DEPARTMENT OF SOFTWARE ENGINEERING

LAB#7

SUBMITTED TO:

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REG NO: 2021-BSE-024

Lab-07 (Public)

Start coding with Codespaces

Add a README file and start coding in a secure, configurable, and dedicated development environment.

Create a codespace

MINGW64:/c/Users/DSP_Lab_S6

```
DSP_Lab_S6@DESKTOP-ADEUIMV MINGW64 ~ (master)
$ git config --global user.name "KDJ-Malik"

DSP_Lab_S6@DESKTOP-ADEUIMV MINGW64 ~ (master)
$ git config --global user.email "23-22411-030@se.fjwu.edu.pk"

DSP_Lab_S6@DESKTOP-ADEUIMV MINGW64 ~ (master)
$ git config --list
diff.astextplain.textconv=astextplain
filter.lfs.clean=git-lfs clean -- %f
filter.lfs.smudge=git-lfs smudge -- %f
filter.lfs.process=git-lfs filter-process
filter.lfs.required=true
http.sslbackend=openssl
http.sslcainfo=C:/Program Files/Git/mingw64/etc/ssl/certs/ca-bundle.crt
core.autocrlf=true
core.fscache=true
core.symlinks=false
pull.rebase=false
credential.helper=manager
credential.https://dev.azure.com.usehttppath=true
init.defaultbranch=master
user.name=KDJ-Malik
user.email=23-22411-030@se.fjwu.edu.pk
core.repositoryformatversion=0
core.filemode=false
core.bare=false
core.logallrefupdates=true
core.symlinks=false
core.ignorecase=true
remote.origin.url=git@github.com:KDJ-Malik/KDJ-Malik.github.io.git
```

```
DSP_Lab_S6@DESKTOP-ADEUIMV MINGW64 ~ (master)
$ ssh-keygen -t ed25519 -C "23-22411-030@se.fjwu.edu.pk"
Generating public/private ed25519 key pair.
Enter file in which to save the key (/c/Users/DSP_Lab_S6/.ssh/id_ed25519):
Enter passphrase (empty for no passphrase):
Enter same passphrase again:
Your identification has been saved in /c/Users/DSP_Lab_S6/.ssh/id_ed25519
Your public key has been saved in /c/Users/DSP_Lab_S6/.ssh/id_ed25519.pub
The key fingerprint is:
SHA256:hfbnrrI3ENSnBHZzDC9rl5ySupGopxTsXTRjy1PmD+w 23-22411-030@se.fjwu.edu.pk
The key's randomart image is:
+--[ED25519 256]--+
|        oo+o.    |
|      ..oo+o     |
|      .B.=o.     |
|   .  =.@.= o    |
|    o   S.X *    |
|   . o o.* B     |
|    o o +.E o    |
|   . .. .oo.     |
|    oo  o+.o.    |
+----[SHA256]-----+

DSP_Lab_S6@DESKTOP-ADEUIMV MINGW64 ~ (master)
$ eval "$(ssh-agent -s)"
Agent pid 1685

DSP_Lab_S6@DESKTOP-ADEUIMV MINGW64 ~ (master)
$ ssh-add ~/.ssh/id_ed25519
Identity added: /c/Users/DSP_Lab_S6/.ssh/id_ed25519 (23-22411-030@se.fjwu.edu.pk
)

DSP_Lab_S6@DESKTOP-ADEUIMV MINGW64 ~ (master)
$

DSP_Lab_S6@DESKTOP-ADEUIMV MINGW64 ~ (master)
$ cat ~/.ssh/id_ed25519.pub
ssh-ed25519 AAAAC3NzaC1lZDI1NTE5AAAAIJeNPU4Ul11PRLgbFT+eg+HpSCHreO/vuHf9T+wj6agz
 23-22411-030@se.fjwu.edu.pk
```

