

LAB 4: Unixland

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COMP-232: Programming Languages
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To say there are a lot of commands in Unixland is an understatement. To view your PATH, type:

```
% echo $PATH
```

When you type **ls**, your PATH environment variable is used to locate the **ls** executable command to run. The commands in the PATH can be binary executables or executable shell scripts.

On my system, there are 40 directories defined in my PATH which are searched in order. The first 9 directories found in the \$PATH are listed below:

```
/usr/local/sbin
```

```
/usr/local/bin
```

```
/usr/sbin
```

```
/usr/bin
```

```
/sbin
```

```
/bin
```

```
/usr/games
```

```
/usr/local/games
```

```
/mnt/c/Program
```

As seen above, Unix will first search for and use `/usr/local/bin/ls` if found, next `/usr/local/bin/ls` is searched for, `/usr/sbin/ls`, and finally `/usr/bin/ls`, which is where the `ls` command executable actually resides.

We can check this by running:

```
john@oho:~$ ls -l /usr/local/sbin/ls /usr/local/bin/ls /usr/sbin/ls /usr/bin/ls
```

```
ls: cannot access '/usr/local/sbin/ls': No such file or directory
```

```
ls: cannot access '/usr/local/bin/ls': No such file or directory
```

```
ls: cannot access '/usr/sbin/ls': No such file or directory
```

```
-rwxr-xr-x 1 root root 142144 Sep  5 2019 /usr/bin/ls
```

So, when you type the **ls** command, the executable you are running is found in the `/usr/bin/ls` directory. The **which** command tells us the location of the `ls` command that is used.

```
john@oho:~$ which ls
```

```
/usr/bin/ls
```

There can be multiple **ls** commands found in the different PATH directories. The first **ls** command found in the PATH is used. A hacker could place a **ls** script in /usr/local/sbin directory if they somehow had access rights to do so, which would run using the user's permissions to do some dastardly deed and then run /usr/bin/ls to show the output the user expected. This is why if you want to add your current directory to your PATH variable, it should be the very last directory searched by adding the '.' character to your PATH, which represents your current directory.

There are 1079 binary files found in the /bin directory alone. Don't worry, we don't need to learn them all!

```
john@oho:~$ ls /bin | wc -l  
1079
```

The more common Unix commands are provided below.

Unixland Exercise

To start this exercise, you need to first create two files: hi.txt and hello.txt.

hi.txt contains two lines: Hi and Bye. hello.txt contains: Hello and Bye.

Let's record what we type using the script command:

```
% script unixland.txt
```

The commands we are learning about are bolded below.

Script started on 2021-09-12 09:47:43-07:00 [TERM="xterm-256color" TTY="/dev/tty2" COLUMNS="110" LINES="56"]

```
john@oho: ls -l  
total 16  
-rw-r--r-- 1 john john 10 Sep 12 09:48 hello.txt  
-rw-r--r-- 1 john john  7 Sep 12 09:48 hi.txt  
-rw-r--r-- 1 john john 8192 Sep 12 09:48 unixland.txt
```

```
john@oho: more hello.txt  
:~::~  
hello.txt  
:~::~  
Hello  
Bye
```

```
john@oho: more hi.txt  
hi.txt  
:~::~  
Hi  
Bye
```

arch

```
john@oho: arch  
x86_64
```

```
john@oho: file /bin/ls  
/bin/ls: ELF 64-bit LSB shared object, x86-64, version 1 (SYSV), dynamically linked, interpreter /lib64/ld-linux-x86-64.so.2,  
BuildID[sha1]=2f15ad836be3339dec0e2e6a3c637e08e48aacbd, for GNU/Linux 3.2.0, stripped
```

cal

john@oho: **cal**

```
September 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
```

cat

john@oho: **cat hi.txt**

```
Hi
Bye
```

john@oho: **cat hi.txt hello.txt**

```
Hi
Bye
Hello
Bye
```

john@oho: **cat hi.txt hello.txt > both.txt**

john@oho: **cat both.txt**

```
Hi
Bye
Hello
Bye
```

cd

john@oho:~\$ **cd**

john@oho:~\$ **pwd**
/home/john

john@oho:~\$ **cd /usr/local/bin**

john@oho:/usr/local/bin\$ **pwd**
/usr/local/bin

john@oho:/usr/local/bin\$ **cd -**
/home/john

john@oho:~\$ **pwd**
/home/john

```
john@oho:~$ cd -  
/usr/local/bin
```

```
john@oho:/usr/local/bin$ pwd  
/usr/local/bin
```

```
john@oho:/usr/local/bin$ cd -  
/home/john
```

