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Basic Shell Commands and Text Manipulation Tools

[stextbox id='black' image='null'] **To do** - You are currently the root user in your terminal. Before proceeding further, type **exit** and hit the ↵ Enter key. [/stextbox]

Use of Basic Shell Commands

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:

```
trainee@SLES12SP1:~> stty -a
speed 38400 baud; rows 24; columns 80; 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; flush = ^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
```

[stextbox id='black' image='null'] The two most important combinations are **intr = ^C** and **susp = ^Z**. The former kills the process whilst the latter suspends its execution. [/stextbox]

Command Line Switches

[stextbox id='black' image='null'] **To do** : Use the **–help** option of the **stty** command to view the command line switches. [/stextbox]

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@SLES12SP1:~> date
Fri 30 Sep 15:19:54 CEST 2016
```

Command Line Switches

[stextbox id='black' image='null'] **To do** : Use the **–help** option of the **date** command to view the command line switches. [/stextbox]

The who Command

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

```
trainee@SLES12SP1:~> who
trainee  pts/0        2016-09-30 10:24 (10.0.2.2)
```

Command Line Switches

[stextbox id='black' image='null'] **To do** : Use the **–help** option of the **who** command to view the command line switches. [/stextbox]

The df Command

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

```
trainee@SLES12SP1:~> df
Filesystem     1K-blocks    Used Available Use% Mounted on
/dev/sda2       18867200 3510848  15185952  19% /
devtmpfs          188376       0    188376   0% /dev
tmpfs             197260       0    197260   0% /dev/shm
tmpfs             197260    5716    191544   3% /run
tmpfs             197260       0    197260   0% /sys/fs/cgroup
/dev/sda2       18867200 3510848  15185952  19% /.snapshots
/dev/sda2       18867200 3510848  15185952  19% /var/lib/mariadb
/dev/sda2       18867200 3510848  15185952  19% /var/lib/libvirt/images
/dev/sda2       18867200 3510848  15185952  19% /var/lib/mailman
/dev/sda2       18867200 3510848  15185952  19% /var/tmp
/dev/sda2       18867200 3510848  15185952  19% /var/lib/pgsql
/dev/sda2       18867200 3510848  15185952  19% /usr/local
/dev/sda2       18867200 3510848  15185952  19% /tmp
/dev/sda2       18867200 3510848  15185952  19% /var/spool
/dev/sda2       18867200 3510848  15185952  19% /srv
/dev/sda2       18867200 3510848  15185952  19% /var/opt
/dev/sda2       18867200 3510848  15185952  19% /opt
/dev/sda2       18867200 3510848  15185952  19% /var/log
/dev/sda2       18867200 3510848  15185952  19% /var/lib/mysql
/dev/sda2       18867200 3510848  15185952  19% /home
/dev/sda2       18867200 3510848  15185952  19% /var/crash
/dev/sda2       18867200 3510848  15185952  19% /var/lib/named
/dev/sda2       18867200 3510848  15185952  19% /boot/grub2/x86_64-efi
/dev/sda2       18867200 3510848  15185952  19% /boot/grub2/i386-pc
```

The units are shown as **blocks**. In order to **humanize** the output, it is possible to use the **-h** switch (also known as a **parameter**, **option** or **flag**):

```
trainee@SLES12SP1:~> df -h
Filesystem      Size  Used Avail Use% Mounted on
/dev/sda2        18G  3.4G   15G  19% /
devtmpfs        184M     0  184M   0% /dev
tmpfs           193M     0  193M   0% /dev/shm
tmpfs           193M  5.6M  188M   3% /run
tmpfs           193M     0  193M   0% /sys/fs/cgroup
/dev/sda2        18G  3.4G   15G  19% /.snapshots
/dev/sda2        18G  3.4G   15G  19% /var/lib/mariadb
/dev/sda2        18G  3.4G   15G  19% /var/lib/libvirt/images
/dev/sda2        18G  3.4G   15G  19% /var/lib/mailman
/dev/sda2        18G  3.4G   15G  19% /var/tmp
/dev/sda2        18G  3.4G   15G  19% /var/lib/pgsql
/dev/sda2        18G  3.4G   15G  19% /usr/local
/dev/sda2        18G  3.4G   15G  19% /tmp
/dev/sda2        18G  3.4G   15G  19% /var/spool
/dev/sda2        18G  3.4G   15G  19% /srv
/dev/sda2        18G  3.4G   15G  19% /var/opt
/dev/sda2        18G  3.4G   15G  19% /opt
/dev/sda2        18G  3.4G   15G  19% /var/log
/dev/sda2        18G  3.4G   15G  19% /var/lib/mysql
/dev/sda2        18G  3.4G   15G  19% /home
/dev/sda2        18G  3.4G   15G  19% /var/crash
/dev/sda2        18G  3.4G   15G  19% /var/lib/named
/dev/sda2        18G  3.4G   15G  19% /boot/grub2/x86_64-efi
/dev/sda2        18G  3.4G   15G  19% /boot/grub2/i386-pc
```

Command Line Switches

[stextbox id='black' image='null'] **To do** : Use the **–help** option of the **df** command to view the command line switches. [/stextbox]

The free Command

This command's output shows the memory usage:

```
trainee@SLES12SP1:~> free
             total       used       free     shared    buffers     cached
Mem:        394524     385872       8652       5120        452     296176
-/+ buffers/cache:      89244     305280
Swap:      2103292        600    2102692
```

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

```
trainee@SLES12SP1:~> free -h
             total       used       free     shared    buffers     cached
Mem:          385M       376M       8.4M       5.0M       452K       289M
-/+ buffers/cache:        87M       298M
Swap:         2.0G       600K       2.0G
```

Command Line Switches

[stextbox id='black' image='null'] **To do** : Use the **–help** option of the **free** command to view the command line switches. [/stextbox]

The whoami Command

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

```
trainee@SLES12SP1:~> whoami
trainee
```

Now become the system administrator **root**:

```
trainee@SLES12SP1:~> su -
Password: fenestros
SLES12SP1:~ #
```

[stextbox id='black' image='null'] **Important** : Note that the password will not be visible. [/stextbox]

Now use the **whoami** command again:

```
SLES12SP1:~ # whoami
root
SLES12SP1:~ #
```

[stextbox id='black' image='null'] **Important** : Note the current effective user ID is root. [/stextbox]

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

```
SLES12SP1:~ # exit
logout
trainee@SLES12SP1:~>
```

Command Line Switches

[stextbox id='black' image='null'] **To do** : Use the **–help** option of the **whoami** command to view the command line switches. [/stextbox]

The pwd Command

This command's output shows the current working directory:

```
trainee@SLES12SP1:~> pwd
/home/trainee
```

Command Line Switches

[stextbox id='black' image='null'] **To do** : Use the **help** command with **pwd** option to view the command line switches. [/stextbox]

The cd Command

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

```
trainee@SLES12SP1:~> cd /tmp
trainee@SLES12SP1:/tmp> pwd
/tmp
trainee@SLES12SP1:/tmp>
```

Command Line Switches

[stextbox id='black' image='null'] **To do** : Use the **help** command with **cd** option to view the command line switches. [/stextbox]

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@SLES12SP1:/tmp> ls
hsperfdata_root
inode
managera141126784165771523 5client
managera3336001029897679475server
managera484793894223296 4844client
managera5050357016347721452server
```

```
systemd-private-04f820fa26c745be8ddba814c6292f21-rtkit-daemon.service-o4lKP5
systemicontmp5578677472245134133dat
systemicontmp708239220502080 2884dat
```

Command Line Switches

[stextbox id='black' image='null'] **To do** : Use the **–help** option of the **ls** command to view the command line switches. [/stextbox]