key2
SHA256:hfbnrrI3ENSnBHZzDC9rl5ySupGopxTsXTRjy1PmD+w
Added on Dec 8, 2025
Never used — Read/write
SSH
Delete

```
DSP_Lab_S6@DESKTOP-ADEUIMV MINGW64 ~ (master)
$ git clone git@github.com:KDJ-Malik/Lab-07.git
Cloning into 'Lab-07'...
warning: You appear to have cloned an empty repository.

DSP_Lab_S6@DESKTOP-ADEUIMV MINGW64 ~/Lab-07 (main)
$ touch readme.md

DSP_Lab_S6@DESKTOP-ADEUIMV MINGW64 ~/Lab-07 (main)
$ git add readme.md

DSP_Lab_S6@DESKTOP-ADEUIMV MINGW64 ~/Lab-07 (main)
$ git commit -m "Initial commit"
[main (root-commit) 3f13b51] Initial commit
 1 file changed, 0 insertions(+), 0 deletions(-)
 create mode 100644 readme.md

DSP_Lab_S6@DESKTOP-ADEUIMV MINGW64 ~/Lab-07 (main)
$ git push -u origin main
Enumerating objects: 3, done.
Counting objects: 100% (3/3), done.
Writing objects: 100% (3/3), 222 bytes | 222.00 KiB/s, done.
Total 3 (delta 0), reused 0 (delta 0), pack-reused 0 (from 0)
To github.com:KDJ-Malik/Lab-07.git
 * [new branch]      main -> main
branch 'main' set up to track 'origin/main'.

DSP_Lab_S6@DESKTOP-ADEUIMV MINGW64 ~/Lab-07 (main)
$
```

Task 1 — Print & filter environment variables

```
khadija@ubuntu:~/Lab-07$ printenv
SHELL=/bin/bash
PWD=/home/khadija/Lab-07
LOGNAME=khadija
XDG_SESSION_TYPE=tty
HOME=/home/khadija
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
30;43:ca=00:tw=30;42:ow=34;42:st=37;44:ex=01;32:*.tar=01;31:*.tgz=01;31:*.arc=01;31:*.arj=01;31:*.taz=01
*.lz4=01;31:*.lzh=01;31:*.lzma=01;31:*.tlz=01;31:*.txz=01;31:*.tzo=01;31:*.t7z=01;31:*.zip=01;31:*.z=01;
gz=01;31:*.lrz=01;31:*.lz=01;31:*.lzo=01;31:*.xz=01;31:*.zst=01;31:*.tzst=01;31:*.bz2=01;31:*.bz=01;31:
2=01;31:*.tz=01;31:*.deb=01;31:*.rpm=01;31:*.jar=01;31:*.war=01;31:*.ear=01;31:*.sar=01;31:*.rar=01;31:
=01;31:*.zoo=01;31:*.cpio=01;31:*.7z=01;31:*.rz=01;31:*.cab=01;31:*.wim=01;31:*.swm=01;31:*.dwm=01;31:*.
=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;
.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=0
:*.mov=01;35:*.mpg=01;35:*.mpeg=01;35:*.m2v=01;35:*.mkv=01;35:*.webm=01;35:*.webp=01;35:*.ogm=01;35:*.mp
;35:*.mp4v=01;35:*.vob=01;35:*.qt=01;35:*.nuv=01;35:*.wmv=01;35:*.asf=01;35:*.rm=01;35:*.rmvb=01;35:*.fl
;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=
5:*.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
36:*.ogg=00;36:*.ra=00;36:*.wav=00;36:*.oga=00;36:*.opus=00;36:*.spx=00;36:*.xspf=00;36:*~=00;90:*#=00;9
crdownload=00;90:*.dpkg-dist=00;90:*.dpkg-new=00;90:*.dpkg-old=00;90:*.dpkg-tmp=00;90:*.old=00;90:*.orig
;90:*.rej=00;90:*.rpmnew=00;90:*.rpmorig=00;90:*.rpmsave=00;90:*.swp=00;90:*.tmp=00;90:*.ucf-dist=00;90:
*.ucf-old=00;90:
SSH_CONNECTION=192.168.154.1 59674 192.168.154.141 22
LESSCLOSE=/usr/bin/lesspipe %s %s
XDG_SESSION_CLASS=user
TERM=xterm-256color
LESSOPEN=| /usr/bin/lesspipe %s
USER=khadija
SHLVL=1
XDG_SESSION_ID=58
XDG_RUNTIME_DIR=/run/user/1000
SSH_CLIENT=192.168.154.1 59674 22
XDG_DATA_DIRS=/usr/share/gnome:/usr/local/share:/usr/share:/var/lib/snapd/desktop
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
SSH_TTY=/dev/pts/0
_=/usr/bin/printenv
OLDPWD=/home/khadija
khadija@ubuntu:~/Lab-07$
```

```
khadija@ubuntu:~/Lab-07$ printenv | grep SHELL
SHELL=/bin/bash
khadija@ubuntu:~/Lab-07$ printenv | grep HOME
HOME=/home/khadija
khadija@ubuntu:~/Lab-07$ printenv | grep USER
USER=khadija
khadija@ubuntu:~/Lab-07$
```

