

NETWORKING & SYSTEM ADMINISTRATION

LAB RECORD

Billan Jacob John
RMCA A
Roll No: 34

1. Basic Linux Commands Explain Linux commands **pwd**, **history**, **man**, **ls**, **cd**, **mkdir**, **rmdir**, **touch**, **rm**, **cat** with examples.

- **pwd**

‘pwd’ stands for Print Working Directory. It prints the path of the working directory, starting from the root. **pwd**

```
t-rex@trex-ZenBook-UX431DA-UM431DA:~$ pwd  
/home/t-rex  
t-rex@trex-ZenBook-UX431DA-UM431DA:~$ █
```

- **history**

The ‘history’ command is used to view the previously executed command.

```
t-rex@trex-ZenBook-UX431DA-UM431DA:~$ history  
1 ~sudo apt-get update  
2 sudo apt-get update  
3 sudo apt-get install -f  
4 sudo apt-get install gnome-tweaks-tools  
5 sudo apt-get install gnome-tweak-tool  
6 pwd  
7 gnome-tweak-tool  
8 install gnome-tweak-tool  
9 install --help  
10 $ sudo apt install tasksel  
11 sudo apt install tasksel  
12 pwd  
13 history  
t-rex@trex-ZenBook-UX431DA-UM431DA:~$ █
```

- **man**

The ‘man’ is a short term for manual page. In Linux is used to display the user manual of any command that we can run on the terminal. It provides a detailed view of the command which includes NAME, SYNOPSIS, DESCRIPTION, OPTIONS, EXIT STATUS, RETURN VALUES, ERRORS, FILES, VERSIONS, EXAMPLES, AUTHORS and SEE ALSO.

```
t-rex@trex-ZenBook-UX431DA-UM431DA:~$ man ls  
t-rex@trex-ZenBook-UX431DA-UM431DA:~$ █
```

```
LS(1)                               User Commands                         LS(1)

NAME
    ls - list directory contents

SYNOPSIS
    ls [OPTION]... [FILE]...

DESCRIPTION
    List information about the FILEs (the current directory by default).
    Sort entries alphabetically if none of -cftuvSUX nor --sort is specified.

    Mandatory arguments to long options are mandatory for short options too.

    -a, --all
        do not ignore entries starting with .

    -A, --almost-all
        do not list implied . and ..

    --author
        with -l, print the author of each file

    -b, --escape
        print C-style escapes for nongraphic characters

    --block-size=SIZE
        scale sizes by SIZE before printing them; e.g., '--block-size=M' prints sizes in units of 1,048,576 bytes; see SIZE format below

    -B, --ignore-backups
        do not list implied entries ending with ~

    -c
        with -lt: sort by, and show, ctime (time of last modification of file status information); with -l: show ctime and sort by name; otherwise: sort by ctime, newest first

    -C
        list entries by columns
Manual page ls(1) line 1 (press h for help or q to quit)
```

- **ls**

The ‘ls’ is the list command in Linux. It will show the full list or content of your directory. Just type ls and press the enter key. The whole content will be shown.

```
t-rex@trex-ZenBook-UX431DA-UM431DA:~$ ls
Desktop      Downloads          Music      Public   Templates
Documents    examples.desktop  Pictures   snap     Videos
t-rex@trex-ZenBook-UX431DA-UM431DA:~$ █
```

- **cd**

'cd' command in linux known as change directory command. It is used to change current working directory. In the above example, we have checked number of directories in our home directory and moved inside the Documents directory by using cd Documents command.

```
t-rex@trex-ZenBook-UX431DA-UM431DA:~/Documents$ cd Documents  
t-rex@trex-ZenBook-UX431DA-UM431DA:~/Documents$
```

- **mkdir**

mkdir command in Linux allows the user to create directories (also referred to as folders in some operating systems). This command can create multiple directories at once as well as set the permissions for the directories. It is important to note that the user executing this command must have enough permissions to create a directory in the parent directory, or you may receive a 'permission denied' error.

```
t-rex@trex-ZenBook-UX431DA-UM431DA:~/Documents$ mkdir testfolder  
t-rex@trex-ZenBook-UX431DA-UM431DA:~/Documents$ ls  
'Network Lab' testfolder
```

- **rmdir**

rmdir command is used remove empty directories from the filesystem in Linux. The rmdir command removes each an every directory specified in the command line only if these directories are empty. So if the specified directory has some directories or files in it then this cannot be removed by rmdir command.

```
t-rex@trex-ZenBook-UX431DA-UM431DA:~/Documents$ rmdir testfolder  
t-rex@trex-ZenBook-UX431DA-UM431DA:~/Documents$ pwd  
/home/t-rex/Documents  
t-rex@trex-ZenBook-UX431DA-UM431DA:~/Documents$ ls  
'Network Lab'  
t-rex@trex-ZenBook-UX431DA-UM431DA:~/Documents$
```

- **touch**

The touch command is a standard command used in UNIX/Linux operating system which is used to create, change and modify timestamps of a file. You can update the modification and access time of each file with the help of touch command.

```
t-rex@trex-ZenBook-UX431DA-UM431DA:~/Documents$ touch test2  
t-rex@trex-ZenBook-UX431DA-UM431DA:~/Documents$ ls  
'Network Lab' test2  
t-rex@trex-ZenBook-UX431DA-UM431DA:~/Documents$
```

- **rm**

The 'rm' means remove. This command is used to remove a file. The command line doesn't have a recycle bin or trash unlike other GUI's to recover the files. Hence, be very much careful while using this command. Once you have deleted a file, it is removed permanently.

```
t-rex@trex-ZenBook-UX431DA-UM431DA:~/Documents$ rm test2
t-rex@trex-ZenBook-UX431DA-UM431DA:~/Documents$ ls
'Network Lab'
t-rex@trex-ZenBook-UX431DA-UM431DA:~/Documents$ █
```

- **cat**

Cat(concatenate) command is very frequently used in Linux. It can be used to display the content of a file, copy content from one file to another, concatenate the contents of multiple files, display the line number, display \$ at the end of the line, etc.

```
t-rex@trex-ZenBook-UX431DA-UM431DA:~/Documents$ cat data
Hi this is Ubuntu
Located in documents
This is for testing cat command.
t-rex@trex-ZenBook-UX431DA-UM431DA:~/Documents$ █
```

2. Basic Linux Commands Explain Linux Commands with Examples.

- **echo**

echo command in linux is used to display line of text/string that are passed as an argument . This is a built in command that is mostly used in shell scripts and batch files to output status text to the screen or a file.

```
t-rex@trex-ZenBook-UX431DA-UM431DA:  
File Edit View Search Terminal Help  
t-rex@trex-ZenBook-UX431DA-UM431DA:~$ echo billan  
billan  
t-rex@trex-ZenBook-UX431DA-UM431DA:~$ name="billan"  
t-rex@trex-ZenBook-UX431DA-UM431DA:~$ echo $name  
billan  
t-rex@trex-ZenBook-UX431DA-UM431DA:~$ 
```

- **head**

The head command, as the name implies, print the top N number of data of the given input. By default, it prints the first 10 lines of the specified files. If more than one file name is provided then data from each file is preceded by its file name.

```
Desktop Downloads Music Public Templates  
t-rex@trex-ZenBook-UX431DA-UM431DA:~$ head billan.txt  
Billan  
Jacob  
John  
MCA A  
2nd sem  
No: 34  
t-rex@trex-ZenBook-UX431DA-UM431DA:~$ head -n3 billan.txt  
Billan  
Jacob  
John  
t-rex@trex-ZenBook-UX431DA-UM431DA:~$ 
```

- **tail**

The tail command, as the name implies, print the last N number of data of the given input. By default it prints the last 10 lines of the specified files. If more than one file name is provided then data from each file is precedes by its file name.

```
t-rex@trex-ZenBook-UX431DA-UM431DA:~$ tail -n3 billan.txt
2nd sem
No: 34

t-rex@trex-ZenBook-UX431DA-UM431DA:~$ tail -n4 billan.txt
MCA A
2nd sem
No: 34

t-rex@trex-ZenBook-UX431DA-UM431DA:~$ tail billan.txt
Billan
Jacob
John
MCA A
2nd sem
No: 34
t-rex@trex-ZenBook-UX431DA-UM431DA:~$ tail -n3 billan.txt
MCA A
2nd sem
No: 34
t-rex@trex-ZenBook-UX431DA-UM431DA:~$
```

- **read**

read command in Linux system is used to read from a file descriptor. Basically, this command read up the total number of bytes from the specified file descriptor into the buffer. If the number or count is zero then this command may detect the errors. But on success, it returns the number of bytes read. Zero indicates the end of the file. If some errors found then it returns -1.

```
hello Billan
t-rex@trex-ZenBook-UX431DA-UM431DA:~$ read hello
hello
t-rex@trex-ZenBook-UX431DA-UM431DA:~$
```

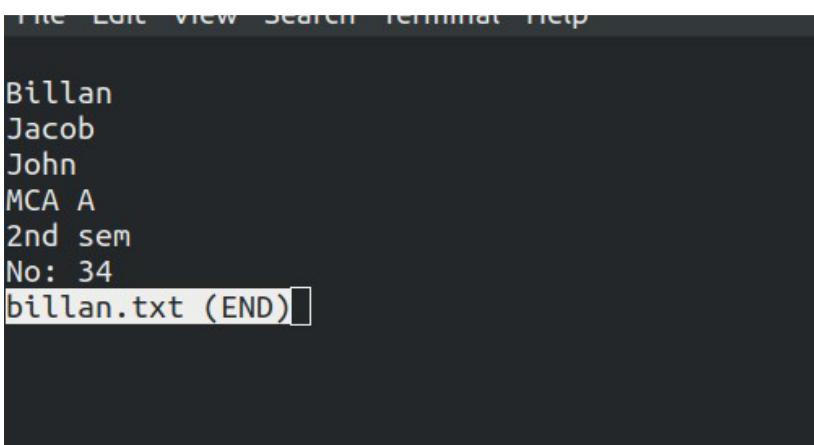
- **more**

more command is used to view the text files in the command prompt, displaying one screen at a time in case the file is large (For example log files). The more command also allows the user do scroll up and down through the page. Another application of more is to use it with some other command after a pipe. When the output is large, we can use more command to see output one by one.

```
t-rex@trex-ZenBook-UX431DA-UM431DA: ~
File Edit View Search Terminal Help
t-rex@trex-ZenBook-UX431DA-UM431DA:~$ more -3 billan.txt
Billan
Jacob
John
t-rex@trex-ZenBook-UX431DA-UM431DA:~$
```

- **less**

Less command is linux utility which can be used to read contents of text file one page(one screen) per time. It has faster access because if file is large, it don't access complete file, but access it page by page. For example, if it's a large file and you are reading it using any text editor, then the complete file will be loaded to main memory, but less command don't load entire file, but load it part by part, which makes it faster.



The screenshot shows a terminal window with a dark background and light-colored text. At the top, there is a menu bar with options: File, Edit, View, Search, Terminal, Help. Below the menu, the text "billan.txt (END)" is displayed in parentheses, indicating the file being viewed and that the end of the file has been reached. The main content area of the terminal shows the following text:

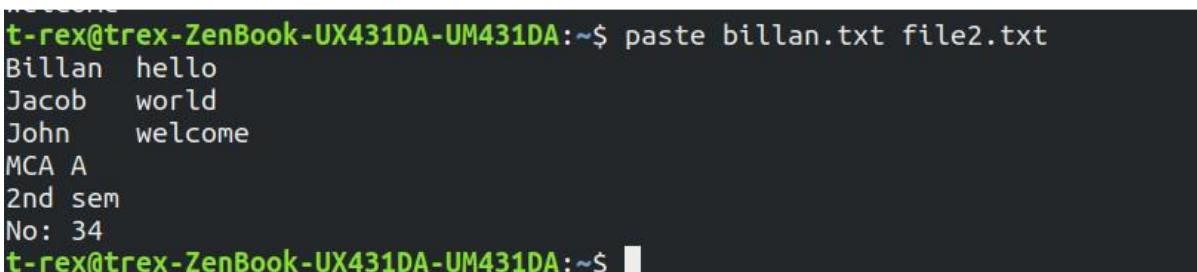
```
Billan
Jacob
John
MCA A
2nd sem
No: 34
```

- **cut**

The cut command in UNIX is a command for cutting out the sections from each line of files and writing the result to standard output. It can be used to cut parts of a line by byte position, character and field. Basically the cut command slices a line and extracts the text. It is necessary to specify option with command otherwise it gives error. If more than one file name is provided then data from each file is not preceded by its file name.

- **paste**

Paste command is one of the useful commands in Unix or Linux operating system. It is used to join files horizontally (parallel merging) by outputting lines consisting of lines from each file specified, separated by tab as delimiter, to the standard output. When no file is specified, or put dash ("") instead of file name, paste reads from standard input and gives output as it is until a interrupt command [Ctrl-c] is given.



The screenshot shows a terminal window with a dark background and light-colored text. The command "paste billan.txt file2.txt" is entered at the prompt. The output shows the contents of the two files joined horizontally, separated by tabs. The "file2.txt" file is empty, so it only contains the separator between the lines of "billan.txt". The output is:

```
t-rex@trex-ZenBook-UX431DA-UM431DA:~$ paste billan.txt file2.txt
Billan    hello
Jacob     world
John      welcome
MCA A
2nd sem
No: 34
```

- **uname**

The command ‘uname’ displays the information about the system.

```
[NO: 34]
t-rex@trex-ZenBook-UX431DA-UM431DA:~$ uname -a
Linux trex-ZenBook-UX431DA-UM431DA 5.4.0-42-generic #46~18.04.1-Ubuntu SMP Fri Jul 10 07:21:24 UTC 2020 x86_64 x86_64 x86_64 GNU/Linux
t-rex@trex-ZenBook-UX431DA-UM431DA:~$ ]
```

- **cp**

cp stands for copy. This command is used to copy files or group of files or directory. It creates an exact image of a file on a disk with different file name. cp command require at least two filenames in its arguments.

```
t-rex@trex-ZenBook-UX431DA-UM431DA:~$ cat file2.txt
hello
world
welcome
t-rex@trex-ZenBook-UX431DA-UM431DA:~$ cat billan.txt
Billan
Jacob
John
MCA A
2nd sem
No: 34
t-rex@trex-ZenBook-UX431DA-UM431DA:~$ cp billan.txt file2.txt
t-rex@trex-ZenBook-UX431DA-UM431DA:~$ cat billan.txt
Billan
Jacob
John
MCA A
2nd sem
No: 34
t-rex@trex-ZenBook-UX431DA-UM431DA:~$ cat file2.txt
Billan
Jacob
John
MCA A
2nd sem
No: 34
t-rex@trex-ZenBook-UX431DA-UM431DA:~$ ]
```

- **mv**

mv stands for move. mv is used to move one or more files or directories from one place to another in a file system like UNIX. It has two distinct functions:

- (i) It renames a file or folder.
- (ii) It moves a group of files to a different directory.