chgrp

```
john@oho: ls -l  
total 16  
-rw-r--r-- 1 john john 17 Sep 12 09:49 both.txt  
-rw-r--r-- 1 john john 10 Sep 12 09:48 hello.txt  
-rw-r--r-- 1 john john 7 Sep 12 09:48 hi.txt  
-rw-r--r-- 1 john john 8192 Sep 12 09:48 unixland.txt
```

```
john@oho: grep netdev /etc/group  
netdev:x:117:john
```

```
john@oho: chgrp netdev both.txt
```

```
john@oho: ls -l both.txt  
-rw-r--r-- 1 john netdev 17 Sep 12 09:49 both.txt
```

```
john@oho: ls -l  
total 16  
-rw-r--r-- 1 john netdev 17 Sep 12 09:49 both.txt  
-rw-r--r-- 1 john john 10 Sep 12 09:48 hello.txt  
-rw-r--r-- 1 john john 7 Sep 12 09:48 hi.txt  
-rw-r--r-- 1 john john 8192 Sep 12 09:48 unixland.txt
```

chmod

```
john@oho: chmod 000 both.txt
```

```
john@oho: more both.txt  
more: cannot open both.txt: Permission denied
```

```
john@oho: ls -l both.txt  
----- 1 john netdev 17 Sep 12 09:49 both.txt
```

```
john@oho: chmod 777 both.txt
```

john@oho: **ls -l both.txt**

-rwxrwxrwx 1 john netdev 17 Sep 12 09:49 both.txt

john@oho: **more both.txt**

Hi

Bye

Hello

Bye

john@oho: **chmod 644 both.txt**

john@oho: **ls -l both.txt**

-rw-r--r-- 1 john netdev 17 Sep 12 09:49 both.txt

john@oho: **more both.txt**

Hi

Bye

Hello

Bye

john@oho: **chmod 600 both.txt**

john@oho: **more both.txt**

Hi

Bye

Hello

Bye

john@oho: **ls -l both.txt**

-rw----- 1 john netdev 17 Sep 12 09:49 both.txt

john@oho: **mkdir mydir**

john@oho: **ls -ld mydir**

drwxr-xr-x 1 john john 4096 Sep 12 09:52 mydir

john@oho: **ls -l mydir**

total 0

john@oho: **chmod 750 mydir**

john@oho: **cd mydir**

john@oho: **touch test.txt**

john@oho: **ls -l**

total 0

```
-rw-r--r-- 1 john john 0 Sep 12 09:54 test.txt
```

```
john@oho: ls -ld mydir
```

```
drwxr-x--- 1 john john 4096 Sep 12 09:54 mydir
```

```
john@oho: cd mydir
```

```
john@oho: ls -l
```

```
total 0
```

```
-rw-r--r-- 1 john john 0 Sep 12 09:54 test.txt
```

```
john@oho: touch nexttest.txt
```

```
john@oho: ls -l
```

```
total 0
```

```
-rw-r--r-- 1 john john 0 Sep 12 09:55 nexttest.txt
```

```
-rw-r--r-- 1 john john 0 Sep 12 09:54 test.txt
```

```
john@oho: cd ..
```

```
john@oho: chmod 644 mydir
```

```
john@oho: ls -ld mydir
```

```
drw-r--r-- 1 john john 4096 Sep 12 09:55 mydir
```

```
john@oho: cd mydir
```

```
bash: cd: mydir: Permission denied
```

```
john@oho: chmod 500 mydir
```

```
john@oho: ls -l mydir
```

```
total 0
```

```
-rw-r--r-- 1 john john 0 Sep 12 09:55 nexttest.txt
```

```
-rw-r--r-- 1 john john 0 Sep 12 09:54 test.txt
```

```
john@oho: ls -ld mydir
```

```
dr-x----- 1 john john 4096 Sep 12 09:55 mydir
```

```
john@oho: cd mydir
```

```
john@oho: touch texas.txt
```

```
touch: cannot touch 'texas.txt': Permission denied
```

```
john@oho: cd ..
```

```
john@oho: ls -ld mydir
```

```
dr-x----- 1 john john 4096 Sep 12 09:55 mydir
```

john@oho: **chmod 750 mydir**

john@oho: **ls -ld mydir**

drwxr-x--- 1 john john 4096 Sep 12 09:55 mydir

john@oho: **cd mydir**

john@oho: **touch texas.txt**

john@oho: **ls -l**

total 0

-rw-r--r-- 1 john john 0 Sep 12 09:55 nexttest.txt

-rw-r--r-- 1 john john 0 Sep 12 09:54 test.txt

-rw-r--r-- 1 john john 0 Sep 12 09:57 texas.txt

cut

john@oho:~\$ **grep john /etc/passwd**

john:x:1000:1000:,,,:/home/john:/bin/bash

john@oho:~\$ **grep john /etc/passwd | cut -f6 -d:**
/home/john

← Cut field 6, delimiter is : from /etc/passwd entry for john.

