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RH12404 - Basic Shell Commands and Text Manipulation Tools

Contents

LAB #1 - Use of Basic Shell Commands

To do - You are currently the root user in your terminal. Before proceeding further, type **exit** and hit the ↵ Enter key.

1.1 - The stty Command

Using this command with the **-a** switch allows you to identify which combination of keys should be used to control a foreground process:

```
[root@redhat9 ~]# exit
logout
[trainee@redhat9 ~]$ stty -a
speed 38400 baud; rows 27; columns 105; line = 0;
intr = ^C; quit = ^\; erase = ^?; kill = ^U; eof = ^D; eol = <undef>; eol2 = <undef>; swtch = <undef>;
start = ^Q; stop = ^S; susp = ^Z; rprnt = ^R; werase = ^W; lnext = ^V; discard = ^O; min = 1; time = 0;
-parenb -parodd -cmspar cs8 -hupcl -cstopb cread -clocal -crtscts
-ignbrk -brkint -ignpar -parmrk -inpck -istrip -inlcr -igncr icrnl ixon -ixoff -iuclc -ixany -imaxbel
-iutf8
opost -olcuc -ocrnl onlcr -onocr -onlret -ofill -ofdel nl0 cr0 tab0 bs0 vt0 ff0
isig icanon iexten echo echoe echok -echonl -noflsh -xcase -tostop -echoprt echoctl echoke -flusho
-extproc
```

Important - The two most important combinations are **intr = ^C** and **susp = ^Z**. The former kills the process whilst the latter suspends its execution.

Command Line Switches

To do : Use the **–help** option of the **stty** command to view the command line switches (also known as a **parameters**, **options** or **flags**).

1.2 - The date command

This command's output gives the current system date and time. The command can also be used to set the system date:

```
[trainee@redhat9 ~]$ date
Wed Sep 25 02:45:00 PM CEST 2024
```

Command Line Switches

To do : Use the **–help** option of the **date** command to view the command line switches.

1.3 - The who Command

This command's output shows who is currently connected to the system:

```
[trainee@redhat9 ~]$ who
trainee  pts/0        2024-09-25 12:47 (10.0.2.1)
```

Command Line Switches

To do : Use the **–help** option of the **who** command to view the command line switches.

1.4 - The df Command

This command's output shows the free space on each mounted block device:

```
[trainee@redhat9 ~]$ df
Filesystem            1K-blocks    Used Available Use% Mounted on
devtmpfs                   4096       0      4096   0% /dev
tmpfs                   3934780       0   3934780   0% /dev/shm
tmpfs                   1573912    9244   1564668   1% /run
/dev/mapper/rhel-root  46110724 7023448  39087276  16% /
/dev/sda1               1038336  406796    631540  40% /boot
tmpfs                    786956      52    786904   1% /run/user/42
tmpfs                    786956      36    786920   1% /run/user/1000
```

The units are shown as **blocks**. In order to **humanize** the output, it is possible to use the **-h** switch:

```
[trainee@redhat9 ~]$ df -h
Filesystem             Size  Used Avail Use% Mounted on
devtmpfs               4.0M     0  4.0M   0% /dev
tmpfs                  3.8G     0  3.8G   0% /dev/shm
tmpfs                  1.6G  9.1M  1.5G   1% /run
/dev/mapper/rhel-root   44G  6.7G   38G  16% /
/dev/sda1             1014M  398M  617M  40% /boot
tmpfs                  769M   52K  769M   1% /run/user/42
tmpfs                  769M   36K  769M   1% /run/user/1000
```

Command Line Switches

To do : Use the **–help** option of the **df** command to view the command line switches.

1.5 - The free Command

This command's output shows the memory usage:

```
[trainee@redhat9 ~]$ free
               total        used        free      shared  buff/cache   available
Mem:         7869560      845388     6607588       15324      678020     7024172
Swap:        5242876           0     5242876
```

The units are shown as **blocks**. In order to **humanize** the output, it is possible to use the **-h** switch:

```
[trainee@redhat9 ~]$ free -h
               total        used        free      shared  buff/cache   available
Mem:           7.5Gi       825Mi       6.3Gi        14Mi       662Mi       6.7Gi
Swap:          5.0Gi          0B       5.0Gi
```

Command Line Switches

To do : Use the **–help** option of the **free** command to view the command line switches.

1.6 - The whoami Command

This command's output indicates the user name associated with the current effective user ID:

```
[trainee@redhat9 ~]$ whoami
trainee
```

Now become the system administrator **root**:

```
[trainee@redhat9 ~]$ su -
Password: fenestros
```

Important : Note that the password will not be visible.

Now use the **whoami** command again:

```
[root@redhat9 ~]# whoami
root
```

Important : Note the current effective user ID is root.

Finally execute the **exit** command to return as **trainee**:

```
[root@redhat9 ~]# exit
logout
[trainee@redhat9 ~]$
```

Command Line Switches

To do : Use the **–help** option of the **whoami** command to view the command line switches.

1.7 - The pwd Command

This command's output shows the current working directory:

```
[trainee@redhat9 ~]$ pwd
/home/trainee
```

Command Line Switches

To do : Use the **help** command with **pwd** option to view the command line switches.

1.8 - The cd Command

This command's output changes the current working directory to that specified by the **argument**:

```
[trainee@redhat9 ~]$ cd /tmp

[trainee@redhat9 tmp]$ pwd
/tmp
```

```
[trainee@redhat9 tmp]$
```

Command Line Switches

To do : Use the **help** command with **cd** option to view the command line switches.

1.9 - The ls Command

This commands output lists information about the files in directory specified as an argument. If no argument is specified, the output lists the files in the current working directory:

```
[trainee@redhat9 tmp]$ ls
dbus-G7skg3Wlpv
dbus-s2vBGtxTHi
inode
systemd-private-7e6b4544d8d34a9bb30a13aeb8e4e02a-colord.service-FfNuds
systemd-private-7e6b4544d8d34a9bb30a13aeb8e4e02a-dbus-broker.service-VIpKgR
systemd-private-7e6b4544d8d34a9bb30a13aeb8e4e02a-kdump.service-0SbYbm
systemd-private-7e6b4544d8d34a9bb30a13aeb8e4e02a-ModemManager.service-k4DpLF
systemd-private-7e6b4544d8d34a9bb30a13aeb8e4e02a-power-profiles-daemon.service-mIx9S5
systemd-private-7e6b4544d8d34a9bb30a13aeb8e4e02a-rtkit-daemon.service-2gD28Z
systemd-private-7e6b4544d8d34a9bb30a13aeb8e4e02a-switcheroo-control.service-rLbOK4
systemd-private-7e6b4544d8d34a9bb30a13aeb8e4e02a-systemd-logind.service-uLNyfd
systemd-private-7e6b4544d8d34a9bb30a13aeb8e4e02a-upower.service-bIpAUN
```

Command Line Switches

To do : Use the **–help** option of the **ls** command to view the command line switches.

1.10 - The lsof Command

This command's output shows information about open files:

```
[trainee@redhat9 tmp]$ su -
Password: fenestros

[root@redhat9 ~]# lsof | more
COMMAND    PID  TID TASKCMD             USER   FD      TYPE             DEVICE  SIZE/OFF       NODE NAME
systemd      1                         root  cwd       DIR              253,0       235        128 /
systemd      1                         root  rtd       DIR              253,0       235        128 /
systemd      1                         root  txt       REG              253,0     98224     701526 /usr/
lib/systemd/systemd
systemd      1                         root  mem       REG              253,0    598592   68842572 /etc/
selinux/targeted/contexts/files/file_contexts.bin
systemd      1                         root  mem       REG              253,0    914360   67157969 /usr/
lib64/libm.so.6
systemd      1                         root  mem       REG              253,0    882376   67158330 /usr/
lib64/libzstd.so.1.5.1
systemd      1                         root  mem       REG              253,0   4487176   67224852 /usr/
lib64/libcrypto.so.3.0.7
systemd      1                         root  mem       REG              253,0   1714208   68560752 /usr/
lib64/libp11-kit.so.0.3.1
systemd      1                         root  mem       REG              253,0   2592552   67918617 /usr/
lib64/libc.so.6
systemd      1                         root  mem       REG              253,0    636848   67918540 /usr/
lib64/libpcre2-8.so.0.11.0
systemd      1                         root  mem       REG              253,0   1288512   68560763 /usr/
lib64/libgcrypt.so.20.4.0
```

```
systemd      1                          root  mem       REG              253,0   3785712   67956161 /usr/
lib64/systemd/libsystemd-shared-252.so
systemd      1                          root  mem       REG              253,0     44784   68560751 /usr/
lib64/libffi.so.8.1.0
systemd      1                          root  mem       REG              253,0    153600   67188275 /usr/
--More--
[q]
```

Command Line Switches

To do : Use the **–help** option of the **lsof** command to view the command line switches.

1.11 - The touch Command

This command updates the access and modification times of one or several file(s) to the current time. If the file does not exist, the system creates an empty file:

```
[root@redhat9 ~]# exit
logout

[trainee@redhat9 tmp]$ touch test

[trainee@redhat9 tmp]$ ls
dbus-G7skg3Wlpv
dbus-s2vBGtxTHi
inode
systemd-private-7e6b4544d8d34a9bb30a13aeb8e4e02a-colord.service-FfNuds
systemd-private-7e6b4544d8d34a9bb30a13aeb8e4e02a-dbus-broker.service-VIpKgR
systemd-private-7e6b4544d8d34a9bb30a13aeb8e4e02a-kdump.service-0SbYbm
```

```
systemd-private-7e6b4544d8d34a9bb30a13aeb8e4e02a-ModemManager.service-k4DpLF
systemd-private-7e6b4544d8d34a9bb30a13aeb8e4e02a-power-profiles-daemon.service-mIx9S5
systemd-private-7e6b4544d8d34a9bb30a13aeb8e4e02a-rtkit-daemon.service-2gD28Z
systemd-private-7e6b4544d8d34a9bb30a13aeb8e4e02a-switcheroo-control.service-rLbOK4
systemd-private-7e6b4544d8d34a9bb30a13aeb8e4e02a-systemd-logind.service-uLNyfd
systemd-private-7e6b4544d8d34a9bb30a13aeb8e4e02a-upower.service-bIpAUN
test
```

Command Line Switches

To do : Use the **–help** option of the **touch** command to view the command line switches.

1.12 - The echo Command

This command writes the arguments to the standard output (i.e. the screen):

```
[trainee@redhat9 tmp]$ echo fenestros
fenestros
```

Command Line Switches

To do : Use the **help** command with **echo** option to view the command line switches.

1.13 - The cp Command

This command is used to copy a file to a destination or multiple files to a directory:

```
[trainee@redhat9 tmp]$ cp test ~

[trainee@redhat9 tmp]$ ls -l ~
total 4
drwxr-xr-x. 2 trainee trainee   6 Oct 19  2023 Desktop
drwxr-xr-x. 2 trainee trainee   6 Oct 19  2023 Documents
drwxr-xr-x. 2 trainee trainee   6 Oct 19  2023 Downloads
drwxr-xr-x. 2 trainee trainee   6 Oct 19  2023 Music
drwxr-xr-x. 2 trainee trainee   6 Oct 19  2023 Pictures
drwxr-xr-x. 2 trainee trainee   6 Oct 19  2023 Public
drwxr-xr-x. 2 trainee trainee   6 Oct 19  2023 Templates
-rw-r--r--. 1 trainee trainee   0 Sep 25 14:59 test
drwxr-xr-x. 2 trainee trainee   6 Oct 19  2023 Videos
-rw-r--r--. 1 trainee trainee 442 Sep 25 14:24 vitext
```

Note the use of the **~** (tilde) character which is a shortcut to the current user's home directory. In the case of this example : **/home/trainee**.

Command Line Switches

To do : Use the **–help** option of the **cp** command to view the command line switches.

1.14 - The file Command

This command determines a file type:

```
[trainee@redhat9 tmp]$ file ~/test
/home/trainee/test: empty
```

Important - Note that in the case of the first line of the above output, the command **file** is incapable of informing you of the type of file since **test** is empty.

Using the > key, redirect the output of **echo fenestros** into the **/home/trainee/test** file as follows:

```
[trainee@redhat9 tmp]$ echo "fenestros" > ~/test
```

Now use the **file** command once again to determine the file type:

```
[trainee@redhat9 tmp]$ file ~/test
/home/trainee/test: ASCII text
```

Command Line Switches

To do : Use the **–help** option of the **file** command to view the command line switches.

1.15 - The cat Command

This commands concatenate files, or standard input, to standard output. In the case of only one file as an argument, the effective result is to print the file contents to the screen:

```
[trainee@redhat9 tmp]$ cat ~/test
fenestros
```

Command Line Switches

To do : Use the **–help** option of the **cat** command to view the command line switches.

1.16 - The mv Command

This command renames a source to a destination or moves sources to a directory:

```
[trainee@redhat9 tmp]$ mv ~/test .

[trainee@redhat9 tmp]$ ls -l ~
total 4
drwxr-xr-x. 2 trainee trainee   6 Oct 19  2023 Desktop
drwxr-xr-x. 2 trainee trainee   6 Oct 19  2023 Documents
drwxr-xr-x. 2 trainee trainee   6 Oct 19  2023 Downloads
drwxr-xr-x. 2 trainee trainee   6 Oct 19  2023 Music
drwxr-xr-x. 2 trainee trainee   6 Oct 19  2023 Pictures
drwxr-xr-x. 2 trainee trainee   6 Oct 19  2023 Public
drwxr-xr-x. 2 trainee trainee   6 Oct 19  2023 Templates
drwxr-xr-x. 2 trainee trainee   6 Oct 19  2023 Videos
-rw-r--r--. 1 trainee trainee 442 Sep 25 14:24 vitext

[trainee@redhat9 tmp]$ mv test TeSt
```

```
[trainee@redhat9 tmp]$ ls -l
total 4
srwxrwxrwx. 1 gdm     gdm      0 Sep 25 12:30 dbus-G7skg3Wlpv
srwxrwxrwx. 1 gdm     gdm      0 Sep 25 12:45 dbus-s2vBGtxTHi
drwxr-xr-x. 2 root    root    54 Sep 25 13:10 inode
drwx------. 3 root    root    17 Sep 25 12:45 systemd-private-7e6b4544d8d34a9bb30a13aeb8e4e02a-colord.service-
FfNuds
drwx------. 3 root    root    17 Sep 25 12:44 systemd-private-7e6b4544d8d34a9bb30a13aeb8e4e02a-dbus-
broker.service-VIpKgR
drwx------. 3 root    root    17 Sep 25 12:44 systemd-private-7e6b4544d8d34a9bb30a13aeb8e4e02a-
kdump.service-0SbYbm
drwx------. 3 root    root    17 Sep 25 12:44 systemd-private-7e6b4544d8d34a9bb30a13aeb8e4e02a-
ModemManager.service-k4DpLF
drwx------. 3 root    root    17 Sep 25 12:44 systemd-private-7e6b4544d8d34a9bb30a13aeb8e4e02a-power-profiles-
daemon.service-mIx9S5
drwx------. 3 root    root    17 Sep 25 12:44 systemd-private-7e6b4544d8d34a9bb30a13aeb8e4e02a-rtkit-
daemon.service-2gD28Z
drwx------. 3 root    root    17 Sep 25 12:44 systemd-private-7e6b4544d8d34a9bb30a13aeb8e4e02a-switcheroo-
control.service-rLbOK4
drwx------. 3 root    root    17 Sep 25 12:44 systemd-private-7e6b4544d8d34a9bb30a13aeb8e4e02a-systemd-
logind.service-uLNyfd
drwx------. 3 root    root    17 Sep 25 12:44 systemd-private-7e6b4544d8d34a9bb30a13aeb8e4e02a-upower.service-
bIpAUN
-rw-r--r--. 1 trainee trainee 10 Sep 25 15:01 TeSt
```

Important - Note the use of the shortcut **.** which indicates the current working directory.

Command Line Switches

To do : Use the **–help** option of the **mv** command to view the command line switches.

1.17 - The mkdir Command

This command creates the directory(ies) if it (they) does (do) not exist:

```
[trainee@redhat9 tmp]$ cd ~

[trainee@redhat9 ~]$ mkdir testdir

[trainee@redhat9 ~]$ ls
Desktop  Documents  Downloads  Music  Pictures  Public  Templates  testdir  Videos  vitext
```

Command Line Switches

To do : Use the **–help** option of the **mkdir** command to view the command line switches.

1.18 - The rmdir Command

This command removes the directory(ies) if it (they) is (are) **empty**:

```
[trainee@redhat9 ~]$ rmdir testdir

[trainee@redhat9 ~]$ ls
Desktop  Documents  Downloads  Music  Pictures  Public  Templates  Videos  vitext
```

Command Line Switches

To do : Use the **–help** option of the **rmdir** command to view the command line switches.

1.19 - The rm Command

This command removes a directory, empty or not, as well as files:

```
[trainee@redhat9 ~]$ mkdir testdir1

[trainee@redhat9 ~]$ cd /tmp

[trainee@redhat9 tmp]$ echo "fenestros" > TeSt

[trainee@redhat9 tmp]$ cd ~

[trainee@redhat9 ~]$ mv /tmp/TeSt ~/testdir1

[trainee@redhat9 ~]$ ls -lR testdir1/
testdir1/:
total 4
-rw-r--r--. 1 trainee trainee 10 Sep 25 15:08 TeSt

[trainee@redhat9 ~]$ rmdir testdir1/
rmdir: failed to remove 'testdir1/': Directory not empty

[trainee@redhat9 ~]$ rm -rf testdir1

[trainee@redhat9 ~]$ ls
```

```
Desktop  Documents  Downloads  Music  Pictures  Public  Templates  Videos  vitext
```

Command Line Switches

To do : Use the **–help** option of the **rm** command to view the command line switches.

1.20 - The sort Command

This command writes a sorted concatenation of all files to standard output:

```
[trainee@redhat9 ~]$ touch aac abc bca xyz

[trainee@redhat9 ~]$ ls

aac  abc  bca  Desktop  Documents  Downloads  Music  Pictures  Public  Templates  Videos  vitext  xyz

[trainee@redhat9 ~]$ ls | sort
aac
abc
bca
Desktop
Documents
Downloads
Music
Pictures
Public
Templates
Videos
vitext
```

```
xyz

[trainee@redhat9 ~]$ ls | sort -r
xyz
vitext
Videos
Templates
Public
Pictures
Music
Downloads
Documents
Desktop
bca
abc
aac
```

Important - Note the use of the **|** character, called a **pipe**. A pipe is used to channel the standard output of the command that precedes it into the standard input of the command that follows it.

Command Line Switches

To do : Use the **–help** option of the **sort** command to view the command line switches.