No additional space is consumed on a disk during renaming. This command normally works silently means no prompt for confirmation.

```
t-rex@trex-ZenBook-UX431DA-UM431DA:~$ ls
billan.txt  Documents  examples.desktop  Music  Public  Templates
Desktop  Downloads  file2.txt  Pictures  snap  Videos
t-rex@trex-ZenBook-UX431DA-UM431DA:~$ mv file2.txt Documents/Network_Lab
mv: target 'Lab' is not a directory
t-rex@trex-ZenBook-UX431DA-UM431DA:~$ mv file2.txt Documents/Network_Lab
t-rex@trex-ZenBook-UX431DA-UM431DA:~$ ls
billan.txt  Documents  examples.desktop  Pictures  snap  Videos
Desktop  Downloads  Music  Public  Templates
t-rex@trex-ZenBook-UX431DA-UM431DA:~$ cd Documents/Network_Lab
t-rex@trex-ZenBook-UX431DA-UM431DA:~/Documents/Network_Lab$ ls
15-06  file2.txt
t-rex@trex-ZenBook-UX431DA-UM431DA:~/Documents/Network_Lab$ 
```

- **locate**

locate command in Linux is used to find the files by name. There are two most widely used file searching utilities accessible to users are called find and locate. The locate utility works better and faster than find command counterpart because instead of searching the file system when a file search is initiated, it would look through a database. This database contains bits and parts of files and their corresponding paths on your system. By default, locate command does not check whether the files found in the database still exist and it never reports files created after the most recent update of the relevant database.

```
t-rex@trex-ZenBook-UX431DA-UM431DA:~$ locate Videos
/home/t-rex/Videos
t-rex@trex-ZenBook-UX431DA-UM431DA:~$ 
```

- **find**

The find command in UNIX is a command line utility for walking a file hierarchy. It can be used to find files and directories and perform subsequent operations on them. It supports searching by file, folder, name, creation date, modification date, owner and permissions. By using the '- exec' other UNIX commands can be executed on files or folders found.

```
t-rex@trex-ZenBook-UX431DA-UM431DA:~$ find Documents
Documents
Documents/Network_Lab
Documents/Network_Lab/file2.txt
Documents/Network_Lab/15-06
Documents/Network_Lab/15-06/Screenshot from 2021-06-15 01-49-28.png
Documents/Network_Lab/15-06/Screenshot from 2021-06-15 01-50-45.png
Documents/Network_Lab/15-06/Screenshot from 2021-06-15 01-41-31.png
Documents/Network_Lab/15-06/Screenshot from 2021-06-15 01-48-54.png
Documents/Network_Lab/15-06/Screenshot from 2021-06-15 01-43-11.png
Documents/Network_Lab/15-06/Screenshot from 2021-06-15 01-46-34.png
Documents/Network_Lab/15-06/Screenshot from 2021-06-15 01-48-42.png
Documents/Network_Lab/15-06/Linux Lab 1.docx
Documents/Network_Lab/15-06/Screenshot from 2021-06-15 01-42-33.png
Documents/Network_Lab/15-06/Screenshot from 2021-06-15 01-44-16.png
```

- **df**

The df command (short for disk free), is used to display information related to file systems about total space and available space.

Syntax :

df [OPTION]... [FILE]...

```
t-rex@trex-ZenBook-UX431DA-UM431DA:~$ df
Filesystem      1K-blocks    Used Available Use% Mounted on
udev            2985740      0   2985740  0% /dev
tmpfs           608520     1820   606700  1% /run
/dev/nvme0n1p6  70031584 9680400  56750752 15% /
tmpfs           3042588    87364  2955224  3% /dev/shm
tmpfs            5120       4    5116  1% /run/lock
tmpfs           3042588      0  3042588  0% /sys/fs/cgroup
/dev/loop1        261760   261760      0 100% /snap/gnome-3-34-1804/36
/dev/loop2         1024    1024      0 100% /snap/gnome-logs/100
/dev/loop3        247552   247552      0 100% /snap/brave/116
/dev/loop4        56704    56704      0 100% /snap/core18/1885
/dev/loop0        183936   183936      0 100% /snap/spotify/46
/dev/loop5        63616    63616      0 100% /snap/gtk-common-themes/1506
/dev/loop6         2304    2304      0 100% /snap/gnome-system-monitor/148
/dev/loop7        30720   30720      0 100% /snap/snapd/8542
/dev/loop8         384     384      0 100% /snap/gnome-characters/550
/dev/loop9        2560    2560      0 100% /snap/gnome-calculator/748
/dev/nvme0n1p1    262144  32076  230068  13% /boot/efi
tmpfs           608516   2072   606444  1% /run/user/1000
t-rex@trex-ZenBook-UX431DA-UM431DA:~$
```

- **du**

du command, short for disk usage, is used to estimate file space usage. The du command can be used to track the files and directories which are consuming excessive amount of space on hard disk drive.

Syntax :

du [OPTION]... [FILE]...

du [OPTION]... --files0-from=F

```
t-rex@trex-ZenBook-UX431DA-UM431DA:~$ du
4      ./Public
24196  ./Pictures/Wallpapers
25836  ./Pictures
4      ./Templates
4      ./config/eog
4      ./config/update-notifier
4      ./config/goa-1.0
4      ./config/autostart
4      ./config/enchant
8      ./config/gtk-4.0
20     ./config/dconf
8      ./config/ibus/bus
12     ./config/ibus
12     ./config/gtk-3.0
8      ./config/gedit
12     ./config/nautilus
4      ./config/gnome-session/saved-session
8      ./config/gnome-session
```

- **useradd**

useradd is a command in Linux that is used to add user accounts to your system. It is just a symbolic link to adduser command in Linux and the difference between both of them is that useradd is a native binary compiled with system whereas adduser is a Perl script which uses useradd binary in the background. It make changes to the following files:

- /etc/passwd
- /etc/shadow
- /etc/group
- /etc/gshadow
- creates a directory for new user in /home

Syntax:

useradd [options] name_of_the_user

- **userdel**

userdel command in Linux system is used to delete a user account and related files. This command basically modifies the system account files, deleting all the entries which refer to the username LOGIN. It is a low-level utility for removing the users.

Syntax:

userdel [options] LOGIN

- **sudo**

sudo (Super User DO) command in Linux is generally used as a prefix of some command that only superuser are allowed to run. If you prefix “sudo” with any command, it will run that command with elevated privileges or in other words allow a user with proper permissions to execute a command as another user, such as the superuser. This is the equivalent of “run as administrator” option in Windows. The option of sudo lets us have multiple administrators. These users who can use the sudo command need to have an entry in the sudoers file located at “/etc/sudoers”. Remember that to edit or view the sudoers file you have to use sudo command. To edit the sudoers file it is recommended to use “visudo” command. By default, sudo requires that users authenticate themselves with a password which is the user’s password, not the root password itself.

```
t-rex@trex-ZenBook-UX431DA-UM431DA:~$ sudo -V
Sudo version 1.8.21p2
Sudoers policy plugin version 1.8.21p2
Sudoers file grammar version 46
Sudoers I/O plugin version 1.8.21p2
t-rex@trex-ZenBook-UX431DA-UM431DA:~$
```

- **passwd**

passwd command in Linux is used to change the user account passwords. The root user reserves the privilege to change the password for any user on the system, while a normal user can only change the account password for his or her own account.

Syntax:

passwd [options] [username]

```
passw... 1/3 plugin version 1.0.21pz
t-rex@trex-ZenBook-UX431DA-UM431DA:~$ passwd
Changing password for t-rex.
(current) UNIX password: 
```

3. Explain linux commands usermod, groupadd, groups, groupmod, groupdel, chmod, chown, id, ps, top with examples.

- **usermod**

usermod command or modify user is a command in Linux that is used to change the properties of a user in Linux through the command line. After creating a user we have to sometimes change their attributes like password or login directory etc. so in order to do that we use the Usermod command.

```
t-rex@trex-ZenBook-UX431DA-UM431DA:~$ sudo usermod -e 2021-08-15 testuser
[sudo] password for t-rex:
t-rex@trex-ZenBook-UX431DA-UM431DA:~$ sudo chage -l testuser
Last password change : Aug 13, 2021
Password expires     : never
Password inactive    : never
Account expires       : Aug 15, 2021
Minimum number of days between password change : 0
Maximum number of days between password change : 99999
Number of days of warning before password expires: 7
t-rex@trex-ZenBook-UX431DA-UM431DA:~$ █
```

```
t-rex@trex-ZenBook-UX431DA-UM431DA:~$ sudo usermod -d /Home/Documents testuser
t-rex@trex-ZenBook-UX431DA-UM431DA:~$ █
```

- **addgroup**

addgroup command in Linux is used to add a new group to your current Linux machine.

```
t-rex@trex-ZenBook-UX431DA-UM431DA:~$ sudo groupadd group1
[sudo] password for t-rex:
Sorry, try again.
[sudo] password for t-rex:
t-rex@trex-ZenBook-UX431DA-UM431DA:~$ sudo groupadd group1
groupadd: group 'group1' already exists
t-rex@trex-ZenBook-UX431DA-UM431DA:~$ sudo groupdel group1
t-rex@trex-ZenBook-UX431DA-UM431DA:~$ sudo groupadd group1
t-rex@trex-ZenBook-UX431DA-UM431DA:~$ sudo tail /etc/group
avahi:x:120:
colord:x:121:
geoclue:x:122:
pulse:x:123:
pulse-access:x:124:
gdm:x:125:
t-rex:x:1000:
sambashare:x:126:t-rex
testuser:x:1001:
group1:x:1002:
t-rex@trex-ZenBook-UX431DA-UM431DA:~$ █
```

- **groups**

Groups command prints the names of the primary and any supplementary groups for each given username, or the current process if no names are given.

```
t-rex@trex-ZenBook-UX431DA-UM431DA:~$ groups t-rex
t-rex : t-rex adm cdrom sudo dip plugdev lpadmin sambashare
t-rex@trex-ZenBook-UX431DA-UM431DA:~$ █
```

- **groupdel**

groupdel command is used to delete a existing group. It will delete all entry that refers to the group, modifies the system account files, and it is handled by superuser or root user.

```
t-rex@trex-ZenBook-UX431DA-UM431DA:~$ sudo groupdel group1
t-rex@trex-ZenBook-UX431DA-UM431DA:~$ sudo tail /etc/group
saned:x:119:
avahi:x:120:
colord:x:121:
geoclue:x:122:
pulse:x:123:
pulse-access:x:124:
gdm:x:125:
t-rex:x:1000:
sambashare:x:126:t-rex
testuser:x:1001:
t-rex@trex-ZenBook-UX431DA-UM431DA:~$ █
```

- **groupmod**

The groupmod command modifies the definition of the specified group by modifying the appropriate entry in the group database.

```
t-rex@trex-ZenBook-UX431DA-UM431DA:~$ sudo groupmod -n newgroup group1
t-rex@trex-ZenBook-UX431DA-UM431DA:~$ sudo tail /etc/group
avahi:x:120:
colord:x:121:
geoclue:x:122:
pulse:x:123:
pulse-access:x:124:
gdm:x:125:
t-rex:x:1000:
sambashare:x:126:t-rex
testuser:x:1001:
newgroup:x:1002:
t-rex@trex-ZenBook-UX431DA-UM431DA:~$ █
```

- **chmod**

The chmod command is used to change the access mode of a file. The name is an abbreviation of change mode.

```
t-rex@trex-ZenBook-UX431DA-UM431DA:~$ chmod u+w text.txt  
t-rex@trex-ZenBook-UX431DA-UM431DA:~$ █
```

- **chown**

The chown command allows you to change the user and/or group ownership of a given file, directory.

```
t-rex@trex-ZenBook-UX431DA-UM431DA:~$ chown t-rex text.txt  
t-rex@trex-ZenBook-UX431DA-UM431DA:~$ █
```

- **id**

id command in Linux is used to find out user and group names and numeric ID's (UID or group ID) of the current user.

```
t-rex@trex-ZenBook-UX431DA-UM431DA:~$ id  
uid=1000(t-rex) gid=1000(t-rex) groups=1000(t-rex),4(adm),24(cdrom),27(sudo),30(dip),46(plugdev),116  
(lpadmin),126(sambashare)  
t-rex@trex-ZenBook-UX431DA-UM431DA:~$ █
```

- **ps**

The ps command, short for Process Status, is a command line utility that is used to display or view information related to the processes running in a Linux system.

```
t-rex@trex-ZenBook-UX431DA-UM431DA:~$ ps -u  
USER      PID %CPU %MEM    VSZ   RSS TTY      STAT START   TIME COMMAND  
t-rex     1005  0.0  0.0  212132  6036 ttyn1    Ssl+ 20:09  0:00 /usr/lib/gdm3/gdm-x-session --ru  
t-rex     1007  6.6  2.3 1760096 141144 ttyn1    Sl+  20:09  6:07 /usr/lib/xorg/Xorg vt1 -displayf  
t-rex     1037  0.0  0.2  577936 16232 ttyn1    Sl+  20:09  0:00 /usr/lib/gnome-session/gnome-ses  
t-rex     1248  7.0  3.9 5061088 239204 ttyn1    Sl+  20:09  6:27 /usr/bin/gnome-shell  
t-rex     1328  0.1  0.1 378020 10400 ttyn1    Sl  20:09  0:07 ibus-daemon --xim --panel disabl  
t-rex     1332  0.0  0.1 296660  8412 ttyn1    Sl  20:09  0:00 /usr/lib/ibus/ibus-dconf  
t-rex     1334  0.0  0.3 356516 22592 ttyn1    Sl  20:09  0:00 /usr/lib/ibus/ibus-x11 --kill-da  
t-rex     1410  0.0  0.3 527568 24156 ttyn1    Sl+  20:09  0:00 /usr/lib/gnome-settings-daemon/g  
t-rex     1412  0.0  0.1 349324 10332 ttyn1    Sl+  20:09  0:00 /usr/lib/gnome-settings-daemon/g  
t-rex     1413  0.0  0.0 423344  5844 ttyn1    Sl+  20:09  0:00 /usr/lib/gnome-settings-daemon/g  
t-rex     1414  0.0  0.0 275860  5912 ttyn1    Sl+  20:09  0:00 /usr/lib/gnome-settings-daemon/g  
t-rex     1416  0.0  0.1 471324 11664 ttyn1    Sl+  20:09  0:00 /usr/lib/gnome-settings-daemon/g  
t-rex     1424  0.0  0.1 392716  9880 ttyn1    Sl+  20:09  0:00 /usr/lib/gnome-settings-daemon/g  
t-rex     1426  0.0  0.1 343096  9808 ttyn1    Sl+  20:09  0:00 /usr/lib/gnome-settings-daemon/g  
t-rex     1430  0.0  0.3 504892 23808 ttyn1    Sl+  20:09  0:00 /usr/lib/gnome-settings-daemon/g  
t-rex     1438  0.0  0.3 440976 23068 ttyn1    Sl+  20:09  0:00 /usr/lib/gnome-settings-daemon/g  
t-rex     1446  0.0  0.1 296644  8384 ttyn1    Sl+  20:09  0:00 /usr/lib/gnome-settings-daemon/g  
t-rex     1447  0.0  0.3 356044 22240 ttyn1    Sl+  20:09  0:00 /usr/lib/gnome-settings-daemon/g  
t-rex     1452  0.0  0.4 678464 24928 ttyn1    Sl+  20:09  0:00 /usr/lib/gnome-settings-daemon/g
```

- **top**

top command is used to show the Linux processes. It provides a dynamic real-time view of the running system.

```
t-rex@trex-ZenBook-UX431DA-UM431DA:~$ top

top - 21:42:26 up 1:32, 1 user, load average: 1.33, 1.57, 1.58
Tasks: 275 total, 1 running, 200 sleeping, 0 stopped, 0 zombie
%Cpu(s): 6.7 us, 1.8 sy, 0.0 ni, 90.8 id, 0.2 wa, 0.0 hi, 0.5 si, 0.0 st
KiB Mem : 6085180 total, 410616 free, 2893852 used, 2780712 buff/cache
KiB Swap: 2097148 total, 2097148 free, 0 used. 2557420 avail Mem

      PID USER      PR  NI    VIRT    RES    SHR S %CPU %MEM     TIME+ COMMAND
2170 t-rex      20   0 3526812 478836 210436 S 24.8  7.9  16:56.74 Web Content
3774 t-rex      20   0 3541220 512096 172060 S 15.2  8.4  23:16.53 Web Content
1007 t-rex      20   0 1760608 141144 103756 S  8.6  2.3   6:11.77 Xorg
1248 t-rex      20   0 5062032 237764 99380 S  6.6  3.9   6:31.39 gnome-shell
1726 t-rex      20   0 4197964 651144 172244 S  6.0 10.7  25:59.43 MainThread
1303 t-rex      9 -11 3250776 24704 20072 S  4.3  0.4   3:36.33 pulseaudio
3185 t-rex      20   0 1468172 157888 53840 S  3.3  2.6   0:38.18 evince
3088 t-rex      20   0 352180 37508 29636 S  2.3  0.6   0:57.92 RDD Process
550 root        -2   0      0      0      0 S  0.7  0.0   0:08.20 sdma0
6285 t-rex    20   0 51316 4080 3364 R  0.7  0.1  0:00.06 top
 1 root        20   0 225584 9332 6776 S  0.3  0.2   0:09.93 systemd
 31 root        20   0      0      0      0 I  0.3  0.0   0:01.67 kworker/3:0-eve
 443 root       -51  0      0      0      0 S  0.3  0.0   0:23.49 irq/71-iwlwifi
 520 root       -2   0      0      0      0 S  0.3  0.0   0:16.56 gfx
```

4. Explain linux commands wc, tar(create, extract using gzip, xz, bzip2), expr, redirections and piping, ssh, ssh-keygen, scp, ssh-copy-id with examples.