date

john@oho: **date**

Sun Sep 12 09:57:46 PDT 2021

diff

john@oho: **cd ..**

john@oho: **ls -l**

```
total 16
-rw----- 1 john netdev      17 Sep 12 09:49 both.txt
-rw-r--r-- 1 john john       10 Sep 12 09:48 hello.txt
-rw-r--r-- 1 john john        7 Sep 12 09:48 hi.txt
drwxr-x--- 1 john john     4096 Sep 12 09:57 [0m[01;34mmydir[0m
-rw-r--r-- 1 john john    16384 Sep 12 09:57 unixland.txt
```

john@oho: **diff hi.txt hello.txt**

1c1

< Hi

> Hello

df

john@oho: **df**

Filesystem	1K-blocks	Used	Available	Use%	Mounted on
rootfs	1951597728	1252705560	698892168	65%	/
none	1951597728	1252705560	698892168	65%	/dev
none	1951597728	1252705560	698892168	65%	/run
none	1951597728	1252705560	698892168	65%	/run/lock
none	1951597728	1252705560	698892168	65%	/run/shm
none	1951597728	1252705560	698892168	65%	/run/user
tmpfs	1951597728	1252705560	698892168	65%	/sys/fs/cgroup
C:\	1951597728	1252705560	698892168	65%	/mnt/c

env

john@oho: **env**

SHELL=/bin/bash

WSL_DISTRO_NAME=Ubuntu

NAME=oho

PWD=/home/john/LAB4

LOGNAME=john

HOME=/home/john

LANG=C.UTF-8

```
LS_COLORS=rs=0:di=01;34:ln=01;36:mh=00:pi=40;33:so=01;35:do=01;35:bd=40;33;01:cd=40;33;01:or=40;31;01:mi=00:su=37;41:sg=
30;43:ca=30;41:tw=30;42:ow=34;42:st=37;44:ex=01;32:*.tar=01;31:*.tgz=01;31:*.arc=01;31:*.arj=01;31:*.taz=01;31:*.lha=01;31:*.l
z4=01;31:*.lzh=01;31:*.lzma=01;31:*.tlz=01;31:*.txz=01;31:*.tzo=01;31:*.t7z=01;31:*.zip=01;31:*.z=01;31:*.dz=01;31:*.gz=01;31:*.
lrz=01;31:*.lz=01;31:*.lzo=01;31:*.xz=01;31:*.zst=01;31:*.tzst=01;31:*.bz2=01;31:*.bz=01;31:*.tbz=01;31:*.tbz2=01;31:*.tz=01;31:*.
deb=01;31:*.rpm=01;31:*.jar=01;31:*.war=01;31:*.ear=01;31:*.sar=01;31:*.rar=01;31:*.alz=01;31:*.ace=01;31:*.zoo=01;31:*.cpio
=01;31:*.7z=01;31:*.rz=01;31:*.cab=01;31:*.wim=01;31:*.swm=01;31:*.dwm=01;31:*.esd=01;31:*.jpg=01;35:*.jpeg=01;35:*.mjpg=
01;35:*.mjpeg=01;35:*.gif=01;35:*.bmp=01;35:*.pbm=01;35:*.pgm=01;35:*.ppm=01;35:*.tga=01;35:*.xbm=01;35:*.xpm=01;35:*.ti
f=01;35:*.tiff=01;35:*.png=01;35:*.svg=01;35:*.svgz=01;35:*.mng=01;35:*.pcx=01;35:*.mov=01;35:*.mpg=01;35:*.mpeg=01;35:*.m
2v=01;35:*.mkv=01;35:*.webm=01;35:*.ogm=01;35:*.mp4=01;35:*.m4v=01;35:*.mp4v=01;35:*.vob=01;35:*.qt=01;35:*.nuv=01;35
:*.wmv=01;35:*.asf=01;35:*.rm=01;35:*.rmvb=01;35:*.flc=01;35:*.avi=01;35:*.fli=01;35:*.flv=01;35:*.gl=01;35:*.dl=01;35:*.xcf=01;
35:*.xwd=01;35:*.yuv=01;35:*.cgm=01;35:*.emf=01;35:*.ogv=01;35:*.ogx=01;35:*.aac=00;36:*.au=00;36:*.flac=00;36:*.m4a=00;3
