc forever preferred_irc forever
zuha@zuha:~$ ssh zuha@192.168.231.132
zuha@192.168.231.132's password:
Welcome to Ubuntu 24.04.3 LTS (GNU/Linux 6.8.0-86-generic x86_64)

 * Documentation:  https://help.ubuntu.com
 * Management:    https://landscape.canonical.com
 * Support:       https://ubuntu.com/pro

System information as of Fri Nov  7 09:23:20 AM UTC 2025

System load:  0.01               Processes:           231
Usage of /:   87.4% of 9.75GB    Users logged in:    1
Memory usage: 12%               IPv4 address for ens33: 192.168.231.132
Swap usage:   0%

=> / is using 87.4% of 9.75GB

Expanded Security Maintenance for Applications is not enabled.

1 update can be applied immediately.
To see these additional updates run: apt list --upgradable

12 additional security updates can be applied with ESM Apps.
Learn more about enabling ESM Apps service at https://ubuntu.com/esm

*** System restart required ***
Last login: Fri Nov  7 05:21:24 2025 from 192.168.231.1
```

- task5\_ufw\_allow\_reload\_status.png

```

zuha@zuha:~$ sudo ufw allow 22/tcp
Skipping adding existing rule
Skipping adding existing rule (v6)
zuha@zuha:~$ sudo ufw reload
Firewall reloaded
zuha@zuha:~$ sudo ufw status

Status: active

To Action From
--
22/tcp ALLOW Anywhere
22/tcp (v6) ALLOW Anywhere (v6)

```

- task5\_ssh\_success\_after\_allow.png

```

zuha@zuha:~$ ssh zuha@192.168.231.132
zuha@192.168.231.132's password:
Welcome to Ubuntu 24.04.3 LTS (GNU/Linux 6.8.0-86-generic x86_64)

 * Documentation:  https://help.ubuntu.com
 * Management:    https://landscape.canonical.com
 * Support:       https://ubuntu.com/pro

System information as of Fri Nov  7 09:26:21 AM UTC 2025

System load:  0.08          Processes:            235
Usage of /:   87.4% of 9.75GB Users logged in:          1
Memory usage: 12%          IPv4 address for ens33: 192.168.231.132
Swap usage:   0%

=> / is using 87.4% of 9.75GB

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1 update can be applied immediately.
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*** System restart required ***
Last login: Fri Nov  7 09:23:21 2025 from 192.168.231.132
zuha@zuha:~$

```

## Task 6 — Configure SSH key-based login from Windows host

- task6\_windows\_sshkey\_and\_list.png

```

zuha@zuha:~$ ssh-keygen -t ed25519 -f ~/.ssh/id_lab7 -C "lab_key"
Generating public/private ed25519 key pair.
/home/zuha/.ssh/id_lab7 already exists.
Overwrite (y/n)? y
Enter passphrase (empty for no passphrase):
Enter same passphrase again:
Your identification has been saved in /home/zuha/.ssh/id_lab7
Your public key has been saved in /home/zuha/.ssh/id_lab7.pub
The key fingerprint is:
SHA256:uwrI8woStA104c9hdar54jw15tnYB9IXVw+K5yw1QMk lab_key
The key's randomart image is:
+--[ED25519 256]--+
| . . . 0.. |
| . . . 0 E 0 |
| = 0 . . 0 0 0 |
| + B + . 0 * . |
| . 0 * . S B . |
| 0 .. = 0 + 0 |
| 0 +. = B + . |
| .. 0 +. = 0 0 |
| . + 0 .. 0 |
+-----[SHA256]-----+
zuha@zuha:~$

```

```

zuha@zuha:~$ ls -la ~/.ssh
total 24
drwx----- 2 zuha zuha 4096 Nov  7 09:27 .
drwxr-x--- 21 zuha zuha 4096 Nov  7 06:30 ..
-rw----- 1 zuha zuha   0 Oct 24 10:05 authorized_keys
-rw----- 1 zuha zuha 399 Nov  7 09:29 id_lab7
-rw-r--r-- 1 zuha zuha  89 Nov  7 09:29 id_lab7.pub
-rw----- 1 zuha zuha 978 Oct 24 05:42 known_hosts
-rw-r--r-- 1 zuha zuha 142 Oct 24 05:42 known_hosts.old
zuha@zuha:~$

```

- task6\_windows\_public\_key.png