- **wc**

wc stands for word count. It is used to find out number of lines, word count byte and characters count in the files specified in the file arguments.

```
File Edit View Search Terminal Help
t-rex@trex-ZenBook-UX431DA-UM431DA:~$ wc -c text.txt
41 text.txt
t-rex@trex-ZenBook-UX431DA-UM431DA:~$
```

- **tar**

The Linux ‘tar’stands for tape archive, is used to create Archive and extract the Archive files.

```
t-rex@trex-ZenBook-UX431DA-UM431DA:~$ tar cf archive.tar t1.txt t2.txt
t-rex@trex-ZenBook-UX431DA-UM431DA:~$ ls archive.tar
archive.tar
t-rex@trex-ZenBook-UX431DA-UM431DA:~$ cat archive.tar
t1.txt00006440001750000175000000000014105517524011015 0ustar  t-rex-trex2.txt000064400017500001750t-tt-ret-t-tttt
t-rex@trex-ZenBook-UX431DA-UM431DA:~$
```

Extract an archive:

```
tar: Error - ts not recoverable. Extracting now.
t-rex@trex-ZenBook-UX431DA-UM431DA:~$ tar -xvf archive.tar
t1.txt
t2.txt
t-rex@trex-ZenBook-UX431DA-UM431DA:~$
```

- **expr**

The expr command evaluates a given expression and displays its corresponding output.

It is used for:

- Basic operations like addition, subtraction, multiplication, division, and modulus on integers.
- Evaluating regular expressions, string operations like substring, length of strings etc.

```
t-rex@trex-ZenBook-UX431DA-UM431DA:~$ expr 2 + 5
7
t-rex@trex-ZenBook-UX431DA-UM431DA:~$
```

- **Redirections & Piping**

Redirection can be defined as changing the way from where commands read input to where commands sends output. You can redirect input and output of a command.

Overwrite

Commands with a single bracket '>' overwrite existing file content.

> : standard output

< : standard input

2> : standard error.

Append

Commands with a double bracket '>>' do not overwrite the existing file content.

>> - standard output

<< - standard input

2>> - standard error

```
cat
t-rex@trex-ZenBook-UX431DA-UM431DA:~$ cat > t1.txt
Written successfully
t-rex@trex-ZenBook-UX431DA-UM431DA:~$ cat t1.txt
Written successfully
t-rex@trex-ZenBook-UX431DA-UM431DA:~$ █
```

A pipe is a form of redirection (transfer of standard output to some other destination) that is used in Linux and other Unix-like operating systems to send the output of one command/program/process to another command/program/process for further processing.

```
t-rex
t-rex@trex-ZenBook-UX431DA-UM431DA:~$ ls -l | more
total 56
-rw-r--r-- 1 t-rex t-rex 137 Aug 13 22:06 archive.tar
drwxr-xr-x 2 t-rex t-rex 4096 Aug 12 14:58 Desktop
drwxr-xr-x 3 t-rex t-rex 4096 Aug 9 20:53 Documents
drwxr-xr-x 2 t-rex t-rex 4096 Aug 13 20:17 Downloads
-rw-r--r-- 1 t-rex t-rex 8980 Jun 8 19:13 examples.desktop
drwxr-xr-x 2 t-rex t-rex 4096 Jun 9 00:47 Music
drwxr-xr-x 5 t-rex t-rex 4096 Aug 13 22:18 Pictures
drwxr-xr-x 2 t-rex t-rex 4096 Jun 9 00:47 Public
drwxr-xr-x 4 t-rex t-rex 4096 Jun 8 17:31 snap
-rw-r--r-- 1 t-rex t-rex 0 Aug 13 22:05 t1.txt
-rw-r--r-- 1 t-rex t-rex 0 Aug 13 22:05 t2.txt
drwxr-xr-x 2 t-rex t-rex 4096 Jun 9 00:47 Templates
-rw-r--r-- 1 t-rex t-rex 41 Aug 9 16:00 text.txt
drwxr-xr-x 2 t-rex t-rex 4096 Jun 9 00:47 Videos
t-rex@trex-ZenBook-UX431DA-UM431DA:~$ █
```

- **ssh**

ssh stands for “Secure Shell”. It is a protocol used to securely connect to a remote server/system. ssh is secure in the sense that it transfers the data in encrypted

form between the host and the client. It transfers inputs from the client to the host and relays back the output. ssh runs at TCP/IP port 22.

```
t-rex@trex-ZenBook-UX431DA-UM431DA:~$  
t-rex@trex-ZenBook-UX431DA-UM431DA:~$  
t-rex@trex-ZenBook-UX431DA-UM431DA:~$ ssh mca@192.168.91
```

- **ssh-keygen**

ssh-keygen is the utility used to generate, manage, and convert authentication keys for SSH. ssh-keygen comes installed with SSH in most of the operating systems. ssh-keygen is able to generate a key using one of three different digital signature algorithms.

```
Generating RSA public/private key pair.  
Enter file in which to save the key (/home/t-rex/.ssh/id_rsa): y  
Enter passphrase (empty for no passphrase):  
Enter same passphrase again:  
Your identification has been saved in y.  
Your public key has been saved in y.pub.  
The key fingerprint is:  
SHA256:5ja6MirIlK/qiNkm9IXy//ZPZtmDqHg+LwqJABcXVT8 t-rex@trex-ZenBook-UX431DA-UM431DA  
The key's randomart image is:  
+---[RSA 2048]---+  
| . oo... |  
| o . . |  
| .. E |  
| .. . |  
| ... S |  
|.=.... o . + |  
|=.=o. +. * o |  
|*+.++ .B..+ . |  
|B*+..*0==o.. |  
+---[SHA256]---+  
t-rex@trex-ZenBook-UX431DA-UM431DA:~$
```

- **scp**

scp (secure copy) command in Linux system is used to copy file(s) between servers in a secure way. The SCP command or secure copy allows secure transferring of files in between the local host and the remote host or between two remote hosts.

- **ssh-copy-id**

ssh-copy-id installs an ssh key on a server as an authorized key. Its purpose is to provision access without requiring a password for each login. This facilitates automated, passwordless logins and single sign-on using the SSH protocol.

```
t-rex@trex-ZenBook-UX431DA-UM431DA:~$ ssh-copy-id mca@192.168.91
```

```
^F
```

5. Lab Assignment Managing Files, Creating Users and Groups Using Command-line tools

1.

- a. Create six files with name of the form songX.mp3
- b. Create six files with name of the form snapX.mp3
- c. Create six files with name of the form filmX.mp3

```
t-rex@trex-ZenBook-UX431DA-UM431DA:~\nFile Edit View Search Terminal Help\nt-rex@trex-ZenBook-UX431DA-UM431DA:~$ touch song1.mp3 song2.mp3 song3.mp3 song4.mp3 song5.mp3 song6.mp3\nt-rex@trex-ZenBook-UX431DA-UM431DA:~$ touch snap1.mp3 snap2.mp3 snap3.mp3 snap4.mp3 snap5.mp3 snap6.mp3\nt-rex@trex-ZenBook-UX431DA-UM431DA:~$ touch film1.mp3 film2.mp3 film3.mp3 film4.mp3 film5.mp3 film6.mp3\nt-rex@trex-ZenBook-UX431DA-UM431DA:~$ 
```

2. From your home directory, move the song files into your music subdirectory, the snapshot files into your pictures subdirectory, and the movie files into videos subdirectory.

```
t-rex@trex-ZenBook-UX431DA-UM431DA:~\nFile Edit View Search Terminal Help\nt-rex@trex-ZenBook-UX431DA-UM431DA:~$ mv song1.mp3 song2.mp3 song3.mp3 song4.mp3 song5.mp3 song6.mp3 Music\nt-rex@trex-ZenBook-UX431DA-UM431DA:~$ mv snap1.mp3 snap2.mp3 snap3.mp3 snap4.mp3 snap5.mp3 snap6.mp3 Pictures\nt-rex@trex-ZenBook-UX431DA-UM431DA:~$ mv film1.mp3 film2.mp3 film3.mp3 film4.mp3 film5.mp3 film6.mp3 Videos
```

3. In your home directory, create three subdirectories for organizing your files. Call these directories friends, family, and work. Create all three with one command.

```
t-rex@trex-ZenBook-UX431DA-UM431DA:~$ mkdir family friends work\nt-rex@trex-ZenBook-UX431DA-UM431DA:~$ 
```

4. Copy song files to the friends folder and snap files to family folder.

```
cp: target 'Music/song6.mp3' is not a directory\nt-rex@trex-ZenBook-UX431DA-UM431DA:~$ cp Music/song1.mp3 Music/song2.mp3 Music/song3.mp3 Music/song4.mp3 Music/song5.mp3 Music/song6.mp3 friends\nt-rex@trex-ZenBook-UX431DA-UM431DA:~$ /*.mp3\nbash: /*.mp3: No such file or directory\nt-rex@trex-ZenBook-UX431DA-UM431DA:~$ cp Pictures/snap1.mp3 Pictures/snap2.mp3 Pictures/snap3.mp3 Pictures/snap4.mp3 Pictures/snap5.mp3 Pictures/snap6.mp3 family\nt-rex@trex-ZenBook-UX431DA-UM431DA:~$ 
```

5. Attempt to delete both family and friends projects with a single rmdir command.

```
t-rex@trex-ZenBook-UX431DA-UM431DA:~$ rmdir family friends  
rmdir: failed to remove 'family': Directory not empty  
rmdir: failed to remove 'friends': Directory not empty  
t-rex@trex-ZenBook-UX431DA-UM431DA:~$
```

6. Use another command that will succeed in deleting both the family and friends folder.

```
rmdir: failed to remove 'friends': Directory not empty  
t-rex@trex-ZenBook-UX431DA-UM431DA:~$ rm -r family friends  
t-rex@trex-ZenBook-UX431DA-UM431DA:~$
```

7. Redirect a long listing of all home directory files, including hidden, into a file named allfiles.txt. Confirm that the file contains the listing.

```
total 1 t-rex t-rex 416 Aug 15 22:42 y.pub  
t-rex@trex-ZenBook-UX431DA-UM431DA:~$ ls -al >allfiles.txt  
t-rex@trex-ZenBook-UX431DA-UM431DA:~$ ls -al >allfiles.txt  
t-rex@trex-ZenBook-UX431DA-UM431DA:~$
```

8. In the command window, display today's date with day of the week, month, date and year.

```
t-rex@trex-ZenBook-UX431DA-UM431DA:~$ date  
Tue Aug 17 16:32:32 IST 2021
```

9. Add the user Juliet

```
Tue Aug 17 16:32:32 IST 2021  
t-rex@trex-ZenBook-UX431DA-UM431DA:~$ sudo useradd juliet  
[sudo] password for t-rex:  
t-rex@trex-ZenBook-UX431DA-UM431DA:~$ cat
```

10. Confirm that Juliet has been added by examining the /etc/passwd file

```
t-rex@trex-ZenBook-UX431DA-UM431DA:~$ cat /etc/passwd  
root:x:0:0:root:/root:/bin/bash  
daemon:x:1:1:daemon:/usr/sbin:/usr/sbin/nologin  
bin:x:2:2:bin:/bin:/usr/sbin/nologin  
sys:x:3:3:sys:/dev:/usr/sbin/nologin  
sync:x:4:65534:sync:/bin:/sync  
games:x:5:60:games:/usr/games:/usr/sbin/nologin  
man:x:6:12:man:/var/cache/man:/usr/sbin/nologin  
lp:x:7:7:lp:/var/spool/lpd:/usr/sbin/nologin  
mail:x:8:8:mail:/var/mail:/usr/sbin/nologin  
news:x:9:9:news:/var/spool/news:/usr/sbin/nologin  
uucp:x:10:10:uucp:/var/spool/uucp:/usr/sbin/nologin  
proxy:x:13:13:proxy:/bin:/usr/sbin/nologin  
www-data:x:33:33:www-data:/var/www:/usr/sbin/nologin
```

11. Use the passwd command to initialize Juliet's password

```
password: you may not view or modify password information for juliet.  
t-rex@trex-ZenBook-UX431DA-UM431DA:~$ sudo passwd juliet  
Enter new UNIX password:  
Retype new UNIX password:  
passwd: password updated successfully  
t-rex@trex-ZenBook-UX431DA-UM431DA:~$ 
```

12. Create a supplementary group called Shakespeare with a group id of 30000.

```
passwd: password updated successfully  
t-rex@trex-ZenBook-UX431DA-UM431DA:~$ groupadd -g 30000 Shakespeare
```

13. Create a supplementary group called artists.

```
groupadd: created group ID 'artists'  
t-rex@trex-ZenBook-UX431DA-UM431DA:~$ sudo groupadd -g 40000 artists  
t-rex@trex-ZenBook-UX431DA-UM431DA:~$ 
```

14. Confirm that Shakespeare and artists have been added by examining the /etc/group file.

```
rtkit:x:114:  
ssh:x:115:  
lpadmin:x:116:t-rex  
whoopsie:x:117:  
scanner:x:118:saned  
saned:x:119:  
avahi:x:120:  
colord:x:121:  
geoclue:x:122:  
pulse:x:123:  
pulse-access:x:124:  
gdm:x:125:  
t-rex:x:1000:  
sambashare:x:126:t-rex  
testuser:x:1001:  
newgroup:x:1002:  
juliet:x:1003:  
Shakespeare:x:30000:  
artists:x:40000:  
t-rex@trex-ZenBook-UX431DA-UM431DA:~$ 
```

15. Add the Juliet user to the Shakespeare group as a supplementary group.

```
t-rex@trex-ZenBook-UX431DA-UM431DA:~$ sudo usermod -a -G Shakespeare juliet  
t-rex@trex-ZenBook-UX431DA-UM431DA:~$ groups juliet  
juliet : juliet Shakespeare
```

16. Confirm that Juliet has been added using the id command.

```
t-rex@trex-ZenBook-UX431DA-UM431DA:~$ id juliet
uid=1002(juliet) gid=1003(juliet) groups=1003(juliet),30000(Shakespeare)
t-rex@trex-ZenBook-UX431DA-UM431DA:~$
```

17. Add Romeo and Hamlet to the Shakespeare group.

```
t-rex@trex-ZenBook-UX431DA-UM431DA:~$ sudo useradd romeo
t-rex@trex-ZenBook-UX431DA-UM431DA:~$ sudo useradd hamlet
t-rex@trex-ZenBook-UX431DA-UM431DA:~$ sudo usermod -a -G Shakespeare romeo hamlet
Useradd: usermod: [optional] LOGIN
```

18. Add Reba, Dolly and Elvis to the artists group.

```
t-rex@trex-ZenBook-UX431DA-UM431DA:~$ sudo useradd reba
t-rex@trex-ZenBook-UX431DA-UM431DA:~$ sudo useradd dolly
t-rex@trex-ZenBook-UX431DA-UM431DA:~$ sudo useradd elvis
t-rex@trex-ZenBook-UX431DA-UM431DA:~$ sudo usermod -a -G artists reba
t-rex@trex-ZenBook-UX431DA-UM431DA:~$ sudo usermod -a -G artists dolly
t-rex@trex-ZenBook-UX431DA-UM431DA:~$ sudo usermod -a -G artists elvis
```

19. Verify the supplemental group memberships by examining the /etc/group file.

```
t-rex@trex-ZenBook-UX431DA-UM431DA:~$ cat /etc/group
root:x:0:
daemon:x:1:
bin:x:2:
sys:x:3:
adm:x:4:syslog,t-rex
tty:x:5:
disk:x:6:
newgroup:x:1002:
juliet:x:1003:
Shakespeare:x:30000:juliet,romeo,hamlet
artists:x:40000:reba,elvis,dolly
romeo:x:40001:
hamlet:x:1004:
reba:x:1005:
elvis:x:1007:
dolly:x:1008:
t-rex@trex-ZenBook-UX431DA-UM431DA:~$
```

20. Attempt to remove user Dolly.

```
t-rex@trex-ZenBook-UX431DA-UM431DA:~$ sudo userdel dolly
[sudo] password for t-rex:
t-rex@trex-ZenBook-UX431DA-UM431DA:~$
```

6. Try out these network commands in Window as well as in Linux and perform at least 4 options with each command: ping route traceroute, nslookup, Ip Config, NetStat .