Task 2 — Export DB_* variables temporarily and observe scope

```
khadija@ubuntu:~/Lab-07$ export DB_URL="postgres://db.example.local:5432/mydb"
khadija@ubuntu:~/Lab-07$ export DB_USER="labuser"
khadija@ubuntu:~/Lab-07$ export DB_PASSWORD="labpass123"
khadija@ubuntu:~/Lab-07$
```

```
khadija@ubuntu:~/Lab-07$ echo "$DB_URL"
postgres://db.example.local:5432/mydb
khadija@ubuntu:~/Lab-07$ echo "$DB_USER"
labuser
khadija@ubuntu:~/Lab-07$ echo "$DB_PASSWORD"
labpass123
khadija@ubuntu:~/Lab-07$
```

```
khadija@ubuntu:~/Lab-07$ printenv | grep '^DB_'
DB_PASSWORD=labpass123
DB_USER=labuser
DB_URL=postgres://db.example.local:5432/mydb
khadija@ubuntu:~/Lab-07$
```

```
khadija@ubuntu:~/Lab-07$ echo "$DB_URL"

khadija@ubuntu:~/Lab-07$ printenv | grep '^DB_'
khadija@ubuntu:~/Lab-07$
```

Task 3 — Make DB_* variables persistent in ~/.bashrc

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

```
khadija@ubuntu:~/Lab-07$ khadija@ubuntu:~/Lab-07$ source ~/.bashrc
khadija@ubuntu:~/Lab-07$ echo "$DB_URL"
postgres://db.example.local:5432/mydb
khadija@ubuntu:~/Lab-07$ echo "$DB_USER"
labuser
khadija@ubuntu:~/Lab-07$ echo "$DB_PASSWORD"
labpass123
khadija@ubuntu:~/Lab-07$ printenv | grep '^DB_'
DB_PASSWORD=labpass123
DB_USER=labuser
DB_URL=postgres://db.example.local:5432/mydb
khadija@ubuntu:~/Lab-07$
```

```
khadija@ubuntu:~/Lab-07$ echo "$DB_URL"
postgres://db.example.local:5432/mydb
khadija@ubuntu:~/Lab-07$ printenv | grep '^DB_'
DB_PASSWORD=labpass123
DB_USER=labuser
DB_URL=postgres://db.example.local:5432/mydb
khadija@ubuntu:~/Lab-07$
```

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

```
khadija@ubuntu:~/Lab-07$ sudo cat /etc/environment
[sudo] password for khadija:
PATH="/usr/local/sbin:/usr/local/bin:/usr/sbin:/usr/bin:/sbin:/bin:/usr/games:/usr/local/games:/snap/bin"
khadija@ubuntu:~/Lab-07$
```

```
khadija@ubuntu:~/Lab-07$ echo "$PATH"
/usr/local/sbin:/usr/local/bin:/usr/sbin:/usr/bin:/sbin:/bin:/usr/games:/usr/local/games:/snap/bin
khadija@ubuntu:~/Lab-07$
```

```
khadija@ubuntu: ~/Lab-07
PATH="/usr/local/sbin:/usr/local
Class="CC_Khadija_Malik"
```

```
khadija@ubuntu:~/Lab-07$ 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_Khadija_Malik"
khadija@ubuntu:~/Lab-07$
```

```
khadija@ubuntu:~$ cd Lab-07
khadija@ubuntu:~/Lab-07$ echo $Class
CC_Khadija_Malik
khadija@ubuntu:~/Lab-07$ echo "$PATH"
/usr/local/sbin:/usr/local/bin:/usr/sbin:/usr/bin:/sbin:/bin:/usr/games:/usr/local/games:/snap/bin
khadija@ubuntu:~/Lab-07$
```

```
khadija@ubuntu:~/Lab-07$ cat > ~/welcome <<'EOF'
> #!/bin/bash
> echo "Welcome to Cloud Computing $USER"
> EOF
khadija@ubuntu:~/Lab-07$ chmod +x ~/welcome
khadija@ubuntu:~/Lab-07$
```

```
khadija@ubuntu:~/Lab-07$ cd ~
khadija@ubuntu:~$ ./welcome
Welcome to Cloud Computing khadija
khadija@ubuntu:~$
```

```
PATH=$PATH:~
```

```
khadija@ubuntu:~$ cd ~
khadija@ubuntu:~$ welcome
Welcome to Cloud Computing khadija
khadija@ubuntu:~$
```