6:*.mid=00;36:*.midi=00;36:*.mka=00;36:*.mp3=00;36:*.mpc=00;36:*.ogg=00;36:*.ra=00;36:*.wav=00;36:*.oga=00;36:*.opus=00;
36:*.spx=00;36:*.xspf=00;36:
```

```
LESSCLOSE=/usr/bin/lesspipe %s %s
```

```
TERM=xterm-256color
```

```
LESSOPEN=| /usr/bin/lesspipe %s
```

```
USER=john
```

```
SHLVL=2
```

```
WLENV=
```

```
XDG_DATA_DIRS=/usr/local/share:/usr/share:/var/lib/napd/desktop
```

```
PATH=/usr/local/sbin:/usr/local/bin:/usr/sbin:/usr/bin:/sbin:/bin:/usr/games:/usr/local/games:/mnt/c/Program
```

```
Files/WindowsApps/CanonicalGroupLimited.UbuntuonWindows_2004.2021.825.0_x64__79rhkp1fndgsc:/mnt/c/ORACLE/WINDOWS
```

```
.X64_193000_db_home/bin:/mnt/c/Windows/system32:/mnt/c/Windows:/mnt/c/Windows/System32/Wbem:/mnt/c/Windows/Sy
```

```
stem32/WindowsPowerShell/v1.0:/mnt/c/Windows/System32/OpenSSH:/mnt/c/Program Files/PuTTY:/mnt/c/Program
```

```
Files/dotnet:/mnt/c/Program Files/Microsoft SQL Server/120/DTS/Binn:/mnt/c/Program Files/Microsoft SQL Server/Client
```

```
SDK/ODBC/110/Tools/Binn:/mnt/c/Program Files (x86)/Microsoft SQL Server/120/Tools/Binn:/mnt/c/Program Files/Microsoft SQL
```

```
Server/120/Tools/Binn:/mnt/c/Program Files (x86)/Microsoft SQL Server/120/Tools/Binn/ManagementStudio:/mnt/c/Program
```

```
Files (x86)/Microsoft SQL Server/120/DTS/Binn:/mnt/c/Program Files/Microsoft SQL Server/Client
```

```
SDK/ODBC/170/Tools/Binn:/mnt/c/Program Files (x86)/Microsoft SQL Server/150/Tools/Binn:/mnt/c/Program Files/Microsoft SQL
```

```
Server/150/Tools/Binn:/mnt/c/Program Files/Microsoft SQL Server/150/DTS/Binn:/mnt/c/Program Files (x86)/Microsoft SQL
```

```
Server/150/DTS/Binn:/mnt/c/Program Files/Azure Data Studio/bin:/mnt/c/Program Files/Microsoft SQL
```

```
Server/130/Tools/Binn:/mnt/c/Program Files
```

```
(x86)/dotnet:/mnt/c/Users/openh/Python39/Scripts:/mnt/c/Users/openh/Python39:/mnt/c/Users/openh/AppData/Local/Micros
```

```
oft/WindowsApps:/mnt/c/cygwin64/bin:/mnt/c/Users/openh/.dotnet/tools:/mnt/c/Program Files/JetBrains/CLion
```

```
2021.2/bin:/mnt/c/Users/openh/AppData/Local/GitHubDesktop/bin:/snap/bin:.
```

```
HOSTTYPE=x86_64
```

```
OLDPWD=/home/john/LAB4/mydir
```

```
_=/usr/bin/env
```

```
john@oho: env | grep SHELL
```

```
SHELL=/bin/bash
```

```
john@oho: echo $SHELL
```

```
/bin/bash
```

```
john@opo: env | grep USER
```

```
USER=john
```

```
john@oho: echo $USER
```

```
john
```