1.21 - The more Command

This command is used to display a long file page by page:

```
[trainee@redhat9 ~]$ more /etc/services
# /etc/services:
# $Id: services,v 1.49 2017/08/18 12:43:23 ovasik Exp $
#
# Network services, Internet style
# IANA services version: last updated 2016-07-08
#
# Note that it is presently the policy of IANA to assign a single well-known
# port number for both TCP and UDP; hence, most entries here have two entries
# even if the protocol doesn't support UDP operations.
# Updated from RFC 1700, ``Assigned Numbers'' (October 1994).  Not all ports
# are included, only the more common ones.
#
# The latest IANA port assignments can be gotten from
#       http://www.iana.org/assignments/port-numbers
# The Well Known Ports are those from 0 through 1023.
# The Registered Ports are those from 1024 through 49151
# The Dynamic and/or Private Ports are those from 49152 through 65535
#
# Each line describes one service, and is of the form:
#
# service-name  port/protocol  [aliases ...]   [# comment]

tcpmux          1/tcp                           # TCP port service multiplexer
tcpmux          1/udp                           # TCP port service multiplexer
rje             5/tcp                           # Remote Job Entry
rje             5/udp                           # Remote Job Entry
--More--(0%)
[q]
```

Important - The ↵ Enter key scrolls down line by line, the Space Bar key scrolls down page by page and the Q key comes back to the command line prompt.

Command Line Switches

To do : Use the **–help** option of the **more** command to view the command line switches.

1.22 - The less Command

The **less** command produces a similar result to that of the **more** command. Practice using the less command and refer to the help using **less –help**. Which command seems the most powerful and versatile ?

```
[trainee@redhat9 ~]$ less /etc/services
# /etc/services:
# $Id: services,v 1.49 2017/08/18 12:43:23 ovasik Exp $
#
# Network services, Internet style
# IANA services version: last updated 2016-07-08
#
# Note that it is presently the policy of IANA to assign a single well-known
# port number for both TCP and UDP; hence, most entries here have two entries
# even if the protocol doesn't support UDP operations.
# Updated from RFC 1700, ``Assigned Numbers'' (October 1994).  Not all ports
# are included, only the more common ones.
#
# The latest IANA port assignments can be gotten from
```

```
#       http://www.iana.org/assignments/port-numbers
# The Well Known Ports are those from 0 through 1023.
# The Registered Ports are those from 1024 through 49151
# The Dynamic and/or Private Ports are those from 49152 through 65535
#
# Each line describes one service, and is of the form:
#
# service-name  port/protocol  [aliases ...]   [# comment]

tcpmux          1/tcp                           # TCP port service multiplexer
tcpmux          1/udp                           # TCP port service multiplexer
rje             5/tcp                           # Remote Job Entry
rje             5/udp                           # Remote Job Entry
/etc/services
[q]
```

Command Line Switches

To do : Use the **–help** option of the **less** command to view the command line switches.

1.23 - The find Command

This command is used to search for a specific file or directory. The default path is the **current directory** and default expression is **-print**:

```
[trainee@redhat9 ~]$ find acc
find: ‘acc’: No such file or directory

[trainee@redhat9 ~]$ find aac
aac
```

Important : Note that when the file cannot be found, the find command informs you clearly. However when the file is found, the find command just prints the name of the file to standard output.

Command Line Switches

To do : Use the **–help** option of the **find** command to view the command line switches.

1.24 - The su Command

This command is used to change the effective user id and group id to that of the user passed as an argument. When executed with no argument, the system assumes the destination user is **root**:

```
[trainee@redhat9 ~]$ su -
Password: fenestros

[root@redhat9 ~]#
```

Important : Note that the password will not be visible.

Command Line Switches

To do : Use the **–help** option of the **su** command to view the command line switches.

1.25 - The updatedb and locate Commands

The **locate** command is used to list files in databases that match a pattern supplied as an argument to the command. The **locate** command uses a database. This database needs to be created using the **updatedb** command before using the **locate** command.

The default database is **/var/lib/mlocate/mlocate.db**:

```
[root@redhat9 ~]# ls -l /var/lib/mlocate/mlocate.db
-rw-r-----. 1 root slocate 3436535 Sep 25 15:21 /var/lib/mlocate/mlocate.db
```

Important : For information concerning the database format, please see **man 5 locatedb**.

The **updatedb** command is configured by editing the **/etc/updatedb.conf** file:

```
[root@redhat9 ~]# cat /etc/updatedb.conf
PRUNE_BIND_MOUNTS = "yes"
PRUNEFS = "9p afs anon_inodefs auto autofs bdev binfmt_misc cgroup cifs coda configfs cpuset debugfs devpts
ecryptfs exofs fuse fuse.sshfs fusectl gfs gfs2 gpfs hugetlbfs inotifyfs iso9660 jffs2 lustre mqueue ncpfs nfs
nfs4 nfsd pipefs proc ramfs rootfs rpc_pipefs securityfs selinuxfs sfs sockfs sysfs tmpfs ubifs udf usbfs ceph
fuse.ceph"
PRUNENAMES = ".git .hg .svn .bzr .arch-ids {arch} CVS"
PRUNEPATHS = "/afs /media /mnt /net /sfs /tmp /udev /var/cache/ccache /var/lib/yum/yumdb /var/lib/dnf/yumdb
```

```
/var/spool/cups /var/spool/squid /var/tmp /var/lib/ceph /var/lib/mock /sysroot/ostree/deploy"
```

Use of these two commands is very simple:

```
[root@redhat9 ~]# updatedb

[root@redhat9 ~]# locate aac
/home/trainee/aac
/usr/lib/.build-id/06/c3a6d0cdc5a9b909aac3230f36c0cdc531df73
/usr/lib/.build-id/09/896cf90eb4029fa90aacc745e15c2e4057f507
/usr/lib/.build-id/14/801c515faacd31994cac96626b4fc6431c98e3
/usr/lib/.build-id/16/6676d6a86bf3cafaac1899f6388fdb8e337b7c
/usr/lib/.build-id/23/6fb54a26ac01da011289125dd0757134b23aac
/usr/lib/.build-id/32/2f4ede33bea5be64a2d1d74437fed6aac08dff
/usr/lib/.build-id/3c/231a016543a94a4ad2fad826bc3aacfe653af3
/usr/lib/.build-id/3d/104aacf884f203e4a4756eab74e265a10f6649
/usr/lib/.build-id/44/a9047149e3968faa7a0066bbbaac1d728b69e8
/usr/lib/.build-id/4a/9684161daa9e62b9bc5b600aacd967c50e57c4
/usr/lib/.build-id/4e/09a851a069264c701ac18fd1aac4bd656e14fa
/usr/lib/.build-id/53/f01644d1fd5ae63b97390282aacf54b0b7d7ce
/usr/lib/.build-id/67/3819a49f31f8bbfb5f7eb89a377094fa84eaac
/usr/lib/.build-id/68/aa242c520331aacf4985d2a098c5da6614237f
/usr/lib/.build-id/7e/eaac475f440b615e0355e10c2c484e129f1474
/usr/lib/.build-id/82/594874aaccba13283a7bfb590a8c2e920ed42a
/usr/lib/.build-id/86/e4d1ddaebefae1e0f496ac74ca91064aac13d6
/usr/lib/.build-id/95/430b0d5c622cb1b4691ec85232b7aac072fcb4
/usr/lib/.build-id/98/39921f8f8e36cdaaac8a434953e4c54ca7dd93
/usr/lib/.build-id/9f/7ae04ba24806351a2963e65f1dfaace1f0394b
/usr/lib/.build-id/b0/61a09a1e360c89eaac146ce8055ca8d45676fc
/usr/lib/.build-id/bf/bf2df2e242f211ebd37ccccbdaaac6bf591bff
/usr/lib/.build-id/c6/d48de21818e9eaac2ceb6273840b600a7eac7d
/usr/lib/.build-id/c9/8ae396ecaacf790ba4bb73ea16f909ef212163
/usr/lib/.build-id/c9/aac0292a12c0bb393cc5457502a0338f1fb554
/usr/lib/.build-id/cc/b6a8165e506f7aacc1e633dba76719e2192fee
```

```
/usr/lib/.build-id/d2/d307f71de28588b58faacd57147c666fbd38b0
/usr/lib/.build-id/d6/a427d13f7f07f818ddc87d705d0747eaaac2ba
/usr/lib/.build-id/e3/8b781faac831c3d302cc7f83ee9c4f1ab85117
/usr/lib/.build-id/ea/ac093f74b0ec2597caac77f848ccf3fad2b6f5
/usr/lib/.build-id/ef/80915badd5754301e394c245c9c8e5dffaac40
/usr/lib/.build-id/f2/267eb994604adc5efff9aac163613ffeaeb77e
/usr/lib/.build-id/f7/9a1addf23c6242b55cfaac4cc39a97d7ed1151
/usr/lib/.build-id/f9/79b85f31aacc55596565106c25f182f55891a7
/usr/lib/.build-id/f9/d198993d87e621b9db59273caace4344254b73
/usr/lib/.build-id/fa/d302f61d5aacdead41db2d128dd0a52eb2b411
/usr/lib/fontconfig/cache/d63f98f14a274bd69a5425fc33aaac6b-le64.cache-8
/usr/lib/modules/5.14.0-284.11.1.el9_2.x86_64/kernel/drivers/scsi/aacraid
/usr/lib/modules/5.14.0-284.11.1.el9_2.x86_64/kernel/drivers/scsi/aacraid/aacraid.ko.xz
/usr/lib/modules/5.14.0-427.37.1.el9_4.x86_64/kernel/drivers/scsi/aacraid
/usr/lib/modules/5.14.0-427.37.1.el9_4.x86_64/kernel/drivers/scsi/aacraid/aacraid.ko.xz
/usr/lib64/libfdk-aac.so.2
/usr/lib64/libfdk-aac.so.2.0.0
/usr/lib64/gstreamer-1.0/libgstfdkaac.so
/usr/lib64/spa-0.2/bluez5/libspa-codec-bluez5-aac.so
/usr/share/doc/fdk-aac-free
/usr/share/doc/fdk-aac-free/ChangeLog
/usr/share/doc/fdk-aac-free/README.fedora
/usr/share/licenses/fdk-aac-free
/usr/share/licenses/fdk-aac-free/NOTICE
/usr/share/mime/audio/aac.xml
```

The default database is **/var/lib/mlocate/mlocate.db** :

```
[root@redhat9 ~]# ls -l /var/lib/mlocate/mlocate.db
-rw-r-----. 1 root slocate 3436535 Sep 25 15:21 /var/lib/mlocate/mlocate.db
```

Important: For more information about the database format, see **man 5 locatedb**.

Command Line Switches

To do : Use the **–help** option of the **updatedb** and **locate** commands to view their command line switches.

1.26 - The whereis Command

This command is used to show the full paths of the executable, the configuration files and the manuals associated with the argument:

```
[root@redhat9 ~]# whereis passwd
passwd: /usr/bin/passwd /etc/passwd /usr/share/man/man5/passwd.5.gz /usr/share/man/man1/passwd.1ossl.gz
/usr/share/man/man1/passwd.1.gz
```

Command Line Switches

To do : Use the **–help** option of the **whereis** command to view the command line switches.

1.27 - The which Command

This command searches the PATH variable and returns to standard output the first full path associated with the argument:

```
[root@redhat9 ~]# which passwd
/usr/bin/passwd
```

Command Line Switches

To do : Use the **–help** option of the **which** command to view the command line switches.

1.28 - The uptime Command

This command prints to standard output the current time, the length of time the system has been up, the number of users on the system and the average number of jobs in the run queue over the last 1, 5 and 15 minutes:

```
[root@redhat9 ~]# uptime
 15:27:33 up  2:42,  1 user,  load average: 0.00, 0.00, 0.00
```

Command Line Switches

The switches associated with this command are:

To do : Use the **–help** option of the **uptime** command to view the command line switches.

1.29 - The w Command

This command outputs the same data as the **uptime** command on the first line and then complements this information with the details of each user connected to the system, including what each user is currently doing. This is the replacement under Linux for the Unix command **whodo**:

```
[root@redhat9 ~]# w
```

```
 15:28:01 up  2:43,  1 user,  load average: 0.00, 0.00, 0.00
USER     TTY        LOGIN@   IDLE   JCPU   PCPU WHAT
trainee  pts/0     12:47    1.00s  0.13s  0.02s sshd: trainee [priv]
```

The JCPU time is the time used by all processes attached to the tty. It does not include past background jobs, but does include currently running background jobs.

The PCPU time is the time used by the current process, named in the **what** field.

Command Line Switches

To do : Use the **–help** option of the **w** command to view the command line switches.

1.30 - The uname Command

This command prints system information to the standard output:

```
[root@redhat9 ~]# uname -a
Linux redhat9.ittraining.loc 5.14.0-427.37.1.el9_4.x86_64 #1 SMP PREEMPT_DYNAMIC Fri Sep 13 12:41:50 EDT 2024
x86_64 x86_64 x86_64 GNU/Linux

[root@redhat9 ~]# uname -s
Linux

[root@redhat9 ~]# uname -n
redhat9.ittraining.loc

[root@redhat9 ~]# uname -r
5.14.0-427.37.1.el9_4.x86_64
```

```
[root@redhat9 ~]# uname -v
#1 SMP PREEMPT_DYNAMIC Fri Sep 13 12:41:50 EDT 2024

[root@redhat9 ~]# uname -m
x86_64

[root@redhat9 ~]# uname -p
x86_64

[root@redhat9 ~]# uname -i
x86_64

[root@redhat9 ~]# uname -o
GNU/Linux
```

Command Line Switches

To do : Use the **–help** option of the **uname** command to view the command line switches.

1.31 - The du Command

This command summarizes disk usage of each file, recursively for directories:

```
[root@redhat9 ~]# du -sh /* 2>/dev/null
0       /afs
0       /bin
358M    /boot
0       /dev
29M     /etc
```

```
4.4M    /home
0       /lib
0       /lib64
0       /media
0       /mnt
0       /opt
0       /proc
2.0G    /root
9.2M    /run
0       /sbin
0       /srv
0       /sys
12K     /tmp
4.0G    /usr
368M    /var
```

Important : Note the use of the **2>/dev/null** redirection. This sends all eventual errors in the **file descriptor** 2 directly to **/dev/null** so that they do not appear in the output. File descriptors are covered in the **The Command Line Interface** unit.

Command Line Switches

To do : Use the **–help** option of the **du** command to view the command line switches.

1.32 - The clear Command

This command is used to clear the current screen of the terminal:

```
[root@redhat9 ~]# clear

[root@redhat9 ~]#
```

1.33 - The exit Command

This command exits the current shell:

```
[root@redhat9 ~]# exit
logout
[trainee@redhat9 ~]$
```

Command Line Switches

To do : Use the **help** command with **exit** option to view the command line switches.

1.34 - The logout Command

This command logs out a user from a login shell writing the utmp and wtmp entries in the log files.

Command Line Switches

To do : Use the **help** command with **logout** option to view the command line switches.

1.35 - The sleep Command

This command pauses for a number seconds. The number is specified as the first argument.

```
[trainee@redhat9 ~]$ sleep 10
```

Command Line Switches

To do : Use the **–help** option of the **sleep** command to view the command line switches.

1.36 - The wall Command

Wall sends a message to everybody logged in with their mesg(1) permission set to yes. The message can be given as an argument to wall, or it can be sent to wall's standard input. When using the standard input from a terminal, the message should be terminated with the EOF key (usually Control-D). The length of the message is limited to 20 lines. For every invocation of wall a notification will be written to syslog, with facility LOG_USER and level LOG_INFO:

```
[trainee@redhat9 ~]$ su -
Password: fenestros

[root@redhat9 ~]# wall this is a message from root
Broadcast message from root@redhat9.ittraining.loc (pts/0) (Wed Sep 25 15:31:46
this is a message from root
```

The wall command ignores the TZ environment variable. The time displayed on the first page is based on the system's regionalisation parameters:

```
[root@redhat9 ~]# date
Wed Sep 25 03:33:11 PM CEST 2024
```

1.37 - The seq Command

The **seq** command prints numbers from FIRST to LAST, in steps of INCREMENT:

- seq [OPTION]... LAST
- seq [OPTION]... FIRST LAST
- seq [OPTION]... FIRST INCREMENT LAST

For example :

```
[root@redhat9 ~]# seq 10
1
2
3
4
5
6
7
8
9
10

[root@redhat9 ~]# seq 10 20
10
11
12
13
14
15
16
17
18
19
20
```

```
[root@redhat9 ~]# seq 20 10 90
20
30
40
50
60
70
80
90
```

Command Line Switches

To do : Use the **–help** option of the **seq** command to view the command line switches.

1.38 - The screen Command

Screen is a full-screen window manager that multiplexes a physical terminal between several processes (typically interactive shells). Each virtual terminal provides the functions of a DEC VT100 terminal and, in addition, several control functions from the ISO 6429 (ECMA 48, ANSI X3.64) and ISO 2022 standards (e.g. insert/delete line and support for multiple character sets). There is a scrollback history buffer for each virtual terminal and a copy-and-paste mechanism that allows moving text regions between windows.

