



## **Cloud Computing**

**BSE ( V-B )**

**Lab 07**

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**Roll No:** 2023-BSE-068

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## **Task 1: Print & filter environment variables**

```
urw@urw:~$ printenv
SHELL=/bin/bash
PWD=/home/urwra
LOGNAME=urwra
XDG_SESSION_TYPE=tty
HOME=/home/urwra
LANG=zh_USTF_8

XDG_COLORS="rs=0;di=0;31;ln=0;36;mh=00;pi=0;40;33;so=01;35;do=01;35;bd=40;33;01;0e=40;33;01;0r=40;31;01mi=00:su=37;41:sg=30;43:ca=00:tw=30;42:ow=34;42:st=37;44:xe=01;32;*:tar=01;31;*:tgz=01;31;*:arc=01;31;*:ari=01;31;*:taz=01;31;*:lha=01;31;*:lzh=01;31;*:lzip=01;31;*:lma=01;31;*:tlz=01;31;*:txz=01;31;*:tzo=01;31;*:t7z=01;31;*:zip=01;31;*:zst=01;31;*:diz=01;31;*:gz=01;31;*:lz=01;31;*:lz0=01;31;*:lz1=01;31;*:xz=01;31;*:tar=01;31;*:tzst=01;31;*:bz2=01;31;*:tbz=01;31;*:tbz2=01;31;*:t2=01;31;*:deb=01;31;*:rpm=01;31;*:jar=01;31;*:war=01;31;*:ear=01;31;*:ear=01;31;*:ear=01;31;*:alz=01;31;*:ace=01;31;*:zoo=01;31;*:cpio=01;31;*:z=01;31;*:rz=01;31;*:xar=01;31;*:cab=01;31;*:wim=01;31;*:swm=01;31;*:ckm=01;31;*:esd=01;31;*:avif=01;35;*:jpg=01;35;*:jpeg=01;35;*:mpg=01;35;*:mpeg=01;35;*:gif=01;35;*:hmp=01;35;*:phbm=01;35;*:pgm=01;35;*:ppm=01;35;*:tga=01;35;*:xbm=01;35;*:xpm=01;35;*:tif=01;35;*:liff=01;35;*:png=01;35;*:svga=01;35;*:svga=01;35;*:mmg=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;*:m4v=01;35;*:mp4=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;35;*:avi=01;35;*:fli=01;35;*:flv=01;35;*:gl=01;35;*:xfl=01;35;*:xcf=01;35;*:yuv=01;35;*:cmg=01;35;*:emf=01;35;*:cov=01;35;*:cxg=01;35;*:aac=00;36;*:au=00;36;*:xf=01;36;*:lac=00;36;*:mda=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;*:ogg=00;36;*:opus=00;36;*:oggp=00;36;*:xspf=00;36;*:xxx=00;90;*:dpkg-old=00;90;*:dpkg-tmp=00;90;*:old=00;90;*:orig=00;90;*:part=00;90;*:rej=00;90;*:rpmmew=00;90;*:rpmporig=00;90;*:rpmsave=00;90;*:swo=00;90;*:tmp=00;90;*:ucf-dict=00;90;*:ucf-new=00;90;*:ucf-old=00;90;
SSH_CONNECTION=192.168.189.1 55256 192.168.189.128 22
LESSCLOSE=/usr/bin/lesspipe %s %
XDG_SESSION_CLASS=user
TERM=xterm
LESSOPEN=| /usr/bin/lesspipe %
USER=urwra
SHLVL=1

XDG_SESSION_ID=39
XDG_RUNTIME_DIR=/run/user/1000
XDG_CLIENT=192.168.189.1 55256 22
XDG_DATA_DIRS=/usr/share/gnome:/usr/local/share:/usr/share:/var/lib/spandeskrc
```

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

## Task 2: Export DB \* variables temporarily and observe scope

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

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

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

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

### Task 3: Make DB\_\* variables persistent in ~/.bashrc

```

# Alias definitions.
# You may want to put all your additions into a separate
file like
# ~/.bash_aliases, instead of adding them here directly.
# See /usr/share/doc/bash-doc/examples in the bash-doc pa
ckage.

if [ -f ~/.bash_aliases ]; then
    . ~/.bash_aliases
fi

# enable programmable completion features (you don't need
to enable
# this, if it's already enabled in /etc/bash.bashrc and ,
etc/profile
# sources /etc/bash.bashrc).
if ! shopt -oq posix; then
    if [ -f /usr/share/bash-completion/bash_completion ]; t
hen
        . /usr/share/bash-completion/bash_completion
    elif [ -f /etc/bash_completion ]; then
        . /etc/bash_completion
    fi
fi
# Lab 7 persistent DB variables
export DB_URL="postgres://db.example.local:5432/mydb"
export DB_USER="labuser"
export DB_PASSWORD="labpass123"
:w