file

john@oho: **file /bin/ls**

/bin/ls: ELF 64-bit LSB shared object, x86-64, version 1 (SYSV), dynamically linked, interpreter /lib64/ld-linux-x86-64.so.2, BuildID[sha1]=2f15ad836be3339dec0e2e6a3c637e08e48aacbd, for GNU/Linux 3.2.0, stripped

john@oho: **file hi.txt**

hi.txt: ASCII text

find

john@oho: **find /usr -name stdio.h -print**

/usr/include/stdio.h

/usr/include/x86_64-linux-gnu/bits/stdio.h

gcc

john@oho: **gcc -v**

<left out some lines here>

gcc version 9.3.0 (Ubuntu 9.3.0-17ubuntu1~20.04)

gdb

john@oho: **gdb -v**

[mGNU gdb (Ubuntu 9.2-0ubuntu1~20.04) 9.2

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grep

john@oho: **grep john /etc/passwd**

john:x:1000:1000:,,,:/home:/bin/bash

john@oho: **ifconfig -a | grep inet**

inet 169.254.36.36 netmask 255.255.0.0

inet fe80::ec81:97e7:28ab:2424 prefixlen 64 scopeid 0xfd<compat,link,site,host>

inet 127.0.0.1 netmask 255.0.0.0

inet6 ::1 prefixlen 128 scopeid 0xfe<compat,link,site,host>

inet 192.168.1.185 netmask 255.255.255.0 broadcast 192.168.1.255

inet6 2603:8000:1a01:c8c2:1c51:67ad:7a41:b1cb prefixlen 64 scopeid 0x0<global>

inet6 2603:8000:1a01:c8c2::1d88 prefixlen 128 scopeid 0x0<global>

inet6 2603:8000:1a01:c8c2:9414:9df6:8768:9109 prefixlen 128 scopeid 0x0<global>

inet6 fe80::1c51:67ad:7a41:b1cb prefixlen 64 scopeid 0xfd<compat,link,site,host>

```
inet 169.254.32.159 netmask 255.255.0.0
inet6 fe80::2db7:d219:5462:209f prefixlen 64 scopeid 0xfd<compat,link,site,host>
inet 169.254.212.235 netmask 255.255.0.0
inet6 fe80::c497:5a3e:a41:d4eb prefixlen 64 scopeid 0xfd<compat,link,site,host>
```

john@oho: **ifconfig -a | grep inet | grep -v inet6**

```
inet 169.254.36.36 netmask 255.255.0.0
inet 127.0.0.1 netmask 255.0.0.0
inet 192.168.1.185 netmask 255.255.255.0 broadcast 192.168.1.255
inet 169.254.32.159 netmask 255.255.0.0
inet 169.254.212.235 netmask 255.255.0.0
```

gzip

john@oho: **cp /etc/passwd .** ← Don't forget the '.' at the end. Copies passwd file into your current directory.

john@oho: **ls -l passwd /etc/passwd**

```
-rw-r--r-- 1 root root 1635 Aug 14 16:22 /etc/passwd
-rw-r--r-- 1 john john 1635 Sep 12 10:00 passwd
```

john@oho: **gzip passwd**

john@oho: **ls -l**

```
total 36
-rw----- 1 john netdev      17 Sep 12 09:49 both.txt
-rw-r--r-- 1 john john       10 Sep 12 09:48 hello.txt
-rw-r--r-- 1 john john        7 Sep 12 09:48 hi.txt
drwxr-x--- 1 john john    4096 Sep 12 09:57 mydir
-rw-r--r-- 1 john john      617 Sep 12 10:00 passwd.gz
-rw-r--r-- 1 john john   24576 Sep 12 09:59 unixland.txt
```

john@oho: **ls -l passwd.gz /etc/passwd**

```
-rw-r--r-- 1 root root 1635 Aug 14 16:22 /etc/passwd
-rw-r--r-- 1 john john 617 Sep 12 10:00 passwd.gz              ← Notice the size. This file is compressed to save disk space.
```

john@oho: **gunzip passwd.gz**

john@oho: **ls -l passwd**

```
-rw-r--r-- 1 john john 1635 Sep 12 10:00 passwd
```

john@oho:~\$ **head /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:/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
```

hostid

```
john@oho: hostid
007f0101
```

```
john@oho: pwd
/home/john/LAB4
```

hostname

```
john@oho: hostname
oho
```

id

```
john@oho:~$ grep john /etc/group
```

```
adm:x:4:syslog,john
dialout:x:20:john
cdrom:x:24:john
floppy:x:25:john
sudo:x:27:john
audio:x:29:john
dip:x:30:john
video:x:44:john
plugdev:x:46:john
netdev:x:117:john
john:x:1000:
```

```
john@oho: id
```

```
uid=1000(john) gid=1000(john)
groups=1000(john),4(adm),20(dialout),24(cdrom),25(floppy),27(sudo),29(audio),30(dip),44(video),46(plugdev),117(netdev)
```

ln

```
john@oho: ln -s /usr/include inc
```

```
john@oho: ls -l
```

```
total 36
-rw----- 1 john netdev 17 Sep 12 09:49 both.txt
-rw-r--r-- 1 john john 10 Sep 12 09:48 hello.txt
-rw-r--r-- 1 john john 7 Sep 12 09:48 hi.txt
lrwxrwxrwx 1 john john 12 Sep 12 10:02 inc -> /usr/include
```

```
drwxr-x--- 1 john john    4096 Sep 12 09:57 mydir
-rw-r--r-- 1 john john    1635 Sep 12 10:00 passwd
-rw-r--r-- 1 john john   28672 Sep 12 10:01 unixland.txt
```

john@oho:~\$ **ls -l /usr/include/signal.h**

```
-rw-r--r-- 1 root root 12309 Dec 16  2020 /usr/include/signal.h
```

john@oho:~\$ **ls -l inc/signal.h**

```
-rw-r--r-- 1 root root 12309 Dec 16  2020 inc/signal.h
```

ls

john@oho: **ls -lR mydir**

mydir:

total 0