- ping

```
C:\Users\ASUS>ping www.google.com

Pinging www.google.com [2404:6800:4007:81c::2004] with 32 bytes of data:
Reply from 2404:6800:4007:81c::2004: time=69ms
Reply from 2404:6800:4007:81c::2004: time=65ms
Reply from 2404:6800:4007:81c::2004: time=58ms
Reply from 2404:6800:4007:81c::2004: time=53ms

Ping statistics for 2404:6800:4007:81c::2004:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
Approximate round trip times in milli-seconds:
    Minimum = 53ms, Maximum = 69ms, Average = 61ms
```

```
t-rex@trex-ZenBook-UX431DA-UM431DA:~$ ping www.google.com
PING www.google.com (142.250.76.36) 56(84) bytes of data.
64 bytes from maa03s36-in-f4.1e100.net (142.250.76.36): icmp_seq=1 ttl=119 time=27.0 ms
64 bytes from maa03s36-in-f4.1e100.net (142.250.76.36): icmp_seq=2 ttl=119 time=30.2 ms
64 bytes from maa03s36-in-f4.1e100.net (142.250.76.36): icmp_seq=3 ttl=119 time=28.5 ms
^Z
[3]+  Stopped                  ping www.google.com
t-rex@trex-ZenBook-UX431DA-UM431DA:~$ ping -i 2 www.google.com
PING www.google.com (142.250.76.36) 56(84) bytes of data.
64 bytes from maa03s36-in-f4.1e100.net (142.250.76.36): icmp_seq=1 ttl=119 time=27.9 ms
64 bytes from maa03s36-in-f4.1e100.net (142.250.76.36): icmp_seq=2 ttl=119 time=27.5 ms
64 bytes from maa03s36-in-f4.1e100.net (142.250.76.36): icmp_seq=3 ttl=119 time=28.9 ms
64 bytes from maa03s36-in-f4.1e100.net (142.250.76.36): icmp_seq=4 ttl=119 time=28.2 ms
^Z
[4]+  Stopped                  ping -i 2 www.google.com
t-rex@trex-ZenBook-UX431DA-UM431DA:~$ ping -c 4 www.google.com
PING www.google.com (142.250.76.36) 56(84) bytes of data.
64 bytes from maa03s36-in-f4.1e100.net (142.250.76.36): icmp_seq=1 ttl=119 time=28.9 ms
64 bytes from maa03s36-in-f4.1e100.net (142.250.76.36): icmp_seq=2 ttl=119 time=30.2 ms
64 bytes from maa03s36-in-f4.1e100.net (142.250.76.36): icmp_seq=3 ttl=119 time=28.4 ms
64 bytes from maa03s36-in-f4.1e100.net (142.250.76.36): icmp_seq=4 ttl=119 time=29.8 ms

--- www.google.com ping statistics ---
4 packets transmitted, 4 received, 0% packet loss, time 3004ms
rtt min/avg/max/mdev = 28.485/29.396/30.241/0.718 ms
t-rex@trex-ZenBook-UX431DA-UM431DA:~$ █
```

- route

```
Command Prompt
C:\Users\ASUS>route

Manipulates network routing tables.

ROUTE [-f] [-p] [-4|-6] command [destination]
          [MASK netmask] [gateway] [METRIC metric] [IF interface]

-f           Clears the routing tables of all gateway entries. If this is
            used in conjunction with one of the commands, the tables are
            cleared prior to running the command.

-p           When used with the ADD command, makes a route persistent across
            boots of the system. By default, routes are not preserved
            when the system is restarted. Ignored for all other commands,
            which always affect the appropriate persistent routes.

-4           Force using IPv4.

-6           Force using IPv6.

command      One of these:
              PRINT    Prints a route
              ADD     Adds a route
              DELETE   Deletes a route
              CHANGE   Modifies an existing route

destination   Specifies the host.
MASK         Specifies that the next parameter is the 'netmask' value.
netmask       Specifies a subnet mask value for this route entry.
```

```
t-rex@trex-ZenBook-UX431DA-UM431DA: ~
File Edit View Search Terminal Help
t-rex@trex-ZenBook-UX431DA-UM431DA:~$ route
Kernel IP routing table
Destination     Gateway         Genmask         Flags Metric Ref    Use Iface
default         _gateway        0.0.0.0         UG    600    0        0 wlp1s0
link-local      0.0.0.0         255.255.0.0     U     1000   0        0 wlp1s0
192.168.1.0    0.0.0.0         255.255.255.0   U     600    0        0 wlp1s0
t-rex@trex-ZenBook-UX431DA-UM431DA:~$ route -n
Kernel IP routing table
Destination     Gateway         Genmask         Flags Metric Ref    Use Iface
0.0.0.0         192.168.1.1    0.0.0.0         UG    600    0        0 wlp1s0
169.254.0.0     0.0.0.0         255.255.0.0     U     1000   0        0 wlp1s0
192.168.1.0    0.0.0.0         255.255.255.0   U     600    0        0 wlp1s0
t-rex@trex-ZenBook-UX431DA-UM431DA:~$ route -Cn
Kernel IP routing cache
Source          Destination     Gateway         Flags Metric Ref    Use Iface
t-rex@trex-ZenBook-UX431DA-UM431DA:~$ ip route
default via 192.168.1.1 dev wlp1s0 proto dhcp metric 600
169.254.0.0/16 dev wlp1s0 scope link metric 1000
192.168.1.0/24 dev wlp1s0 proto kernel scope link src 192.168.1.9 metric 600
t-rex@trex-ZenBook-UX431DA-UM431DA:~$
```

- traceroute

```
Report bugs to <bug-inetutils@gnu.org>.  
t-rex@trex-ZenBook-UX431DA-UM431DA:~$ traceroute --v  
traceroute (GNU inetutils) 1.9.4  
Copyright (C) 2015 Free Software Foundation, Inc.  
License GPLv3+: GNU GPL version 3 or later <http://gnu.org/licenses/gpl.html>.  
This is free software: you are free to change and redistribute it.  
There is NO WARRANTY, to the extent permitted by law.  
  
Written by Elian Gidoni.
```

```
t-rex@trex-ZenBook-UX431DA-UM431DA:~$ traceroute google.com  
traceroute to google.com (142.250.193.142), 64 hops max  
 1  192.168.1.1  4.514ms  0.962ms  2.013ms  
 2  *  *  *  
 3  *  *  *  
 4  *  *  *  
 5  *  *  *  
 6  *  *  *  
 7  *  *  *  
 8  *  *  *  
 9  *  *  *  
10  *  *  *  
11  * ^Z  
[5]+  Stopped                  traceroute google.com
```

```
C:\Users\ASUS>tracert  
  
Usage: tracert [-d] [-h maximum_hops] [-j host-list] [-w timeout]  
                [-R] [-S srcaddr] [-4] [-6] target_name  
  
Options:  
  -d                 Do not resolve addresses to hostnames.  
  -h maximum_hops    Maximum number of hops to search for target.  
  -j host-list       Loose source route along host-list (IPv4-only).  
  -w timeout         Wait timeout milliseconds for each reply.  
  -R                 Trace round-trip path (IPv6-only).  
  -S srcaddr         Source address to use (IPv6-only).  
  -4                 Force using IPv4.  
  -6                 Force using IPv6.
```

- nslookup

```
C:\Users\ASUS>nslookup  
Default Server: dns.google  
Address: 8.8.8.8  
  
>  
> ^Z  
  
C:\Users\ASUS>
```

```
t-rex@trex-ZenBook-UX431DA-UM431DA:~$ nslookup www.google.com
Server:      127.0.0.53
Address:     127.0.0.53#53

Non-authoritative answer:
Name:   www.google.com
Address: 142.250.193.4
Name:   www.google.com
Address: 2404:6800:4002:819::2004

t-rex@trex-ZenBook-UX431DA-UM431DA:~$ ns lookup 209.132.183.181
Command 'ns' not found, but can be installed with:

sudo apt install ns2
```

- ipconfig

```
t-rex@trex-ZenBook-UX431DA-UM431DA:~$ ifconfig -a
lo: flags=73<UP,LOOPBACK,RUNNING> mtu 65536
    inet 127.0.0.1 netmask 255.0.0.0
        inet6 ::1 prefixlen 128 scopeid 0x10<host>
            loop txqueuelen 1000 (Local Loopback)
            RX packets 12735 bytes 1234684 (1.2 MB)
            RX errors 0 dropped 0 overruns 0 frame 0
            TX packets 12735 bytes 1234684 (1.2 MB)
            TX errors 0 dropped 0 overruns 0 carrier 0 collisions 0

wlp1s0: flags=4163<UP,BROADCAST,RUNNING,MULTICAST> mtu 1500
    inet 192.168.43.34 netmask 255.255.255.0 broadcast 192.168.43.255
        inet6 2409:4073:4e8e:fa60:8c55:661f:5e08:962b prefixlen 64 scopeid 0x0<global>
        inet6 fe80::f24a:eeee:26e1:b30e prefixlen 64 scopeid 0x20<link>
        inet6 2409:4073:4e8e:fa60:48ce:2752:a607:b181 prefixlen 64 scopeid 0x0<global>
        ether 04:ed:33:ad:43:d2 txqueuelen 1000 (Ethernet)
        RX packets 886576 bytes 322926143 (322.9 MB)
        RX errors 0 dropped 0 overruns 0 frame 0
        TX packets 111575 bytes 22944023 (22.9 MB)
        TX errors 0 dropped 0 overruns 0 carrier 0 collisions 0

t-rex@trex-ZenBook-UX431DA-UM431DA:~$ ifconfig -s
Iface      MTU      RX-OK RX-ERR RX-DRP RX-OVR      TX-OK TX-ERR TX-DRP TX-OVR Flg
lo        65536     12863      0      0 0       12863      0      0      0 LRU
wlp1s0     1500    887154      0      0 0       112464      0      0      0 BMRU
t-rex@trex-ZenBook-UX431DA-UM431DA:~$ █
```

```
C:\Users\ASUS>ipconfig

Windows IP Configuration

Wireless LAN adapter Local Area Connection* 3:

    Media State . . . . . : Media disconnected
    Connection-specific DNS Suffix . :

Wireless LAN adapter Local Area Connection* 4:

    Media State . . . . . : Media disconnected
    Connection-specific DNS Suffix . . .

Wireless LAN adapter Wi-Fi:

    Connection-specific DNS Suffix . . .
    IPv6 Address . . . . . : 2409:4073:4e8e:fa60:ac3e:3171:51bb:d611
    Temporary IPv6 Address . . . . . : 2409:4073:4e8e:fa60:b825:ff2e:ddf9:e631
    Link-local IPv6 Address . . . . . : fe80::ac3e:3171:51bb:d611%4
    IPv4 Address . . . . . : 192.168.43.34
    Subnet Mask . . . . . : 255.255.255.0
    Default Gateway . . . . . : fe80::922b:d2ff:febe:dec1%4
                                         192.168.43.1
```

- **netstat**

```
t-rex@trex-ZenBook-UX431DA-UM431DA:~$ netstat -l
Active Internet connections (only servers)
Proto Recv-Q Send-Q Local Address          Foreign Address        State
tcp      0      0 localhost:domain        0.0.0.0:*
tcp      0      0 0.0.0.0:ssh           0.0.0.0:*
tcp      0      0 localhost:ipp          0.0.0.0:*
tcp      0      0 localhost:mysql        0.0.0.0:*
tcp6     0      0 [::]:ssh              [::]:*
tcp6     0      0 ip6-localhost:ipp      [::]:*
tcp6     0      0 [::]:http             [::]:*
udp      0      0 0.0.0.0:mdns          0.0.0.0:*
udp      0      0 trex-ZenBook-UX43:34307 0.0.0.0:*
udp      0      0 trex-ZenBook-UX43:52081 0.0.0.0:*
```

```
t-rex@trex-ZenBook-UX431DA-UM431DA:~$ netstat -at
Active Internet connections (servers and established)
Proto Recv-Q Send-Q Local Address          Foreign Address        State
tcp      0      0 localhost:domain        0.0.0.0:*
tcp      0      0 0.0.0.0:ssh           0.0.0.0:*
tcp      0      0 localhost:ipp          0.0.0.0:*
tcp      0      0 localhost:mysql        0.0.0.0:*
tcp      0      0 trex-ZenBook-UX43:51968 52.46.133.124:https ESTABLISHED
tcp      0      0 trex-ZenBook-UX43:54292 104.18.29.173:https ESTABLISHED
tcp      0      0 trex-ZenBook-UX43:57048 del03s10-in-f2.1e:https ESTABLISHED
tcp      0      0 trex-ZenBook-UX43:37896 49.44.144.61:https ESTABLISHED
tcp      0      0 trex-ZenBook-UX43:34714 maa03s35-in-f10.1:https ESTABLISHED
tcp      0      0 trex-ZenBook-UX43:58370 del11s14-in-f2.1e:https ESTABLISHED
```

```
t-rex@trex-ZenBook-UX431DA-UM431DA:~$ netstat -a
Active Internet connections (servers and established)
Proto Recv-Q Send-Q Local Address           Foreign Address         State
tcp        0      0 localhost:domain        0.0.0.0:*
tcp        0      0 0.0.0.0:ssh             0.0.0.0:*
tcp        0      0 localhost:ipp            0.0.0.0:*
tcp        0      0 localhost:mysql          0.0.0.0:*
tcp        0      0 trex-ZenBook-UX43:51968  52.46.133.124:https ESTABLISHED
tcp        0      0 trex-ZenBook-UX43:54292  104.18.29.173:https ESTABLISHED
tcp        0      0 trex-ZenBook-UX43:36432  del12s08-in-f14.1:https TIME_WAIT
tcp        1      64   trex-ZenBook-UX43:42278  a184-84-176-83.de:https CLOSING
tcp        0      0 trex-ZenBook-UX43:57048  del03s10-in-f2.1e:https ESTABLISHED
tcp        0      0 trex-ZenBook-UX43:34714  maa03s35-in-f10.1:https ESTABLISHED
```

```
Command Prompt - netstat
Link-local IPv6 Address . . . . . : fe80::ac3e:3171:51bb:d611%4
IPv4 Address. . . . . : 192.168.43.34
Subnet Mask . . . . . : 255.255.255.0
Default Gateway . . . . . : fe80::922b:d2ff:febe:dec1%4
                                         192.168.43.1

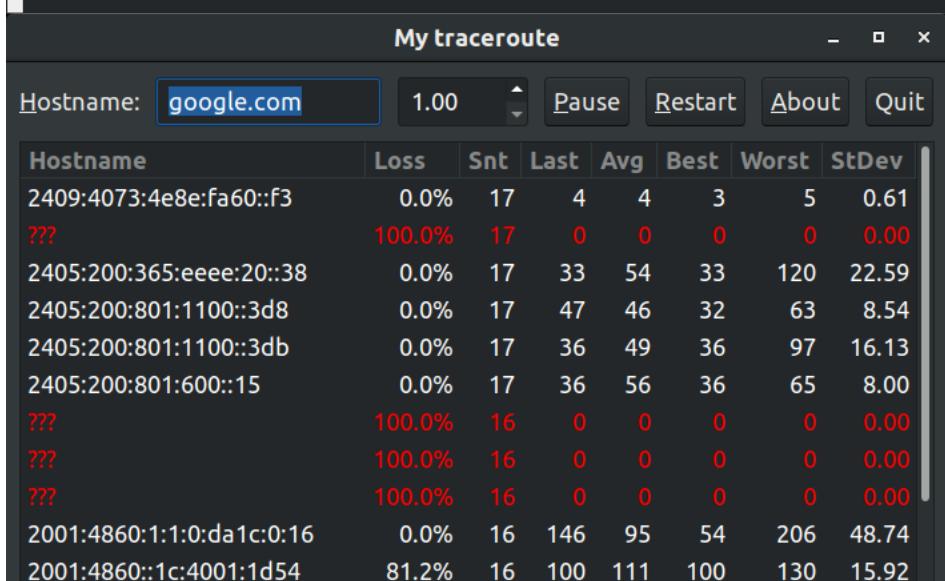
C:\Users\ASUS>netsat
'netsat' is not recognized as an internal or external command,
operable program or batch file.

C:\Users\ASUS>netstat
Active Connections

 Proto Local Address          Foreign Address        State
 TCP   127.0.0.1:4843          support:59763        ESTABLISHED
 TCP   127.0.0.1:59763         support:4843        ESTABLISHED
 TCP   192.168.43.34:52458    maa03s34-in-f14:https ESTABLISHED
 TCP   192.168.43.34:53877    ec2-50-16-7-188:https ESTABLISHED
 TCP   192.168.43.34:54194    server-13-249-218-82:https TIME_WAIT
 TCP   192.168.43.34:55431    104.17.2.2:https     ESTABLISHED
 TCP   192.168.43.34:56445    server-99-86-14-25:https TIME_WAIT
```

