

CLOUD COMPUTING LAB

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Class: 5B

LAB #07

TASK 1 — Print & filter environment variables

task1_printenv_all.png

```
maria06@maria076:~$ printenv
SHELL=/bin/bash
PWD=/home/maria06
LOGNAME=maria06
XDG_SESSION_TYPE=tty
HOME=/home/maria06
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;3
3;01:or=40;31;01:mi=00:su=37;41:sg=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;31:*.lha=01;31:*.lz4=01;31:*.l
zh=01;31:*.lzma=01;31:*.tlz=01;31:*.txz=01;31:*.tzo=01;31:*.t7z=01;31:*.zip=01;31:*.z
=01;31:*.dz=01;31:*.gz=01;31:*.lrz=01;31:*.lz=01;31:*.lzo=01;31:*.xz=01;31:*.zst=01;3
1:*.tzst=01;31:*.bz2=01;31:*.bz=01;31:*.tbz=01;31:*.tbz2=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:*.alz=01;31:
*.ace=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:*.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;3
5:*.mng=01;35:*.pcx=01;35:*.mov=01;35:*.mpg=01;35:*.mpeg=01;35:*.m2v=01;35:*.mkv=01;3
5:*.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:*.wmv=01;35:*.asf=01;35:*.rm=01;35:*.rmvb=01;35:*.flc=01;3
5:*.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:*.f
lac=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:*.#*=00;90:*.bak=00;90:*.crdownload=00;90:*.dpkg-dist=00;90:*.dpkg-new=00;90:*.d
pkg-old=00;90:*.dpkg-tmp=00;90:*.old=00;90:*.orig=00;90:*.part=00;90:*.rej=00;90:*.rp
mnew=00;90:*.rpmorig=00;90:*.rpmsave=00;90:*.swp=00;90:*.tmp=00;90:*.ucf-dist=00;90:*.
ucf-new=00;90:*.ucf-old=00;90:
SSH_CONNECTION=192.168.153.1 58424 192.168.153.130 22
LESSCLOSE=/usr/bin/lesspipe %s %s
XDG_SESSION_CLASS=user
TERM=xterm-256color
LESSOPEN=| /usr/bin/lesspipe %s
USER=maria06
SHLVL=1
XDG_SESSION_ID=4
XDG_RUNTIME_DIR=/run/user/1000
SSH_CLIENT=192.168.153.1 58424 22
```

task1_grep_shell_home_user.png

```
maria06@maria076:~$ printenv | grep SHELL
intenv | SHELL=/bin/bash
maria06@maria076:~$ printenv | grep HOME
HOME=/home/maria06
maria06@maria076:~$ printenv | grep USER
USER=maria06
maria06@maria076:~$
```

TASK 2 — Export DB_* variables temporarily and observe scope

task2_exports_all.png

```
maria06@maria076:~$ export DB_URL="postgres://db.example.local:5432/mydb"
maria06@maria076:~$ export DB_USER="labuser"
maria06@maria076:~$ export DB_PASSWORD="labpass123"
```

task2_echoes_all.png

```
maria06@maria076:~$ echo "$DB_URL"
postgres://db.example.local:5432/mydb
maria06@maria076:~$ echo "$DB_USER"
labuser
maria06@maria076:~$ echo "$DB_PASSWORD"
labpass123
```

task2_printenv_grep_db.png

```
maria06@maria076:~$ printenv | grep '^DB_'
DB_PASSWORD=labpass123
DB_USER=labuser
DB_URL=postgres://db.example.local:5432/mydb
maria06@maria076:~$ _
```

task2_after_restart_checks.png

```
maria06@maria076:~$ echo "$DB_URL"
maria06@maria076:~$ printenv | grep '^DB_'
maria06@maria076:~$
```