The screen command is not installed by default under RHEL 9:

```
[root@redhat9 ~]# which screen
/usr/bin/which: no screen in (/root/.local/bin:/root/bin:/usr/local/sbin:/usr/local/bin:/usr/sbin:/usr/bin)

[root@redhat9 ~]# dnf makecache
Updating Subscription Management repositories.
Red Hat Enterprise Linux 9 for x86_64 - AppStream (RPMs)                  25 kB/s | 4.5 kB     00:00
```

```
Red Hat Enterprise Linux 9 for x86_64 - BaseOS (RPMs)                    25 kB/s | 4.1 kB     00:00
Metadata cache created.

[root@redhat9 ~]# dnf install screen -y
Updating Subscription Management repositories.
Last metadata expiration check: 0:00:49 ago on Wed 25 Sep 2024 03:35:01 PM CEST.
No match for argument: screen
Error: Unable to find a match: screen

[root@redhat9 ~]# subscription-manager repos --enable codeready-builder-for-rhel-9-$(arch)-rpms
Repository 'codeready-builder-for-rhel-9-x86_64-rpms' is enabled for this system.

[root@redhat9 ~]# dnf install https://dl.fedoraproject.org/pub/epel/epel-release-latest-9.noarch.rpm
Updating Subscription Management repositories.
Red Hat CodeReady Linux Builder for RHEL 9 x86_64 (RPMs)                 5.0 MB/s | 9.1 MB     00:01
Last metadata expiration check: 0:00:01 ago on Wed 25 Sep 2024 03:39:17 PM CEST.
epel-release-latest-9.noarch.rpm                                         158 kB/s |  18 kB     00:00
Dependencies resolved.
================================================================================================
 Package                    Architecture         Version                Repository                  Size
================================================================================================
Installing:
 epel-release               noarch               9-8.el9                @commandline                18 k

Transaction Summary
================================================================================================
Install  1 Package

Total size: 18 k
Installed size: 26 k
Is this ok [y/N]: y
Downloading Packages:
Running transaction check
Transaction check succeeded.
```

```
Running transaction test
Transaction test succeeded.
Running transaction
  Preparing        :                                                                        1/1
  Installing       : epel-release-9-8.el9.noarch                                            1/1
  Running scriptlet: epel-release-9-8.el9.noarch                                            1/1
Many EPEL packages require the CodeReady Builder (CRB) repository.
It is recommended that you run /usr/bin/crb enable to enable the CRB repository.

  Verifying        : epel-release-9-8.el9.noarch                                            1/1
Installed products updated.

Installed:
  epel-release-9-8.el9.noarch

Complete!

[root@redhat9 ~]# dnf install screen
Updating Subscription Management repositories.
Extra Packages for Enterprise Linux 9 - Next - x86_64                   179 kB/s | 276 kB     00:01
Last metadata expiration check: 0:00:01 ago on Wed 25 Sep 2024 03:43:49 PM CEST.
Dependencies resolved.
================================================================================================
 Package                Architecture           Version                         Repository            Size
================================================================================================
Installing:
 screen                 x86_64                 4.8.0-6.el9                     epel                 649 k

Transaction Summary
================================================================================================
Install  1 Package

Total download size: 649 k
Installed size: 957 k
```

```
Is this ok [y/N]: y
Downloading Packages:
screen-4.8.0-6.el9.x86_64.rpm                                                1.0 MB/s | 649 kB     00:00
--------------------------------------------------------------------------------------------------------
Total                                                                        875 kB/s | 649 kB     00:00
Running transaction check
Transaction check succeeded.
Running transaction test
Transaction test succeeded.
Running transaction
  Preparing        :                                                                                1/1
  Running scriptlet: screen-4.8.0-6.el9.x86_64                                                      1/1
  Installing       : screen-4.8.0-6.el9.x86_64                                                      1/1
  Running scriptlet: screen-4.8.0-6.el9.x86_64                                                      1/1
  Verifying        : screen-4.8.0-6.el9.x86_64                                                      1/1
Installed products updated.

Installed:
  screen-4.8.0-6.el9.x86_64

Complete!
```

Create a session with screen:

```
[root@redhat9 ~]# screen -S mysession
```

Now press the CTRL and A keys, release the A key and press the C key in order to create a second **nested** screen.

To return to the first screen, use the CTRL A A keys. This allows you to toggle between the last two screens used.

To see the status of all active screens, use the **screen -ls** command:

```
[root@redhat9 ~]# screen -ls
There is a screen on:
```

```
        3103.mysession  (Attached)
1 Socket in /run/screen/S-root.
```

Now enter the following commands:

```
[root@redhat9 ~]# sleep 999 &
[1] 3153

[root@redhat9 ~]# jobs -l
[1]+  3153 Running                 sleep 999 &

[root@redhat9 ~]#
```

In order to detach the current screen press the CTRL and A keys, release the A key and press the D key:

```
[root@redhat9 ~]# screen -S mysession
[detached from 3103.mysession]

[root@redhat9 ~]#
```

To re-attach the screen, execute the following command:

```
[root@redhat9 ~]# screen -r
```

Using the jobs command, check if the process created by the sleep command is still running:

```
[root@redhat9 ~]# jobs -l
[1]+  3153 Running                 sleep 999 &

[root@redhat9 ~]#
```

To move forward or backwards between screens press the CTRL and A keys, release the A key and press the N key or press the CTRL and A keys, release the A key and press the P key.

Once again detach the current screen by pressing the CTRL A keys, releasing the A key and then pressing D:

```
[root@redhat9 ~]# screen -S mysession
[detached from 3103.mysession]

[root@redhat9 ~]#
```

Now create a new, non-nested screen:

```
[root@redhat9 ~]# screen -S mysession1
```

Use the **screen -ls** command to see what has happened:

```
[root@redhat9 ~]# screen -ls
There are screens on:
        3181.mysession1 (Attached)
        3103.mysession  (Detached)
2 Sockets in /run/screen/S-root.
```

Note, however, that this screen 0 is not the same as the previous screen 0 in which you executed the sleep command:

```
[root@redhat9 ~]# jobs -l
[root@redhat9 ~]#
```

To re-attach a specific screen, reference it by it's number:

```
[root@redhat9 ~]# screen -r 3103

[root@redhat9 ~]# screen -ls
There are screens on:
        3181.mysession1 (Attached)
        3103.mysession  (Attached)
2 Sockets in /run/screen/S-root.
```

Once again detach the current screen by pressing the CTRL A keys, releasing the A key and then pressing D:

```
[root@redhat9 ~]# screen -S mysession1
[detached from 3181.mysession1]

[root@redhat9 ~]#
```

Now check which screen you are connected to:

```
[root@redhat9 ~]# screen -ls
There are screens on:
        3181.mysession1 (Detached)
        3103.mysession  (Attached)
2 Sockets in /run/screen/S-root.
```

Finally, kill the two sessions:

```
[root@redhat9 ~]# screen -ls
There are screens on:
        3181.mysession1 (Detached)
        3103.mysession  (Attached)
2 Sockets in /run/screen/S-root.
```

Tuez maintenant les deux sessions :

```
[root@redhat9 ~]# screen -XS 3181 quit

[root@redhat9 ~]# screen -ls
There is a screen on:
        3103.mysession  (Detached)
1 Socket in /run/screen/S-root.

[root@redhat9 ~]# screen -XS 3103 quit
```

```
[root@redhat9 ~]# screen -ls
No Sockets found in /run/screen/S-root.
```

Command Line Switches

To do : Use the **–help** option of the **screen** command to view the command line switches.

LAB #2 - Switches and Arguments

Switches under Linux can either be short or long. Several differences are important to note.

Firstly short options are generally preceded by a single dash **-**, whilst long options are preceded by a double dash **- -**.

An example is the help option used with most commands:

- -h
- –help

Secondly, Linux short switches can be combined whereas long switches cannot be combined. For example **ls -l -a -i** can also be written as **ls -lai**, **ls -lia** or **ls -ali**:

```
[root@redhat9 ~]# ls -lai /tmp
total 12
 33554561 drwxrwxrwt. 16 root root 4096 Sep 25 15:54 .
      128 dr-xr-xr-x. 18 root root  235 Oct 19  2023 ..
 33786429 srwxrwxrwx.  1 gdm  gdm     0 Sep 25 12:30 dbus-G7skg3Wlpv
 33625153 srwxrwxrwx.  1 gdm  gdm     0 Sep 25 12:45 dbus-s2vBGtxTHi
 33554609 drwxrwxrwt.  2 root root    6 Sep 25 12:30 .font-unix
 34654589 drwxrwxrwt.  2 root root   18 Sep 25 12:44 .ICE-unix
```

```
 33625083 drwxr-xr-x.  2 root root   54 Sep 25 13:10 inode
100664689 drwx------.  3 root root   17 Sep 25 12:45 systemd-private-7e6b4544d8d34a9bb30a13aeb8e4e02a-
colord.service-FfNuds
    10601 drwx------.  3 root root   17 Sep 25 12:44 systemd-private-7e6b4544d8d34a9bb30a13aeb8e4e02a-dbus-
broker.service-VIpKgR
 67157623 drwx------.  3 root root   17 Sep 25 12:44 systemd-private-7e6b4544d8d34a9bb30a13aeb8e4e02a-
kdump.service-0SbYbm
 67157622 drwx------.  3 root root   17 Sep 25 12:44 systemd-private-7e6b4544d8d34a9bb30a13aeb8e4e02a-
ModemManager.service-k4DpLF
 67155430 drwx------.  3 root root   17 Sep 25 12:44 systemd-private-7e6b4544d8d34a9bb30a13aeb8e4e02a-power-
profiles-daemon.service-mIx9S5
 67155431 drwx------.  3 root root   17 Sep 25 12:44 systemd-private-7e6b4544d8d34a9bb30a13aeb8e4e02a-rtkit-
daemon.service-2gD28Z
 67157618 drwx------.  3 root root   17 Sep 25 12:44 systemd-private-7e6b4544d8d34a9bb30a13aeb8e4e02a-switcheroo-
control.service-rLbOK4
 67157619 drwx------.  3 root root   17 Sep 25 12:44 systemd-private-7e6b4544d8d34a9bb30a13aeb8e4e02a-systemd-
logind.service-uLNyfd
 67157620 drwx------.  3 root root   17 Sep 25 12:44 systemd-private-7e6b4544d8d34a9bb30a13aeb8e4e02a-
upower.service-bIpAUN
 33625086 -r--r--r--.  1 gdm  gdm    11 Sep 25 12:45 .X1024-lock
 33625152 -r--r--r--.  1 gdm  gdm    11 Sep 25 12:45 .X1025-lock
  2074740 drwxrwxrwt.  2 root root   32 Sep 25 12:45 .X11-unix
    10599 drwxrwxrwt.  2 root root    6 Sep 25 12:30 .XIM-unix

[root@redhat9 ~]# ls -ali /tmp
total 12
 33554561 drwxrwxrwt. 16 root root 4096 Sep 25 15:54 .
      128 dr-xr-xr-x. 18 root root  235 Oct 19  2023 ..
 33786429 srwxrwxrwx.  1 gdm  gdm     0 Sep 25 12:30 dbus-G7skg3Wlpv
 33625153 srwxrwxrwx.  1 gdm  gdm     0 Sep 25 12:45 dbus-s2vBGtxTHi
 33554609 drwxrwxrwt.  2 root root    6 Sep 25 12:30 .font-unix
 34654589 drwxrwxrwt.  2 root root   18 Sep 25 12:44 .ICE-unix
 33625083 drwxr-xr-x.  2 root root   54 Sep 25 13:10 inode
100664689 drwx------.  3 root root   17 Sep 25 12:45 systemd-private-7e6b4544d8d34a9bb30a13aeb8e4e02a-
```

```
colord.service-FfNuds
    10601 drwx------.  3 root root   17 Sep 25 12:44 systemd-private-7e6b4544d8d34a9bb30a13aeb8e4e02a-dbus-
broker.service-VIpKgR
 67157623 drwx------.  3 root root   17 Sep 25 12:44 systemd-private-7e6b4544d8d34a9bb30a13aeb8e4e02a-
kdump.service-0SbYbm
 67157622 drwx------.  3 root root   17 Sep 25 12:44 systemd-private-7e6b4544d8d34a9bb30a13aeb8e4e02a-
ModemManager.service-k4DpLF
 67155430 drwx------.  3 root root   17 Sep 25 12:44 systemd-private-7e6b4544d8d34a9bb30a13aeb8e4e02a-power-
profiles-daemon.service-mIx9S5
 67155431 drwx------.  3 root root   17 Sep 25 12:44 systemd-private-7e6b4544d8d34a9bb30a13aeb8e4e02a-rtkit-
daemon.service-2gD28Z
 67157618 drwx------.  3 root root   17 Sep 25 12:44 systemd-private-7e6b4544d8d34a9bb30a13aeb8e4e02a-switcheroo-
control.service-rLbOK4
 67157619 drwx------.  3 root root   17 Sep 25 12:44 systemd-private-7e6b4544d8d34a9bb30a13aeb8e4e02a-systemd-
logind.service-uLNyfd
 67157620 drwx------.  3 root root   17 Sep 25 12:44 systemd-private-7e6b4544d8d34a9bb30a13aeb8e4e02a-
upower.service-bIpAUN
 33625086 -r--r--r--.  1 gdm  gdm    11 Sep 25 12:45 .X1024-lock
 33625152 -r--r--r--.  1 gdm  gdm    11 Sep 25 12:45 .X1025-lock
  2074740 drwxrwxrwt.  2 root root   32 Sep 25 12:45 .X11-unix
    10599 drwxrwxrwt.  2 root root    6 Sep 25 12:30 .XIM-unix

[root@redhat9 ~]# ls -ial /tmp
total 12
 33554561 drwxrwxrwt. 16 root root 4096 Sep 25 15:54 .
      128 dr-xr-xr-x. 18 root root  235 Oct 19  2023 ..
 33786429 srwxrwxrwx.  1 gdm  gdm     0 Sep 25 12:30 dbus-G7skg3Wlpv
 33625153 srwxrwxrwx.  1 gdm  gdm     0 Sep 25 12:45 dbus-s2vBGtxTHi
 33554609 drwxrwxrwt.  2 root root    6 Sep 25 12:30 .font-unix
 34654589 drwxrwxrwt.  2 root root   18 Sep 25 12:44 .ICE-unix
 33625083 drwxr-xr-x.  2 root root   54 Sep 25 13:10 inode
100664689 drwx------.  3 root root   17 Sep 25 12:45 systemd-private-7e6b4544d8d34a9bb30a13aeb8e4e02a-
colord.service-FfNuds
    10601 drwx------.  3 root root   17 Sep 25 12:44 systemd-private-7e6b4544d8d34a9bb30a13aeb8e4e02a-dbus-
```

```
broker.service-VIpKgR
 67157623 drwx------.  3 root root   17 Sep 25 12:44 systemd-private-7e6b4544d8d34a9bb30a13aeb8e4e02a-
kdump.service-0SbYbm
 67157622 drwx------.  3 root root   17 Sep 25 12:44 systemd-private-7e6b4544d8d34a9bb30a13aeb8e4e02a-
ModemManager.service-k4DpLF
 67155430 drwx------.  3 root root   17 Sep 25 12:44 systemd-private-7e6b4544d8d34a9bb30a13aeb8e4e02a-power-
profiles-daemon.service-mIx9S5
 67155431 drwx------.  3 root root   17 Sep 25 12:44 systemd-private-7e6b4544d8d34a9bb30a13aeb8e4e02a-rtkit-
daemon.service-2gD28Z
 67157618 drwx------.  3 root root   17 Sep 25 12:44 systemd-private-7e6b4544d8d34a9bb30a13aeb8e4e02a-switcheroo-
control.service-rLbOK4
 67157619 drwx------.  3 root root   17 Sep 25 12:44 systemd-private-7e6b4544d8d34a9bb30a13aeb8e4e02a-systemd-
logind.service-uLNyfd
 67157620 drwx------.  3 root root   17 Sep 25 12:44 systemd-private-7e6b4544d8d34a9bb30a13aeb8e4e02a-
upower.service-bIpAUN
 33625086 -r--r--r--.  1 gdm  gdm    11 Sep 25 12:45 .X1024-lock
 33625152 -r--r--r--.  1 gdm  gdm    11 Sep 25 12:45 .X1025-lock
  2074740 drwxrwxrwt.  2 root root   32 Sep 25 12:45 .X11-unix
    10599 drwxrwxrwt.  2 root root    6 Sep 25 12:30 .XIM-unix
```

However **ls -l –all –inode** cannot be written **ls -l –allinode**:

```
[root@redhat9 ~]# ls -l --all --inode /tmp
total 12
 33554561 drwxrwxrwt. 16 root root 4096 Sep 25 15:54 .
      128 dr-xr-xr-x. 18 root root  235 Oct 19  2023 ..
 33786429 srwxrwxrwx.  1 gdm  gdm     0 Sep 25 12:30 dbus-G7skg3Wlpv
 33625153 srwxrwxrwx.  1 gdm  gdm     0 Sep 25 12:45 dbus-s2vBGtxTHi
 33554609 drwxrwxrwt.  2 root root    6 Sep 25 12:30 .font-unix
 34654589 drwxrwxrwt.  2 root root   18 Sep 25 12:44 .ICE-unix
 33625083 drwxr-xr-x.  2 root root   54 Sep 25 13:10 inode
100664689 drwx------.  3 root root   17 Sep 25 12:45 systemd-private-7e6b4544d8d34a9bb30a13aeb8e4e02a-
colord.service-FfNuds
    10601 drwx------.  3 root root   17 Sep 25 12:44 systemd-private-7e6b4544d8d34a9bb30a13aeb8e4e02a-dbus-
```

```
broker.service-VIpKgR
 67157623 drwx------.  3 root root   17 Sep 25 12:44 systemd-private-7e6b4544d8d34a9bb30a13aeb8e4e02a-
kdump.service-0SbYbm
 67157622 drwx------.  3 root root   17 Sep 25 12:44 systemd-private-7e6b4544d8d34a9bb30a13aeb8e4e02a-
ModemManager.service-k4DpLF
 67155430 drwx------.  3 root root   17 Sep 25 12:44 systemd-private-7e6b4544d8d34a9bb30a13aeb8e4e02a-power-
profiles-daemon.service-mIx9S5
 67155431 drwx------.  3 root root   17 Sep 25 12:44 systemd-private-7e6b4544d8d34a9bb30a13aeb8e4e02a-rtkit-
daemon.service-2gD28Z
 67157618 drwx------.  3 root root   17 Sep 25 12:44 systemd-private-7e6b4544d8d34a9bb30a13aeb8e4e02a-switcheroo-
control.service-rLbOK4
 67157619 drwx------.  3 root root   17 Sep 25 12:44 systemd-private-7e6b4544d8d34a9bb30a13aeb8e4e02a-systemd-
logind.service-uLNyfd
 67157620 drwx------.  3 root root   17 Sep 25 12:44 systemd-private-7e6b4544d8d34a9bb30a13aeb8e4e02a-
upower.service-bIpAUN
 33625086 -r--r--r--.  1 gdm  gdm    11 Sep 25 12:45 .X1024-lock
 33625152 -r--r--r--.  1 gdm  gdm    11 Sep 25 12:45 .X1025-lock
  2074740 drwxrwxrwt.  2 root root   32 Sep 25 12:45 .X11-unix
    10599 drwxrwxrwt.  2 root root    6 Sep 25 12:30 .XIM-unix

[root@redhat9 ~]# ls -l --allinode /tmp
ls: unrecognized option '--allinode'
Try 'ls --help' for more information.
```

Important - You should **not** combine any short options that take an argument.

LAB #3 - Regular Expressions

Text files play a very important role under Linux. For example, almost all configuration files are simple text files and being able to manipulate them is

of great importance. Manipulating text files is essentially achieved by using **Regular Expressions**. There are two types of Regular Expressions:

- The IEEE POSIX Basic Regular Expressions (**BRE**) understood by the commands **vi**, **grep**, **expr** and **sed**,
- The IEEE POSIX Extended Regular Expressions (**ERE**) understood by the commands **egrep** (grep -E) and **awk**.

