CLOUD COMPUTING LAB
BSE (V-B)

Submitted By:

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Roll No:

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Submitted To:

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LAB 07

Environment Variables, PATH, UFW, and SSH Key Authentication

Task 1

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

```
TERM=xterm
LESSOPEN=| /usr/bin/lesspipe %s
USER=musfira
SHLVL=1
XDG_SESSION_ID=3
XDG_RUNTIME_DIR=/run/user/1000
SSH_CLIENT=192.168.111.1 51129 22
XDG_DATA_DIRS=/usr/share/gnome:/usr/local/share:/usr/share:/var/lib/snapd/deskto
p
PATH=/usr/local/sbin:/usr/local/bin:/usr/sbin:/usr/bin:/sbin:/bin:/usr/games:/us
r/local/games:/snap/bin
DBUS_SESSION_BUS_ADDRESS=unix:path=/run/user/1000/bus
SSH_TTY=/dev/pts/0
_=/usr/bin/printenv
musfira@ubuntu:~$
```

Task 2

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

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

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

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

Task 3

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

```
# Lab 7 persistent DB variables
export DB_URL="postgres://db.example.local:5432/mydb"
export DB_USER="labuser"
export DB_PASSWORD="labpass123"
-- INSERT --
```

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

Task 4

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

PATH=$PATH:~
-- INSERT --
```

```
musfira@ubuntu:~$ vim ~/.bashrc
musfira@ubuntu:~$ source ~/.bashrc
cd ~
welcome
Welcome to Cloud Computing musfira
musfira@ubuntu:~$
```

```
musfira@ubuntu:~$ echo $Class
echo "$PATH"

/usr/local/sbin:/usr/local/bin:/usr/sbin:/usr/bin:/sbin:/bin:/usr/games:/usr/local/games:/snap/bin
musfira@ubuntu:~$
```

```
musfira@ubuntu:~$ echo "$PATH"
/usr/local/sbin:/usr/local/bin:/usr/sbin:/usr/bin:/sbin:/bin:/usr/games:/usr/local/games:/snap/bin
musfira@ubuntu:~$
```

```
musfira@ubuntu:~$ sudo vim /etc/environment
musfira@ubuntu:~$ cat /etc/environment
cat /etc/environment
PATH="/usr/local/sbin:/usr/local/bin:/usr/sbin:/usr/bin:/sbin:/bin:/usr/games:/usr/local/games:/snap/bin"
Class="CC-V-B-2023-BSE-045"
PATH="/usr/local/sbin:/usr/local/bin:/usr/sbin:/usr/bin:/sbin:/bin:/usr/games:/usr/local/games:/snap/bin"
Class="CC-V-B-2023-BSE-045"
musfira@ubuntu:~$
```

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

```
PATH="/usr/local/sbin:/usr/local/bin:/usr/sbin:/usr/bin:/sbin:/bin:/usr/games:/usr/local/games:/snap/bin"
Class="CC-V-B-2023-BSE-045"
```

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

chmod +x ~/welcome
musfira@ubuntu:~$
```

```
musfira@ubuntu:~$ cd ~
./welcome
Welcome to Cloud Computing musfira
musfira@ubuntu:~$
```

Task 5

```
Microsoft Windows [Version 10.0.26200.6901]
(c) Microsoft Corporation. All rights reserved.

C:\Users\Musfi>ssh musfira@192.168.111.136
ssh: connect to host 192.168.111.136 port 22: Connection timed out

C:\Users\Musfi>
```

```
Expanded Security Maintenance for Applications is not enabled.

21 updates can be applied immediately.
16 of these updates are standard security updates.
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 04:23:09 2025 from 192.168.111.1
musfira@ubuntu:~$
```

```
musfira@ubuntu:~$ sudo ufw allow 22/tcp
sudo ufw reload
sudo ufw status
Rule updated
Rule updated (v6)
Firewall reloaded
Status: active

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

musfira@ubuntu:~$
```

```
musfira@ubuntu:~$ sudo ufw deny 22/tcp
sudo ufw status numbered
Rule added
Rule added (v6)
Status: active

     To                    Action      From
     --                    ------      ----
[ 1] 22/tcp                DENY IN     Anywhere
[ 2] 22/tcp (v6)           DENY IN     Anywhere (v6)

musfira@ubuntu:~$
```

```
musfira@ubuntu:~$ sudo ufw enable
sudo ufw status verbose
[sudo] password for musfira:
Command may disrupt existing ssh connections. Proceed with operation (y|n)? Y
Firewall is active and enabled on system startup
Status: active
Logging: on (low)
Default: deny (incoming), allow (outgoing), deny (routed)
New profiles: skip
musfira@ubuntu:~$
```