```

```

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

```

```

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

```

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

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

```
urwa@urwa:~$ echo "$PATH"
/usr/local/sbin:/usr/local/bin:/usr/sbin:/usr/bin:/sbin:/bi
n:/usr/games:/usr/local/games:/snap/bin
urwa@urwa:~$ █
```

```
urwa@urwa:~$ PATH="/usr/local/sbin:/usr/local/bin:/usr/sbin:/usr/bin:/sbi
n:/bin:/usr/games:/usr/local/games:/snap/bin"
Class="CC-<Urwa>"  
~  
~  
~
```

```
urwa@urwa:~$ cat /etc/environment
PATH="/usr/local/sbin:/usr/local/bin:/usr/sbin:/usr/bin:/sbi
n:/bin:/usr/games:/usr/local/games:/snap/bin"
Class="CC-<Urwa>"
urwa@urwa:~$ █
```

```
urwa@urwa:~$ echo $Class
echo "$PATH"  

/usr/local/sbin:/usr/local/bin:/usr/sbin:/usr/bin:/sbin:/bin
:/usr/games:/usr/local/games:/snap/bin
urwa@urwa:~$ █
```

```
urwa@urwa:~$ cat > ~/welcome <<'EOF'
>
>
> #!/bin/bash
echo "Welcome to Cloud Computing $USER"
EOF
urwa@urwa:~$ chmod +x ~/welcome
urwa@urwa:~$ ^C
urwa@urwa:~$ ~/welcome
Welcome to Cloud Computing urwa
```

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

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

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

## Task 5: Block and allow SSH using ufw (firewall)

```
urwa@urwa:~$ sudo ufw enable  
sudo ufw status verbose  
[sudo] password for urwa:  
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), disabled (routed)  
)  
New profiles: skip  
urwa@urwa:~$
```

```
urwa@urwa:~$ 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)
```

```
urwa@urwa:~$ ssh urwa@192.168.189.128
urwa@192.168.189.128'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 Wed Dec 24 04:24:56 PM UTC 2025

  System load:  0.06           Processes:          236
  Usage of /:   81.6% of 9.75GB  Users logged in:    1
  Memory usage: 24%            IPv4 address for ens33: 192
                               .168.189.128
  Swap usage:   0%

  * Strictly confined Kubernetes makes edge and IoT secure. Learn how MicroK8s just raised the bar for easy, resilient and secure K8s cluster deployment.

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

Expanded Security Maintenance for Applications is not enabled.

.

76 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: Wed Dec 24 16:18:46 2025 from 192.168.189.1
urwa@urwa:~$ █
```

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

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

```
urwa@urwa:~$ ssh urwa@192.168.189.128
urwa@192.168.189.128'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 Wed Dec 24 04:27:00 PM UTC 2025

System load: 0.13           Processes:          242
Usage of /: 81.6% of 9.75GB Users logged in:    1
Memory usage: 24%           IPv4 address for ens33: 192.168.189.128
Swap usage: 0%

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

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*** System restart required ***
Last login: Wed Dec 24 16:24:56 2025 from 192.168.189.128
```

## **Task 6: Configure SSH key-based login from Windows host**

```
urwa@urwa:~$ ssh-keygen -t ed25519 -f ~/.ssh/id_lab7 -C "lab_key"
ls -la ~/.ssh
Generating public/private ed25519 key pair.
Enter passphrase (empty for no passphrase):
Enter same passphrase again:
Your identification has been saved in /home/urwa/.ssh/id_lab7
Your public key has been saved in /home/urwa/.ssh/id_lab7.pub
The key fingerprint is:
SHA256:hPteY6Cio/uaUbUvZHRXTf528uzbQu5PGVIc0zqDG0E lab_key
The key's randomart image is:
+--[ED25519 256]--+
|       .+o.|
|       . .o . +|
|   o o o   .o + |
|   o o +   o.= |
|   . + . S   +++.| 
|   . o . o   ..o=o|
|.. o o . + o .+|
|o... o . o   oo.| 
|=o. .       .+=|
+---[SHA256]----+
total 24
drwx----- 2 urwa urwa 4096 Dec 24 16:27 .
drwxr-x-- 25 urwa urwa 4096 Dec 23 14:50 ..
-rw----- 1 urwa urwa 0 Oct 24 14:08 authorized_keys
-rw----- 1 urwa urwa 399 Dec 24 16:27 id_lab7
-rw-r--r-- 1 urwa urwa 89 Dec 24 16:27 id_lab7.pub
-rw----- 1 urwa urwa 978 Oct 24 14:58 known_hosts
-rw-r--r-- 1 urwa urwa 142 Oct 24 14:57 known_hosts.old
urwa@urwa:~$
```

```
urwa@urwa:~$ ssh-keygen -t ed25519 -f $env:USERPROFILE\.ssh\id_lab7 -C "lab_key"
Generating public/private ed25519 key pair.
Enter passphrase (empty for no passphrase):
Enter same passphrase again:
Your identification has been saved in :USERPROFILE.sshid_lab7
Your public key has been saved in :USERPROFILE.sshid_lab7.pub
The key fingerprint is:
SHA256:1zsL+KqL70OclUUUsqW8WtkYhQbsgT3Iewhosbj3lM lab_key
The key's randomart image is:
+--[ED25519 256]--+
|       .o. +. |
|...     ..+ o  |
|o.=o= .o =   |
|oooO.o.* .   |
|.+ .o..ESo. . |
|o . . = *o . |
| . + +. . o  |
|   .o . . o  |
|   .o=+. . . |
+---[SHA256]----+
urwa@urwa:~$
```