Regular Expressions use **Metacharacters**. Certain are common to both BREs and EREs:

Metacharacter	**Description**
^*string*	Match lines beginning with *string*
*string***$**	Match lines ending with *string*
Metacharacter	Cancel any special effect associated with *Metacharacter*
[*string***]**	Match any of the characters within *string*
[^*string***]**	Exclude any of the characters in *string*
.	Match any character except when at the end of a line
*character**	Match 0 or more occurrences of *character*
\<	Match *string* at the beginning of a word
\>	Match *string* at the end of a word

BREs

Certain Metacharacters are specific to BREs:

Metacharacter	**Description**
\{x,y\}	Match from **x** to **y** occurrences of the preceeding element
\{x\}	Match exactly **x** occurrences of the preceeding element
\{x,\}	Match **x** or more occurrences of the preceeding element
\(BRE)	Commit to memory the BRE
\1	Recall the first BRE committed to memory
\2, \3 …	Recall the second BRE committed to memory, recall the third BRE committed to memory …

EREs

Certain Metacharacters are specific to EREs:

Metacharacter	Description
{x,y}	Match from **x** to **y** occurrences of the preceeding element
{x}	Match exactly **x** occurrences of the preceeding element
{x,}	
?	Matches 0 or 1 occurrence of the preceeding element
+	Matches 1 or more occurrence(s) of the preceeding element
|	Matches either the expression before or the expression after the operator
()	Combines the Reguler Expressions between the parentheses

Manipulating Text Files

Text-search Utilities

The grep Command

The **grep** command can be used to find lines containing a string of characters in a group of files. The **-v** or **–invert-case** option can be stipulated to find lines that do **not** contain the specified string.

The grep command is case sensitive. The **-i** or **–ignore-case** option can be specified in order to use grep in a non case sensitive search.

The grep command can also use **BREs**.

Command Line Switches

To do : Use the **–help** option of the **grep** command to view the command line switches.

The egrep Command

The **egrep** command is identical to the **grep** command when used with the **-E** switch. Both can use EREs.

Command Line Switches

To do : Use the **–help** option of the **egrep** command to view the command line switches.

The fgrep Command

The **fgrep** command is identical to the **grep** command when used with the **-F** switch. Both have no knowledge of Regular Expressions.

To do : Use the **–help** option of the **fgrep** command to view the command line switches.

LAB #4 - Using grep, egrep and fgrep

Create the following file:

```
[root@redhat9 ~]# cd /tmp

[root@redhat9 tmp]# vi greptest

[root@redhat9 tmp]# cat greptest
fenestrOS
```

```
fenestros
555-5555
f
.fenestros
.fe
£
```

Now use grep to search for lines containing at least one uppercase or lowercase letter:

```
[root@redhat9 ~]# grep '[a-zA-Z]' /tmp/greptest
fenestrOS
fenestros
f
.fenestros
.fe
```

Next use grep to search for lines containing at least one uppercase or lowercase letter or a number:

```
[root@redhat9 ~]# grep '[a-zA-Z0-9]' /tmp/greptest
fenestrOS
fenestros
555-5555
f
.fenestros
.fe
```

To search for the NNN-NNNN pattern where N is a number, use the following command:

```
[root@redhat9 ~]# grep '[0-9]\{3\}-[0-9]\{4\}' /tmp/greptest
555-5555
```

Lines containing just one character have that character both at the beginning (**^**) and at the end (**$**) of the line:

```
[root@redhat9 ~]# grep '^.$' /tmp/greptest
```

```
f
£
```

To search for a line containing a special character such as **.**, that character needs to be preceded by \:

```
[root@redhat9 ~]# grep '^\.' /tmp/greptest
.fenestros
.fe
```

Important - The grep command can also be used to search for a string in all the files within a specific directory as follows **grep -rnw 'directory' -e “pattern”**. You can also search only within certain files by specifying the files extensions: **grep –include={*.doc,*.xls} -rnw 'directory' -e “pattern”**. Finally you can exclude certain file extensions as follows: **grep –exclude=*.doc -rnw 'directory' -e “pattern”**.

Make the following changes to the greptest file:

```
[root@redhat9 tmp]# vi greptest
[root@redhat9 tmp]# cat greptest
# Starting comment
fenestrOS
fenestros
# Another comment
555-5555
f

.fenestros

.fe

£
```

```
# End comment
```

Now use the **grep** command with the **-E** switch to remove all the comments and empty lines:

```
[root@redhat9 ~]# grep -E -v '^(#|$)' /tmp/greptest
fenestrOS
fenestros
555-5555
f
.fenestros
.fe
£
```

Important - The expression **'^(#|$)'** matches all lines beginning with the **#** character OR all lines with zero characters between the start and the end of the line.

Now use the **egrep** command to do the same thing, this time redirecting the output to the file **/tmp/greptest1**:

```
[root@redhat9 ~]# egrep -v '^(#|$)'  /tmp/greptest > /tmp/greptest1
[root@redhat9 ~]# cat /tmp/greptest1
fenestrOS
fenestros
555-5555
f
.fenestros
.fe
£
```

Important: The above command is very useful when you want to quickly ascertain which directives are active in a very long configuration file.

Make the following changes to the greptest file:

```
[root@redhat9 tmp]# vi greptest

[root@redhat9 tmp]# cat greptest
# Starting comment
^ This line will be used to demonstrate the use of fgrep
fenestrOS
fenestros
# Another comment
555-5555
f

.fenestros

.fe

£
# End comment
```

Now use fgrep to match the line starting with the **^** character:

```
[root@redhat9 ~]# fgrep '^' /tmp/greptest
^ This line will be used to demonstrate the use of fgrep
```

Compare the above output to that when using the grep command:

```
[root@redhat9 ~]# grep '^' /tmp/greptest
# Starting comment
^ This line will be used to demonstrate the use of fgrep
fenestrOS
fenestros
# Another comment
555-5555
```

```
f

.fenestros

.fe

£
# End comment
```

As you can see, grep matched **every** line that had a *beginning*. In order to get the same result as the grep command, you need to use the following command:

```
[root@redhat9 ~]# grep '^\^' /tmp/greptest
^ This line will be used to demonstrate the use of fgrep
```

The Stream EDitor SED

sed is an abbreviation of *Stream EDitor* and is a non-interactive text editor. sed's basic syntax is as follows:

```
sed [address] command [arguments] file
```

The specified commands are applied to each line in the file unless an *address* is specified. Sed prints all results to standard output and does not modify the source file. The address therefore specifies which lines are concerned by the command.

sed's addresses are as follows:

address	**Matching lines**
x	Line number **x**
$	The last line of the file
/BRE/	Lines matching the specified BRE
x,y	From line **x** to line **y**
/ERb1/, /ERb2/	All lines from the first line that matches the first BRE to the first line that matches the second BRE

sed's commands are as follows:

command	Description
d	Do not show the matching line(s) on standard output
p	Show the matching line(s) on standard output
s	Do a substitution upon match
w	Write the matching line(s) to a file
=	Print the matching line's number
!	Exclude the line(s) matching the address

Command Line Switches

To do : Use the **–help** option of the **fgrep** command to view the command line switches.

LAB #5 - Using sed

Start by displaying the contents of the file **/etc/services** whilst inhibiting the display of the first 10 lines:

```
[root@redhat9 ~]# sed '1,10d' /etc/services | more
# are included, only the more common ones.
#
# The latest IANA port assignments can be gotten from
#       http://www.iana.org/assignments/port-numbers
# The Well Known Ports are those from 0 through 1023.
# The Registered Ports are those from 1024 through 49151
# The Dynamic and/or Private Ports are those from 49152 through 65535
#
# Each line describes one service, and is of the form:
#
```

```
# service-name  port/protocol  [aliases ...]   [# comment]

tcpmux          1/tcp                           # TCP port service multiplexer
tcpmux          1/udp                           # TCP port service multiplexer
rje             5/tcp                           # Remote Job Entry
rje             5/udp                           # Remote Job Entry
echo            7/tcp
echo            7/udp
discard         9/tcp           sink null
discard         9/udp           sink null
systat          11/tcp          users
systat          11/udp          users
daytime         13/tcp
--More--
```

Now display the same file without any commented lines:

```
[root@redhat9 ~]# sed '/^#/d' /etc/services | more

tcpmux          1/tcp                           # TCP port service multiplexer
tcpmux          1/udp                           # TCP port service multiplexer
rje             5/tcp                           # Remote Job Entry
rje             5/udp                           # Remote Job Entry
echo            7/tcp
echo            7/udp
discard         9/tcp           sink null
discard         9/udp           sink null
systat          11/tcp          users
systat          11/udp          users
daytime         13/tcp
daytime         13/udp
qotd            17/tcp          quote
qotd            17/udp          quote
msp             18/tcp                          # message send protocol
```

```
msp             18/udp                          # message send protocol
chargen         19/tcp          ttytst source
chargen         19/udp          ttytst source
ftp-data        20/tcp
ftp-data        20/udp
ftp             21/tcp
ftp             21/udp          fsp fspd
--More--
```

Important: Note that the BRE is preceeded and followed by the **/** character.

Continue by trying to just display the first two lines of **/etc/passwd**:

```
[root@redhat9 ~]# sed '1,2p' /etc/passwd
root:x:0:0:root:/root:/bin/bash
root:x:0:0:root:/root:/bin/bash
bin:x:1:1:bin:/bin:/sbin/nologin
bin:x:1:1:bin:/bin:/sbin/nologin
daemon:x:2:2:daemon:/sbin:/sbin/nologin
adm:x:3:4:adm:/var/adm:/sbin/nologin
lp:x:4:7:lp:/var/spool/lpd:/sbin/nologin
...
```

Important: As you can see in the above output, the command used displays not only the first two lines but **also** the entire file. As a result the first two lines are displayed twice.

To force sed to **only** display the lines you specify, use the **-n** switch:

```
[root@redhat9 ~]# sed -n '1,2p' /etc/passwd
root:x:0:0:root:/root:/bin/bash
bin:x:1:1:bin:/bin:/sbin/nologin
```

Now you want to use sed to strip out the comments from **/etc/services** and save the result to **/tmp/sedtest** without displaying anything on standard output:

```
[root@redhat9 ~]# sed -n '/^#/!w /tmp/sedtest' /etc/services

[root@redhat9 ~]# more /tmp/sedtest

tcpmux          1/tcp                           # TCP port service multiplexer
tcpmux          1/udp                           # TCP port service multiplexer
rje             5/tcp                           # Remote Job Entry
rje             5/udp                           # Remote Job Entry
echo            7/tcp
echo            7/udp
discard         9/tcp           sink null
discard         9/udp           sink null
systat          11/tcp          users
systat          11/udp          users
daytime         13/tcp
daytime         13/udp
qotd            17/tcp          quote
qotd            17/udp          quote
msp             18/tcp                          # message send protocol
msp             18/udp                          # message send protocol
chargen         19/tcp          ttytst source
chargen         19/udp          ttytst source
ftp-data        20/tcp
ftp-data        20/udp
ftp             21/tcp
ftp             21/udp          fsp fspd
```

```
--More--(0%)
```

Important: In the above command, we start by matching all lines in the /etc/services file that start with a #. We then tell sed to write all non-matching lines to the file /tmp/sedtest.

Finally, create a file containing **user1,user2,user3**. Replace the commas by spaces:

```
[root@redhat9 ~]# echo "user1,user2,user3" > /tmp/sedtest1
[root@redhat9 ~]# cat /tmp/sedtest1 | sed 's/,/ /g'
user1 user2 user3
```

Important: The above sed command has the following format **s/what is to be replaced (character, string or BRE)/replacement/g**. The use of the **g** character forces sed to replace all occurences that match. If **g** is not stipulated, only the first matching occurence is replaced.

The Text Processor AWK

Presentation

The **awk** command acts as a **filter** and uses the following syntax:

```
awk [-F seperator] '[condition] {action}' [file]
```

Field Separation

A file or a text stream is treated by awk as a sequence of records. By default each line is a record. Awk analyzes each record, separating that record into fields and then storing the record and fields in variables:

- $0 contains the record,
- $1 contains the first field,
- $2 contains the second field,
- e.t.c.

Awk interprets a space as a separator between fields unless a different separator is specified with the **-F** option.

Awk then checks if the condition is met for each record and if so, executes the action.

For example, the following command takes the standard output of **ls -l** and prints fields 8, 3 and 4 to standard output:

```
[root@redhat9 tmp]# ls -l | awk '{print $8 $3 $4}'

05:23rootroot
05:21rootroot
05:28rootroot
05:29rootroot
12:05rootroot
```

Since there is no condition, the action is applied to every record.

To make the output easier to read, you can include spaces between each field:

```
[root@redhat9 tmp]# ls -l | awk '{print $8 " " $3 " " $4}'
05:23 root root
05:21 root root
05:28 root root
05:29 root root
```

```
12:05 root root
```

Conditions

A regular expression applied to a record

- Format:
  - /regular expression/ {action}
- Exemple:
  - /hello/ {print $0}

A regular expression applied to a field

- Format:
  - $n ~/regular expression/ {action}
  - $n!~/regular expression/ {action}
- Examples:
  - $1 ~/hello/ {print $0}
  - $1!~/hello/ {print $0}

Comparisons

- Format:
  - $n operator criteria {action}
- Example:
  - $1 > 20 {print $0}

Operators

Operator	Condition
<	Less than
⇐	Less than or equal to
==	Equal to
!=	Different
>	Greater than
>=	Greater than or equal to

Logical Operators

- Format:
  - test1 logical operator test2 {action}
- Example:
  - $1 ~/hello/ && $2 > 20 {print $0}

Operators

Operator	Condition
||	OR
&&	AND
!	NO

Built-in Variables

- Format:
  - expression1, expression2 {instruction}
- Example:
  - NR==7, NR==10 {print $0}

Variables

Variable	Description

Variable	Description
NR	Total number of records
NF	Total number of fields
FILENAME	Name of current input file
FS	The field separator, by default a **space** or **tab**
RS	The record separator, by default **newline**
OFS	Output field separator, by default a **space**
ORS	Output record separator, by default **newline**
OFMT	Numeric output format, by default“%.6g”

Awk Scripts

To combine several *clauses* composed of *conditions* and *actions* in the same statement, it is advisable to create an *awk script*. Awk scripts are comprised of three sections:

- **BEGIN**
  - This section is executed once, prior to executing the body of the script
- **BODY**
  - This sections contains the clauses to be applied to each line
- **END**
  - This section is executed once, after executing the body of the script

For example:

```
[root@redhat9 tmp]# cat > scriptawk
BEGIN {
  print "List of mounted filesystems"}
{print $0}
END {
  print "================================="}
[^D]
```

Now apply the awk script to **/etc/fstab** :

```
[root@redhat9 tmp]# awk -f scriptawk /etc/mtab
List of mounted filesystems
sysfs /sys sysfs rw,seclabel,nosuid,nodev,noexec,relatime 0 0
proc /proc proc rw,nosuid,nodev,noexec,relatime 0 0
devtmpfs /dev devtmpfs rw,seclabel,nosuid,size=1897604k,nr_inodes=474401,mode=755 0 0
securityfs /sys/kernel/security securityfs rw,nosuid,nodev,noexec,relatime 0 0
tmpfs /dev/shm tmpfs rw,seclabel,nosuid,nodev 0 0
devpts /dev/pts devpts rw,seclabel,nosuid,noexec,relatime,gid=5,mode=620,ptmxmode=000 0 0
tmpfs /run tmpfs rw,seclabel,nosuid,nodev,mode=755 0 0
tmpfs /sys/fs/cgroup tmpfs ro,seclabel,nosuid,nodev,noexec,mode=755 0 0
cgroup /sys/fs/cgroup/systemd cgroup
rw,seclabel,nosuid,nodev,noexec,relatime,xattr,release_agent=/usr/lib/systemd/systemd-cgroups-agent,name=systemd
0 0
pstore /sys/fs/pstore pstore rw,seclabel,nosuid,nodev,noexec,relatime 0 0
bpf /sys/fs/bpf bpf rw,nosuid,nodev,noexec,relatime,mode=700 0 0
cgroup /sys/fs/cgroup/hugetlb cgroup rw,seclabel,nosuid,nodev,noexec,relatime,hugetlb 0 0
cgroup /sys/fs/cgroup/devices cgroup rw,seclabel,nosuid,nodev,noexec,relatime,devices 0 0
cgroup /sys/fs/cgroup/cpuset cgroup rw,seclabel,nosuid,nodev,noexec,relatime,cpuset 0 0
cgroup /sys/fs/cgroup/cpu,cpuacct cgroup rw,seclabel,nosuid,nodev,noexec,relatime,cpu,cpuacct 0 0
cgroup /sys/fs/cgroup/net_cls,net_prio cgroup rw,seclabel,nosuid,nodev,noexec,relatime,net_cls,net_prio 0 0
cgroup /sys/fs/cgroup/rdma cgroup rw,seclabel,nosuid,nodev,noexec,relatime,rdma 0 0
cgroup /sys/fs/cgroup/freezer cgroup rw,seclabel,nosuid,nodev,noexec,relatime,freezer 0 0
cgroup /sys/fs/cgroup/perf_event cgroup rw,seclabel,nosuid,nodev,noexec,relatime,perf_event 0 0
cgroup /sys/fs/cgroup/pids cgroup rw,seclabel,nosuid,nodev,noexec,relatime,pids 0 0
cgroup /sys/fs/cgroup/blkio cgroup rw,seclabel,nosuid,nodev,noexec,relatime,blkio 0 0
cgroup /sys/fs/cgroup/memory cgroup rw,seclabel,nosuid,nodev,noexec,relatime,memory 0 0
none /sys/kernel/tracing tracefs rw,seclabel,relatime 0 0
configfs /sys/kernel/config configfs rw,relatime 0 0
/dev/sda3 / xfs rw,seclabel,relatime,attr2,inode64,logbufs=8,logbsize=32k,noquota 0 0
selinuxfs /sys/fs/selinux selinuxfs rw,relatime 0 0
systemd-1 /proc/sys/fs/binfmt_misc autofs
rw,relatime,fd=36,pgrp=1,timeout=0,minproto=5,maxproto=5,direct,pipe_ino=1976 0 0
debugfs /sys/kernel/debug debugfs rw,seclabel,relatime 0 0
hugetlbfs /dev/hugepages hugetlbfs rw,seclabel,relatime,pagesize=2M 0 0
```

```
mqueue /dev/mqueue mqueue rw,seclabel,relatime 0 0
/dev/sda1 /boot ext4 rw,seclabel,relatime 0 0
sunrpc /var/lib/nfs/rpc_pipefs rpc_pipefs rw,relatime 0 0
tmpfs /run/user/1000 tmpfs rw,seclabel,nosuid,nodev,relatime,size=382740k,mode=700,uid=1000,gid=1000 0 0
binfmt_misc /proc/sys/fs/binfmt_misc binfmt_misc rw,relatime 0 0
tracefs /sys/kernel/debug/tracing tracefs rw,seclabel,relatime 0 0
==================================
```

Important: Note the use of the **-f** switch which instructs awk to use the script.