TASK 3 — Make DB_* variables persistent in

task3_bashrc_added.png

```

C:\> maria06@maria076: ~
# ~/.bashrc: executed by bash(1) for non-login shells.
# (then in vim: go to end and add:)
# Lab 7 persistent DB variables
export DB_URL="postgres://db.example.local:5432/mydb"
export DB_USER="labuser"
export DB_PASSWORD="labpass123"
# save and exit

```

task3_source_and_verification.png

```

maria06@maria076:~$ source ~/.bashrc
"
echo "$DB_PASSWORD"
labpass123
printenv | grep 'maria06@maria076:~$ echo "$DB_URL"'
postgres://db.example.local:5432/mydb
maria06@maria076:~$ echo "$DB_USER"
labuser
maria06@maria076:~$ echo "$DB_PASSWORD"
labpass123
maria06@maria076:~$ printenv | grep '^DB_'
DB_PASSWORD=labpass123
DB_USER=labuser
DB_URL=postgres://db.example.local:5432/mydb
maria06@maria076:~$

```

task3_after_restart_persistent.png

```

maria06@maria076:~$ echo "$DB_URL"
postgres://db.example.local:5432/mydb
maria06@maria076:~$ 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

```

maria06@maria076:~$ sudo cat /etc/environment
[sudo] password for maria06:
PATH="/usr/local/sbin:/usr/local/bin:/usr/sbin:/usr/bin:/sbin:/bin:/usr/games:/usr/local/games:/snap/bin"
maria06@maria076:~$

```

task4_echo_path_before.png

```
maria06@maria076:~$ echo "$PATH"
/usr/local/sbin:/usr/local/bin:/usr/sbin:/usr/bin:/sbin:/bin:/usr/games:/usr/local/ga
mes:/snap/bin
maria06@maria076:~$ _
```

task4_etc_environment_after.png

```
maria06@maria076:~$ sudo cat /etc/environment
ggTH="/usr/local/sbin:/usr/local/bin:/usr/sbin:/usr/bin:/sbin:/bin:/usr/games:/usr/lo
cal/games:/snap/bin"# add line:
# Class="CC-<your_class_name>"
```

task4_etc_environment_after.png

```
maria06@maria076:~$ echo $Class

maria06@maria076:~$ echo "$PATH"
/usr/local/sbin:/usr/local/bin:/usr/sbin:/usr/bin:/sbin:/bin:/usr/games:/usr/local/ga
mes:/snap/bin
maria06@maria076:~$
```

task4_welcome_create_and_chmod.png

```
maria06@maria076:~$ cat > ~/welcome <<'EOF'
> #!/bin/bash
> echo "Welcome to Cloud Computing $USER"
> EOF
maria06@maria076:~$
maria06@maria076:~$ chmod +x ~/welcome
maria06@maria076:~$ ls -l ~/welcome
-rwxrwxr-x 1 maria06 maria06 52 Nov  9 19:27 /home/maria06/welcome
maria06@maria076:~$ _
```

task4_welcome_run_dot.png

```
maria06@maria076:~$ cd ~
maria06@maria076:~$ ./welcome
Welcome to Cloud Computing maria06
maria06@maria076:~$
```

task4_bashrc_source_and_welcome.png

```
maria06@maria076:~$ cd ~
maria06@maria076:~$ welcome
```

TASK 5 — Block and allow SSH using ufw

task5_ufw_enable_and_status.png

```
maria06@maria076:~$ sudo ufw enable
sudo ufw status verbose
Command may disrupt existing ssh connections. Proceed with operation (y|n)? Aborted
maria06@maria076:~$ _
```

task5_ufw_enable_and_status.png

```
maria06@maria076:~$ sudo ufw deny 22/tcp
sudo ufw status numbered
Rules updated
Rules updated (v6)
maria06@maria076:~$ _
```

task5_ufw_allow_reload_status.png

```
maria06@maria076:~$ sudo ufw allow 22/tcp
[sudo] password for maria06:
Sorry, try again.
[sudo] password for maria06:
Rules updated
Rules updated (v6)
maria06@maria076:~$ sudo ufw reload
Firewall not enabled (skipping reload)
maria06@maria076:~$ sudo ufw status
Status: inactive
maria06@maria076:~$ _
```

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

A. On Windows host (client) — group related client actions:

task6_windows_sshkey_and_list.png