- **mtr**

```
t-rex@trex-ZenBook-UX431DA-UM431DA:~$ mtr google.com
Gtk-Message: 11:10:11.230: Failed to load module "canberra-gtk-module"
```



- host

```
t-rex@trex-ZenBook-UX431DA-UM431DA:~$ host google.com
google.com has address 142.250.194.78
google.com has IPv6 address 2404:6800:4007:817::200e
google.com mail is handled by 30 alt2.aspmx.l.google.com.
google.com mail is handled by 20 alt1.aspmx.l.google.com.
google.com mail is handled by 10 aspmx.l.google.com.
google.com mail is handled by 50 alt4.aspmx.l.google.com.
google.com mail is handled by 40 alt3.aspmx.l.google.com.
t-rex@trex-ZenBook-UX431DA-UM431DA:~$ █
```

- ss

```
t-rex@trex-ZenBook-UX431DA-UM431DA:~$ ss
NetidState  Recv-Q  Send-Q          Local Address:Port
                                         Peer Address:Port
u_strESTAB  0        0              * 149017
                                         * 149018
u_strESTAB  0        0              * 86073
                                         * 86074
u_strESTAB  0        0              * 33514
                                         * 30568
u_strESTAB  0        0              /run/user/1000/bus 33394
                                         * 30295
u_strESTAB  0        0              /var/run/dbus/system_bus_socket 19390
                                         * 28740
u_strESTAB  0        0              * 202107
                                         * 202767
u_strESTAB  0        0              * 35340
                                         * 33480
u_strESTAB  0        0              * 24553
                                         * 30320
u_strESTAB  0        0              /run/user/1000/bus 30163
                                         * 33229
u_strESTAB  0        0              /run/systemd/journal/stdout 28018
                                         * 22042
u_strESTAB  0        0              /run/systemd/journal/stdout 39980
                                         + 20002
```

- last

-

```
root@tryit-rational:~# last
reboot    system boot  5.4.0-81-generic Sun Sep 12 20:32    still running

wtmp begins Sun Sep 12 20:32:09 2021
```

- find

```
root@tryit-rational:~# find
.
./.config
./.config/lxc
./.config/lxc/config.yml
root@tryit-rational:~# █
```

LAMP INSTALLATION PROCEDURE

Install Apache2

- Update your system: sudo apt update
- Install Apache2 using apt: sudo apt install apache2
- Confirm apache2 is running: sudo systemctl status apache2

```
t-rex@trex-ZenBook-UX431DA-UM431DA:~$ sudo apt install apache2
Reading package lists... Done
Building dependency tree
Reading state information... Done
The following package was automatically installed and is no longer required:
  shim
Use 'sudo apt autoremove' to remove it.
The following additional packages will be installed:
  apache2-bin apache2-data apache2-utils
Suggested packages:
  apache2-doc apache2-suexec-pristine | apache2-suexec-custom
The following packages will be upgraded:
  apache2 apache2-bin apache2-data apache2-utils
4 upgraded, 0 newly installed, 0 to remove and 13 not upgraded.
Need to get 1,411 kB of archives.
After this operation, 9,216 B of additional disk space will be used.
Do you want to continue? [Y/n] Y
Get:1 http://in.archive.ubuntu.com/ubuntu bionic-updates/main amd64 apache2 amd64 2.4
 [95.1 kB]
Get:2 http://in.archive.ubuntu.com/ubuntu bionic-updates/main amd64 apache2-bin amd64
```

```
t-rex@trex-ZenBook-UX431DA-UM431DA:~$ sudo systemctl status apache2
● apache2.service - The Apache HTTP Server
   Loaded: loaded (/lib/systemd/system/apache2.service; enabled; vendor preset: enabled)
   Drop-In: /lib/systemd/system/apache2.service.d
             └─apache2-systemd.conf
     Active: active (running) since Fri 2021-10-01 17:36:57 IST; 10s ago
       Process: 31633 ExecStop=/usr/sbin/apachectl stop (code=exited, status=0/SUCCESS)
       Process: 31638 ExecStart=/usr/sbin/apachectl start (code=exited, status=0/SUCCESS)
     Main PID: 31643 (apache2)
        Tasks: 6 (limit: 4915)
      CGroup: /system.slice/apache2.service
              ├─31643 /usr/sbin/apache2 -k start
              ├─31644 /usr/sbin/apache2 -k start
              ├─31645 /usr/sbin/apache2 -k start
              ├─31646 /usr/sbin/apache2 -k start
              ├─31647 /usr/sbin/apache2 -k start
              └─31648 /usr/sbin/apache2 -k start

Oct 01 17:36:57 trex-ZenBook-UX431DA-UM431DA systemd[1]: Starting The Apache HTTP Server...
Oct 01 17:36:57 trex-ZenBook-UX431DA-UM431DA apachectl[31638]: AH00558: apache2: Could not r
Oct 01 17:36:57 trex-ZenBook-UX431DA-UM431DA systemd[1]: Started The Apache HTTP Server.
[lines 1-20/20 (END)]
```

If not working: sudo systemctl stop apache2
sudo systemctl start apache2

Once installed test by accessing your server's IP in browser:

<http://127.0.0.1/>
<http://localhost/>



Apache2 Ubuntu Default Page

It works!

This is the default welcome page used to test the correct operation of the Apache2 server after installation on Ubuntu systems. It is based on the equivalent page on Debian, from which the Ubuntu Apache packaging is derived. If you can read this page, it means that the Apache HTTP server installed at this site is working properly. You should **replace this file** (located at /var/www/html/index.html) before continuing to operate your HTTP server.

If you are a normal user of this web site and don't know what this page is about, this probably means that the site is currently unavailable due to maintenance. If the problem persists, please contact the site's administrator.

Configuration Overview

Ubuntu's Apache2 default configuration is different from the upstream default configuration, and split into several files optimized for interaction with Ubuntu tools. The configuration system is **fully documented in /usr/share/doc/apache2/README.Debian.gz**. Refer to this for the full documentation. Documentation for the web server itself can be found by accessing the **manual** if the apache2-doc package was installed on this server.

Install MySQL

Install: `sudo apt install mysql-server`
 `sudo mysql_secure_installation`

Test: `sudo systemctl status mysql`

```
t-rex@trex-ZenBook-UX431DA-UM431DA:~
```

```
File Edit View Search Terminal Help
t-rex@trex-ZenBook-UX431DA-UM431DA:~$ sudo systemctl status mysql
[sudo] password for t-rex:
Sorry, try again.
[sudo] password for t-rex:
● mysql.service - LSB: Start and stop the mysql database server daemon
   Loaded: loaded (/etc/init.d/mysql; generated)
   Active: active (exited) since Fri 2021-10-01 22:53:38 IST; 4min 8s ago
     Docs: man:systemd-sysv-generator(8)
  Process: 1741 ExecStart=/etc/init.d/mysql start (code=exited, status=0/SUCCESS)

Oct 01 22:53:37 trex-ZenBook-UX431DA-UM431DA systemd[1]: Starting LSB: Start and stop the mysql data
Oct 01 22:53:38 trex-ZenBook-UX431DA-UM431DA mysql[1741]: * Starting MariaDB database server mysqld
Oct 01 22:53:38 trex-ZenBook-UX431DA-UM431DA mysql[1741]: ...done.
Oct 01 22:53:38 trex-ZenBook-UX431DA-UM431DA systemd[1]: Started LSB: Start and stop the mysql datab
lines 1-10/10 (END)
```

Install PHP and commonly used modules

`sudo apt install php libapache2-mod-php php-apache php-cli php-gd php-curl
php-mysql`

```
sudo systemctl restart apache2
```

```
sudo: 3 incorrect password attempts
t-rex@trex-ZenBook-UX431DA-UM431DA:~$ sudo apt install php libapache2-mod-php php-mysql
[sudo] password for t-rex:
Reading package lists... Done
Building dependency tree
Reading state information... Done
libapache2-mod-php is already the newest version (1:7.2+60ubuntu1).
php is already the newest version (1:7.2+60ubuntu1).
php-mysql is already the newest version (1:7.2+60ubuntu1).
0 upgraded, 0 newly installed, 0 to remove and 13 not upgraded.
t-rex@trex-ZenBook-UX431DA-UM431DA:~$ sudo nano /etc/apache2/mods-available/dir.conf
```

Test PHP processing on web server

```
sudo nano /var/www/html/phpinfo.php
```

Inside the file type in the valid PHP code:

```
<?php
    phpinfo();
?>
```

Press **ctrl+x** to save and close the file. Press **y** and **ENTER** to confirm.
Open a browser and type in your IP address/phpinfo.php

<http://127.0.0.1/phpinfo.php>

OUTPUT

PHP Version 7.4.3	
System	Linux kmabhijith-VirtualBox 5.11.0-27-generic #29~20.04.1-Ubuntu SMP Wed Aug 11 15:58:17 UTC 2021 x86_64
Build Date	Aug 13 2021 05:39:12
Server API	Apache 2.0 Handler
Virtual Directory Support	disabled
Configuration File (php.ini) Path	/etc/php/7.4/apache2
Loaded Configuration File	/etc/php/7.4/apache2/php.ini
Scan this dir for additional .ini files	/etc/php/7.4/apache2/conf.d
Additional .ini files parsed	/etc/php/7.4/apache2/conf.d/10-mysqlind.ini, /etc/php/7.4/apache2/conf.d/10-opcache.ini, /etc/php/7.4/apache2/conf.d/10-pdo.ini, /etc/php/7.4/apache2/conf.d/15-xml.ini, /etc/php/7.4/apache2/conf.d/20-bz2.ini, /etc/php/7.4/apache2/conf.d/20-calendar.ini, /etc/php/7.4/apache2/conf.d/20-ctype.ini, /etc/php/7.4/apache2/conf.d/20-curl.ini, /etc/php/7.4/apache2/conf.d/20-dom.ini, /etc/php/7.4/apache2/conf.d/20-exif.ini, /etc/php/7.4/apache2/conf.d/20-ffi.ini, /etc/php/7.4/apache2/conf.d/20-fileinfo.ini, /etc/php/7.4/apache2/conf.d/20-ftp.ini, /etc/php/7.4/apache2/conf.d/20-gd.ini, /etc/php/7.4/apache2/conf.d/20-gettext.ini, /etc/php/7.4/apache2/conf.d/20-iconv.ini, /etc/php/7.4/apache2/conf.d/20-iconv.ini, /etc/php/7.4/apache2/conf.d/20-mbstring.ini, /etc/php/7.4/apache2/conf.d/20-mbstring.ini, /etc/php/7.4/apache2/conf.d/20-openssl.ini, /etc/php/7.4/apache2/conf.d/20-openssl.ini, /etc/php/7.4/apache2/conf.d/20-phar.ini, /etc/php/7.4/apache2/conf.d/20-phar.ini, /etc/php/7.4/apache2/conf.d/20-pspell.ini, /etc/php/7.4/apache2/conf.d/20-pspell.ini, /etc/php/7.4/apache2/conf.d/20-readline.ini, /etc/php/7.4/apache2/conf.d/20-readline.ini, /etc/php/7.4/apache2/conf.d/20-session.ini, /etc/php/7.4/apache2/conf.d/20-session.ini, /etc/php/7.4/apache2/conf.d/20-sqlite3.ini, /etc/php/7.4/apache2/conf.d/20-sqlite3.ini, /etc/php/7.4/apache2/conf.d/20-sysvmsg.ini, /etc/php/7.4/apache2/conf.d/20-sysvmsg.ini, /etc/php/7.4/apache2/conf.d/20-sysvshm.ini, /etc/php/7.4/apache2/conf.d/20-sysvshm.ini, /etc/php/7.4/apache2/conf.d/20-zip.ini, /etc/php/7.4/apache2/conf.d/20-zip.ini, /etc/php/7.4/apache2/conf.d/20-zipArchive.ini, /etc/php/7.4/apache2/conf.d/20-zipArchive.ini

Installing phpMyAdmin

```
sudo apt install phpmyadmin  
sudo systemctl restart apache2
```

The screenshot shows the phpMyAdmin login interface. At the top, there's a logo of a sailboat and the text "Welcome to phpMyAdmin". Below it is a language selection dropdown set to "English". A "Log in" button is present, with fields for "Username" (set to "root") and "Password".

The screenshot shows the main phpMyAdmin dashboard for the "test" database. On the left, there's a sidebar with icons for "New", "information_schema", "mysql", "performance_schema", "phpmyadmin", "test", and "user". The main area displays a table with one row, labeled "Sum". The table has columns for "Table", "Action", "Rows", "Type", "Collation", "Size", and "Overhead". The "Rows" column shows "1". The "Type" column shows "InnoDB". The "Collation" column shows "utf8mb4_general_ci". The "Size" column shows "16.0 KiB". The "Overhead" column shows "0.0". Below the table, there are buttons for "Print" and "Data dictionary", and a "Create table" button.