The printf function

The integrated function **printf** is used to format output and has the following syntax:

```
printf ("string",expression1,expression2,...,expressionn)
```

string contains as many formats as there are expressions.

Examples of formats commonly used are:

Format	Description
%30s	Displays a right-justified string of 30 characters
%-30s	Displays a left-justified string of 30 characters
%4d	Displays a right-justified decimal number of 4 digits
%-4d	Displays a left-justified decimal number of 4 digits

Control Statements

awk can use the following control statements:

if

```
if condition {

    command
    command
    ...
}

else {

    command
    command
    ...
}
```

or:

```
if condition

    command

else

    command
```

for

```
for variable in list {

    command
    command
```

```
    ...

}
```

or:

```
for variable in list

    command
```

or in the case of a table:

```
for key in table {

    print key , table[key]

}
```

while

```
while condition {

     command
     command
     ...

}
```

do-while

```
do {
```

```
     command
     command
     ...

} while condition
```

Command Line Switches

To do : Use the **–help** option of the **awk** command to view the command line switches.

LAB #6 - Using awk

Create the file **sales.txt**:

```
[root@redhat9 tmp]# vi sales.txt
[root@redhat9 tmp]# cat sales.txt
# Annual sales by French department
# 83
Desktops§100
Portables§50
Servers§21
Ipads§4

# 06
Desktops§99
Portables§60
Servers§8
Ipads§16
```

```
# 13
Desktops§130
Portables§65
Servers§12
Ipads§56
```

Now create the awk script **sales.awk**:

```
[root@redhat9 tmp]# vi sales.awk

[root@redhat9 tmp]# cat sales.awk
# BEGIN
BEGIN {
    FS="§"
}
# TABLE
$1 !~ /^#/ && $1 !~ /^$/ {
    sales[$1]+=$2
}
# END
END {
    for (pc in sales)
    printf("PC Type :  %s \t Sales (06+13+83) : %10d\n",pc,sales[pc]);
}
```

This script contains 13 lines. The purpose of this script is to calculate the total number of computers sold in the three French departments from the data present in the **sales** file:

```
     1  # BEGIN
     2  BEGIN {
     3      FS="§"
     4  }
     5  # TABLE
     6  $1 !~ /^#/ && $1 !~ /^$/ {
```

```
 7      sales[$1]+=$2
 8  }
 9  # END
10  END {
11      for (pc in sales)
12      printf("PC Type :  %s \t Sales (06+13+83) : %10d\n",pc,sales[pc]);
13  }
```

It is important that you understand the key lines in the above script:

- Line **3**,
  - Defines a new field seperator in a BEGIN section.
- Line **6**,
  - Discards all commented and empty lines.
- Line **7**,
  - The table's key is **$1**, in other words the different types of computers. Against each key, the number of each type of computer sold is stored in **$2**. The **+=** characters indicate that the value stored in $2 is incremental.
- Line **12**,
  - Uses printf to format the output of each line in the table.

Now execute the script and check the output is correct:

```
[root@redhat9 tmp]# awk -f /tmp/sales.awk /tmp/sales.txt
PC Type :  Portables     Sales (06+13+83) :        175
PC Type :  Ipads         Sales (06+13+83) :         76
PC Type :  Desktops      Sales (06+13+83) :        329
PC Type :  Servers       Sales (06+13+83) :         41
```

LAB #7 - Other Useful Commands

7.1 - The expand Command

The **expand** command converts tabulations in a file to spaces and prints the results to STDOUT. With no file as an argument or with the **-** character as an argument, the command takes it's input from STDIN.

Create the following file:

```
[root@redhat9 tmp]# vi expand

[root@redhat9 tmp]# cat expand
un  deux    trois    quatre    cinq
un  deux    trois    quatre    cinq
un  deux    trois    quatre    cinq
un  deux    trois    quatre    cinq
un  deux    trois    quatre    cinq
un  deux    trois    quatre    cinq
un  deux    trois    quatre    cinq
un  deux    trois    quatre    cinq
un  deux    trois    quatre    cinq
un  deux    trois    quatre    cinq
```

Now use the **-vet** switches of the **cat** command to view the non-printable characters:

```
[root@redhat9 tmp]# cat -vet expand
un^Ideux^Itrois^Iquatre^Icinq$
un^Ideux^Itrois^Iquatre^Icinq$
un^Ideux^Itrois^Iquatre^Icinq$
un^Ideux^Itrois^Iquatre^Icinq$
un^Ideux^Itrois^Iquatre^Icinq$
un^Ideux^Itrois^Iquatre^Icinq$
un^Ideux^Itrois^Iquatre^Icinq$
un^Ideux^Itrois^Iquatre^Icinq$
un^Ideux^Itrois^Iquatre^Icinq$
un^Ideux^Itrois^Iquatre^Icinq$
```

Important : As you can see the tabulations are shown as **^I** and the end of each line as a **$**.

Now use the **expand** command to convert the tabulations into spaces and send the result to the **expand1** file:

```
[root@redhat9 ~]# expand expand > expand1
```

View the resulting **expand1** file with the **cat** command and the **-vet** switches:

```
[root@redhat9 ~]# cat -vet expand1
un      deux    trois   quatre  cinq$
un      deux    trois   quatre  cinq$
un      deux    trois   quatre  cinq$
un      deux    trois   quatre  cinq$
un      deux    trois   quatre  cinq$
un      deux    trois   quatre  cinq$
un      deux    trois   quatre  cinq$
un      deux    trois   quatre  cinq$
un      deux    trois   quatre  cinq$
un      deux    trois   quatre  cinq$
un      deux    trois   quatre  cinq$
```

Important : As you can see, the tabulations have been changed into spaces.

Command Line Switches

To do : Use the **–help** option of the **expand** command to view the command line

switches.

7.2 - The unexpand Command

The **unexpand** command converts spaces in a file to tabulations and prints the results to STDOUT. With no file as an argument or with the **-** character as an argument, the command takes it's input from STDIN.

Now use the **unexpand** command to convert the spaces in the **expand1** file into tabulations and send the result to the **expand2** file:

```
[root@redhat9 ~]# cat -vet expand1
un      deux    trois   quatre  cinq$
un      deux    trois   quatre  cinq$
un      deux    trois   quatre  cinq$
un      deux    trois   quatre  cinq$
un      deux    trois   quatre  cinq$
un      deux    trois   quatre  cinq$
un      deux    trois   quatre  cinq$
un      deux    trois   quatre  cinq$
un      deux    trois   quatre  cinq$
un      deux    trois   quatre  cinq$
un      deux    trois   quatre  cinq$

[root@redhat9 ~]# unexpand -a expand1 > expand2

[root@redhat9 ~]# cat -vet expand2
un^Ideux^Itrois^Iquatre^Icinq$
un^Ideux^Itrois^Iquatre^Icinq$
un^Ideux^Itrois^Iquatre^Icinq$
un^Ideux^Itrois^Iquatre^Icinq$
un^Ideux^Itrois^Iquatre^Icinq$
un^Ideux^Itrois^Iquatre^Icinq$
un^Ideux^Itrois^Iquatre^Icinq$
```

```
un^Ideux^Itrois^Iquatre^Icinq$
un^Ideux^Itrois^Iquatre^Icinq$
un^Ideux^Itrois^Iquatre^Icinq$
```

Important : Note that the spaces have been replaced by tabulations.

Command Line Switches

To do : Use the **–help** option of the **unexpand** command to view the command line switches.

7.3 - The cut Command

The cut command splits each line of a file into columns starting with column 1. Each column contains one character. The command can also be used to split lines into fields where the default seperator is a tablulation. The default seperator can be changed by using the **-d** switch.

Select the first 7 columns of the **/etc/passwd** file:

```
[root@redhat9 tmp]# cut -c1-7 /etc/passwd
root:x:
bin:x:1
daemon:
adm:x:3
lp:x:4:
sync:x:
shutdow
```

```
halt:x:
mail:x:
operato
games:x
ftp:x:1
nobody:
systemd
dbus:x:
polkitd
avahi:x
tss:x:5
colord:
clevis:
rtkit:x
sssd:x:
geoclue
libstor
systemd
setroub
pipewir
flatpak
gdm:x:4
cockpit
cockpit
gnome-i
sshd:x:
chrony:
dnsmasq
tcpdump
trainee
```

In order to select columns 1 to 5, columns 10 to 15 and columns 30 and higher, us the following command:

```
[root@redhat9 tmp]# cut -c1-5,10-15,30- /etc/passwd
```

```
root:0:rootsh
bin:x:bin:/gin
daemo2:2:dain/nologin
adm:x:adm:/nologin
lp:x:lp:/vabin/nologin
sync:0:syncnc
shutdx:6:0::/sbin/shutdown
halt:0:haltalt
mail:12:maiail:/sbin/nologin
operax:11:0t:/sbin/nologin
games2:100:es:/sbin/nologin
ftp:x50:FTP:/sbin/nologin
nobod65534:verflow User:/:/sbin/nologin
systeoredumstemd Core Dumper:/:/sbin/nologin
dbus::81:Syus:/:/sbin/nologin
polki:998:9lkitd:/:/sbin/nologin
avahi0:70:ASD Stack:/var/run/avahi-daemon:/sbin/nologin
tss:x59:AccTPM access:/dev/null:/sbin/nologin
color997:99ord:/var/lib/colord:/sbin/nologin
clevi996:99ption Framework unprivileged user:/var/cache/clevis:/usr/sbin/nologin
rtkit72:172proc:/sbin/nologin
sssd:5:991:/:/sbin/nologin
geocl:994:9oclue:/var/lib/geoclue:/sbin/nologin
libstemgmt:on account for libstoragemgmt:/:/usr/sbin/nologin
systeom:x:9 Userspace OOM Killer:/:/usr/sbin/nologin
setroshoot:nux troubleshoot server:/var/lib/setroubleshoot:/sbin/nologin
pipewx:985:ystem Daemon:/var/run/pipewire:/sbin/nologin
flatp:984:9atpak system helper:/:/sbin/nologin
gdm:x42::/vin/nologin
cockps:x:98 cockpit web service:/nonexisting:/sbin/nologin
cockpsinstaUser for cockpit-ws instances:/nonexisting:/sbin/nologin
gnometial-s::/run/gnome-initial-setup/:/sbin/nologin
sshd::74:Prted SSH:/usr/share/empty.sshd:/sbin/nologin
chron980:97m user:/var/lib/chrony:/sbin/nologin
```

```
dnsma:979:9P and DNS server:/var/lib/dnsmasq:/sbin/nologin
tcpdu:72:72gin
train:1000:home/trainee:/bin/bash
```

In order to select the 2nd, 4th and 6th column, use the following command:

```
[root@redhat9 tmp]# cut -d: -f2,4,6 /etc/passwd
x:0:/root
x:1:/bin
x:2:/sbin
x:4:/var/adm
x:7:/var/spool/lpd
x:0:/sbin
x:0:/sbin
x:0:/sbin
x:12:/var/spool/mail
x:0:/root
x:100:/usr/games
x:50:/var/ftp
x:65534:/
x:997:/
x:81:/
x:996:/
x:70:/var/run/avahi-daemon
x:59:/dev/null
x:993:/var/lib/colord
x:992:/var/cache/clevis
x:172:/proc
x:991:/
x:990:/var/lib/geoclue
x:988:/
x:987:/
x:986:/var/lib/setroubleshoot
x:984:/var/run/pipewire
```

```
x:983:/
x:42:/var/lib/gdm
x:982:/nonexisting
x:981:/nonexisting
x:980:/run/gnome-initial-setup/
x:74:/usr/share/empty.sshd
x:979:/var/lib/chrony
x:978:/var/lib/dnsmasq
x:72:/
x:1000:/home/trainee
```

Command Line Switches

To do : Use the **–help** option of the **cut** command to view the command line switches.

7.4 - The uniq Command

The following command is used to extract the Primary Group GIDs from the **/etc/passwd** file:

```
[root@redhat9 tmp]# cut -d: -f4 /etc/passwd | sort -n | uniq
0
1
2
4
7
12
42
50
59
```

```
70
72
74
81
100
172
978
979
980
981
982
983
984
986
987
988
990
991
992
993
996
997
1000
65534
```

Important: Note the use of the **uniq** command to remove duplicates from the list.

Command Line Switches

To do : Use the **–help** option of the **uniq** command to view the command line switches.

7.5 - The tr Command

The **tr** command is used to substitute certain characters by other characters. This command **only** accepts data from standard input (hence the pipe):

```
[root@redhat9 tmp]# cat /etc/passwd | tr "[a-z]" "[A-Z]"
ROOT:X:0:0:ROOT:/ROOT:/BIN/BASH
BIN:X:1:1:BIN:/BIN:/SBIN/NOLOGIN
DAEMON:X:2:2:DAEMON:/SBIN:/SBIN/NOLOGIN
ADM:X:3:4:ADM:/VAR/ADM:/SBIN/NOLOGIN
LP:X:4:7:LP:/VAR/SPOOL/LPD:/SBIN/NOLOGIN
SYNC:X:5:0:SYNC:/SBIN:/BIN/SYNC
SHUTDOWN:X:6:0:SHUTDOWN:/SBIN:/SBIN/SHUTDOWN
HALT:X:7:0:HALT:/SBIN:/SBIN/HALT
MAIL:X:8:12:MAIL:/VAR/SPOOL/MAIL:/SBIN/NOLOGIN
OPERATOR:X:11:0:OPERATOR:/ROOT:/SBIN/NOLOGIN
GAMES:X:12:100:GAMES:/USR/GAMES:/SBIN/NOLOGIN
FTP:X:14:50:FTP USER:/VAR/FTP:/SBIN/NOLOGIN
NOBODY:X:65534:65534:KERNEL OVERFLOW USER:/:/SBIN/NOLOGIN
SYSTEMD-COREDUMP:X:999:997:SYSTEMD CORE DUMPER:/:/SBIN/NOLOGIN
DBUS:X:81:81:SYSTEM MESSAGE BUS:/:/SBIN/NOLOGIN
POLKITD:X:998:996:USER FOR POLKITD:/:/SBIN/NOLOGIN
AVAHI:X:70:70:AVAHI MDNS/DNS-SD STACK:/VAR/RUN/AVAHI-DAEMON:/SBIN/NOLOGIN
TSS:X:59:59:ACCOUNT USED FOR TPM ACCESS:/DEV/NULL:/SBIN/NOLOGIN
COLORD:X:997:993:USER FOR COLORD:/VAR/LIB/COLORD:/SBIN/NOLOGIN
CLEVIS:X:996:992:CLEVIS DECRYPTION FRAMEWORK UNPRIVILEGED USER:/VAR/CACHE/CLEVIS:/USR/SBIN/NOLOGIN
RTKIT:X:172:172:REALTIMEKIT:/PROC:/SBIN/NOLOGIN
SSSD:X:995:991:USER FOR SSSD:/:/SBIN/NOLOGIN
GEOCLUE:X:994:990:USER FOR GEOCLUE:/VAR/LIB/GEOCLUE:/SBIN/NOLOGIN
LIBSTORAGEMGMT:X:988:988:DAEMON ACCOUNT FOR LIBSTORAGEMGMT:/:/USR/SBIN/NOLOGIN
```

```
SYSTEMD-OOM:X:987:987:SYSTEMD USERSPACE OOM KILLER:/:/USR/SBIN/NOLOGIN
SETROUBLESHOOT:X:986:986:SELINUX TROUBLESHOOT SERVER:/VAR/LIB/SETROUBLESHOOT:/SBIN/NOLOGIN
PIPEWIRE:X:985:984:PIPEWIRE SYSTEM DAEMON:/VAR/RUN/PIPEWIRE:/SBIN/NOLOGIN
FLATPAK:X:984:983:USER FOR FLATPAK SYSTEM HELPER:/:/SBIN/NOLOGIN
GDM:X:42:42::/VAR/LIB/GDM:/SBIN/NOLOGIN
COCKPIT-WS:X:983:982:USER FOR COCKPIT WEB SERVICE:/NONEXISTING:/SBIN/NOLOGIN
COCKPIT-WSINSTANCE:X:982:981:USER FOR COCKPIT-WS INSTANCES:/NONEXISTING:/SBIN/NOLOGIN
GNOME-INITIAL-SETUP:X:981:980::/RUN/GNOME-INITIAL-SETUP/:/SBIN/NOLOGIN
SSHD:X:74:74:PRIVILEGE-SEPARATED SSH:/USR/SHARE/EMPTY.SSHD:/SBIN/NOLOGIN
CHRONY:X:980:979:CHRONY SYSTEM USER:/VAR/LIB/CHRONY:/SBIN/NOLOGIN
DNSMASQ:X:979:978:DNSMASQ DHCP AND DNS SERVER:/VAR/LIB/DNSMASQ:/SBIN/NOLOGIN
TCPDUMP:X:72:72::/:/SBIN/NOLOGIN
TRAINEE:X:1000:1000:TRAINEE:/HOME/TRAINEE:/BIN/BASH
```

Command Line Switches

To do : Use the **–help** option of the **tr** command to view the command line switches.