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

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

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

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

khadija@ubuntu:~$
```

```
C:\Users\DSP_Lab_S6>ssh khadija@192.168.154.141
ssh: connect to host 192.168.154.141 port 22: Connection timed out

C:\Users\DSP_Lab_S6>
```

```
khadija@ubuntu:~$ sudo ufw allow 22/tcp
[sudo] password for khadija:
Rule updated
Rule updated (v6)
khadija@ubuntu:~$ sudo ufw reload
Firewall reloaded
khadija@ubuntu:~$ sudo ufw status
Status: active

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

khadija@ubuntu:~$
```

```
C:\Users\DSP_Lab_S6>ssh khadija@192.168.154.141
khadija@192.168.154.141'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 Mon Dec  8 07:36:31 AM UTC 2025

  System load:  0.0               Processes:             286
  Usage of /:   53.1% of 19.51GB  Users logged in:       1
  Memory usage: 26%               IPv4 address for ens33: 192.168.154.141
  Swap usage:   0%


Expanded Security Maintenance for Applications is not enabled.

45 updates 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: Mon Dec  8 07:14:12 2025 from 192.168.154.1
khadija@ubuntu:~$
```

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

```
Command Prompt

C:\Users\DSP_Lab_S6>ssh-keygen -t ed25519 -f ~Users/DSP_Lab_S6/.ssh/id_lab7 -C "lab_key"
Generating public/private ed25519 key pair.
Enter passphrase (empty for no passphrase):
Enter same passphrase again:
Saving key "~Users/DSP_Lab_S6/.ssh/id_lab7" failed: No such file or directory

C:\Users\DSP_Lab_S6>ssh-keygen -t ed25519 -f %USERPROFILE%\.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 C:\Users\DSP_Lab_S6\.ssh\id_lab7
Your public key has been saved in C:\Users\DSP_Lab_S6\.ssh\id_lab7.pub
The key fingerprint is:
SHA256:/OOetJC0cK4W+JBSy+ZJIN1I3n3XOZVt4VTpaeuX6Eg lab_key
The key's randomart image is:
+--[ED25519 256]--+
|              ==|
|   .         =.o|
|  + + .     . o.o.|
|. = + ... . +  + |
| . + +..S.   .. .|
|  . O .= +     . |
|   = + .= +E  o .|
|    o o. +.+.. o.|
|     .. .=...  .|
+----[SHA256]-----+

C:\Users\DSP_Lab_S6>dir %USERPROFILE%\.ssh
 Volume in drive C has no label.
 Volume Serial Number is 6C05-61A3

 Directory of C:\Users\DSP_Lab_S6\.ssh

12/08/2025  01:51 PM    <DIR>          .
12/08/2025  01:51 PM    <DIR>          ..
12/08/2025  11:37 AM               419 id_ed25519
12/08/2025  11:37 AM               109 id_ed25519.pub
12/08/2025  01:51 PM               399 id_lab7
12/08/2025  01:51 PM                90 id_lab7.pub
12/08/2025  11:45 AM             1,671 known_hosts
11/03/2025  02:40 PM               939 known_hosts.old
               6 File(s)          3,627 bytes
               2 Dir(s)  210,126,454,784 bytes free

C:\Users\DSP_Lab_S6>
```

```
C:\Users\DSP_Lab_S6>type %USERPROFILE%\.ssh\id_lab7.pub
ssh-ed25519 AAAAC3NzaC1lZDI1NTE5AAAAIPt9zKPLGRmy7J/RUCmVOWgAllORc9au6ObOzDB6KuAs lab_key