ANSIBLE INSTALLATION

```
sudo apt install ansible  
ansible --version
```

```
t-rex@trex-ZenBook-UX431DA-UM431DA:~$ ansible --version  
ansible 2.5.1  
  config file = /etc/ansible/ansible.cfg  
  configured module search path = [u'/home/t-rex/.ansible/plugins/modules', u'/usr/share/ansible/plugins/modules']  
  ansible python module location = /usr/lib/python2.7/dist-packages/ansible  
  executable location = /usr/bin/ansible  
  python version = 2.7.17 (default, Feb 27 2021, 15:10:58) [GCC 7.5.0]  
t-rex@trex-ZenBook-UX431DA-UM431DA:~$
```

Shell Scripting

1. Write a shell script to ask your name, and college name and print it on the screen.

```
t-rex@trex-ZenBook-UX431DA-UM431DA:~/Shell_files$ bash name.sh
Enter name
Billan
Enter college
Amal Jyothi College
Name: Billan
College: Amal Jyothi College
t-rex@trex-ZenBook-UX431DA-UM431DA:~/Shell_files$
```

```
t-rex@trex-ZenBook-UX431DA-UM431DA:~/Shell_files$ cat name.sh
File Edit View Search Terminal Help
#!/bin/bash
echo "Enter name"
read name
echo "Enter college"
read college
echo "Name: $name"
echo "College: $college"
~
```

2. Write a shell script to set a value for a variable and display it on command line interface.

```
t-rex@trex-ZenBook-UX431DA-UM431DA:~/Shell_files$ vi variable.sh
t-rex@trex-ZenBook-UX431DA-UM431DA:~/Shell_files$ bash variable.sh
value: linux
t-rex@trex-ZenBook-UX431DA-UM431DA:~/Shell_files$ cat variable.sh
#!/bin/bash
name="linux"
echo "value: $name"
t-rex@trex-ZenBook-UX431DA-UM431DA:~/Shell_files$
```

3. Write a shell script to perform addition, subtraction, multiplication, division with two numbers that is accepted from user.

```
t-rex@trex-ZenBook-UX431DA-UM431DA:~/Shell_files$ bash calc.sh
Enter two numbers:
4
2
sum: 6
difference: 2
product: 8
Division: 2
t-rex@trex-ZenBook-UX431DA-UM431DA:~/Shell_files$
```

```

#!/bin/bash
echo "Enter two numbers: "
read n
read m

add=$((n+m))
sub=$((n-m))
mul=$((n*m))
div=$((n/m))

echo "sum: $add"
echo "difference: $sub"
echo "product: $mul"
echo "Division: $div"

```

4. Write a shell script to check the value of a given number and display whether the number is found or not.

```

number is not found
t-rex@trex-ZenBook-UX431DA-UM431DA:~$ vi check.sh
t-rex@trex-ZenBook-UX431DA-UM431DA:~$ bash check.sh
Enter a number:
4
number is not found
t-rex@trex-ZenBook-UX431DA-UM431DA:~$ bash check.sh
Enter a number:
50
number is found
t-rex@trex-ZenBook-UX431DA-UM431DA:~$ 

```

The screenshot shows a terminal window with the following content:

```

File Edit View Search Terminal Help
#!/bin/bash
echo "Enter a number: "
read n
if [ $n -eq 50 ]
then
    echo "number is found"
else
    echo "number is not found"
fi
~
```

5. Write a shell script to display current date, calendar.

```
t-rex@trex-ZenBook-UX431DA-UM431DA:~/Shell_files$ vi calender.sh
t-rex@trex-ZenBook-UX431DA-UM431DA:~/Shell_files$ bash calender.sh
Date: Tue Oct  5 01:48:24 IST 2021
Calender:
    October 2021
Su Mo Tu We Th Fr Sa
                1  2
3  4  5  6  7  8  9
10 11 12 13 14 15 16
17 18 19 20 21 22 23
24 25 26 27 28 29 30
31
t-rex@trex-ZenBook-UX431DA-UM431DA:~/Shell_files$
```

```
File Edit View Search Terminal Help
#!/bin/bash
echo "Date: $(date)"
echo "Calender:"
cal
~
~
~
```

6. Write a shell script to check a number is even or odd.

```
o ls even
t-rex@trex-ZenBook-UX431DA-UM431DA:~/Shell_files$ vi oddeven.sh
t-rex@trex-ZenBook-UX431DA-UM431DA:~/Shell_files$ bash oddeven.sh
Enter a number:
8
8 is even
t-rex@trex-ZenBook-UX431DA-UM431DA:~/Shell_files$
```

```
#!/bin/bash
echo "Enter a number: "
read num

if [ $((num%2)) -eq 0 ]
then
    echo "$num is even"
else
    echo "$num is odd"
fi
~
```

7. Write a shell script to check a number is greater than, less than or equal to another number.

```
t-rex@trex-ZenBook-UX431DA-UM431DA:~/Shell_files$ vi check.sh
t-rex@trex-ZenBook-UX431DA-UM431DA:~/Shell_files$ bash check.sh
Enter two numbers:
8 5
8 is greatest
t-rex@trex-ZenBook-UX431DA-UM431DA:~/Shell_files$
```

```
File Edit View Search Terminal Help  
#!/bin/bash  
echo "Enter two numbers: "  
read n m  
  
if [ $n -gt -$m ]  
then  
    echo "$n is greatest"  
fi  
  
if [ $m -gt $n ]  
then  
    echo "$m is the greatest"  
fi  
if [ $n -eq $m ]  
then  
    echo "Equal"  
fi
```

8. Write a shell script to find the sum of first 10 numbers.

```
t-rex@trex-ZenBook-UX431DA-UM431DA:~/Shell_files$ vi sumof10.sh  
t-rex@trex-ZenBook-UX431DA-UM431DA:~/Shell_files$ bash sumof10.sh  
Sum of first 10 numbers: 55  
t-rex@trex-ZenBook-UX431DA-UM431DA:~/Shell_files$ █
```

```
#!/bin/bash  
n=10  
i=1  
sum=0  
while [ $i -le $n ]  
do  
    sum=$((sum+i))  
    i=$((i+1))  
done  
echo "Sum of first 10 numbers:$sum"  
~  
~
```

9. Write a shell script to find the sum, the average and the product of the four integers entered.

```
t-rex@trex-ZenBook-UX431DA-UM431DA:~/Shell_files$ vi sumavgpro.sh  
t-rex@trex-ZenBook-UX431DA-UM431DA:~/Shell_files$ bash sumavgpro.sh  
Enter four number:  
1 2 4 5  
Sum=12  
Product=40  
Average=3  
t-rex@trex-ZenBook-UX431DA-UM431DA:~/Shell_files$ █
```

```
File Edit View Search Terminal Help
#!/bin/bash
echo "Enter four number: "
read a b c d

sum=$((a+b+c+d))
pro=$((a*b*c*d))
avg=$((sum/4))

echo "Sum=$sum"
echo "Product=$pro"
echo "Average=$avg"
~
```

10. Write a shell script to find the smallest of three numbers.

```
t-rex@trex-ZenBook-UX431DA-UM431DA:~/Shell_files$ vi smallest.sh
t-rex@trex-ZenBook-UX431DA-UM431DA:~/Shell_files$ bash smallest.sh
Enter three numbers:
4 3 5
5 is greatest
t-rex@trex-ZenBook-UX431DA-UM431DA:~/Shell_files$
```

```
File Edit View Search Terminal Help
#!/bin/bash
echo "Enter three numbers: "
read a b c

if [ $a -gt $b ] && [ $a -gt $c ]
then
    echo "$a is greatest"
fi
if [ $b -gt $a ] && [ $b -gt $c ]
then
    echo "$b is greatest"
else
    echo "$c is greatest"
fi
~
```

11. Write a shell program to find factorial of given number.

```
t-rex@trex-ZenBook-UX431DA-UM431DA:~/Shell_files$ vi fact.sh
t-rex@trex-ZenBook-UX431DA-UM431DA:~/Shell_files$ bash fact.sh
Enter number:
4
Factorial is: 24
t-rex@trex-ZenBook-UX431DA-UM431DA:~/Shell_files$
```

```
File Edit View Search Terminal T
#!/bin/bash
echo "Enter number: "
read n
fact=1

while [ $n -gt 1 ]
do
    fact=$((fact*n))
    n=$((n-1))
done
echo "Factorial is: $fact"
~
```

12. Write a shell program to check a number is palindrome or not.

```
number is palindrome
t-rex@trex-ZenBook-UX431DA-UM431DA:~/Shell_files$ vi palin.sh
t-rex@trex-ZenBook-UX431DA-UM431DA:~/Shell_files$ bash palin.sh
Enter number:
92729
Number is palindrome
t-rex@trex-ZenBook-UX431DA-UM431DA:~/Shell files$
```

```
#! /bin/bash

echo "Enter number:"
read num
#
s=0
rev=0
temp=$num

while [ $num -gt 0 ]
do
    s=$(( $num % 10 ))
    num=$(( $num / 10 ))
    rev=$( echo ${rev}${s} )
done

if [ $temp -eq $rev ];
then
    echo "Number is palindrome"
else
    echo "Number is NOT palindrome"
fi
```

13. Write a shell script to find the average of the numbers entered in command line.

```
Average is : 3
t-rex@trex-ZenBook-UX431DA-UM431DA:~/Shell_files$ vi avg.sh
t-rex@trex-ZenBook-UX431DA-UM431DA:~/Shell_files$ bash avg.sh
Enter size:
4
Enter numbers:
6
3
4
2
Average is : 3
t-rex@trex-ZenBook-UX431DA-UM431DA:~/Shell_files$
```

```
#!/bin/bash
echo "Enter size: "
read n

i=1
sum=0

echo "Enter numbers: "
while [ $i -le $n ]
do
    read num
    sum=$((sum+num))
    i=$((i+1))

done
avg=$((sum/n))
echo "Average is : $avg"
~
```

14. Write a shell program to find the sum of all the digits in a number.

```
t-rex@trex-ZenBook-UX431DA-UM431DA:~/Shell_files$ vi sumofdigits.sh
t-rex@trex-ZenBook-UX431DA-UM431DA:~/Shell_files$ bash sumofdigits.sh
Enter number:
3563
sum of digits: 17
t-rex@trex-ZenBook-UX431DA-UM431DA:~/Shell_files$
```

```
#!/bin/bash

echo "Enter number: "
read n

rem=0
sum=0
while [ $n -gt 0 ]
do
    rem=$((n%10))
    n=$((n/10))
    sum=$((sum+rem))
done
echo "sum of digits: $sum"
~
```

15. Write a shell Script to check whether given year is leap year or not.

```
t-rex@trex-ZenBook-UX431DA-UM431DA:~/Shell_files$ vi leapyear.sh
t-rex@trex-ZenBook-UX431DA-UM431DA:~/Shell_files$ bash leapyear.sh
Enter year (YYYY) : 2004
leap year
t-rex@trex-ZenBook-UX431DA-UM431DA:~/Shell_files$
```

```
File Edit view Search Terminal Help
#!/bin/bash

echo -n "Enter year (YYYY) : "
read y

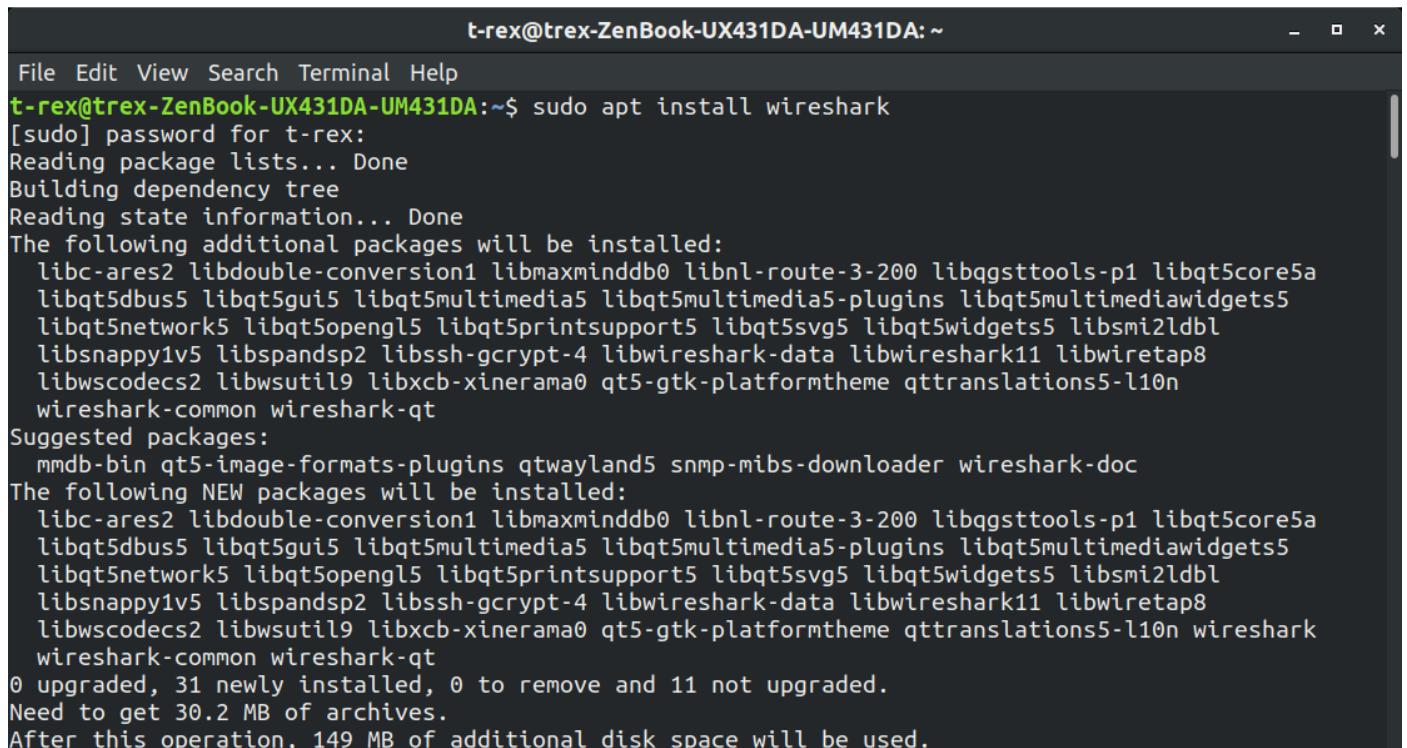
if [ $($y % 400) -eq 0 ]
then
echo leap year
elif [ $($y % 100) -eq 0 ]
then
echo not a leap year
elif [ $($y % 4) -eq 0 ]
then
echo leap year
else
echo not a leap year
fi
```

ANALYZING NETWORK PACKET STREAM USING NC AND WIRESHARK

1. Analyzing network packet stream using wireshark. Perform basic network service tests using nc.

Wireshark:

```
sudo apt install wireshark  
wireshark --version
```



The screenshot shows a terminal window with a dark background and light-colored text. The title bar reads "t-rex@trex-ZenBook-UX431DA-UM431DA: ~". The window contains the following text:

```
File Edit View Search Terminal Help  
t-rex@trex-ZenBook-UX431DA-UM431DA:~$ sudo apt install wireshark  
[sudo] password for t-rex:  
Reading package lists... Done  
Building dependency tree  
Reading state information... Done  
The following additional packages will be installed:  
 libcurl-ares2 libdouble-conversion1 libmaxminddb0 libnl-route-3-200 libqgsttools-p1 libqt5core5a  
 libqt5dbus5 libqt5gui5 libqt5multimedia5 libqt5multimedia5-plugins libqt5multimediawidgets5  
 libqt5network5 libqt5opengl5 libqt5printsupport5 libqt5svg5 libqt5widgets5 libsmi2l dbl  
 libsnappy1v5 libspandsp2 libssh-gcrypt-4 libwireshark-data libwireshark11 libwiretap8  
 libwscodecs2 libwsutil9 libxcb-xinerama0 qt5-gtk-platformtheme qttranslations5-l10n  
 wireshark-common wireshark-qt  
Suggested packages:  
 mmdb-bin qt5-image-formats-plugins qtwayland5 snmp-mibs-downloader wireshark-doc  
The following NEW packages will be installed:  
 libcurl-ares2 libdouble-conversion1 libmaxminddb0 libnl-route-3-200 libqgsttools-p1 libqt5core5a  
 libqt5dbus5 libqt5gui5 libqt5multimedia5 libqt5multimedia5-plugins libqt5multimediawidgets5  
 libqt5network5 libqt5opengl5 libqt5printsupport5 libqt5svg5 libqt5widgets5 libsmi2l dbl  
 libsnappy1v5 libspandsp2 libssh-gcrypt-4 libwireshark-data libwireshark11 libwiretap8  
 libwscodecs2 libwsutil9 libxcb-xinerama0 qt5-gtk-platformtheme qttranslations5-l10n wireshark  
 wireshark-common wireshark-qt  
0 upgraded, 31 newly installed, 0 to remove and 11 not upgraded.  
Need to get 30.2 MB of archives.  
After this operation, 149 MB of additional disk space will be used.
```

```
t-rex@trex-ZenBook-UX431DA-UM431DA:~
```

File Edit View Search Terminal Help

Processing triggers for gnome-menus (3.13.3-11ubuntu1.1) ...
Processing triggers for hicolor-icon-theme (0.17-2) ...
Processing triggers for mime-support (3.60ubuntu1) ...
t-rex@trex-ZenBook-UX431DA-UM431DA:~\$ wireshark --version
Wireshark 2.6.10 (Git v2.6.10 packaged as 2.6.10-1~ubuntu18.04.0)

Copyright 1998-2019 Gerald Combs <gerald@wireshark.org> and contributors.
License GPLv2+: GNU GPL version 2 or later <<http://www.gnu.org/licenses/old-licenses/gpl-2.0.html>>
This is free software; see the source for copying conditions. There is NO
warranty; not even for MERCHANTABILITY or FITNESS FOR A PARTICULAR PURPOSE.