```
maria06@maria076:~$ cat ~/.ssh/id_lab7.pub
ssh-ed25519 AAAAC3NzaC1lZDI1NTE5AAAAIIb9pzHMS2QPPwgBivIM7swdhoi9UpcVaIqTmlopQIT6 lab_
key
maria06@maria076:~$
```

task6_windows_public_key.png

```
>> ssh-keygen -t ed25519 -f %env:USERPROFILE%.ssh\id_lab7 -C "lab_key"

Directory: C:\Users\Administrator\.ssh

Mode                LastWriteTime         Length Name
----                -
-a-----         10/3/2025    7:58 AM             419 id_ed25519
-a-----         10/3/2025    7:58 AM             105 id_ed25519.pub
-a-----         11/8/2025   11:24 AM             1677 known_hosts
-a-----         11/8/2025   11:23 AM             926 known_hosts.old
Generating public/private ed25519 key pair.
Enter passphrase (empty for no passphrase):
Enter same passphrase again:
Your identification has been saved in C:\Users\Administrator\.ssh\id_lab7
Your public key has been saved in C:\Users\Administrator\.ssh\id_lab7.pub
The key fingerprint is:
SHA256:S8kiQaNde3F8FaNS1VgibsKACxMp9QjMOLq1EeVwQ4 lab_key
The key's randomart image is:
+--[ED25519 256]--+
| =.++=oo ..o o=+o |
| +=Xoo + +.ooo.. |
| .ooo=.. + +.. |
| E + .. o + . |
| = o .. S |
| . o . o . |
| . |
+----[SHA256]-----+
```

task6_windows_known_hosts_cleared_and_empty.png

```
C:\Users\Administrator>type %USERPROFILE%.ssh\id_lab7.pub
ssh-ed25519 AAAAC3NzaC1lZDI1NTE5AAAAIDYR/kb11NqjAoIIvh/kY/kDHSEnULpqEqHTrQPpJqJJ lab_key
C:\Users\Administrator>
```

```
C:\Users\Administrator>del %USERPROFILE%.ssh\known_hosts
C:\Users\Administrator>type %USERPROFILE%.ssh\known_hosts
The operation completed successfully.
```

task6_windows_ssh_accept_hostkey_and_login.png

```
C:\Users\Administrator>ssh maria06@192.168.153.130
The authenticity of host '192.168.153.130 (192.168.153.130)' can't be established.
ED25519 key fingerprint is SHA256:XmKnQT0I0NpXovxntS7Yt840suUHQqPigCA6Nt9R0cc.
This key is not known by any other names.
Are you sure you want to continue connecting (yes/no/[fingerprint])? yes
Warning: Permanently added '192.168.153.130' (ED25519) to the list of known hosts.
maria06@192.168.153.130'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 Tue Nov 11 03:47:59 AM UTC 2025

System load:  0.08           Processes:            219
Usage of /:   56.8% of 9.75GB Users logged in:      1
Memory usage: 15%           IPv4 address for ens33: 192.168.153.130
Swap usage:   0%
```

task6_windows_known_hosts_after_connect.png