C:\Users\DSP_Lab_S6>
```

```
C:\Users\DSP_Lab_S6>echo. > %USERPROFILE%\.ssh\known_hosts

C:\Users\DSP_Lab_S6>type %USERPROFILE%\.ssh\known_hosts


C:\Users\DSP_Lab_S6>
```

```
C:\Users\DSP_Lab_S6>ssh khadija@192.168.154.141
The authenticity of host '192.168.154.141 (192.168.154.141)' can't be established.
ED25519 key fingerprint is SHA256:2j5w22FBkoCcu1IKpzWkuqYrxjxtCSza3K+wXerWuIg.
This key is not known by any other names.
Are you sure you want to continue connecting (yes/no/[fingerprint])? yes
Warning: Permanently added '192.168.154.141' (ED25519) to the list of known hosts.
khadija@192.168.154.141's password:
Welcome to Ubuntu 24.04.3 LTS (GNU/Linux 6.8.0-88-generic x86_64)

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

 System information as of Mon Dec  8 08:57:41 AM UTC 2025

  System load:  0.0                Processes:             227
  Usage of /:   52.4% of 19.51GB   Users logged in:       0
  Memory usage: 9%                 IPv4 address for ens33: 192.168.154.141
  Swap usage:   0%


Expanded Security Maintenance for Applications is not enabled.

45 updates 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: Mon Dec  8 08:47:15 2025 from 192.168.154.1
khadija@ubuntu:~$
```

```
C:\Users\DSP_Lab_S6>type %USERPROFILE%\.ssh\known_hosts

192.168.154.141 ssh-ed25519 AAAAC3NzaC1lZDI1NTE5AAAAIIZDlCEf6nehfk2rtlJKZ9EK1qikYKkijZhBEFBmvExw
192.168.154.141 ssh-rsa AAAAB3NzaC1yc2EAAAADAQABAAABgQCvTgHYe79vl6zZNxJHJaagzw/HtvIDQxoUmiJWAkA3ZIzSvtvaxswT4hhOpFQdBaVy
sUgmMVUQtbZQpy5X/v6lNhfcAFV7sIwVSWkjPaMz+mMrsE7NuE/Q0azsVXRslOl4teSiTWoe8J22PvmQBO96vXDSXPD2mzAySXLWfZ/037fgPh6i8uzabxh8
ADcrCadBubrfHzxCqs6Qz9ndfD5ZKz/ugB3uqe7/HPxCn+E0n9K1FD2lAGtAQ3vjuV1zCzsm1WrxuejtkA+D5Xe+V4qIb+ptOedZAdtcKCcFrbe/FtsoLLLI
R1605J6AXqkSib/QtFOKNzyiEnWPNdYdO7uTxZ6YcBxUPWoVWbVtIvkANbHsANTz3vjFWequAEWCKCJgZ4J5h+AR2nEBmcQfSUIAI0cB1D7Buw9tqdKEiD1y
t4OxPXEYv0NWHcnW51HBqnyC7ncCIrF5gO8G+nFmYaU3WUxJ1a0/gYiM7jZijHKfEPWgr+uFZhCdKWWpToHEz+s=
192.168.154.141 ecdsa-sha2-nistp256 AAAAE2VjZHNhLXNoYTItbmlzdHAyNTYAAAAIbmlzdHAyNTYAAABBBE+UBuJzB301VgJTnxbzMMggeXvlYwgy
SH0L/6ktkuZ6bP0t6CJfXGW7trlMLnWaUCqQ6GEjkvPd3CHJnQ2xNnA=

C:\Users\DSP_Lab_S6>
```

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

```
khadija@ubuntu:~$ echo "ssh-ed25519 AAAAC3NzaC1lZDI1NTE5AAAAIPt9zKPLGRmy7J/RUCmVOWgAllORc9au6ObOzDB6KuAs lab_key" >> ~/.
ssh/authorized_keys
khadija@ubuntu:~$ chmod 600 ~/.ssh/authorized_keys
khadija@ubuntu:~$ cat ~/.ssh/authorized_keys
ssh-ed25519 AAAAC3NzaC1lZDI1NTE5AAAAIPt9zKPLGRmy7J/RUCmVOWgAllORc9au6ObOzDB6KuAs lab_key
khadija@ubuntu:~$
```

```
C:\Users\DSP_Lab_S6>ssh khadija@192.168.154.141
khadija@192.168.154.141's password:
Welcome to Ubuntu 24.04.3 LTS (GNU/Linux 6.8.0-88-generic x86_64)

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

 System information as of Mon Dec  8 09:34:22 AM UTC 2025

  System load:  0.01                 Processes:             228
  Usage of /:   52.4% of 19.51GB     Users logged in:       1
  Memory usage: 10%                  IPv4 address for ens33: 192.168.154.141
  Swap usage:   0%


Expanded Security Maintenance for Applications is not enabled.