Compiled (64-bit) with Qt 5.9.5, with libpcap, with POSIX capabilities (Linux),
with libnl 3, with GLib 2.56.4, with zlib 1.2.11, with SMI 0.4.8, with c-ares
1.14.0, with Lua 5.2.4, with GnuTLS 3.5.18, with Gcrypt 1.8.1, with MIT
Kerberos, with MaxMind DB resolver, with nghttp2 1.30.0, with LZ4, with Snappy,
with libxml2 2.9.4, with QtMultimedia, with SBC, with SpanDSP, without bcg729.

Running on Linux 5.4.0-84-generic, with AMD Ryzen 5 3500U with Radeon Vega
Mobile Gfx (with SSE4.2), with 5942 MB of physical memory, with locale en_IN,
with libpcap version 1.8.1, with GnuTLS 3.5.18, with Gcrypt 1.8.1, with zlib
1.2.11, binary plugins supported (0 loaded).

Built using gcc 7.4.0.

```
t-rex@trex-ZenBook-UX431DA-UM431DA:~$
```

Netcat

```
t-rex@trex-ZenBook-UX431DA-UM431DA:~$ sudo apt install netcat
```

Reading package lists... Done
Building dependency tree
Reading state information... Done
The following additional packages will be installed:
 netcat-traditional
The following NEW packages will be installed:
 netcat netcat-traditional
0 upgraded, 2 newly installed, 0 to remove and 11 not upgraded.
Need to get 65.1 kB of archives.
After this operation, 157 kB of additional disk space will be used.
Do you want to continue? [Y/n]

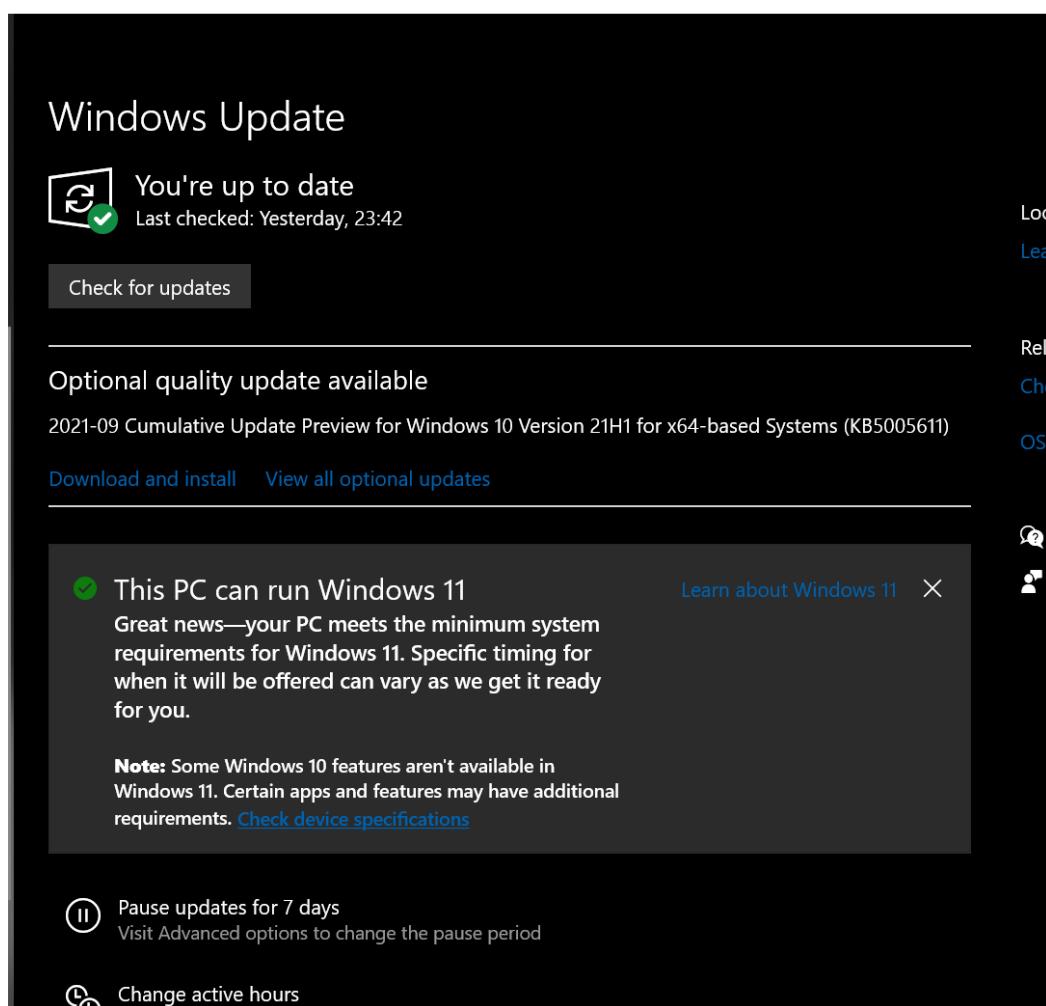
t-rex@trex-ZenBook-UX431DA-UM431DA: ~

File Edit View Search Terminal Help
Processing triggers for man-db (2.8.3-2ubuntu0.1) ...
t-rex@trex-ZenBook-UX431DA-UM431DA:~\$ nc -h
OpenBSD netcat (Debian patchlevel 1.187-1ubuntu0.1)
usage: nc [-46CDdFhklNnrStUuvZz] [-I length] [-i interval] [-M ttl]
[-m minttl] [-O length] [-P proxy_username] [-p source_port]
[-q seconds] [-s source] [-T keyword] [-V rtable] [-W recvlimit] [-w timeout]
[-X proxy_protocol] [-x proxy_address[:port]] [destination] [port]
Command Summary:
-4 Use IPv4
-6 Use IPv6
-b Allow broadcast
-C Send CRLF as line-ending
-D Enable the debug socket option
-d Detach from stdin
-F Pass socket fd
-h This help text
-I length TCP receive buffer length
-i interval Delay interval for lines sent, ports scanned
-k Keep inbound sockets open for multiple connects
-l Listen mode, for inbound connects
-M ttl Outgoing TTL / Hop Limit
-m minttl Minimum incoming TTL / Hop Limit
-N Shutdown the network socket after EOF on stdin
-n Suppress name/port resolutions

DOCKER INSTALLATION

Installing Docker on Windows 10

- First make sure Windows is up to date.
- In the Windows search type "Windows Update" and select Windows Update setting. You should see a green check and "You're up to date". If not click "Check for updates". You will need to repeat this process until you no longer have any updates to install.



Next install WSL2

- From the Windows Search Type "powershell" then right-click on Windows PowerShell and then Run as administrator.
- In the Administrator: Windows PowerShell window run (copy and past) "wsl – install" to install Windows Services for Linux (wsl).

```
Display usage information.
PS C:\Windows\system32> wsl --install
Installing: Virtual Machine Platform
Virtual Machine Platform has been installed.
Installing: Windows Subsystem for Linux
Windows Subsystem for Linux has been installed.
Downloading: WSL Kernel
Installing: WSL Kernel
WSL Kernel has been installed.
Downloading: Ubuntu
The requested operation is successful. Changes will not be effective until the system is rebooted.
PS C:\Windows\system32>
```

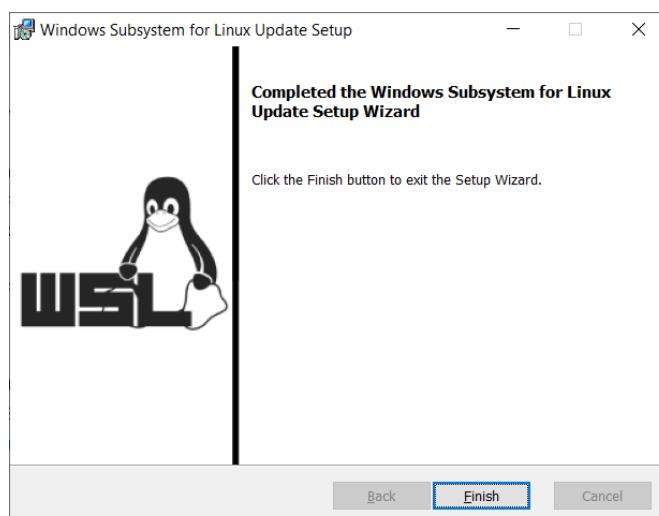
- Next enable the Virtual Machine Platform. In the Administrator: Windows PowerShell run (copy and past) "dism.exe /online /enablefeature /featurename:VirtualMachinePlatform /all /norestart".

```
PS C:\Windows\system32> dism.exe /online /enable-feature /featurename:VirtualMachinePlatform /all /norestart
Deployment Image Servicing and Management tool
Version: 10.0.19041.844

Image Version: 10.0.19043.1266

Enabling feature(s)
[=====100.0%=====]
The operation completed successfully.
PS C:\Windows\system32>
```

- Download and install the WSL2 Linux kernel update package for x64 machines



- Set up a Linux user

```
Retype new password:  
passwd: password updated successfully  
Installation successful!  
To run a command as administrator (user "root"), use "sudo <command>".  
See "man sudo_root" for details.  
  
Welcome to Ubuntu 20.04 LTS (GNU/Linux 5.10.16.3-microsoft-standard-WSL2 x86_64)  
  
 * Documentation: https://help.ubuntu.com  
 * Management: https://landscape.canonical.com  
 * Support: https://ubuntu.com/advantage  
  
System information as of Fri Oct 1 11:50:30 IST 2021  
  
System load: 0.16 Processes: 8  
Usage of /: 0.4% of 250.98GB Users logged in: 0  
Memory usage: 2% IPv4 address for eth0: 172.24.46.235  
Swap usage: 0%  
  
0 updates can be installed immediately.  
0 of these updates are security updates.  
  
The list of available updates is more than a week old.  
To check for new updates run: sudo apt update  
  
This message is shown once once a day. To disable it please create the
```

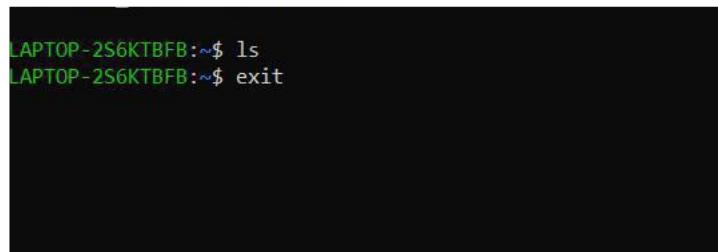
- Reboot Windows.
- Again, from the Windows Search Type "powershell" then right-click on Windows PowerShell and then Run as administrator.
- In the PowerShell window run "wsl --set-defaultversion 2".

```
Windows PowerShell  
Copyright (C) Microsoft Corporation. All rights reserved.  
  
Try the new cross-platform PowerShell https://aka.ms/pscore6  
  
PS C:\Windows\system32> wsl --set-default-version 2  
For information on key differences with WSL 2 please visit https://aka.ms/wsl2  
The operation completed successfully.  
PS C:\Windows\system32>
```

- Next install a Linux distribution from the Microsoft Store



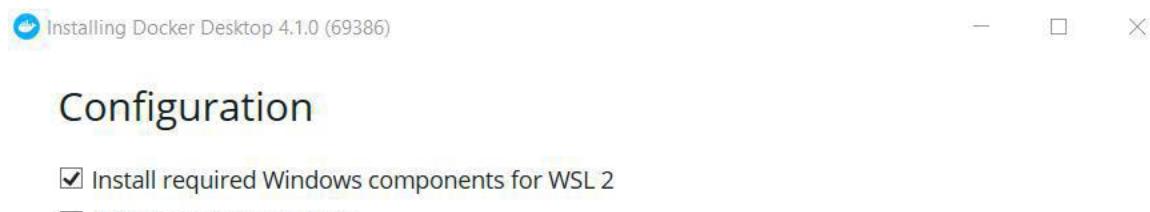
- You will now be able to run Linux commands in the Ubuntu terminal window.



```
LAPTOP-2S6KTBFB:~$ ls
LAPTOP-2S6KTBFB:~$ exit
```

Now you can install Docker Desktop for Windows

- Download the Docker Desktop for Windows installer from <https://www.docker.com/products/docker-desktop>
- Run the installer.