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

```
urwa@urwa:~$ ssh urwa@192.168.189.128
urwa@192.168.189.128'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 Wed Dec 24 04:41:47 PM UTC 2025

 System load: 0.1 Processes: 243
 Usage of /: 81.6% of 9.75GB Users logged in: 1
 Memory usage: 25% IPv4 address for ens33: 192
.168.189.128
 Swap usage: 0%

 * Strictly confined Kubernetes makes edge and IoT secure. Learn how MicroK8s
 just raised the bar for easy, resilient and secure K8s cluster deployment.

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

Expanded Security Maintenance for Applications is not enabled
.

76 updates can be applied immediately.
To see these additional updates run: apt list --upgradable

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com/esm

*** System restart required ***
Last login: Wed Dec 24 16:27:01 2025 from 192.168.189.128
urwa@urwa:~$
```

```
PS C:\Users\TT> type $env:USERPROFILE\.ssh\known_hosts
192.168.189.128 ssh-ed25519 AAAAC3NzaC1lZDI1NTE5AAAICEz1KJxXvUE8EI6S8nfKqtXd3UMn
:Cks2usNM1yGEzJK
192.168.189.128 ssh-rsa AAAAB3NzaC1yc2EAAAQABAAQgQDVX55msLieE1a/QhcNUxLxSShIb
:iCVaji6622z8nQTGd2eL9a6RWL+dgyQ4niN6JPAYkbtLu1mctM0zcjBbAUvg6BA/Yw47WYHpnBG/Y1Mn
2CpPov8+srdgjUsGLRZBFcF78rSzT8kjxYAcffR4HyRVEr5J10pFA8LZBFYv17s98ugJLjgYhsA4DY/Y
h+FnaqM0tBb7wwc3WdIYrS781k111PR6SJFP18320prFmeygU/wKwM0zH2JpwDr0mXfpbK/D6zZAahNDg
M3xbB0wcrBB+Sgb3LUrNVbpQ9aaIpMQW3M6LQ2Bec2FSXtwmQck4qBhVZK2fngL10/pW76Q+io1V2BVUw
9BkAmjw2Hce+2gUPqMsRVqEUlooKtLQ/lphzVWB1tP9SX9ETa08v16oHmjhePYGd9RxUSio28K1Mi6lgT
VhPIx7L1+ohojFX/47vvzIQVYxutg3MVD4vhuAYnG/xQy+J2980MiHH1DlpCSFxGu9C9nj+PjeYE6z0s
=
192.168.189.128 ecdsa-sha2-nistp256 AAAAE2VjZHNhLXNoYTItbmlzdHAyNTYAAAAIbmlzdHAyN
TYAAABBE6J5rCnzv1A1oZ1NKHVclqUCUg1dyim6+6tyZmHDM8NPvJ5I9NQ6ztaAOUUvCvqH13JIRHlhx
1nCkCAAt6vA3aM=
PS C:\Users\TT>
```

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

```
PS C:\Users\TT> ssh urwa@192.168.189.128
urwa@192.168.189.128'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 Wed Dec 24 04:48:23 PM UTC 2025

System load:  0.02          Processes:      251
Usage of /:   81.6% of 9.75GB  Users logged in:   1
Memory usage: 25%           IPv4 address for ens33: 192.168.189.128
Swap usage:   0%

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

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*** System restart required ***
Last login: Wed Dec 24 16:45:25 2025 from 192.168.189.1
```

```
urwa@urwa:~$ ssh -i ~/.ssh/id_lab7 urwa@192.168.189.128
urwa@192.168.189.128'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 Wed Dec 24 04:50:00 PM UTC 2025

System load:  0.0          Processes:      255
Usage of /:   81.6% of 9.75GB  Users logged in:   1
Memory usage: 26%           IPv4 address for ens33: 192.168.189.128
Swap usage:   0%

* Strictly confined Kubernetes makes edge and IoT secure. Learn how MicroK8s
just raised the bar for easy, resilient and secure K8s cluster deployment

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

Expanded Security Maintenance for Applications is not enabled.

76 updates can be applied immediately.
To see these additional updates run: apt list --upgradable

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Learn more about enabling ESM Apps service at https://ubuntu.com/esm

*** System restart required ***
Last login: Wed Dec 24 16:48:24 2025 from 192.168.189.1
```