Task 6

```
musfira@ubuntu:~$ echo "ssh-ed25519 AAAA... yourpublickey ... comment" >> ~/.ssh/authorized_keys
musfira@ubuntu:~$ chmod 600 ~/.ssh/authorized_keys
musfira@ubuntu:~$ cat ~/.ssh/authorized_keys
ssh-ed25519 AAAA... yourpublickey ... comment
ssh-ed25519 AAAA... yourpublickey ... comment
musfira@ubuntu:~$
```

```
musfira@ubuntu:~$ mkdir -p ~/.ssh
chmod 700 ~/.ssh
> ~/.ssh/authorized_keys
musfira@ubuntu:~$
```

```
https://ubuntu.com/engage/secure-kubernetes-at-the-edge

Expanded Security Maintenance for Applications is not enabled.

21 updates can be applied immediately.
16 of these updates are standard security updates.
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 05:07:11 2025 from 192.168.111.136
musfira@ubuntu:~$
```

```
musfira@ubuntu:~$ ssh musfira@192.168.111.136
musfira@192.168.111.136'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
```

```
PS C:\Users\Musfi> type $env:USERPROFILE\.ssh\known_hosts
PS C:\Users\Musfi>
```

```
Windows PowerShell
Copyright (C) Microsoft Corporation. All rights reserved.

Install the latest PowerShell for new features and improvements! ht

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

```
musfira@ubuntu:~$ echo "ssh-ed25519 AAAA...yourpublickey... lab_key" >> ~/.ssh/authorized_keys
musfira@ubuntu:~$
```

```
Expanded Security Maintenance for Applications is not enabled.

21 updates can be applied immediately.
16 of these updates are standard security updates.
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 05:03:47 2025 from 192.168.111.1
musfira@ubuntu:~$
```

```
musfira@ubuntu:~$ ssh-keygen -t ed25519 -f ~/.ssh/id_lab7 -C "lab_key"
Generating public/private ed25519 key pair.
Enter passphrase (empty for no passphrase):
Enter same passphrase again:
Your identification has been saved in /home/musfira/.ssh/id_lab7
Your public key has been saved in /home/musfira/.ssh/id_lab7.pub
The key fingerprint is:
SHA256:lJjzNj+PKfuV/WDJEu5Ch/GWKIVVJl/9XMucGLxovKE lab_key
The key's randomart image is:
+--[ED25519 256]--+
|          ..+ .. |
|       o ..+ + o |
|      + oo. o *.=|
|      +. o= o =o|
|       S.o=+.    |
|      ..E+o== .  |
|        ooo= *   |
|       . .B o o  |
|        .++.o   .|
+----[SHA256]-----+
musfira@ubuntu:~$ ls -la ~/.ssh
total 24
drwx------  2 musfira musfira 4096 Nov  7 04:59 .
drwxr-x--- 28 musfira musfira 4096 Nov  7 04:42 ..
-rw-------  1 musfira musfira    0 Oct 19 08:45 authorized_keys
-rw-------  1 musfira musfira  399 Nov  7 04:59 id_lab7
-rw-r--r--  1 musfira musfira   89 Nov  7 04:59 id_lab7.pub
-rw-------  1 musfira musfira  978 Oct 25 13:17 known_hosts
-rw-r--r--  1 musfira musfira  142 Oct 25 13:15 known_hosts.old
musfira@ubuntu:~$
```

EXAM EVALUTAION

Q-01

```
USER=musfira
SHLVL=1
DB_URL=postgres://db.example.local:5432/mydb
XDG_SESSION_ID=3
XDG_RUNTIME_DIR=/run/user/1000
SSH_CLIENT=192.168.111.1 51129 22
XDG_DATA_DIRS=/usr/share/gnome:/usr/local/share:/usr/sh
PATH=/usr/local/sbin:/usr/local/bin:/usr/sbin:/usr/bin
DBUS_SESSION_BUS_ADDRESS=unix:path=/run/user/1000/bus
SSH_TTY=/dev/pts/0
OLDPWD=/home/musfira
_=/usr/bin/printenv
musfira@ubuntu:~$
```