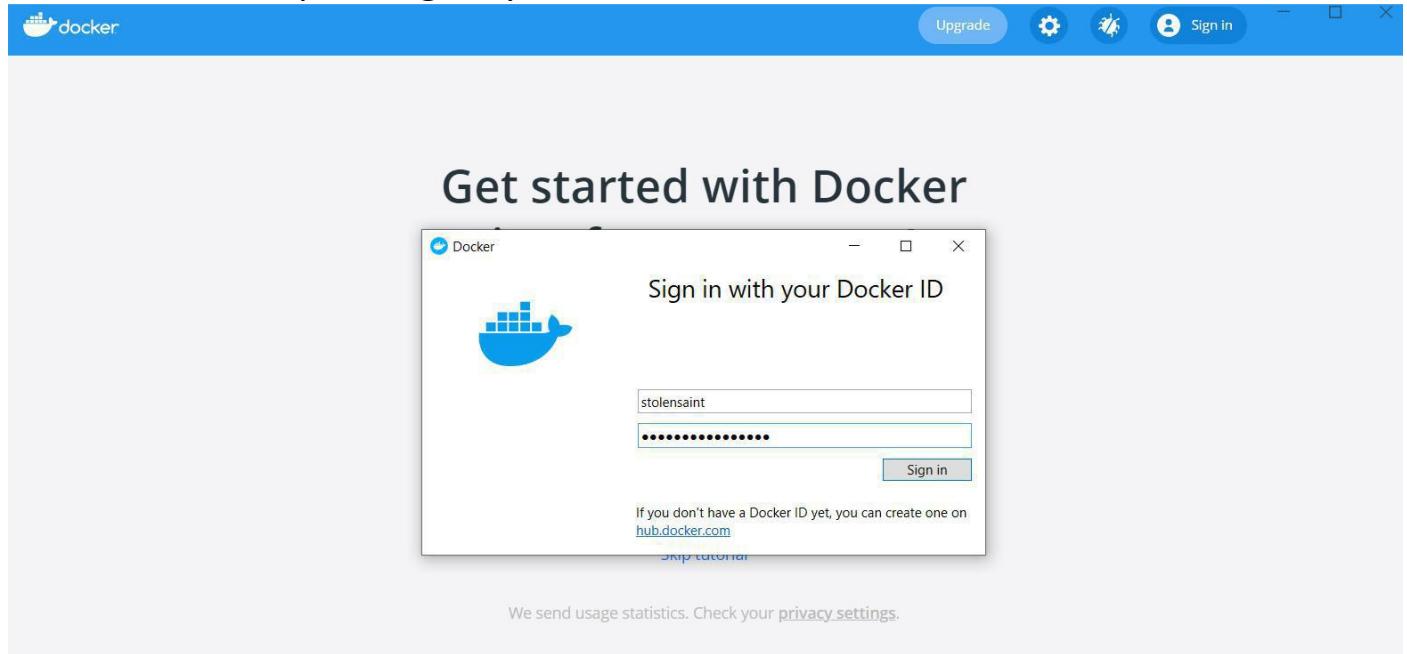
Docker Desktop 4.1.0

Installation succeeded

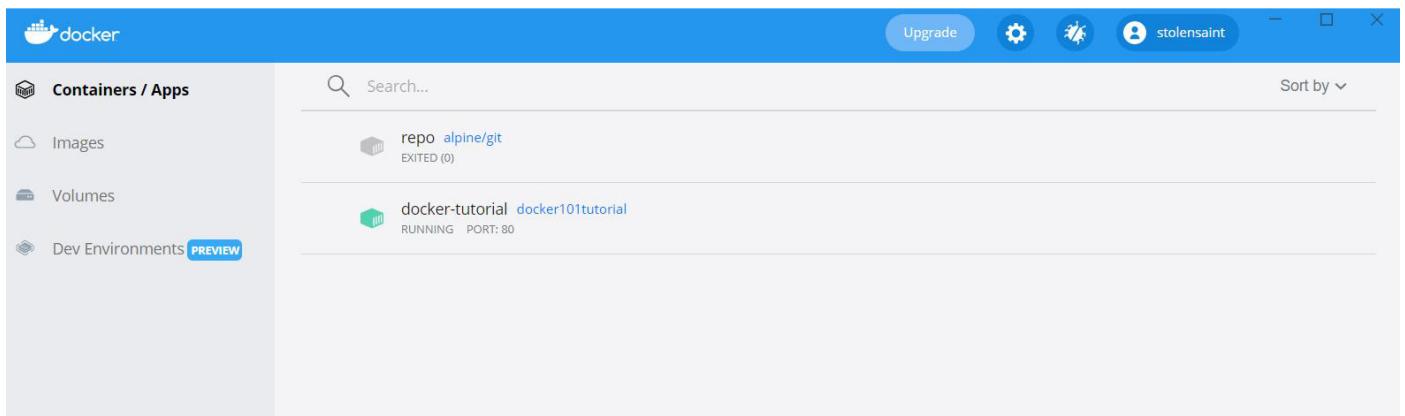
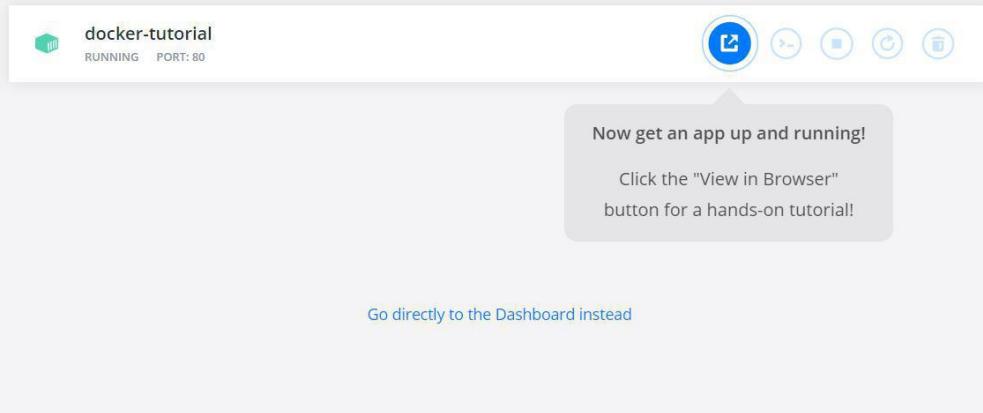
You must log out of Windows to complete installation.

Close and log out

- Reboot Windows.
- Login to Windows and let Docker finish setting up. This can take a few minutes depending on your machine.



✓ You ran your first container image



- Run the docker "Hello World" from an Ubuntu Terminal run "docker run hello-world".

```
Unable to find image 'hello-world:latest' locally
latest: Pulling from library/hello-world
2db29710123e: Pull complete
Digest: sha256:9ade9cc2e26189a19c2e8854b9c8f1e14829b51c55a630ee675a5a9540ef6ccf
Status: Downloaded newer image for hello-world:latest
```

Hello from Docker!
This message shows that your installation appears to be working correctly.

To generate this message, Docker took the following steps:
1. The Docker client contacted the Docker daemon.
2. The Docker daemon pulled the "hello-world" image from the Docker Hub.
(amd64)
3. The Docker daemon created a new container from that image which runs the
executable that produces the output you are currently reading.
4. The Docker daemon streamed that output to the Docker client, which sent it
to your terminal.

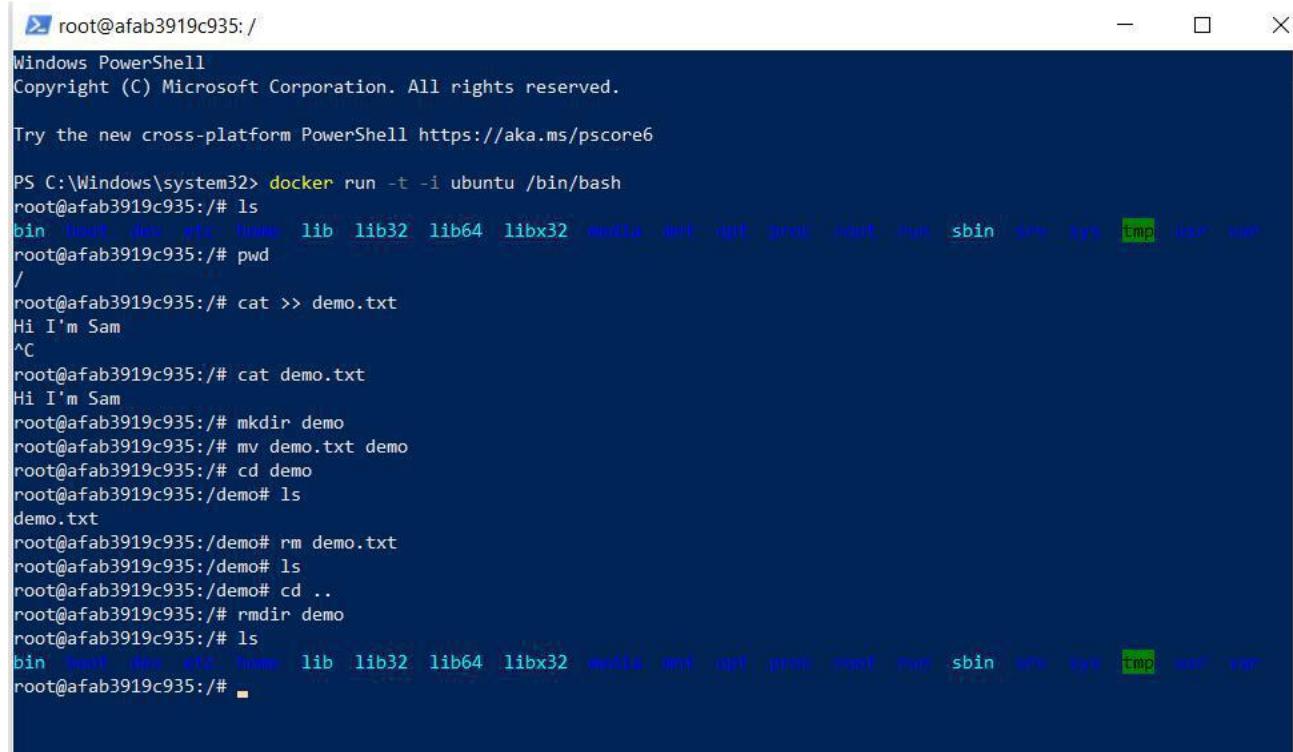
To try something more ambitious, you can run an Ubuntu container with:
\$ docker run -it ubuntu bash

Share images, automate workflows, and more with a free Docker ID:
<https://hub.docker.com/>

For more examples and ideas, visit:
<https://docs.docker.com/get-started/>

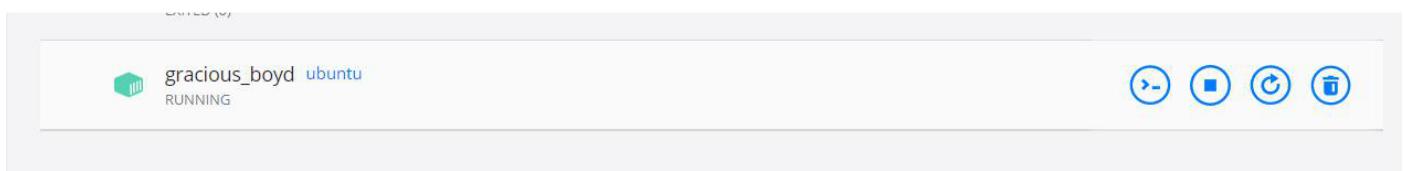
Running Ubuntu Machine

- Run the command “docker run -t -i ubuntu /bin/bash” in powershell
- This is a Linux root bash, try some commands

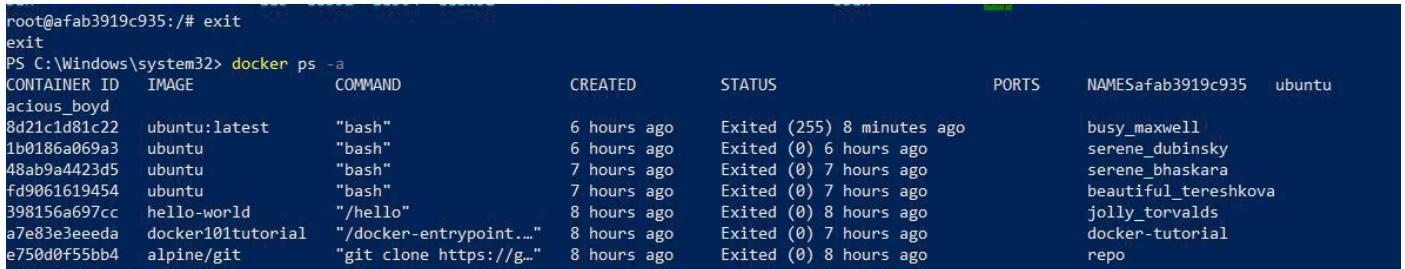


```
root@afab3919c935: /  
Windows PowerShell  
Copyright (C) Microsoft Corporation. All rights reserved.  
  
Try the new cross-platform PowerShell https://aka.ms/pscore6  
  
PS C:\Windows\system32> docker run -t -i ubuntu /bin/bash  
root@afab3919c935:/# ls  
bin boot dev etc home lib lib32 lib64 libx32 media opt proc root run sbin sys tmp user var  
root@afab3919c935:/# pwd  
/  
root@afab3919c935:/# cat >> demo.txt  
Hi I'm Sam  
^C  
root@afab3919c935:/# cat demo.txt  
Hi I'm Sam  
root@afab3919c935:/# mkdir demo  
root@afab3919c935:/# mv demo.txt demo  
root@afab3919c935:/# cd demo  
root@afab3919c935:/demo# ls  
demo.txt  
root@afab3919c935:/demo# rm demo.txt  
root@afab3919c935:/demo# ls  
root@afab3919c935:/demo# cd ..  
root@afab3919c935:/# rmdir demo  
root@afab3919c935:/# ls  
bin boot dev etc home lib lib32 lib64 libx32 media opt proc root run sbin sys tmp user var  
root@afab3919c935:/# ■
```

Docker GUI-Containers



Removing All Containers



```
root@afab3919c935:/# exit  
exit  
PS C:\Windows\system32> docker ps -a  
CONTAINER ID IMAGE COMMAND CREATED STATUS PORTS NAMES  
acious_boyd 8d21c1d81c22 ubuntu:latest "bash" 6 hours ago Exited (255) 8 minutes ago busy_maxwell  
1b0186a069a3 ubuntu "bash" 6 hours ago Exited (0) 6 hours ago serene_dubinsky  
48ab9a4423d5 ubuntu "bash" 7 hours ago Exited (0) 7 hours ago serene_bhaskara  
f09061619454 ubuntu "bash" 7 hours ago Exited (0) 7 hours ago beautiful_tereshkova  
398156a697cc hello-world "/hello" 8 hours ago Exited (0) 8 hours ago jolly_torvalds  
a7e83e3eeda docker101tutorial "/docker-entrypoint..." 8 hours ago Exited (0) 7 hours ago docker-tutorial  
e750d0f55bb4 alpine/git "git clone https://g..." 8 hours ago Exited (0) 8 hours ago repo
```

```

C:\Windows\system32> docker rm -f busy_maxwell
PS C:\Windows\system32> docker ps -a
CONTAINER ID   IMAGE          COMMAND       CREATED      STATUS        PORTS     NAMES
afab3919c935   ubuntu         "/bin/bash"   7 minutes ago Exited (0) 2 minutes ago
1b0186a069a3   ubuntu         "bash"       6 hours ago  Exited (0) 6 hours ago
48ab9a4423d5   ubuntu         "bash"       8 hours ago  Exited (0) 7 hours ago
fd9061619454   ubuntu         "bash"       8 hours ago  Exited (0) 7 hours ago
398156a697cc   hello-world   "/hello"    8 hours ago  Exited (0) 8 hours ago
a7e83e3eeda   docker101tutorial "/docker-entrypoint...." 8 hours ago  Exited (0) 8 hours ago
e750d0f55bb4   alpine/git    "git clone https://g..." 8 hours ago  Exited (0) 8 hours ago
PS C:\Windows\system32> docker rm -f gracious Boyd
gracious Boyd
PS C:\Windows\system32> docker rm -f serene_dubinsky
serene_dubinsky
PS C:\Windows\system32> docker rm -f serene_bhaskara
serene_bhaskara
PS C:\Windows\system32> docker rm -f beautiful_tereshkova
beautiful_tereshkova
PS C:\Windows\system32> docker rm -f jolly_torvalds
jolly_torvalds
PS C:\Windows\system32> docker rm -f docker-tutorial
docker-tutorial
PS C:\Windows\system32> docker rm -f repo
repo
PS C:\Windows\system32> docker ps -a
CONTAINER ID   IMAGE          COMMAND       CREATED      STATUS        PORTS     NAMES
PS C:\Windows\system32>

```

The screenshot shows the Docker desktop application window. The left sidebar has sections for 'Containers / Apps', 'Images', 'Volumes', and 'Dev Environments' (with a 'PREVIEW' badge). The main area features a large blue 3D cube icon and the text 'No containers running'. Below it, a message says 'Try running a container: Copy and paste this command into your terminal and then come back'. A command line input field contains the text 'docker run -d -p 80:80 docker/getting-started'. At the bottom, there's a link 'Explore more in the Docker Docs'.