7.6 - The paste Command

The **paste** command concatenates lines from n files. For example:

```
[root@redhat9 tmp]# paste -d: /etc/passwd /etc/shadow
root:x:0:0:root:/root:/bin/bash:root:$6$AbCPA3HFsB/NDBkA$q2T8XLo83bPWCid/WHo.i0m9dgjdfQWiZAkqD/ajOjZ8gHdKFYX5y8ku
TvIYY/qMjmu9beCk3BZV8ewL/Q15D1::0:99999:7:::
bin:x:1:1:bin:/bin:/sbin/nologin:bin:*:19347:0:99999:7:::
daemon:x:2:2:daemon:/sbin:/sbin/nologin:daemon:*:19347:0:99999:7:::
adm:x:3:4:adm:/var/adm:/sbin/nologin:adm:*:19347:0:99999:7:::
lp:x:4:7:lp:/var/spool/lpd:/sbin/nologin:lp:*:19347:0:99999:7:::
```

```
sync:x:5:0:sync:/sbin:/bin/sync:sync:*:19347:0:99999:7:::
shutdown:x:6:0:shutdown:/sbin:/sbin/shutdown:shutdown:*:19347:0:99999:7:::
halt:x:7:0:halt:/sbin:/sbin/halt:halt:*:19347:0:99999:7:::
mail:x:8:12:mail:/var/spool/mail:/sbin/nologin:mail:*:19347:0:99999:7:::
operator:x:11:0:operator:/root:/sbin/nologin:operator:*:19347:0:99999:7:::
games:x:12:100:games:/usr/games:/sbin/nologin:games:*:19347:0:99999:7:::
ftp:x:14:50:FTP User:/var/ftp:/sbin/nologin:ftp:*:19347:0:99999:7:::
nobody:x:65534:65534:Kernel Overflow User:/:/sbin/nologin:nobody:*:19347:0:99999:7:::
systemd-coredump:x:999:997:systemd Core Dumper:/:/sbin/nologin:systemd-coredump:!!:19649::::::
dbus:x:81:81:System message bus:/:/sbin/nologin:dbus:!!:19649::::::
polkitd:x:998:996:User for polkitd:/:/sbin/nologin:polkitd:!!:19649::::::
avahi:x:70:70:Avahi mDNS/DNS-SD Stack:/var/run/avahi-daemon:/sbin/nologin:avahi:!!:19649::::::
tss:x:59:59:Account used for TPM access:/dev/null:/sbin/nologin:tss:!!:19649::::::
colord:x:997:993:User for colord:/var/lib/colord:/sbin/nologin:colord:!!:19649::::::
clevis:x:996:992:Clevis Decryption Framework unprivileged
user:/var/cache/clevis:/usr/sbin/nologin:clevis:!!:19649::::::
rtkit:x:172:172:RealtimeKit:/proc:/sbin/nologin:rtkit:!!:19649::::::
sssd:x:995:991:User for sssd:/:/sbin/nologin:sssd:!!:19649::::::
geoclue:x:994:990:User for geoclue:/var/lib/geoclue:/sbin/nologin:geoclue:!!:19649::::::
libstoragemgmt:x:988:988:daemon account for libstoragemgmt:/:/usr/sbin/nologin:libstoragemgmt:!*:19649::::::
systemd-oom:x:987:987:systemd Userspace OOM Killer:/:/usr/sbin/nologin:systemd-oom:!*:19649::::::
setroubleshoot:x:986:986:SELinux troubleshoot
server:/var/lib/setroubleshoot:/sbin/nologin:setroubleshoot:!!:19649::::::
pipewire:x:985:984:PipeWire System Daemon:/var/run/pipewire:/sbin/nologin:pipewire:!!:19649::::::
flatpak:x:984:983:User for flatpak system helper:/:/sbin/nologin:flatpak:!!:19649::::::
gdm:x:42:42::/var/lib/gdm:/sbin/nologin:gdm:!!:19649::::::
cockpit-ws:x:983:982:User for cockpit web service:/nonexisting:/sbin/nologin:cockpit-ws:!!:19649::::::
cockpit-wsinstance:x:982:981:User for cockpit-ws instances:/nonexisting:/sbin/nologin:cockpit-
wsinstance:!!:19649::::::
gnome-initial-setup:x:981:980::/run/gnome-initial-setup/:/sbin/nologin:gnome-initial-setup:!!:19649::::::
sshd:x:74:74:Privilege-separated SSH:/usr/share/empty.sshd:/sbin/nologin:sshd:!!:19649::::::
chrony:x:980:979:chrony system user:/var/lib/chrony:/sbin/nologin:chrony:!!:19649::::::
dnsmasq:x:979:978:Dnsmasq DHCP and DNS server:/var/lib/dnsmasq:/sbin/nologin:dnsmasq:!!:19649::::::
tcpdump:x:72:72::/:/sbin/nologin:tcpdump:!!:19649::::::
```

```
trainee:x:1000:1000:trainee:/home/trainee:/bin/bash:trainee:$6$RTR0r5su3SinU2DK$dt/TI6LByO3SKM04nopxI33O7.eE62rPQ
0DlO2HRH2PUtPM4c1pvh3koznv6nE6Z0oCoM0Fq7IUdt8cbjXUMh0::0:99999:7:::
```

Command Line Switches

To do : Use the **–help** option of the **paste** command to view the command line switches.

7.7 - The split Command

The split command is used to divide a large file into smaller segments. Create an empty 250 MB file as follows:

```
[root@redhat9 tmp]# dd if=/dev/zero of=/file bs=1024k count=250
250+0 records in
250+0 records out
262144000 bytes (262 MB, 250 MiB) copied, 0.132123 s, 2.0 GB/s
```

Now use the split command to divide the file into 5 smaller files each of 50:

```
[root@redhat9 tmp]# split -b 50m /file filepart

[root@redhat9 tmp]# ls -l | grep filepart
-rw-r--r--. 1 root root 52428800 Sep 25 16:17 filepartaa
-rw-r--r--. 1 root root 52428800 Sep 25 16:17 filepartab
-rw-r--r--. 1 root root 52428800 Sep 25 16:17 filepartac
-rw-r--r--. 1 root root 52428800 Sep 25 16:17 filepartad
-rw-r--r--. 1 root root 52428800 Sep 25 16:17 filepartae
```

Important: Note that the 5 files were created in the current working directory.

You can re-construct the original file by using the **cat** command:

```
[root@redhat9 tmp]# cat fileparta* > newfile
[root@redhat9 tmp]# ls -l | grep newf
-rw-r--r--. 1 root root 262144000 Sep 25 16:18 newfile
[root@redhat9 tmp]# ls -l / | grep file
-rw-r--r--.   1 root root 262144000 Sep 25 16:17 file
```

Command Line Switches

To do : Use the **–help** option of the **split** command to view the command line switches.

7.8 - The diff Command

The diff command compares two fles and indicates what changes need to be made to the first file in order that it be identical to the second file.

Copy the **/etc/passwd** file to the **/root** directory:

```
[root@redhat9 ~]# cp /etc/passwd /root
```

Edit the ***/root/passwd** file as shown:

```
...
trainee10:x:1000:1000:trainee:/home/trainee:/bin/bash
...
```

Delete the **tcpdump** entry and add the following line to the end of **/root/passwd**:

```
...
Linux est super!
```

Now compare the two files:

```
[root@redhat9 tmp]# diff /etc/passwd /root/passwd
26,27c26
< tcpdump:x:72:72::/:/sbin/nologin
< trainee:x:1000:1000:trainee:/home/trainee:/bin/bash
---
> trainee10:x:1000:1000:trainee:/home/trainee:/bin/bash
36a36
> Linux est super!
```

In this output you will notice the **<** and **>** characters. The first makes reference to the first file, /etc/passwd, whist the second makes reference to the second file, /root/passwd.

The output **26,27c26** means that line 27 needs to be changed in /etc/passwd so that is the same as line 26 in /root/passwd.

The output **36a36** means that at line 36 in /etc/passwd line 36 from /root/passwd needs to be added.

Command Line Switches

To do : Use the **–help** option of the **diff** command to view the command line switches.

7.9 - The cmp Command

The **cmp** command compares two files character by character. By default, the command stops after finding the first difference:

```
[root@redhat9 tmp]# cmp /root/passwd /etc/passwd
/root/passwd /etc/passwd differ: byte 1300, line 26
```

The **-l** switch shows all of the differences in a three column format:

```
[root@redhat9 tmp]# cmp -l /root/passwd /etc/passwd | more
cmp: EOF on /root/passwd after byte 1931
1300 162 143
1301 141 160
1302 151 144
1303 156 165
1304 145 155
1305 145 160
1306  61  72
1307  60 170
1309 170  67
1310  72  62
1311  61  72
1312  60  67
1313  60  62
1314  60  72
1316  61  57
1317  60  72
1318  60  57
1319  60 163
1320  72 142
1321 164 151
1322 162 156
1323 141  57
1324 151 156
--More--
```

The first column represents the character **number**, the second column represents the **ASCII octal value** of the character in the **/root/passwd** file and the third column represents the **ASCII octal value** of the character in the **/etc/passwd** file.

Command Line Switches

To do : Use the **–help** option of the **cmp** command to view the command line switches.

7.10 - The patch Command

La commande **patch** est utilisée pour appliquer des modifications à un fichier à partir d'un fichier patch qui contient les The **patch** command is used to apply modifications contained within a patch file to an older version of a file so that it becomes the newer version of the file.

The **patch** command is not installed by default in RHEL 9:

```
[root@redhat9 ~]# dnf install patch -y
```

If you recall, you made some changes to the /tmp/greptest et /tmp/greptest1 files:

```
[root@redhat9 tmp]# cat /tmp/greptest
# Starting comment
^ This line will be used to demonstrate the use of fgrep
fenestrOS
fenestros
# Another comment
555-5555
f

.fenestros
```

```
.fe

£
# End comment

[root@redhat9 tmp]# cat /tmp/greptest1
fenestrOS
fenestros
555-5555
f
.fenestros
.fe
£
```

Now create a patch file containing the modifications that need to be applied to /tmp/greptest in order for it to be identical to /tmp/greptest1:

```
[root@redhat9 tmp]# diff -u greptest greptest1 > greptest.patch
```

A look at the patch file shows the chnages that need to be made to the **greptest** file:

```
[root@redhat9 tmp]# cat greptest.patch
--- greptest    2021-04-20 05:23:52.710188632 -0400
+++ greptest1   2021-04-20 05:21:55.189882834 -0400
@@ -1,14 +1,7 @@
-# Starting comment
-^ This line will be used to demonstrate the use of fgrep
 fenestrOS
 fenestros
-# Another comment
 555-5555
 f
-
 .fenestros
-
```

```
 .fe
-
 £
-# End comment
```

Now apply the patch file:

```
[root@redhat9 tmp]# patch < greptest.patch
patching file greptest
```

Finally, check the contents of the patched **greptest** file:

```
[root@redhat9 tmp]# cat greptest
fenestrOS
fenestros
555-5555
f
.fenestros
.fe
£
```

Command Line Switches

To do : Use the **–help** option of the **patch** command to view the command line switches.

7.11 - The strings Command

The **strings** Command is used to extract any printable string in one or more object files or executables. An object fie is an intermediary file used when compiling.

The format of an object file is **ELF** (Executable and Linkable Format). This same format is also used for:

- executables,
- shared libraries,
- core dumps.

Used as is, the command extracts all strings greater than 4 characters in length:

```
[root@redhat9 tmp]# strings /usr/bin/passwd | more
/lib64/ld-linux-x86-64.so.2
libuser.so.1
g_value_get_int64
is_selinux_enabled
_ITM_deregisterTMCloneTable
g_free
g_value_array_get_nth
audit_open
__gmon_start__
g_value_get_string
g_type_check_value_holds
g_value_get_long
freecon
audit_log_acct_message
_ITM_registerTMCloneTable
lu_ent_set_string
lu_ent_get_first_value_strdup
lu_error_free
lu_user_lock
lu_strerror
lu_ent_free
lu_ent_new
lu_user_modify
--More--
```

Print the offset within the file before each string:

```
[root@redhat9 tmp]# strings -t d /usr/bin/passwd | more
    624 /lib64/ld-linux-x86-64.so.2
   2809 libuser.so.1
   2822 g_value_get_int64
   2840 is_selinux_enabled
   2859 _ITM_deregisterTMCloneTable
   2887 g_free
   2894 g_value_array_get_nth
   2916 audit_open
   2927 __gmon_start__
   2942 g_value_get_string
   2961 g_type_check_value_holds
   2986 g_value_get_long
   3003 freecon
   3011 audit_log_acct_message
   3034 _ITM_registerTMCloneTable
   3060 lu_ent_set_string
   3078 lu_ent_get_first_value_strdup
   3108 lu_error_free
   3122 lu_user_lock
   3135 lu_strerror
   3147 lu_ent_free
   3159 lu_ent_new
   3170 lu_user_modify
--More--
```

The **-t** switch can take one of three arguments that specify the numbering system to use:

Argument	**Numbering System**
d	Decimal
o	Octal
x	Hexadecimal

The **-n** switch prints sequences of characters that are at least **min-len** characters long, instead of the default 4:

```
[root@redhat9 tmp]# strings -t d -n 15 /usr/bin/passwd | more
    624 /lib64/ld-linux-x86-64.so.2
   2822 g_value_get_int64
   2840 is_selinux_enabled
   2859 _ITM_deregisterTMCloneTable
   2894 g_value_array_get_nth
   2942 g_value_get_string
   2961 g_type_check_value_holds
   2986 g_value_get_long
   3011 audit_log_acct_message
   3034 _ITM_registerTMCloneTable
   3060 lu_ent_set_string
   3078 lu_ent_get_first_value_strdup
   3185 lu_prompt_console
   3212 lu_user_lookup_name
   3239 lu_ent_set_long
   3281 lu_user_removepass
   3300 libgobject-2.0.so.0
   3320 libglib-2.0.so.0
   3379 poptHelpOptions
   3435 poptSetOtherOptionHelp
   3543 libpam_misc.so.0
   3584 audit_log_user_avc_message
   3611 libselinux.so.1
--More--
```