```

zuha@zuha:~$ cat ~/.ssh/id_lab7.pub
ssh-ed25519 AAAAC3NzaC1lZDI1NTE5AAAAIPjJVYCoqWHDaOsrC2ZHN7/wMrOsmRZSn+Wqtm2d8frc lab_key
zuha@zuha:~$

```

- task6\_windows\_known\_hosts\_cleared\_and\_empty.png

```

PS C:\Users\S Y S> Clear-Content $env:USERPROFILE\.ssh\known_hosts
PS C:\Users\S Y S> type $env:USERPROFILE\.ssh\known_hosts

```

- task6\_windows\_ssh\_accept\_hostkey\_and\_login.png

```

zuha@zuha:~$ ssh zuha@192.168.231.132
zuha@192.168.231.132's password:
Welcome to Ubuntu 24.04.3 LTS (GNU/Linux 6.8.0-87-generic x86_64)

 * Documentation:  https://help.ubuntu.com
 * Management:    https://landscape.canonical.com
 * Support:       https://ubuntu.com/pro

System information as of Fri Nov  7 09:53:58 AM UTC 2025

System load:  0.06               Processes:            229
Usage of /:   87.4% of 9.75GB    Users logged in:     1
Memory usage: 9%                IPv4 address for ens33: 192.168.231.132
Swap usage:   0%

=> / is using 87.4% of 9.75GB

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Last login: Fri Nov  7 09:52:55 2025 from 192.168.231.1

```

- task6\_windows\_known\_hosts\_after\_connect.png

```

PS C:\Users\S Y S> type $env:USERPROFILE\.ssh\known_hosts
PS C:\Users\S Y S> ssh zuha@192.168.231.132

```

- task6\_server\_clear\_authorized\_keys.png

```

zuha@zuha:~$ mkdir -p ~/.ssh
zuha@zuha:~$ chmod 700 ~/.ssh
zuha@zuha:~$ > ~/.ssh/authorized_keys

```

- task6\_server\_add\_key\_and\_show.png

```

zuha@zuha:~$ echo "ssh-ed25519 AAAA... yourpublickey ... comment" >> ~/.ssh/authorized_key
zuha@zuha:~$ chmod 600 ~/.ssh/authorized_keys
zuha@zuha:~$ cat ~/.ssh/authorized_keyscat ~/.ssh/authorized_keys
cat: /home/zuha/.ssh/authorized_keyscat: No such file or directory
ssh-ed25519 AAAA... yourpublickey ... comment

```

- task6\_ssh\_passwordless\_login.png



```

zuha@zuha:~$ ssh zuha@192.168.231.132
zuha@192.168.231.132's password:
Welcome to Ubuntu 24.04.3 LTS (GNU/Linux 6.8.0-87-generic x86_64)

 * Documentation:  https://help.ubuntu.com
 * Management:    https://landscape.canonical.com
 * Support:       https://ubuntu.com/pro

System information as of Fri Nov  7 09:53:58 AM UTC 2025

System load:  0.06               Processes:           229
Usage of /:   87.4% of 9.75GB    Users logged in:    1
Memory usage: 9%                IPv4 address for ens33: 192.168.231.132
Swap usage:   0%

=> / is using 87.4% of 9.75GB

Expanded Security Maintenance for Applications is not enabled.

1 update can be applied immediately.
To see these additional updates run: apt list --upgradable

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Learn more about enabling ESM Apps service at https://ubuntu.com/esm

Last login: Fri Nov  7 09:52:55 2025 from 192.168.231.1

```

- task6\_ssh\_with\_identity\_file.png

```

zuha@zuha:~$ ssh -i ~/.ssh/id_lab7 zuha@192.168.231.132
zuha@192.168.231.132's password:
Welcome to Ubuntu 24.04.3 LTS (GNU/Linux 6.8.0-87-generic x86_64)

 * Documentation:  https://help.ubuntu.com
 * Management:    https://landscape.canonical.com
 * Support:       https://ubuntu.com/pro

System information as of Fri Nov  7 10:01:01 AM UTC 2025

System load:  0.0               Processes:           239
Usage of /:   87.4% of 9.75GB    Users logged in:    1
Memory usage: 9%                IPv4 address for ens33: 192.168.231.132
Swap usage:   0%

=> / is using 87.4% of 9.75GB

Expanded Security Maintenance for Applications is not enabled.

1 update can be applied immediately.
To see these additional updates run: apt list --upgradable

12 additional security updates can be applied with ESM Apps.
Learn more about enabling ESM Apps service at https://ubuntu.com/esm

Last login: Fri Nov  7 09:55:05 2025 from 192.168.231.132

```