```
musfira@ubuntu:~$ printenv PATH
printenv LANG
printenv PWD
/usr/local/sbin:/usr/local/bin:/usr/sbin:/usr/bin:/sbin:/bin:/usr/games:/usr/local/games:/snap/bin:/home/musfira
en_US.UTF-8
/home/musfira
musfira@ubuntu:~$
```

Q-02

```
musfira@ubuntu:~$ export STUDENT_NAME="Musfira"
export STUDENT_ROLL_NUMBER="FJWU12345"
export STUDENT_SEMESTER="7th"
musfira@ubuntu:~$ echo $STUDENT_NAME
echo $STUDENT_ROLL_NUMBER
echo $STUDENT_SEMESTER
Musfira
FJWU12345
7th
musfira@ubuntu:~$ printenv | grep STUDENT_
STUDENT_NAME=Musfira
STUDENT_SEMESTER=7th
STUDENT_ROLL_NUMBER=FJWU12345
musfira@ubuntu:~$ echo $STUDENT_NAME
printenv | grep STUDENT_
Musfira
STUDENT_NAME=Musfira
STUDENT_SEMESTER=7th
STUDENT_ROLL_NUMBER=FJWU12345
musfira@ubuntu:~$
```

Q-03

```
musfira@ubuntu:~$ source ~/.bashrc
echo $STUDENT_NAME
printenv | grep '^STUDENT_'
-bash: /home/musfira/.bashrc: line 1:
-bash: /home/musfira/.bashrc: line 1:
Musfira
STUDENT_NAME=Musfira
STUDENT_SEMESTER=7th
STUDENT_ROLL_NUMBER=FJWU12345
musfira@ubuntu:~$ echo $STUDENT_NAME
printenv | grep '^STUDENT_'
Musfira
STUDENT_NAME=Musfira
STUDENT_SEMESTER=7th
STUDENT_ROLL_NUMBER=FJWU12345
musfira@ubuntu:~$
```

```
PATH=$PATH:~

export STUDENT_NAME="Musfira"
export STUDENT_ROLL_NUMBER="FJWU12345"
export STUDENT_SEMESTER="7th"


^G Help              ^O Write Out        ^W Where Is
```

Q-04

```
musfira@ubuntu:~$ sudo ufw deny proto icmp from any to any
sudo ufw status numbered
ERROR: Unsupported protocol 'icmp'
Status: active

     To                          Action      From
     --                          ------      ----
[ 1] 22/tcp                      ALLOW IN    Anywhere
[ 2] 22/tcp (v6)                 ALLOW IN    Anywhere (v6)

musfira@ubuntu:~$
```

```
musfira@ubuntu:~$ sudo ufw enable
sudo ufw status
[sudo] password for musfira:
Command may disrupt existing ssh connections. Proceed with operation (y|n)? y
Firewall is active and enabled on system startup
Status: active

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

musfira@ubuntu:~$
```

```
PS C:\Users\Musfi> ping 192.168.111.132

Pinging 192.168.111.132 with 32 bytes of data:
Reply from 192.168.111.1: Destination host unreachable.
Request timed out.
Request timed out.
Request timed out.

Ping statistics for 192.168.111.132:
    Packets: Sent = 4, Received = 1, Lost = 3 (75% loss),
PS C:\Users\Musfi>
```

```
PS C:\Users\Musfi>  ping 192.168.111.132

Pinging 192.168.111.132 with 32 bytes of data:
Request timed out.
Request timed out.
Request timed out.
Request timed out.

Ping statistics for 192.168.111.132:
    Packets: Sent = 4, Received = 0, Lost = 4 (100% loss),
PS C:\Users\Musfi>
```

```
musfira@ubuntu:~$ sudo ufw allow proto icmp from any to any
sudo ufw reload
sudo ufw status
ERROR: Unsupported protocol 'icmp'
Firewall reloaded
Status: active

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

musfira@ubuntu:~$
```