

LAB # 07:
CLOUD COMPUTING:

FROM:

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2023-BSE-005
SECTION A

TO:

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TITLE:

ENVIRONMENT VARIABLES, PATH, UFW,
AND SSH KEY AUTHENTICATION

Task 1 – Print & filter environment variables

```
aleena004@aleena004:~$ printenv
SHELL=/bin/bash
PWD=/home/aleena004
LOGNAME=aleena004
XDG_SESSION_TYPE=tty
HOME=/home/aleena004
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;4
*.tar=01;31:*.tgz=01;31:*.arc=01;31:*.arj=01;31:*.taz=01;31:*.lha=01;31:*.lz4=01;31:*.lzh=01;31:*.lzma=01;31:*.tlz=01;31:*.t
*:z=01;31:*.dz=01;31:*.gz=01;31:*.lrz=01;31:*.lz=01;31:*.lzo=01;31:*.xz=01;31:*.zst=01;31:*.bz2=01;31:*.bz=01;
*=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
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
.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:*.m
5:*.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:
*: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:*
6:*.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:*
36:*.xspf=00;36:*=~00;90:*=#00;90:*.bak=00;90:*.crdownload=00;90:*.dpkg-dist=00;90:*.dpkg-new=00;90:*.dpkg-old=00;90:*.dpkg-
*:*.rej=00;90:*.rpmnew=00;90:*.rmporig=00;90:*.rpmsave=00;90:*.swp=00;90:*.tmp=00;90:*.ucf-dist=00;90:*.ucf-new=00;90:*.uc
SSH_CONNECTION=192.168.231.1 51899 192.168.231.132 22
LESSCLOSE=/usr/bin/lesspipe %s %
XDG_SESSION_CLASS=user
TERM=xterm-256color
LESSOPEN=| /usr/bin/lesspipe %
USER=aleena004
SHLVL=1
XDG_SESSION_ID=4
XDG_RUNTIME_DIR=/run/user/1000
SSH_CLIENT=192.168.231.1 51899 22
XDG_DATA_DIRS=/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
aleena004@aleena004:~$
```

```
aleena004@aleena004:~$ printenv | grep SHELL
SHELL=/bin/bash
aleena004@aleena004:~$ printenv | grep HOME
HOME=/home/aleena004
aleena004@aleena004:~$ printenv | grep USER
USER=aleena004
aleena004@aleena004:~$
```

Task 2 – Export DB_*variables temporarily and observe scope

```
aleena004@aleena004:~$ export DB_URL="postgres://db.example.local:5432/mydb"
aleena004@aleena004:~$ export DB_USER="labuser"
aleena004@aleena004:~$ export DB_PASSWORD="labpass123"
aleena004@aleena004:~$ echo "$DB_URL"
postgres://db.example.local:5432/mydb
aleena004@aleena004:~$ echo "$DB_USER"
labuser
aleena004@aleena004:~$ echo "$DB_PASSWORD"
labpass123
aleena004@aleena004:~$
```

```
aleena004@aleena004:~$ printenv | grep '^DB_'
DB_PASSWORD=labpass123
DB_USER=labuser
DB_URL=postgres://db.example.local:5432/mydb
aleena004@aleena004:~$
```

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

```
aleena004@aleena004:~$ vim /home/aleena004/.bashrc

# ~/.bashrc: executed by bash(1) for non-login shells.
# lab 7 persistent DB variables
export DB_URL="postgres://db.example.local:5432/mydb"
export DB_USER="labuser"
export DB_PASSWORD="labpass123"

# see /usr/share/doc/bash/examples/startup-files (in the package bash-doc)
# for examples

# If not running interactively, don't do anything
case $- in
    *i*) ;;
    *) return;;
esac

# don't put duplicate lines or lines starting with space in the history.
# See bash(1) for more options
HISTCONTROL=ignoreboth

# append to the history file, don't overwrite it
shopt -s histappend

# for setting history length see HISTSIZE and HISTFILESIZE in bash(1)
HISTSIZE=1000
HISTFILESIZE=2000

# check the window size after each command and, if necessary,
# update the values of LINES and COLUMNS.
shopt -s checkwinsize

# If set, the pattern "##" used in a pathname expansion context will
# match all files and zero or more directories and subdirectories.
#shopt -s globstar

# make less more friendly for non-text input files, see lesspipe(1)
[ -x /usr/bin/lesspipe ] && eval "$(SHELL=/bin/sh lesspipe)"
```

```
".bashrc" 122L, 3915B written
aleena004@aleena004:~$ source /home/aleena004/.bashrc
aleena004@aleena004:~$ _
```

```
aleena004@aleena004:~$ echo "$DB_URL"
postgres://db.example.local:5432/mydb
aleena004@aleena004:~$ echo "$DB_USER"
labuser
aleena004@aleena004:~$ echo "$DB_PASSWORD"
labpass123
aleena004@aleena004:~$ printenv | grep '^DB_'
DB_PASSWORD=labpass123
DB_USER=labuser
DB_URL=postgres://db.example.local:5432/mydb
aleena004@aleena004:~$
```