```
-rw-r--r-- 1 john john 0 Sep 12 09:55 nexttest.txt
```

```
-rw-r--r-- 1 john john 0 Sep 12 09:54 test.txt
```

```
-rw-r--r-- 1 john john 0 Sep 12 09:57 texas.txt
```

john@oho: **ls**

```
both.txt  hello.txt  hi.txt  mydir  passwd  unixland.txt
```

make

john@oho:~/LAB4\$ **make -v**

GNU Make 4.2.1

Built for x86_64-pc-linux-gnu

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md5sum

john@oho: **md5sum passwd**

```
0a694909e131aa1635798b82734fc7a0 passwd
```

mkdir

john@oho: **mkdir -p sun/moon/earth**

← -p will create all directories that don't exist in one command.

john@oho: **ls -lR sun**

sun:

total 0

```
drwxr-xr-x 1 john john 4096 Sep 12 10:04 moon
```

```
sun/moon:
total 0
drwxr-xr-x 1 john john 4096 earth
```

```
sun/moon/earth:
total 0
```

mv

```
john@oho: mv both.txt newname.txt
```

nohup

```
john@oho: nohup ls &
[1] 443
john@oho: nohup: ignoring input and appending output to 'nohup.out'
[1]+  Done                  nohup ls
```

```
john@oho: ls -l nohup.out
-rw----- 1 john john 73 Sep 12 10:05 nohup.out
```

```
john@oho: more nohup.out
hello.txt
hi.txt
inc
mydir
newname.txt
nohup.out
passwd
sun
unixland.txt
```

od

```
john@oho: pwd
/home/john/LAB4
```

```
john@oho: od -ax hi.txt
00000000 H i n l B y e n l
        6948 420a 6579 000a
00000007
```

```
john@oho: od -ax hello.txt
00000000 H e l l o n l B y e n l
        6548 6c6c 0a6f 7942 0a65
0000012
```

ps

john@oho: **ps**

PID	TTY	TIME	CMD
346	pts/0	00:00:00	bash
449	pts/0	00:00:00	ps

john@oho: **ps -ef**

UID	PID	PPID	C	STIME	TTY	TIME	CMD
root	1	0	0	08:51	?	00:00:00	/init
root	6	1	0	08:51	tty1	00:00:00	/init
john	7	6	0	08:51	tty1	00:00:00	-bash
root	67	1	0	09:09	tty2	00:00:00	/init
john	68	67	0	09:09	tty2	00:00:00	-bash
john	345	68	0	09:47	tty2	00:00:00	script unixland.txt
john	346	345	0	09:47	pts/0	00:00:00	bash -i
john	450	346	0	10:06	pts/0	00:00:00	ps -ef

rmdir

john@oho: **mkdir toremove.dir**

john@oho: **touch toremove.dir/test.txt**

john@oho: **ls -lR toremove.dir**

toremove.dir:

total 0

-rw-r--r-- 1 john john 0 Sep 12 12:43 test.txt

john@oho: **ls -ld toremove.dir**

drwxr-xr-x 1 john john 4096 Sep 12 12:43 toremove.dir

john@oho: **rmdir toremove.dir**

rmdir: failed to remove 'toremove.dir': Directory not empty

john@oho: **rm toremove.dir/test.txt**

john@oho: **rmdir toremove.dir**

john@oho: **ls -ld toremove.dir**

ls: cannot access 'toremove.dir': No such file or directory

sftp

```
john@oho: cd ~/LAB4
```

```
john@oho: ls
```

```
copy.txt hello.txt hi.txt inc mydir newname.txt nohup.out passwd sun unixland.dos.txt unixland.txt
```

```
john@oho: ls -l
```

```
total 112
```

```
-rw-r--r-- 1 john john 41258 Sep 12 10:26 copy.txt
-rw-r--r-- 1 john john 10 Sep 12 09:48 hello.txt
-rw-r--r-- 1 john john 7 Sep 12 09:48 hi.txt
lrwxrwxrwx 1 john john 12 Sep 12 10:02 inc -> /usr/include
drwxr-x--- 1 john john 4096 Sep 12 09:57 mydir
-rw----- 1 john netdev 17 Sep 12 09:49 newname.txt
-rw----- 1 john john 73 Sep 12 10:05 nohup.out
-rw-r--r-- 1 john john 1635 Sep 12 10:00 passwd
drwxr-xr-x 1 john john 4096 Sep 12 10:11 sun
-rw-r--r-- 1 john john 0 Sep 12 10:25 unixland.dos.txt
-rw-r--r-- 1 john john 34036 Sep 12 10:29 unixland.txt
```

