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Roll_No : 2023-BSE-073

Subject: Cloud Computing

Semester & Section : V-B

Lab :07

Task 1 — Print & filter environment variables

- task1_printenv_all.png

```
zsh: cannot access '/tmp/Desktop/PSL/10_Script/11_Env' or directory
zuha@zuha:~$ printenv
SHELL=/bin/bash
CREDENTIALS_DIRECTORY=/run/credentials/getty@tty1.service
MEMORY_PRESSURE_WRITE=c29tZSAyMDAwMDAgMjAwMDAwMAA=
XDG_SEAT=seat0
PWD=/home/zuha
LOGNAME=zuha
XDG_SESSION_TYPE=tty
SYSTEM_EXEC_PID=1526
HOME=/home/zuha
LANG=en_US.UTF-8
LS_COLORS=r=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:*,lzma=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:*,lz=01:31:*,lzma=01:31:*,xz=01:31:*,zst=01:31:*,lzst=01:31:*,bz2=01:31:*,bz=01:31:*,tbz=01:31:*,tb2
2=01:31:*,tz=01:31:*,deb=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:*,dum=01:31:*,esd=01:31:*,avif=01:35:*,jpg=01:35:*,jpeg=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:*,png=01:35:*,svg=01:35:*,mng=01:35:*,pcx=01:35
*:*,mov=01:35:*,mpg=01:35:*,mpeg=01:35:*,m2v=01:35:*,mkv=01:35:*,webm=01:35:*,webp=01:35:*,ogg=01:35:*,mp4=01:35:*,m4v=01:35:*,vob=01:35:*,qt=01:35
*:*,nuv=01:35:*,umvc=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:*,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:*,mp3new=00:90:*,part=00:90:*,rej=00:90:*,rppmorig=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/getty@tty1.service/memory.pressure
INVOCATION_ID=34ea83696878410798513f7b50fc2705
XDG_SESSION_CLASS=user
TERM=linux
LESSOPEN=| /usr/bin/lesspipe %
USER=zuha
SHLVL=1
XDG_VTNR=1
XDG_SESSION_ID=1
XDG_RUNTIME_DIR=/run/user/1000
XDG_DATA_DIRS=/usr/share/gnome:/usr/local/share:/usr/share:/var/lib/snapd/desktop
HUSHLOGIN=False
PATH=/usr/local/sbin:/usr/local/bin:/usr/sbin:/usr/bin:/sbin:/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
zuha@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

```
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

```
t1

#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

chmod zuha@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 DB_PASSWORD=123pass123
#add at end:
PATH=$PATH:~
1 change; before #3 5 seconds ago
```

- task4_bashrc_source_and_welcome.png

```
welcomezuha:~$  

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_if_in forever preferred_if_in forever
zuha@zuha:~$ ssh zuha@192.168.231.132
zuh@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

```
valid_ltt forever preferred_ltt 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 09:26:21 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 ens3: 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.
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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/zuhu/.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/zuhu/.ssh/id_lab7
Your public key has been saved in /home/zuhu/.ssh/id_lab7.pub
The key fingerprint is:
SHA256:uwrI8woStA104c9hdar54jw15tnYB9IXVw+K5yw1QMK lab_key
The key's randomart image is:
+-- [ED25519 256] --
| . . . 0 ..
| . . . o E o
| = 0 . o o o
| + B + o * .
| .o * . S B .
| o ..= o + o
| o +.=B + .
| ..o+= o o
| .+o ..o
+--- [SHA256] -----
```

```
[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
```

- task6_windows_public_key.png

```
[lab_key]
[zuha@zuha:~]$ cat ~/.ssh/id_lab7.pub
ssh-ed25519 AAAAC3NzaC1lZDI1NTE5AAAIPjJVYCoqWHdAOsrC2ZHn7/wMr0smRZSn+Wqtm2d8frc 1ab_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
zuhah@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

 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 09:52:55 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_keys
zuha@zuha:~$ chmod 600 ~/.ssh/authorized_keys
zuha@zuha:~$ cat ~/.ssh/authorized_keys
cat: /home/zuhah/.ssh/authorized_keys: No such file or directory
ssh-ed25519 AAAA... yourpublickey ... comment
```

- task6_ssh_passwordless_login.png

```
zuhu@zuhu:~$ ssh zuha@192.168.231.132
zuhu@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.
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Last login: Fri Nov  7 09:52:55 2025 from 192.168.231.1
```

- task6_ssh_with_identity_file.png

```
zuhu@zuhu:~$ ssh -i ~/.ssh/id_lab7 zuha@192.168.231.132
zuhu@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
```