45 updates 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: Mon Dec  8 09:29:59 2025 from 192.168.154.1
khadija@ubuntu:~$
```

```
C:\Users\DSP_Lab_S6>ssh -i %USERPROFILE%\.ssh\id_lab7 khadija@192.168.154.141
Welcome to Ubuntu 24.04.3 LTS (GNU/Linux 6.8.0-88-generic x86_64)

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

 System information as of Mon Dec  8 09:29:36 AM UTC 2025

  System load:  0.0                  Processes:             230
  Usage of /:   52.4% of 19.51GB     Users logged in:       1
  Memory usage: 10%                  IPv4 address for ens33: 192.168.154.141
  Swap usage:   0%


Expanded Security Maintenance for Applications is not enabled.

45 updates 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: Mon Dec  8 09:29:36 2025 from 192.168.154.1
khadija@ubuntu:~$
```

Exam Evaluation Questions:

Q1: Quick Environment Audit

```
khadija@ubuntu:~$ printenv
SHELL=/bin/bash
DB_PASSWORD=labpass123
PWD=/home/khadija
LOGNAME=khadija
XDG_SESSION_TYPE=tty
DB_USER=labuser
HOME=/home/khadija
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;
30;43:ca=00:tw=30;42:ow=34;42:st=37;44:ex=01;32:*.tar=01;31:*.tgz=01;31:
*.lz4=01;31:*.lzh=01;31:*.lzma=01;31:*.tlz=01;31:*.txz=01;31:*.tzo=01;31:
gz=01;31:*.lrz=01;31:*.lz=01;31:*.lzo=01;31:*.xz=01;31:*.zst=01;31:*.tzs
2=01;31:*.tz=01;31:*.deb=01;31:*.rpm=01;31:*.jar=01;31:*.war=01;31:*.ear
=01;31:*.zoo=01;31:*.cpio=01;31:*.7z=01;31:*.rz=01;31:*.cab=01;31:*.wim=
=01;35:*.jpg=01;35:*.jpeg=01;35:*.mjpg=01;35:*.mjpeg=01;35:*.gif=01;35:
.tga=01;35:*.xbm=01;35:*.xpm=01;35:*.tif=01;35:*.tiff=01;35:*.png=01;35:
:*.mov=01;35:*.mpg=01;35:*.mpeg=01;35:*.m2v=01;35:*.mkv=01;35:*.webm=01;
;35:*.mp4v=01;35:*.vob=01;35:*.qt=01;35:*.nuv=01;35:*.wmv=01;35:*.asf=01
;35:*.fli=01;35:*.flv=01;35:*.gl=01;35:*.dl=01;35:*.xcf=01;35:*.xwd=01;3
5:*.ogx=01;35:*.aac=00;36:*.au=00;36:*.flac=00;36:*.m4a=00;36:*.mid=00;3
36:*.ogg=00;36:*.ra=00;36:*.wav=00;36:*.oga=00;36:*.opus=00;36:*.spx=00;
crdownload=00;90:*.dpkg-dist=00;90:*.dpkg-new=00;90:*.dpkg-old=00;90:*.c
;90:*.rej=00;90:*.rpmnew=00;90:*.rpmorig=00;90:*.rpmsave=00;90:*.swp=00;
*.ucf-old=00;90:
SSH_CONNECTION=192.168.154.1 50766 192.168.154.141 22
LESSCLOSE=/usr/bin/lesspipe %s %s
XDG_SESSION_CLASS=user
```

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

Q2: Short-lived Student Info

```
khadija@ubuntu:~$ export STUDENT_NAME="John Doe"
khadija@ubuntu:~$ export STUDENT_ROLL_NUMBER="12345"
khadija@ubuntu:~$ export STUDENT_SEMESTER="5"
khadija@ubuntu:~$
```