```
C:\Users\Administrator>type %USERPROFILE%.ssh\known_hosts
192.168.153.130 ssh-ed25519 AAAAC3NzaC1lZDI1NTE5AAAAIFcaq/OdiF/p76y9dVWmwiQh8A1JKHBbmbFmVThK6kG1
192.168.153.130 ssh-rsa AAAAB3NzaC1yc2EAAAADAQABAAQgQDfrqZWn0j4a2jOCxF+fQMdVJlW7/z9tI/mW7ZJ9yKrGpgwWCVjekH49P0nnTwIs21A
shInmAuwIKj+swYrxOTqEcXs9nJHyYGRZxdFddJDe2bb4iKovO3Ge2bNmlvFXLRC1iNfPNQdv4d8euKUiCCf6Ri06nGg5U/F+HvO04QmWmYo9+RJeio/l6ho
iTEwFxc8R4ruX2696BG1VRcULUB90llkYDqXddixmJV0/Aa8L3qy22t07/26a0JQ7BEKDvebjC2m4JtR8z1Pz9N9Vg4/59wyUCr28P8XNH6CYKbCM1vtNix
iF1dh7kqbZ2YwR2yFOTigy5icChyoIOBcGcNHMTFRPCLZuCU1G03YIwqMDexTdNxZX3PFSpA32fYEvvd0HE1ApwY0daVyAcxB4o1xE2WEhbNU80YwIza0qrM
jXoqsJLaybf9mop/2Rakb20gH2OM6NPoihklyRFQRW9cPHAs413EBTyfCNEbAnHtXFN7FcG1D85pDKgpMoVWHsk=
192.168.153.130 ecdsa-sha2-nistp256 AAAAE2VjZHNhLXNoYTItbmlzdHAyNTYAAAAIbmlzdHAyNTYAAABBBNf15JCJC8GIBLhBPhIXIZZEQwPM6RMO
bJstfqZM1lUF1DXGzhJJBVRWyGy6URZJ1bkZGCaZ6Yw0ImzVHbaigSA=
```

B. On Ubuntu server — group related server-side commands:

task6_server_clear_authorized_keys.png

```
maria06@maria076:~$ mkdir -p ~/.ssh
maria06@maria076:~$ chmod 700 ~/.ssh
maria06@maria076:~$ > ~/.ssh/authorized_keys
```

task6_server_add_key_and_show.png

```
maria06@maria076:~$ echo "ssh-ed25519 AAAA... yourpublickey ... comment" >> ~/.ssh/authorized_keys
maria06@maria076:~$ chmod 600 ~/.ssh/authorized_keys
maria06@maria076:~$ cat ~/.ssh/authorized_keys
ssh-ed25519 AAAA... yourpublickey ... comment
maria06@maria076:~$
```

task6_ssh_passwordless_login.png

```
C:\Users\Administrator>ssh maria06@192.168.153.130
maria06@192.168.153.130'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 Tue Nov 11 03:58:13 AM UTC 2025

System load:  0.02               Processes:    214
Usage of /:   56.8% of 9.75GB    Users logged in: 1
Memory usage: 14%               IPv4 address for ens33: 192.168.153.1
Swap usage:   0%

Expanded Security Maintenance for Applications is not enabled.

1 update can be applied immediately.
1 of these updates is a standard security update.
To see these additional updates run: apt list --upgradable

Enable ESM Apps to receive additional future security updates.
See https://ubuntu.com/esm or run: sudo pro status
```

task6_ssh_with_identity_file.png

```
C:\Users\Administrator>ssh -i ~/.ssh/id_lab7 maria06@192.168.153.130
maria06@192.168.153.130'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 Tue Nov 11 04:00:42 AM UTC 2025

System load:  0.01          Processes:      216
Usage of /:   56.8% of 9.75GB Users logged in:  1
Memory usage: 14%          IPv4 address for ens33: 192.168.153.130
Swap usage:   0%

Expanded Security Maintenance for Applications is not enabled.

1 update can be applied immediately.
1 of these updates is a standard security update.
To see these additional updates run: apt list --upgradable

Enable ESM Apps to receive additional future security updates.
See https://ubuntu.com/esm or run: sudo pro status

Failed to connect to https://changelogs.ubuntu.com/meta-release-lts. Check your Internet connection or proxy settings

Last login: Tue Nov 11 03:58:14 2025 from 192.168.153.1
-bash: /home/maria06/.bashrc: line 124: syntax error near unexpected token `fi'
-bash: /home/maria06/.bashrc: line 124: `fi'
maria06@maria076:~$
```