The **-f** switch prints the name of the file before each string:

```
[root@redhat9 tmp]# strings -f /bin/* | grep "(c)"
/bin/btrace: # Copyright (c) 2005 Silicon Graphics, Inc.
/bin/buildah: 0,1,2,3,4,5,6,7,8,9,(a)(b)(c)(d)(e)(f)(g)(h)(i)(j)(k)(l)(m)(n)(o)(p)(q)(r)(s)(t)(u)(v)(w)(x)(y)(z)
/bin/buildah:
```

```
B!!B!?B..B0,B0.B1,B1.B10B11B12B13B14B15B16B17B18B19B2,B2.B20B21B22B23B24B25B26B27B28B29B3,B3.B30B31B32B33B34B35B3
6B37B38B39B4,B4.B40B41B42B43B44B45B46B47B48B49B5,B5.B50B6,B6.B7,B7.B8,B8.B9,B9.B==B?!B??BAUBBqBCDBDJBDZBDzBGBBGyB
HPBHVBHgBHzBIIBIJBIUBIVBIXBKBBKKBKMBLJBLjBMBBMCBMDBMRBMVBMWBNJBNjBNoBPHBPRBPaBRsBSDBSMBSSBSvBTMBVIBWCBWZBWbBXIBcc
BcdBcmBdBBdaBdlBdmBdzBeVBffBfiBflBfmBhaBiiBijBinBivBixBkABkVBkWBkgBklBkmBktBljBlmBlnBlxBm2Bm3BmABmVBmWBmbBmgBmlBm
mBmsBnABnFBnVBnWBnjBnmBnsBoVBpABpFBpVBpWBpcBpsBsrBstBviBxiC(1)C(2)C(3)C(4)C(5)C(6)C(7)C(8)C(9)C(A)C(B)C(C)C(D)C(E
)C(F)C(G)C(H)C(I)C(J)C(K)C(L)C(M)C(N)C(O)C(P)C(Q)C(R)C(S)C(T)C(U)C(V)C(W)C(X)C(Y)C(Z)C(a)C(b)C(c)C(d)C(e)C(f)C(g)
C(h)C(i)C(j)C(k)C(l)C(m)C(n)C(o)C(p)C(q)C(r)C(s)C(t)C(u)C(v)C(w)C(x)C(y)C(z)C...C10.C11.C12.C13.C14.C15.C16.C17.C
18.C19.C20.C::=C===CCo.CFAXCGHzCGPaCIIICLTDCL
/bin/cdda-player: (c) 1997-98 Gerd Knorr <kraxel@goldbach.in-berlin.de>
/bin/cdda-player: (c) 2005-2006, 2017 Rocky Bernstein <rocky@gnu.org>
/bin/cd-drive: Copyright (c) 2003-2005, 2007-2008, 2011-2015, 2017 R. Bernstein
/bin/cd-info: Copyright (c) 2003-2005, 2007-2008, 2011-2015, 2017 R. Bernstein
/bin/cd-read: Copyright (c) 2003-2005, 2007-2008, 2011-2015, 2017 R. Bernstein
/bin/chcat:         if len(c) > 0 and (c[0] == "+" or c[0] == "-"):
/bin/chcat:                 if len(c) > 0 and c[0] == "+":
/bin/chcat:                 if len(c) > 0 and c[0] == "-":
/bin/clevis: # Copyright (c) 2017 Red Hat, Inc.
/bin/clevis-decrypt: # Copyright (c) 2017 Red Hat, Inc.
/bin/clevis-decrypt-null: # Copyright (c) 2017 Red Hat, Inc.
/bin/clevis-decrypt-tang: # Copyright (c) 2017 Red Hat, Inc.
/bin/clevis-decrypt-tpm2: # Copyright (c) 2017 Red Hat, Inc.
/bin/clevis-encrypt-null: # Copyright (c) 2017 Red Hat, Inc.
/bin/clevis-encrypt-tang: # Copyright (c) 2017 Red Hat, Inc.
/bin/clevis-encrypt-tpm2: # Copyright (c) 2017 Red Hat, Inc.
/bin/clevis-luks-bind: # Copyright (c) 2016 Red Hat, Inc.
/bin/clevis-luks-common-functions: # Copyright (c) 2019 Red Hat, Inc.
/bin/clevis-luks-edit: # Copyright (c) 2020 Red Hat, Inc.
/bin/clevis-luks-list: # Copyright (c) 2017-2019 Red Hat, Inc.
/bin/clevis-luks-pass: # Copyright (c) 2019 Red Hat, Inc.
/bin/clevis-luks-regen: # Copyright (c) 2020 Red Hat, Inc.
/bin/clevis-luks-report: # Copyright (c) 2018, 2020 Red Hat, Inc.
/bin/clevis-luks-unbind: # Copyright (c) 2017 Red Hat, Inc.
/bin/clevis-luks-unlock: # Copyright (c) 2016 Red Hat, Inc.
/bin/diffpp: # Copyright (c) 1996-1998 Markku Rossi
```

```
/bin/gnome-control-center: NM_IS_REMOTE_CONNECTION (c)
/bin/ibus-setup: # Copyright (c) 2007-2010 Peng Huang <shawn.p.huang@gmail.com>
/bin/ibus-setup: # Copyright (c) 2018-2019 Takao Fujiwara <takao.fujiwara1@gmail.com>
/bin/ibus-setup: # Copyright (c) 2007-2018 Red Hat, Inc.
/bin/iso-info: Copyright (c) 2003-2005, 2007-2008, 2011-2015, 2017 R. Bernstein
/bin/iso-read: Copyright (c) 2003-2005, 2007-2008, 2011-2015, 2017 R. Bernstein
/bin/itstool: # Copyright (c) 2010-2018 Shaun McCance <shaunm@gnome.org>
/bin/lsusb.py: # Copyright (c) 2009 Kurt Garloff <garloff@suse.de>
/bin/lsusb.py: # Copyright (c) 2013,2018 Kurt Garloff <kurt@garloff.de>
/bin/mmc-tool: Copyright (c) 2003-2005, 2007-2008, 2011-2015, 2017 R. Bernstein
/bin/orca: __copyright__ = "Copyright (c) 2010-2012 The Orca Team" \
/bin/orca:                 "Copyright (c) 2012 Igalia, S.L."
/bin/pinentry: # Copyright (c) 2006 SUSE LINUX Products GmbH, Nuernberg, Germany.
/bin/pinentry: # Copyright (c) 2009 Fedora Project
/bin/pinentry: # Copyright (c) 2014-2015 Red Hat
/bin/pkgconf: Copyright (c) 2011, 2012, 2013, 2014, 2015, 2016, 2017, 2018, 2019, 2020
/bin/pod2usage: # Copyright (c) 1996-2000 by Bradford Appleton. All rights reserved.
/bin/pod2usage: # Copyright (c) 2001-2016 by Marek Rouchal.
/bin/podman: 0,1,2,3,4,5,6,7,8,9,(a)(b)(c)(d)(e)(f)(g)(h)(i)(j)(k)(l)(m)(n)(o)(p)(q)(r)(s)(t)(u)(v)(w)(x)(y)(z)
/bin/podman:
B!!B!?B..B0,B0.B1,B1.B10B11B12B13B14B15B16B17B18B19B2,B2.B20B21B22B23B24B25B26B27B28B29B3,B3.B30B31B32B33B34B35B3
6B37B38B39B4,B4.B40B41B42B43B44B45B46B47B48B49B5,B5.B50B6,B6.B7,B7.B8,B8.B9,B9.B==B?!B??BAUBBqBCDBDJBDZBDzBGBBGyB
HPBHVBHgBHzBIIBIJBIUBIVBIXBKBBKKBKMBLJBLjBMBBMCBMDBMRBMVBMWBNJBNjBNoBPHBPRBPaBRsBSDBSMBSSBSvBTMBVIBWCBWZBWbBXIBcc
BcdBcmBdBBdaBdlBdmBdzBeVBffBfiBflBfmBhaBiiBijBinBivBixBkABkVBkWBkgBklBkmBktBljBlmBlnBlxBm2Bm3BmABmVBmWBmbBmgBmlBm
mBmsBnABnFBnVBnWBnjBnmBnsBoVBpABpFBpVBpWBpcBpsBsrBstBviBxiC(1)C(2)C(3)C(4)C(5)C(6)C(7)C(8)C(9)C(A)C(B)C(C)C(D)C(E
)C(F)C(G)C(H)C(I)C(J)C(K)C(L)C(M)C(N)C(O)C(P)C(Q)C(R)C(S)C(T)C(U)C(V)C(W)C(X)C(Y)C(Z)C(a)C(b)C(c)C(d)C(e)C(f)C(g)
C(h)C(i)C(j)C(k)C(l)C(m)C(n)C(o)C(p)C(q)C(r)C(s)C(t)C(u)C(v)C(w)C(x)C(y)C(z)C...C10.C11.C12.C13.C14.C15.C16.C17.C
18.C19.C20.C::=C===CCo.CFAXCGHzCGPaCIIICLTDCL
/bin/podmansh: 0,1,2,3,4,5,6,7,8,9,(a)(b)(c)(d)(e)(f)(g)(h)(i)(j)(k)(l)(m)(n)(o)(p)(q)(r)(s)(t)(u)(v)(w)(x)(y)(z)
/bin/podmansh:
B!!B!?B..B0,B0.B1,B1.B10B11B12B13B14B15B16B17B18B19B2,B2.B20B21B22B23B24B25B26B27B28B29B3,B3.B30B31B32B33B34B35B3
6B37B38B39B4,B4.B40B41B42B43B44B45B46B47B48B49B5,B5.B50B6,B6.B7,B7.B8,B8.B9,B9.B==B?!B??BAUBBqBCDBDJBDZBDzBGBBGyB
HPBHVBHgBHzBIIBIJBIUBIVBIXBKBBKKBKMBLJBLjBMBBMCBMDBMRBMVBMWBNJBNjBNoBPHBPRBPaBRsBSDBSMBSSBSvBTMBVIBWCBWZBWbBXIBcc
BcdBcmBdBBdaBdlBdmBdzBeVBffBfiBflBfmBhaBiiBijBinBivBixBkABkVBkWBkgBklBkmBktBljBlmBlnBlxBm2Bm3BmABmVBmWBmbBmgBmlBm
```

```
mBmsBnABnFBnVBnWBnjBnmBnsBoVBpABpFBpVBpWBpcBpsBsrBstBviBxiC(1)C(2)C(3)C(4)C(5)C(6)C(7)C(8)C(9)C(A)C(B)C(C)C(D)C(E
)C(F)C(G)C(H)C(I)C(J)C(K)C(L)C(M)C(N)C(O)C(P)C(Q)C(R)C(S)C(T)C(U)C(V)C(W)C(X)C(Y)C(Z)C(a)C(b)C(c)C(d)C(e)C(f)C(g)
C(h)C(i)C(j)C(k)C(l)C(m)C(n)C(o)C(p)C(q)C(r)C(s)C(t)C(u)C(v)C(w)C(x)C(y)C(z)C...C10.C11.C12.C13.C14.C15.C16.C17.C
18.C19.C20.C::=C===CCo.CFAXCGHzCGPaCIIICLTDCL
/bin/qemu-ga: Copyright (c) 2003-2023 Fabrice Bellard and the QEMU Project developers
/bin/rescan-scsi-bus.sh: # (c) 1998--2010 Kurt Garloff <kurt@garloff.de>, GNU GPL v2 or v3
/bin/rescan-scsi-bus.sh: # (c) 2006--2018 Hannes Reinecke, GNU GPL v2 or later
/bin/rhc: 0,1,2,3,4,5,6,7,8,9,(a)(b)(c)(d)(e)(f)(g)(h)(i)(j)(k)(l)(m)(n)(o)(p)(q)(r)(s)(t)(u)(v)(w)(x)(y)(z)
/bin/rhc:
B!!B!?B..B0,B0.B1,B1.B10B11B12B13B14B15B16B17B18B19B2,B2.B20B21B22B23B24B25B26B27B28B29B3,B3.B30B31B32B33B34B35B3
6B37B38B39B4,B4.B40B41B42B43B44B45B46B47B48B49B5,B5.B50B6,B6.B7,B7.B8,B8.B9,B9.B==B?!B??BAUBBqBCDBDJBDZBDzBGBBGyB
HPBHVBHgBHzBIIBIJBIUBIVBIXBKBBKKBKMBLJBLjBMBBMCBMDBMRBMVBMWBNJBNjBNoBPHBPRBPaBRsBSDBSMBSSBSvBTMBVIBWCBWZBWbBXIBcc
BcdBcmBdBBdaBdlBdmBdzBeVBffBfiBflBfmBhaBiiBijBinBivBixBkABkVBkWBkgBklBkmBktBljBlmBlnBlxBm2Bm3BmABmVBmWBmbBmgBmlBm
mBmsBnABnFBnVBnWBnjBnmBnsBoVBpABpFBpVBpWBpcBpsBsrBstBviBxiC(1)C(2)C(3)C(4)C(5)C(6)C(7)C(8)C(9)C(A)C(B)C(C)C(D)C(E
)C(F)C(G)C(H)C(I)C(J)C(K)C(L)C(M)C(N)C(O)C(P)C(Q)C(R)C(S)C(T)C(U)C(V)C(W)C(X)C(Y)C(Z)C(a)C(b)C(c)C(d)C(e)C(f)C(g)
C(h)C(i)C(j)C(k)C(l)C(m)C(n)C(o)C(p)C(q)C(r)C(s)C(t)C(u)C(v)C(w)C(x)C(y)C(z)C...C10.C11.C12.C13.C14.C15.C16.C17.C
18.C19.C20.C::=C===CCo.CFAXCGHzCGPaCIIICLTDCL
/bin/screen: Copyright (c) 2018-2020 Alexander Naumov, Amadeusz Slawinski
/bin/screen: Copyright (c) 2015-2017 Juergen Weigert, Alexander Naumov, Amadeusz Slawinski
/bin/screen: Copyright (c) 2010-2014 Juergen Weigert, Sadrul Habib Chowdhury
/bin/screen: Copyright (c) 2008-2009 Juergen Weigert, Michael Schroeder, Micah Cowan, Sadrul Habib Chowdhury
/bin/screen: Copyright (c) 1993-2007 Juergen Weigert, Michael Schroeder
/bin/screen: Copyright (c) 1987 Oliver Laumann
/bin/scsi-rescan: # (c) 1998--2010 Kurt Garloff <kurt@garloff.de>, GNU GPL v2 or v3
/bin/scsi-rescan: # (c) 2006--2018 Hannes Reinecke, GNU GPL v2 or later
/bin/sg_test_rwbuf: (c) Douglas Gilbert, Kurt Garloff, 2000-2007, GNU GPL
/bin/slabinfo: slabinfo 4/15/2011. (c) 2007 sgi/(c) 2011 Linux Foundation.
/bin/sliceprint: # Copyright (c) 1996-1999 Markku Rossi
/bin/soundstretch:     Copyright (c) Olli Parviainen
/bin/soundstretch:    SoundStretch v%s -  Copyright (c) Olli Parviainen
/bin/ssh-copy-id: # Copyright (c) 1999-2020 Philip Hands <phil@hands.com>
/bin/strace: Copyright (c) 1991-%s The strace developers <%s>.
/bin/strace-log-merge: # Copyright (c) 2012-2021 The strace developers.
/bin/tree: $Version: $ tree v1.8.0 (c) 1996 - 2018 by Steve Baker, Thomas Moore, Francesc Rocher, Florian Sesser,
```

```
Kyosuke Tokoro $
/bin/usb-devices: # Copyright (c) 2009 Greg Kroah-Hartman <greg@kroah.com>
/bin/usb-devices: # Copyright (c) 2009 Randy Dunlap <rdunlap@xenotime.net>
/bin/usb-devices: # Copyright (c) 2009 Frans Pop <elendil@planet.nl>
/bin/vm-support: # Copyright (c) 2006-2022 VMware, Inc. All rights reserved.
/bin/wavpack:  Copyright (c) 1998 - 2020 David Bryant.  All Rights Reserved.
/bin/wvgain:  Copyright (c) 2005 - 2020 David Bryant.  All Rights Reserved.
/bin/wvtag:  Copyright (c) 2018 - 2020 David Bryant.  All Rights Reserved.
/bin/wvunpack:  Copyright (c) 1998 - 2020 David Bryant.  All Rights Reserved.
/bin/xgettext: UNICODE_VALUE (c) >= 0 && UNICODE_VALUE (c) < 0x110000
/bin/zip: Copyright (c) 1990-2008 Info-ZIP - Type '%s "-L"' for software license.
/bin/zip: Copyright (c) 1990-2008 Info-ZIP.  All rights reserved.
/bin/zip:     bzip2 code and library copyright (c) Julian     (See the bzip2 license for t>
/bin/zipcloak: Copyright (c) 1990-2008 Info-ZIP - Type '%s "-L"' for software license.
/bin/zipcloak: Copyright (c) 1990-2008 Info-ZIP.  All rights reserved.
/bin/zipnote: Copyright (c) 1990-2008 Info-ZIP - Type '%s "-L"' for software license.
/bin/zipnote: Copyright (c) 1990-2008 Info-ZIP.  All rights reserved.
/bin/zipsplit: Copyright (c) 1990-2008 Info-ZIP - Type '%s "-L"' for software license.
/bin/zipsplit: Copyright (c) 1990-2008 Info-ZIP.  All rights reserved.
```

Command Line Switches

To do : Use the **–help** option of the **strings** command to view the command line switches.

7.12 - The comm Command

This command compares two text files and prints the differences to standard output:

```
[root@redhat9 tmp]# comm /etc/passwd /root/passwd
```

```
        root:x:0:0:root:/root:/bin/bash
        bin:x:1:1:bin:/bin:/sbin/nologin
        daemon:x:2:2:daemon:/sbin:/sbin/nologin
        adm:x:3:4:adm:/var/adm:/sbin/nologin
        lp:x:4:7:lp:/var/spool/lpd:/sbin/nologin
        sync:x:5:0:sync:/sbin:/bin/sync
        shutdown:x:6:0:shutdown:/sbin:/sbin/shutdown
        halt:x:7:0:halt:/sbin:/sbin/halt
        mail:x:8:12:mail:/var/spool/mail:/sbin/nologin
        operator:x:11:0:operator:/root:/sbin/nologin
        games:x:12:100:games:/usr/games:/sbin/nologin
        ftp:x:14:50:FTP User:/var/ftp:/sbin/nologin
        nobody:x:65534:65534:Kernel Overflow User:/:/sbin/nologin
        dbus:x:81:81:System message bus:/:/sbin/nologin
        systemd-coredump:x:999:997:systemd Core Dumper:/:/sbin/nologin
        systemd-resolve:x:193:193:systemd Resolver:/:/sbin/nologin
        tss:x:59:59:Account used by the trousers package to sandbox the tcsd daemon:/dev/null:/sbin/nologin
        polkitd:x:998:996:User for polkitd:/:/sbin/nologin
        unbound:x:997:994:Unbound DNS resolver:/etc/unbound:/sbin/nologin
        libstoragemgmt:x:996:993:daemon account for libstoragemgmt:/var/run/lsm:/sbin/nologin
        cockpit-ws:x:995:991:User for cockpit-ws:/nonexisting:/sbin/nologin
        sssd:x:994:990:User for sssd:/:/sbin/nologin
        setroubleshoot:x:993:989::/var/lib/setroubleshoot:/sbin/nologin
        sshd:x:74:74:Privilege-separated SSH:/var/empty/sshd:/sbin/nologin
        chrony:x:992:988::/var/lib/chrony:/sbin/nologin
tcpdump:x:72:72::/:/sbin/nologin
    trainee10:x:1000:1000:trainee:/home/trainee:/bin/bash
comm: file 2 is not in sorted order
    cockpit-wsinstance:x:991:987:User for cockpit-ws instances:/nonexisting:/sbin/nologin
    rngd:x:990:986:Random Number Generator Daemon:/var/lib/rngd:/sbin/nologin
    gluster:x:989:985:GlusterFS daemons:/run/gluster:/sbin/nologin
    qemu:x:107:107:qemu user:/:/sbin/nologin
    rpc:x:32:32:Rpcbind Daemon:/var/lib/rpcbind:/sbin/nologin
    rpcuser:x:29:29:RPC Service User:/var/lib/nfs:/sbin/nologin
```

```
    saslauth:x:988:76:Saslauthd user:/run/saslauthd:/sbin/nologin
    radvd:x:75:75:radvd user:/:/sbin/nologin
    dnsmasq:x:983:983:Dnsmasq DHCP and DNS server:/var/lib/dnsmasq:/sbin/nologin
    Linux est super!
trainee:x:1000:1000:trainee:/home/trainee:/bin/bash
comm: file 1 is not in sorted order
cockpit-wsinstance:x:991:987:User for cockpit-ws instances:/nonexisting:/sbin/nologin
rngd:x:990:986:Random Number Generator Daemon:/var/lib/rngd:/sbin/nologin
gluster:x:989:985:GlusterFS daemons:/run/gluster:/sbin/nologin
qemu:x:107:107:qemu user:/:/sbin/nologin
rpc:x:32:32:Rpcbind Daemon:/var/lib/rpcbind:/sbin/nologin
rpcuser:x:29:29:RPC Service User:/var/lib/nfs:/sbin/nologin
saslauth:x:988:76:Saslauthd user:/run/saslauthd:/sbin/nologin
radvd:x:75:75:radvd user:/:/sbin/nologin
dnsmasq:x:983:983:Dnsmasq DHCP and DNS server:/var/lib/dnsmasq:/sbin/nologin
```

Important: The lines to the left are those that only appear in the first file. The lines on the right are those that exist in both files. The lines in the middle are those that only exist in the second file.

If you only want to see the lines common to both files, use the following command:

```
[root@redhat9 tmp]# comm -12 /etc/passwd /root/passwd
root:x:0:0:root:/root:/bin/bash
bin:x:1:1:bin:/bin:/sbin/nologin
daemon:x:2:2:daemon:/sbin:/sbin/nologin
adm:x:3:4:adm:/var/adm:/sbin/nologin
lp:x:4:7:lp:/var/spool/lpd:/sbin/nologin
sync:x:5:0:sync:/sbin:/bin/sync
shutdown:x:6:0:shutdown:/sbin:/sbin/shutdown
halt:x:7:0:halt:/sbin:/sbin/halt
```

```
mail:x:8:12:mail:/var/spool/mail:/sbin/nologin
operator:x:11:0:operator:/root:/sbin/nologin
games:x:12:100:games:/usr/games:/sbin/nologin
ftp:x:14:50:FTP User:/var/ftp:/sbin/nologin
nobody:x:65534:65534:Kernel Overflow User:/:/sbin/nologin
dbus:x:81:81:System message bus:/:/sbin/nologin
systemd-coredump:x:999:997:systemd Core Dumper:/:/sbin/nologin
systemd-resolve:x:193:193:systemd Resolver:/:/sbin/nologin
tss:x:59:59:Account used by the trousers package to sandbox the tcsd daemon:/dev/null:/sbin/nologin
polkitd:x:998:996:User for polkitd:/:/sbin/nologin
unbound:x:997:994:Unbound DNS resolver:/etc/unbound:/sbin/nologin
libstoragemgmt:x:996:993:daemon account for libstoragemgmt:/var/run/lsm:/sbin/nologin
cockpit-ws:x:995:991:User for cockpit-ws:/nonexisting:/sbin/nologin
sssd:x:994:990:User for sssd:/:/sbin/nologin
setroubleshoot:x:993:989::/var/lib/setroubleshoot:/sbin/nologin
sshd:x:74:74:Privilege-separated SSH:/var/empty/sshd:/sbin/nologin
chrony:x:992:988::/var/lib/chrony:/sbin/nologin
comm: file 2 is not in sorted order
comm: file 1 is not in sorted order
```

Command Line Switches

To do : Use the **–help** option of the **comm** command to view the command line switches.