Task 4- System-wide environment variables, welcome script, and PATH

```
aleena004@aleena004:~$ sudo cat /etc/environment
[sudo] password for aleena004:
PATH="/usr/local/sbin:/usr/local/bin:/usr/sbin:/usr/bin:/sbin:/bin:/usr/games:/usr/local/games:/snap/bin"
aleena004@aleena004:~$ echo "$PATH"
/usr/local/sbin:/usr/local/bin:/usr/sbin:/usr/bin:/sbin:/bin:/usr/games:/usr/local/games:/snap/bin
aleena004@aleena004:~$ sudo vim /etc/environment
```

```
[1] aleena004@aleena004: ~
PAdd line: Class="CC-BSE-5A"TH="/usr/local/sbin:/usr/local/bin:/usr/sbin:/usr/bin:/sbin:/bin:/usr/games:/usr/local/games:/snap/bin"
~
```

```
aleena004@aleena004:~$ cat > ~/welcome << EOF
>#!/bin/bash
> echo "welcome to Cloud Computing $USER"
> EOF
aleena004@aleena004:~$ chmod +x ~/welcome
aleena004@aleena004:~$ cd ~
aleena004@aleena004:~$ ./welcome
welcome to Cloud Computing aleena004
aleena004@aleena004:~$
```

```
aleena004@aleena004:~$ vim ~/.bashrc
```

```
[1] aleena004@aleena004: ~
# If not running interactively, don't do anything
case $- in
  *i*) ;;
  *) return;;
esac

# don't put duplicate lines or lines starting with space in the history.
# See bash(1) for more options
HISTCONTROL=ignoreboth

# append to the history file, don't overwrite it
shopt -s histappend

# for setting history length see HISTSIZE and HISTFILESIZE in bash(1)
HISTSIZE=1000
HISTFILESIZE=2000

# check the window size after each command and, if necessary,
# update the values of LINES and COLUMNS.
shopt -s checkwinsize

# If set, the pattern "*" used in a pathname expansion context will
# match all files and zero or more directories and subdirectories.
#shopt -s globstar

# make less more friendly for non-text input files, see lesspipe(1)
[ -x /usr/bin/lesspipe ] && eval "$(SHELL=/bin/sh lesspipe)"

# set variable identifying the chroot you work in (used in the prompt below)
if [ -z "${debian_chroot:-}" ] && [ -r /etc/debian_chroot ]; then
  debian_chroot=$(cat /etc/debian_chroot)
fi

# set a fancy prompt (non-color, unless we know we "want" color)
case "$TERM" in
  xterm-color|*-256color) color_prompt=yes;;
esac
PATH=$PATH:~
```

```
aleena004@aleena004:~$ source ~/.bashrc
aleena004@aleena004:~$ cd ~
aleena004@aleena004:~$ welcome
welcome to Cloud Computing aleena004
aleena004@aleena004:~$ ./welcome
welcome to Cloud Computing aleena004
aleena004@aleena004:~$
```

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

```
aleena004@aleena004:~$ sudo ufw enable
Command may disrupt existing ssh connections. Proceed with operation (y|n)? y
Firewall is active and enabled on system startup
aleena004@aleena004:~$ sudo ufw status verbose
Status: active
Logging: on (low)
Default: deny (incoming), allow (outgoing), disabled (routed)
New profiles: skip
aleena004@aleena004:~$ sudo ufw deny 22/tcp
Rule added
Rule added (v6)
aleena004@aleena004:~$ sudo ufw status numbered
Status: active

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

aleena004@aleena004:~$
```

```
aleena004@aleena004:~$ ssh aleena004@192.168.231.132
aleena004@192.168.231.132's password:
Welcome to Ubuntu 24.04.3 LTS (GNU/Linux 6.8.0-87-generic x86_64)
```

```
aleena004@aleena004:~$ sudo ufw allow 22/tcp
[sudo] password for aleena004:
Rule updated
Rule updated (v6)
aleena004@aleena004:~$ sudo ufw reload
Firewall reloaded
aleena004@aleena004:~$ sudo ufw status
Status: active

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

aleena004@aleena004:~$
```

```
aleena004@aleena004:~$ ssh aleena004@192.168.231.132
aleena004@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 Mon Dec 22 08:16:23 AM UTC 2025

System load: 0.03          Processes:           240
Usage of /: 89.5% of 9.75GB  Users logged in:    1
Memory usage: 20%          IPv4 address for ens33: 192.168.231.132
Swap usage:  0%

=> / is using 89.5% of 9.75GB

Expanded Security Maintenance for Applications is not enabled.

169 updates can be applied immediately.
39 of these updates are standard security updates.
To see these additional updates run: apt list --upgradable

13 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 22 08:13:45 2025 from 192.168.231.132
aleena004@aleena004:~$
```