```
khadija@ubuntu:~$ echo $STUDENT_NAME
John Doe
khadija@ubuntu:~$ echo $STUDENT_ROLL_NUMBER
12345
khadija@ubuntu:~$ echo $STUDENT_SEMESTER
5
khadija@ubuntu:~$
```

```
khadija@ubuntu:~$ printenv | grep STUDENT_
STUDENT_NAME=John Doe
STUDENT_SEMESTER=5
STUDENT_ROLL_NUMBER=12345
khadija@ubuntu:~$
```

```
khadija@ubuntu:~$ echo $STUDENT_NAME

khadija@ubuntu:~$ printenv | grep STUDENT_
khadija@ubuntu:~$
```

Q3: Make It Sticky (Persistence Check for Student Info)

```
export STUDENT_NAME="John Doe"
export STUDENT_ROLL_NUMBER="12345"
export STUDENT_SEMESTER="5"


^G Help        ^O Write Out    ^W Wh
^X Exit        ^R Read File    ^\ Re
```

```
khadija@ubuntu:~$ khadija@ubuntu:~$ source ~/.bashrc
khadija@ubuntu:~$ echo $STUDENT_NAME
John Doe
khadija@ubuntu:~$ echo $STUDENT_ROLL_NUMBER
12345
khadija@ubuntu:~$ echo $STUDENT_SEMESTER
5
khadija@ubuntu:~$ printenv | grep '^STUDENT_'
STUDENT_NAME=John Doe
STUDENT_SEMESTER=5
STUDENT_ROLL_NUMBER=12345
khadija@ubuntu:~$
```

```
Last login: Mon Dec  8 09:44:29 2025 from 192.168.154.1
khadija@ubuntu:~$ echo $STUDENT_NAME
John Doe
khadija@ubuntu:~$ printenv | grep '^STUDENT_'
STUDENT_NAME=John Doe
STUDENT_SEMESTER=5
STUDENT_ROLL_NUMBER=12345
khadija@ubuntu:~$
```

Q4: Firewall Rules: Block and Restore Ping (ICMP)

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

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


khadija@ubuntu:~$
```

```
khadija@ubuntu:~$ sudo ufw deny from any to any proto icmp
ERROR: Unsupported protocol 'icmp'
khadija@ubuntu:~$ sudo iptables -A INPUT -p icmp --icmp-type echo-request -j DROP
khadija@ubuntu:~$ sudo iptables -L -v -n
Chain INPUT (policy DROP 0 packets, 0 bytes)
 pkts bytes target     prot opt in     out     source               destination
17155 1366K ufw-before-logging-input  0    --  *      *       0.0.0.0/0            0.0.0.0/0
17155 1366K ufw-before-input  0    --  *      *       0.0.0.0/0            0.0.0.0/0
   67  6283 ufw-after-input  0    --  *      *       0.0.0.0/0            0.0.0.0/0
    0     0 ufw-after-logging-input  0    --  *      *       0.0.0.0/0            0.0.0.0/0
    0     0 ufw-reject-input  0    --  *      *       0.0.0.0/0            0.0.0.0/0
    0     0 ufw-track-input  0    --  *      *       0.0.0.0/0            0.0.0.0/0
    0     0 DROP       1    --  *      *       0.0.0.0/0            0.0.0.0/0            icmptype 8

Chain FORWARD (policy DROP 0 packets, 0 bytes)
```

```
C:\Users\DSP_Lab_S6>ping 192.168.154.141

Pinging 192.168.154.141 with 32 bytes of data:
Request timed out.
```

```
khadija@ubuntu:~$ sudo ufw status verbose
Status: active
Logging: on (low)
Default: deny (incoming), allow (outgoing), disabled (routed)
New profiles: skip

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

khadija@ubuntu:~$
```

```
C:\Users\DSP_Lab_S6>ping 192.168.154.141

Pinging 192.168.154.141 with 32 bytes of data:
Reply from 192.168.154.141: bytes=32 time<1ms TTL=64
Reply from 192.168.154.141: bytes=32 time<1ms TTL=64
Reply from 192.168.154.141: bytes=32 time<1ms TTL=64
Reply from 192.168.154.141: bytes=32 time<1ms TTL=64

Ping statistics for 192.168.154.141:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
Approximate round trip times in milli-seconds:
    Minimum = 0ms, Maximum = 0ms, Average = 0ms

C:\Users\DSP_Lab_S6>_
```

END