7.13 - The head Command

The **head** command is used to display the first **x** lines of a file. The default value of x is 10:

```
[root@redhat9 tmp]# head /etc/passwd
```

```
root:x:0:0:root:/root:/bin/bash
bin:x:1:1:bin:/bin:/sbin/nologin
daemon:x:2:2:daemon:/sbin:/sbin/nologin
adm:x:3:4:adm:/var/adm:/sbin/nologin
lp:x:4:7:lp:/var/spool/lpd:/sbin/nologin
sync:x:5:0:sync:/sbin:/bin/sync
shutdown:x:6:0:shutdown:/sbin:/sbin/shutdown
halt:x:7:0:halt:/sbin:/sbin/halt
mail:x:8:12:mail:/var/spool/mail:/sbin/nologin
operator:x:11:0:operator:/root:/sbin/nologin
```

You can change the default value of x by using the **-n** switch:

```
[root@redhat9 tmp]# head -n 15 /etc/passwd
root:x:0:0:root:/root:/bin/bash
bin:x:1:1:bin:/bin:/sbin/nologin
daemon:x:2:2:daemon:/sbin:/sbin/nologin
adm:x:3:4:adm:/var/adm:/sbin/nologin
lp:x:4:7:lp:/var/spool/lpd:/sbin/nologin
sync:x:5:0:sync:/sbin:/bin/sync
shutdown:x:6:0:shutdown:/sbin:/sbin/shutdown
halt:x:7:0:halt:/sbin:/sbin/halt
mail:x:8:12:mail:/var/spool/mail:/sbin/nologin
operator:x:11:0:operator:/root:/sbin/nologin
games:x:12:100:games:/usr/games:/sbin/nologin
ftp:x:14:50:FTP User:/var/ftp:/sbin/nologin
nobody:x:65534:65534:Kernel Overflow User:/:/sbin/nologin
dbus:x:81:81:System message bus:/:/sbin/nologin
systemd-coredump:x:999:997:systemd Core Dumper:/:/sbin/nologin
```

The command can also be used to display the first **y** bytes of a file by using the **-c** switch:

```
[root@redhat9 tmp]# head -c 150 /etc/passwd
root:x:0:0:root:/root:/bin/bash
```

```
bin:x:1:1:bin:/bin:/sbin/nologin
daemon:x:2:2:daemon:/sbin:/sbin/nologin
adm:x:3:4:adm:/var/adm:/sbin/nologin
lp:x:4:7[root@redhat9 tmp]#
```

If the value of **y** is negative, head displays all bytes in the file **except** the last y bytes:

```
[root@redhat9 tmp]# head -c -150 /etc/passwd
root:x:0:0:root:/root:/bin/bash
bin:x:1:1:bin:/bin:/sbin/nologin
daemon:x:2:2:daemon:/sbin:/sbin/nologin
adm:x:3:4:adm:/var/adm:/sbin/nologin
lp:x:4:7:lp:/var/spool/lpd:/sbin/nologin
sync:x:5:0:sync:/sbin:/bin/sync
shutdown:x:6:0:shutdown:/sbin:/sbin/shutdown
halt:x:7:0:halt:/sbin:/sbin/halt
mail:x:8:12:mail:/var/spool/mail:/sbin/nologin
operator:x:11:0:operator:/root:/sbin/nologin
games:x:12:100:games:/usr/games:/sbin/nologin
ftp:x:14:50:FTP User:/var/ftp:/sbin/nologin
nobody:x:65534:65534:Kernel Overflow User:/:/sbin/nologin
dbus:x:81:81:System message bus:/:/sbin/nologin
systemd-coredump:x:999:997:systemd Core Dumper:/:/sbin/nologin
systemd-resolve:x:193:193:systemd Resolver:/:/sbin/nologin
tss:x:59:59:Account used by the trousers package to sandbox the tcsd daemon:/dev/null:/sbin/nologin
polkitd:x:998:996:User for polkitd:/:/sbin/nologin
unbound:x:997:994:Unbound DNS resolver:/etc/unbound:/sbin/nologin
libstoragemgmt:x:996:993:daemon account for libstoragemgmt:/var/run/lsm:/sbin/nologin
cockpit-ws:x:995:991:User for cockpit-ws:/nonexisting:/sbin/nologin
sssd:x:994:990:User for sssd:/:/sbin/nologin
setroubleshoot:x:993:989::/var/lib/setroubleshoot:/sbin/nologin
sshd:x:74:74:Privilege-separated SSH:/var/empty/sshd:/sbin/nologin
chrony:x:992:988::/var/lib/chrony:/sbin/nologin
tcpdump:x:72:72::/:/sbin/nologin
```

```
trainee:x:1000:1000:trainee:/home/trainee:/bin/bash
cockpit-wsinstance:x:991:987:User for cockpit-ws instances:/nonexisting:/sbin/nologin
rngd:x:990:986:Random Number Generator Daemon:/var/lib/rngd:/sbin/nologin
gluster:x:989:985:GlusterFS daemons:/run/gluster:/sbin/nologin
qemu:x:107:107:qemu user:/:/sbin/nologin
rpc:x:32:32:Rpcbind Daemon:/var/lib/rpcbind:/sbin/nologin
rpcuser:x:29:29:RPC Service User:/var/lib/nfs:/sbin/nologin
saslauth:x:988:76:Saslauthd us[root@redhat9 tmp]#
```

Both x and y can accept multipliers:

```
[root@redhat9 tmp]# head -c 1b /etc/passwd
root:x:0:0:root:/root:/bin/bash
bin:x:1:1:bin:/bin:/sbin/nologin
daemon:x:2:2:daemon:/sbin:/sbin/nologin
adm:x:3:4:adm:/var/adm:/sbin/nologin
lp:x:4:7:lp:/var/spool/lpd:/sbin/nologin
sync:x:5:0:sync:/sbin:/bin/sync
shutdown:x:6:0:shutdown:/sbin:/sbin/shutdown
halt:x:7:0:halt:/sbin:/sbin/halt
mail:x:8:12:mail:/var/spool/mail:/sbin/nologin
operator:x:11:0:operator:/root:/sbin/nologin
games:x:12:100:games:/usr/games:/sbin/nologin
ftp:x:14:50:FTP User:/var/ftp:/sbin/nologin
nobody:x:65534:65534:Kernel Overflow [root@redhat9 tmp]#

[root@redhat9 tmp]# head -c 512 /etc/passwd
root:x:0:0:root:/root:/bin/bash
bin:x:1:1:bin:/bin:/sbin/nologin
daemon:x:2:2:daemon:/sbin:/sbin/nologin
adm:x:3:4:adm:/var/adm:/sbin/nologin
lp:x:4:7:lp:/var/spool/lpd:/sbin/nologin
sync:x:5:0:sync:/sbin:/bin/sync
shutdown:x:6:0:shutdown:/sbin:/sbin/shutdown
```

```
halt:x:7:0:halt:/sbin:/sbin/halt
mail:x:8:12:mail:/var/spool/mail:/sbin/nologin
operator:x:11:0:operator:/root:/sbin/nologin
games:x:12:100:games:/usr/games:/sbin/nologin
ftp:x:14:50:FTP User:/var/ftp:/sbin/nologin
nobody:x:65534:65534:Kernel Overflow [root@redhat9 tmp]#
```

The common multipliers are:

Multiplier	Number of bytes
b	512
KB	1000
K	1024
MB	1000*1000
M	1024*1024
GB	1000*1000*1000
G	1024*1024*1024

Command Line Switches

To do : Use the **–help** option of the **head** command to view the command line switches.

7.14 - The tail Command

The **tail** command is used to display the last **x** lines of a file. The default value of x is 10:

```
[root@redhat9 tmp]# tail /etc/passwd
trainee:x:1000:1000:trainee:/home/trainee:/bin/bash
cockpit-wsinstance:x:991:987:User for cockpit-ws instances:/nonexisting:/sbin/nologin
```

```
rngd:x:990:986:Random Number Generator Daemon:/var/lib/rngd:/sbin/nologin
gluster:x:989:985:GlusterFS daemons:/run/gluster:/sbin/nologin
qemu:x:107:107:qemu user:/:/sbin/nologin
rpc:x:32:32:Rpcbind Daemon:/var/lib/rpcbind:/sbin/nologin
rpcuser:x:29:29:RPC Service User:/var/lib/nfs:/sbin/nologin
saslauth:x:988:76:Saslauthd user:/run/saslauthd:/sbin/nologin
radvd:x:75:75:radvd user:/:/sbin/nologin
dnsmasq:x:983:983:Dnsmasq DHCP and DNS server:/var/lib/dnsmasq:/sbin/nologin
```

You can change the default value of x by using the **-n** switch:

```
root@redhat9 tmp]# tail -n 15 /etc/passwd
sssd:x:994:990:User for sssd:/:/sbin/nologin
setroubleshoot:x:993:989::/var/lib/setroubleshoot:/sbin/nologin
sshd:x:74:74:Privilege-separated SSH:/var/empty/sshd:/sbin/nologin
chrony:x:992:988::/var/lib/chrony:/sbin/nologin
tcpdump:x:72:72::/:/sbin/nologin
trainee:x:1000:1000:trainee:/home/trainee:/bin/bash
cockpit-wsinstance:x:991:987:User for cockpit-ws instances:/nonexisting:/sbin/nologin
rngd:x:990:986:Random Number Generator Daemon:/var/lib/rngd:/sbin/nologin
gluster:x:989:985:GlusterFS daemons:/run/gluster:/sbin/nologin
qemu:x:107:107:qemu user:/:/sbin/nologin
rpc:x:32:32:Rpcbind Daemon:/var/lib/rpcbind:/sbin/nologin
rpcuser:x:29:29:RPC Service User:/var/lib/nfs:/sbin/nologin
saslauth:x:988:76:Saslauthd user:/run/saslauthd:/sbin/nologin
radvd:x:75:75:radvd user:/:/sbin/nologin
dnsmasq:x:983:983:Dnsmasq DHCP and DNS server:/var/lib/dnsmasq:/sbin/nologin
```

The command can also be used to display the last **y** bytes of a file by using the **-c** switch:

```
[root@redhat9 tmp]# tail -c 150 /etc/passwd
er:/run/saslauthd:/sbin/nologin
radvd:x:75:75:radvd user:/:/sbin/nologin
```

```
dnsmasq:x:983:983:Dnsmasq DHCP and DNS server:/var/lib/dnsmasq:/sbin/nologin
```

If the value of **y** is positive, tail displays all bytes in the file after the yth byte:

```
[root@redhat9 tmp]# tail -c +150 /etc/passwd
7:lp:/var/spool/lpd:/sbin/nologin
sync:x:5:0:sync:/sbin:/bin/sync
shutdown:x:6:0:shutdown:/sbin:/sbin/shutdown
halt:x:7:0:halt:/sbin:/sbin/halt
mail:x:8:12:mail:/var/spool/mail:/sbin/nologin
operator:x:11:0:operator:/root:/sbin/nologin
games:x:12:100:games:/usr/games:/sbin/nologin
ftp:x:14:50:FTP User:/var/ftp:/sbin/nologin
nobody:x:65534:65534:Kernel Overflow User:/:/sbin/nologin
dbus:x:81:81:System message bus:/:/sbin/nologin
systemd-coredump:x:999:997:systemd Core Dumper:/:/sbin/nologin
systemd-resolve:x:193:193:systemd Resolver:/:/sbin/nologin
tss:x:59:59:Account used by the trousers package to sandbox the tcsd daemon:/dev/null:/sbin/nologin
polkitd:x:998:996:User for polkitd:/:/sbin/nologin
unbound:x:997:994:Unbound DNS resolver:/etc/unbound:/sbin/nologin
libstoragemgmt:x:996:993:daemon account for libstoragemgmt:/var/run/lsm:/sbin/nologin
cockpit-ws:x:995:991:User for cockpit-ws:/nonexisting:/sbin/nologin
sssd:x:994:990:User for sssd:/:/sbin/nologin
setroubleshoot:x:993:989::/var/lib/setroubleshoot:/sbin/nologin
sshd:x:74:74:Privilege-separated SSH:/var/empty/sshd:/sbin/nologin
chrony:x:992:988::/var/lib/chrony:/sbin/nologin
tcpdump:x:72:72::/:/sbin/nologin
trainee:x:1000:1000:trainee:/home/trainee:/bin/bash
cockpit-wsinstance:x:991:987:User for cockpit-ws instances:/nonexisting:/sbin/nologin
rngd:x:990:986:Random Number Generator Daemon:/var/lib/rngd:/sbin/nologin
gluster:x:989:985:GlusterFS daemons:/run/gluster:/sbin/nologin
qemu:x:107:107:qemu user:/:/sbin/nologin
rpc:x:32:32:Rpcbind Daemon:/var/lib/rpcbind:/sbin/nologin
rpcuser:x:29:29:RPC Service User:/var/lib/nfs:/sbin/nologin
```

```
saslauth:x:988:76:Saslauthd user:/run/saslauthd:/sbin/nologin
radvd:x:75:75:radvd user:/:/sbin/nologin
dnsmasq:x:983:983:Dnsmasq DHCP and DNS server:/var/lib/dnsmasq:/sbin/nologin
```

Both x and y can accept multipliers:

```
[root@redhat9 tmp]# tail -c 1b /etc/passwd
nstances:/nonexisting:/sbin/nologin
rngd:x:990:986:Random Number Generator Daemon:/var/lib/rngd:/sbin/nologin
gluster:x:989:985:GlusterFS daemons:/run/gluster:/sbin/nologin
qemu:x:107:107:qemu user:/:/sbin/nologin
rpc:x:32:32:Rpcbind Daemon:/var/lib/rpcbind:/sbin/nologin
rpcuser:x:29:29:RPC Service User:/var/lib/nfs:/sbin/nologin
saslauth:x:988:76:Saslauthd user:/run/saslauthd:/sbin/nologin
radvd:x:75:75:radvd user:/:/sbin/nologin
dnsmasq:x:983:983:Dnsmasq DHCP and DNS server:/var/lib/dnsmasq:/sbin/nologin

[root@redhat9 tmp]# tail -c 512 /etc/passwd
nstances:/nonexisting:/sbin/nologin
rngd:x:990:986:Random Number Generator Daemon:/var/lib/rngd:/sbin/nologin
gluster:x:989:985:GlusterFS daemons:/run/gluster:/sbin/nologin
qemu:x:107:107:qemu user:/:/sbin/nologin
rpc:x:32:32:Rpcbind Daemon:/var/lib/rpcbind:/sbin/nologin
rpcuser:x:29:29:RPC Service User:/var/lib/nfs:/sbin/nologin
saslauth:x:988:76:Saslauthd user:/run/saslauthd:/sbin/nologin
radvd:x:75:75:radvd user:/:/sbin/nologin
dnsmasq:x:983:983:Dnsmasq DHCP and DNS server:/var/lib/dnsmasq:/sbin/nologin
```

The common multipliers are:

Multiplier	**Number of bytes**
b	512
KB	1000
K	1024

Multiplier	Number of bytes
MB	1000*1000
M	1024*1024
GB	1000*1000*1000
G	1024*1024*1024

A useful switch to use with the tail command is **-f**. This switch continually updates the output:

```
[root@redhat9 tmp]# tail -f /var/log/messages
Sep 25 15:59:09 redhat9 systemd[1]: packagekit.service: Consumed 27.056s CPU time.
Sep 25 16:21:00 redhat9 systemd[1]: Started /usr/bin/systemctl start man-db-cache-update.
Sep 25 16:21:00 redhat9 systemd[1]: Starting man-db-cache-update.service...
Sep 25 16:21:01 redhat9 systemd[1]: Starting PackageKit Daemon...
Sep 25 16:21:01 redhat9 systemd[1]: Started PackageKit Daemon.
Sep 25 16:21:01 redhat9 dbus-broker[743]: A security policy denied :1.25 to send method call
/org/freedesktop/PackageKit:org.freedesktop.DBus.Properties.GetAll to :1.99.
Sep 25 16:21:04 redhat9 systemd[1]: man-db-cache-update.service: Deactivated successfully.
Sep 25 16:21:04 redhat9 systemd[1]: Finished man-db-cache-update.service.
Sep 25 16:21:04 redhat9 systemd[1]: run-r92bee130695b430689098f98ad81e47d.service: Deactivated successfully.
Sep 25 16:26:07 redhat9 systemd[1]: packagekit.service: Deactivated successfully.
^C
```

Command Line Switches

To do : Use the **–help** option of the **head** command to view the command line switches.

LAB #8 - Use the grep, tr and cut to extract your IPv4 address from the output of ifconfig

```
[root@redhat9 tmp]# ifconfig ens18
```

```
ens18: flags=4163<UP,BROADCAST,RUNNING,MULTICAST>  mtu 1500
        inet 10.0.2.101  netmask 255.255.255.0  broadcast 10.0.2.255
        inet6 fe80::9086:d7ff:fe66:e75a  prefixlen 64  scopeid 0x20<link>
        ether 92:86:d7:66:e7:5a  txqueuelen 1000  (Ethernet)
        RX packets 63639  bytes 160337691 (152.9 MiB)
        RX errors 0  dropped 0  overruns 0  frame 0
        TX packets 52302  bytes 7554310 (7.2 MiB)
        TX errors 0  dropped 0 overruns 0  carrier 0  collisions 0

[root@redhat9 tmp]# ifconfig ens18 | grep "inet"
        inet 10.0.2.101  netmask 255.255.255.0  broadcast 10.0.2.255
        inet6 fe80::9086:d7ff:fe66:e75a  prefixlen 64  scopeid 0x20<link>

[root@redhat9 tmp]# ifconfig ens18 | grep "inet" | grep -v "inet6"
        inet 10.0.2.101  netmask 255.255.255.0  broadcast 10.0.2.255

[root@redhat9 tmp]# ifconfig ens18 | grep "inet" | grep -v "inet6" | tr -s " " ":"
:inet:10.0.2.101:netmask:255.255.255.0:broadcast:10.0.2.255

[root@redhat9 tmp]# ifconfig ens18 | grep "inet" | grep -v "inet6" | tr -s " " ":" | cut -d: -f3
10.0.2.101
```

Important : Note the use of the **-s** switch with the **tr** command. This switch replaces a string of x identical characters with a single character.

LAB #9 - Use the grep, awk and sed to extract your IPv4 address from the output of ip

```
[root@redhat9 tmp]# ip addr show ens18
2: ens18: <BROADCAST,MULTICAST,UP,LOWER_UP> mtu 1500 qdisc fq_codel state UP group default qlen 1000
    link/ether 92:86:d7:66:e7:5a brd ff:ff:ff:ff:ff:ff
```

```
    altname enp0s18
    inet 10.0.2.101/24 brd 10.0.2.255 scope global noprefixroute ens18
       valid_lft forever preferred_lft forever
    inet6 fe80::9086:d7ff:fe66:e75a/64 scope link noprefixroute
       valid_lft forever preferred_lft forever

[root@redhat9 tmp]# ip addr show ens18 | grep "inet"
    inet 10.0.2.101/24 brd 10.0.2.255 scope global noprefixroute ens18
    inet6 fe80::9086:d7ff:fe66:e75a/64 scope link noprefixroute

[root@redhat9 tmp]# ip addr show ens18 | grep "inet" | grep -v "inet6"
    inet 10.0.2.101/24 brd 10.0.2.255 scope global noprefixroute ens18

[root@redhat9 tmp]# ip addr show ens18 | grep "inet" | grep -v "inet6" | awk '{ print $2; }'
10.0.2.101/24

[root@redhat9 tmp]# ip addr show ens18 | grep "inet" | grep -v "inet6" | awk '{ print $2; }' | sed 's/\/.*$//'
10.0.2.101
```