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

```
aleena004@aleena004:~$ 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/aleena004/.ssh/id_lab7
Your public key has been saved in /home/aleena004/.ssh/id_lab7.pub
The key fingerprint is:
SHA256:e+s8AZ16a6uJOZmKHQr3u9uFuZvQIlZeisQt4Ca+9uE lab_key
The key's randomart image is:
++-[ED25519 256]--+
| . .
| . . o . .
| . o = o . o
| .o + = .So
| ..o = o...o
| ...oo.o.oo..o
| =.=.o== ++.
| . +EB=B=o+=o
+---[SHA256]----+
aleena004@aleena004:~$
```

```
aleena004@aleena004:~$ ls -la ~/.ssh
total 24
drwx----- 2 aleena004 aleena004 4096 Dec 22 08:18 .
drwxr-x--- 23 aleena004 aleena004 4096 Dec 22 08:07 ..
-rw----- 1 aleena004 aleena004 0 Sep 30 12:09 authorized_keys
-rw----- 1 aleena004 aleena004 444 Dec 22 08:18 id_lab7
-rw-r--r-- 1 aleena004 aleena004 89 Dec 22 08:18 id_lab7.pub
-rw----- 1 aleena004 aleena004 978 Dec 22 08:12 known_hosts
-rw-r--r-- 1 aleena004 aleena004 142 Dec 22 08:12 known_hosts.old
aleena004@aleena004:~$ type $env:USERPROFILE\.ssh\id_lab7.pub
-bash: type: :USERPROFILE.sshid_lab7.pub: not found
aleena004@aleena004:~$ cat ~/.ssh/id_lab7.pub
ssh-ed25519 AAAAC3NzaC1lZDI1NTE5AAAAIKFPLKBilLeF52FSt5alRXoRlVex7S6MUzmMCDR6tV5V lab_key
aleena004@aleena004:~$
```

```
aleena004@aleena004:~$ type $env:USERPROFILE\.ssh\known_hosts
-bash: type: :USERPROFILE.sshknown_hosts: not found
aleena004@aleena004:~$ ls $env:USERPROFILE\.ssh
ls: cannot access ':USERPROFILE.ssh': No such file or directory
aleena004@aleena004:~$ mkdir -p ~/.ssh
aleena004@aleena004:~$ chmod 700 ~/.ssh
aleena004@aleena004:~$ > ~/.ssh/authorized_keys
aleena004@aleena004:~$ echo "ssh-ed25519 AAAA... yourpublicity ... comment" >> ~/.ssh/authorized_keys
aleena004@aleena004:~$ chmod 600 ~/.ssh/authorized_keys
aleena004@aleena004:~$ cat ~/.ssh/authorized_keys
ssh-ed25519 AAAA... yourpublicity ... comment
aleena004@aleena004:~$
```

```
aleena004@aleena004:~$ ssh -i $env:USERPROFILE\.ssh\id_ed25519 aleena004@192.168.231.132
Warning: Identity file :USERPROFILE.sshid_ed25519 not accessible: No such file or directory.
aleena004@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 Mon Dec 22 08:29:35 AM UTC 2025
```

```
System load: 0.29 Processes: 245
Usage of /: 89.5% of 9.75GB Users logged in: 1
Memory usage: 20% IPv4 address for ens33: 192.168.231.132
Swap usage: 0%
```

```
=> / is using 89.5% of 9.75GB
```

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

```
169 updates can be applied immediately.
39 of these updates are standard security updates.
To see these additional updates run: apt list --upgradable
```

```
13 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 22 08:16:24 2025 from 192.168.231.132
aleena004@aleena004:~$
```