```
john@oho: sftp comp232.com
```

← Could also use: **sftp 143.198.238.179**

```
john@comp232.com's password: <enter user password>
```

```
Connected to comp232.com.
```

sftp> help

Available commands:

bye	Quit sftp
cd path	Change remote directory to 'path'
chgrp [-h] grp path	Change group of file 'path' to 'grp'
chmod [-h] mode path	Change permissions of file 'path' to 'mode'
chown [-h] own path	Change owner of file 'path' to 'own'
df [-hi] [path]	Display statistics for current directory or filesystem containing 'path'
exit	Quit sftp
get [-afpR] remote [local]	Download file
help	Display this help text
lcd path	Change local directory to 'path'
lls [ls-options [path]]	Display local directory listing
lmkdir path	Create local directory
ln [-s] oldpath newpath	Link remote file (-s for symlink)
lpwd	Print local working directory
ls [-lafhlNrSt] [path]	Display remote directory listing
lumask umask	Set local umask to 'umask'
mkdir path	Create remote directory
progress	Toggle display of progress meter
put [-afpR] local [remote]	Upload file
pwd	Display remote working directory
quit	Quit sftp
reget [-fpR] remote [local]	Resume download file
rename oldpath newpath	Rename remote file

reput [-fpR] local [remote]	Resume upload file
rm path	Delete remote file
rmdir path	Remove remote directory
symlink oldpath newpath	Symlink remote file
version	Show SFTP version
!command	Execute 'command' in local shell
!	Escape to local shell
?	Synonym for help

sftp> ls
LAB1

sftp> mkdir LAB4

sftp> ls
LAB1 LAB4

sftp> cd LAB4

sftp> ls

sftp> ll
copy.txt hello.txt hi.txt inc mydir newname.txt nohup.out passwd sun unixland.dos.txt unixland.txt

sftp> mput *.txt

Uploading copy.txt to /home/john/LAB4/copy.txt		
copy.txt	100%	40KB
366.7KB/s 00:00		
Uploading hello.txt to /home/john/LAB4/hello.txt		
hello.txt	100%	10
0.3KB/s 00:00		
Uploading hi.txt to /home/john/LAB4/hi.txt		
hi.txt	100%	7
0.3KB/s 00:00		
Uploading newname.txt to /home/john/LAB4/newname.txt		
newname.txt	100%	17
0.6KB/s 00:00		
Uploading unixland.dos.txt to /home/john/LAB4/unixland.dos.txt		
unixland.dos.txt	100%	0
0.0KB/s 00:00		
Uploading unixland.txt to /home/john/LAB4/unixland.txt		
unixland.txt	100%	33KB
452.2KB/s 00:00		

sftp> ls
copy.txt hello.txt hi.txt newname.txt unixland.dos.txt unixland.txt

sftp> pwd
Remote working directory: /home/john/LAB4

sftp> lpwd
Local working directory: /home/john/LAB4

sftp> **quit**

sleep

john@oho: **sleep 5**

sort

john@oho: **cut -f7 -d: /etc/passwd**

/bin/bash

/usr/sbin/nologin

/usr/sbin/nologin

/usr/sbin/nologin

/bin/sync

/usr/sbin/nologin

/usr/sbin/nologin

/usr/sbin/nologin

/usr/sbin/nologin

/usr/sbin/nologin

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/usr/sbin/nologin

/usr/sbin/nologin

/usr/sbin/nologin

/bin/false

/usr/sbin/nologin

/usr/sbin/nologin

/usr/sbin/nologin

/usr/sbin/nologin

/bin/false

/bin/bash

john@oho: **cut -f7 -d: /etc/passwd | sort**

/bin/bash

/bin/bash

/bin/false

/bin/false


```
john@comp232: exit  
logout  
Connection to comp232.com closed.
```

```
john@oho: ssh john@143.198.238.179  
john@143.198.238.179's password:  
Welcome to Ubuntu 20.04.2 LTS (GNU/Linux 5.4.0-73-generic x86_64)  
Last login: Sun Sep 12 17:08:44 2021 from 23.241.58.212
```

```
john@comp232:~$ pwd  
/home/john
```

```
john@comp232:~$ uname -a  
Linux comp232 5.4.0-73-generic #82-Ubuntu SMP Wed Apr 14 17:39:42 UTC 2021 x86_64 x86_64 x86_64 GNU/Linux
```

```
john@comp232:~$ exit  
logout  
Connection to 143.198.238.179 closed.
```

stty

```
john@oho: stty  
speed 38400 baud; line = 0;  
eol = M-^?; eol2 = M-^?; swtch = M-^?;  
ixany iutf8
```

sudo

```
john@oho: ls -l /etc/shadow
```

```
-rw-r----- 1 root shadow 973 Aug 14 16:22 /etc/shadow
```

```
john@oho: cat /etc/shadow  
cat: /etc/shadow: Permission denied
```

```
john@oho: sudo cat /etc/shadow | tail  
[sudo] password for john:  
messagebus:*:18677:0:99999:7::  
syslog:*:18677:0:99999:7::  
_apt:*:18677:0:99999:7::  
tss:*:18677:0:99999:7::  
uidd:*:18677:0:99999:7::  
tcpdump:*:18677:0:99999:7::  
sshd:*:18677:0:99999:7::  
landscape:*:18677:0:99999:7::  
pollinate:*:18677:0:99999:7::
```

```
john:$6$NiKId9M7f/ss7XGt$bmp4QIPpP4UJedv2GK5Y.n3BXDrw5X0TS4f3SUhXiKesfVlwW2qYwgyT0Yb2ZVbx6WAVWKP4  
wjrq9KilylWS01:18853:0:99999:7:::
```

sync

```
john@oho: sync
```

```
john@oho: sync ← Anyone know the difference between typing “sync” and “sync; sync”?
```

tar

```
john@oho: pwd  
/home/john/LAB4
```

```
john@oho: cd ..
```

```
john@oho: tar cvf lab4.tar ./LAB4  
./LAB4/  
./LAB4/hello.txt  
./LAB4/hi.txt  
./LAB4/inc  
./LAB4/mydir/  
./LAB4/mydir/nexttest.txt  
./LAB4/mydir/test.txt  
./LAB4/mydir/texas.txt  
./LAB4/newname.txt  
./LAB4/nohup.out  
./LAB4/passwd  
./LAB4/sun/  
./LAB4/sun/moon/  
./LAB4/sun/moon/earth/  
./LAB4/unixland.txt
```

```
john@oho: ls -l lab4.tar  
-rw-r--r-- 1 john john 61440 Sep 12 10:10 lab4.tar
```

```
john@oho:~$ tar tvf lab4.tar ← Displays what files are in the lab4.tar file.
```

```
drwxr-xr-x john/john      0 2021-09-12 10:06 ./LAB4/  
-rw-r--r-- john/john    10 2021-09-12 09:48 ./LAB4/hello.txt  
-rw-r--r-- john/john      7 2021-09-12 09:48 ./LAB4/hi.txt  
lrwxrwxrwx john/john      0 2021-09-12 10:02 ./LAB4/inc -> /usr/include  
drwxr-x--- john/john      0 2021-09-12 09:57 ./LAB4/mydir/  
-rw-r--r-- john/john      0 2021-09-12 09:55 ./LAB4/mydir/nexttest.txt  
-rw-r--r-- john/john      0 2021-09-12 09:54 ./LAB4/mydir/test.txt  
-rw-r--r-- john/john      0 2021-09-12 09:57 ./LAB4/mydir/texas.txt  
-rw----- john/netdev   17 2021-09-12 09:49 ./LAB4/newname.txt  
-rw----- john/john     73 2021-09-12 10:05 ./LAB4/nohup.out  
-rw-r--r-- john/john  1635 2021-09-12 10:00 ./LAB4/passwd
```

```
drwxr-xr-x john/john      0 2021-09-12 10:04 ./LAB4/sun/
drwxr-xr-x john/john      0 2021-09-12 10:04 ./LAB4/sun/moon/
drwxr-xr-x john/john      0 2021-09-12 10:04 ./LAB4/sun/moon/earth/
-rw-r--r-- john/john    40960 2021-09-12 10:09 ./LAB4/unixland.txt
```

john@oho: **cd LAB4**

john@oho: **cd sun**

john@oho: **ls**
moon

```
john@oho: tar xvf lab4.tar          ← x for extract
./LAB4/
./LAB4/hello.txt
./LAB4/hi.txt
./LAB4/inc
./LAB4/mydir/
./LAB4/mydir/nexttest.txt
./LAB4/mydir/test.txt
./LAB4/mydir/texas.txt
./LAB4/newname.txt
./LAB4/nohup.out
./LAB4/passwd
./LAB4/sun/
./LAB4/sun/moon/
./LAB4/sun/moon/earth/
./LAB4/unixland.txt
```

john@oho: **ls**
moon LAB4

john@oho: **ls LAB4**
hello.txt hi.txt mydir newname.txt nohup.out passwd unixland.txt

john@oho: **cd ..**

john@oho: **ls**
hello.txt hi.txt newname.txt nohup.out passwd sun unixland.txt

john@oho: **ls sun**
moon

john@oho: **pwd**
/home/john/LAB4

uptime

```
john@oho: uptime  
10:12:10 up 1:20, 0 users, load average: 0.52, 0.58, 0.59
```

which

```
john@oho: which gzip  
/usr/bin/gzip
```

whoami

```
john@oho: whoami  
john
```

```
john@oho: exit ← Exits running the script unixland.txt command.  
exit
```

After exiting the script command, you should now have a unixland.txt file ready to upload to comp232.com.

To turn in your work to receive full credit for this assignment, please:

```
% sftp <username>@comp232.com
```

```
sftp> cd LAB4
```

```
sftp> put unixland.txt
```

```
sftp> ls -l
```

```
sftp> quit
```

```
% exit
```