The lsof Command

This command's output shows information about open files:

```
trainee@SLES12SP1:/tmp> su -
Password:
SLES12SP1:~ # lsof | more
COMMAND     PID  TID       USER   FD      TYPE             DEVICE SIZE/OFF       NODE NAME
systemd       1            root  cwd       DIR               0,34      156        256 /
systemd       1            root  rtd       DIR               0,34      156        256 /
systemd       1            root  txt       REG               0,34  1218976      74832 /usr/lib/systemd/systemd
systemd       1            root  mem       REG               0,34    18904      23416 /lib64/libdl-2.19.so
systemd       1            root  mem       REG               0,34   416064      24152 /usr/lib64/libpcre.so.1.2.1
systemd       1            root  mem       REG               0,34  1974416      23410 /lib64/libc-2.19.so
systemd       1            root  mem       REG               0,34   137440      23438 /lib64/libpthread-2.19.so
systemd       1            root  mem       REG               0,34    42672      23442 /lib64/librt-2.19.so
systemd       1            root  mem       REG               0,34   150128      24032
/usr/lib64/libseccomp.so.2.1.0
systemd       1            root  mem       REG               0,34    43960      25095 /lib64/libapparmor.so.1.0.4
systemd       1            root  mem       REG               0,34    84864      24581 /usr/lib64/libkmod.so.2.2.7
systemd       1            root  mem       REG               0,34    18976      24919 /lib64/libcap.so.2.22
systemd       1            root  mem       REG               0,34   100312      24963
/usr/lib64/libaudit.so.1.0.0
```

```
systemd       1            root  mem       REG                0,34    60096      59333 /lib64/libpam.so.0.83.1
systemd       1            root  mem       REG                0,34    40880      23873 /lib64/libwrap.so.0.7.6
systemd       1            root  mem       REG                0,34   138792      25858 /lib64/libselinux.so.1
systemd       1            root  mem       REG                0,34   158192      23402 /lib64/ld-2.19.so
systemd       1            root    0u      CHR                 1,3      0t0       4298 /dev/null
systemd       1            root    1u      CHR                 1,3      0t0       4298 /dev/null
systemd       1            root    2u      CHR                 1,3      0t0       4298 /dev/null
systemd       1            root    3r     0000                0,10        0       4268 anon_inode
systemd       1            root    4u     0000                0,10        0       4268 anon_inode
--More--
```

Command Line Switches

[stextbox id='black' image='null'] **To do** : Use the **–help** option of the **lsof** command to view the command line switches. [/stextbox]

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:

```
SLES12SP1:~ # exit
logout
trainee@SLES12SP1:/tmp> touch test
trainee@SLES12SP1:/tmp> ls
hsperfdata_root
inode
managera141126784165771523 5client
managera333600102989767947 5server
managera484793894223296484 4client
managera505035701634772145 2server
systemd-private-04f820fa26c745be8ddba814c6292f21-rtkit-daemon.service-o4lKP5
```

```
systemicontmp557867747224513413 3dat
systemicontmp708239220502080288 4dat
test
```

Command Line Switches

[stextbox id='black' image='null'] **To do** : Use the **–help** option of the **touch** command to view the command line switches. [/stextbox]

The echo Command

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

```
trainee@SLES12SP1:/tmp> echo fenestros
fenestros
```

Command Line Switches

[stextbox id='black' image='null'] **To do** : Use the **help** command with **echo** option to view the command line switches. [/stextbox]

The cp Command

This command is used to copy a source to a destination or multiple sources to a directory:

```
trainee@SLES12SP1:/tmp> cp test ~
trainee@SLES12SP1:/tmp> ls -l ~
total 4
drwxr-xr-x 1 trainee users   0 May  1 15:58 bin
drwxr-xr-x 1 trainee users   0 May  2 16:11 Desktop
drwxr-xr-x 1 trainee users   0 May  2 16:11 Documents
```

```
drwxr-xr-x 1 trainee users   0 May  2 16:11 Downloads
drwxr-xr-x 1 trainee users   0 May  2 16:11 Music
drwxr-xr-x 1 trainee users   0 May  2 16:11 Pictures
drwxr-xr-x 1 trainee users   0 May  2 16:11 Public
drwxr-xr-x 1 trainee users  20 May  1 15:58 public_html
drwxr-xr-x 1 trainee users   0 May  2 16:11 Templates
-rw-r--r-- 1 trainee users   0 Oct  1 06:01 test
drwxr-xr-x 1 trainee users   0 May  2 16:11 Videos
-rw-r--r-- 1 trainee users 391 Sep 30 10:27 vitext
```

[stextbox id='black' image='null'] 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**. [/stextbox]

Command Line Switches

[stextbox id='black' image='null'] **To do** : Use the **–help** option of the **cp** command to view the command line switches. [/stextbox]

The file Command

This command determines a file type:

```
trainee@SLES12SP1:/tmp> file ~/test
/home/trainee/test: empty
```

[stextbox id='black' image='null'] **Important** - Note that in the case of the first line of the above output, tha command **file** is incapable of informing you of the type of file since **test** is empty. [/stextbox]

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

```
trainee@SLES12SP1:/tmp> echo "fenestros" > ~/test
```

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

```
trainee@SLES12SP1:/tmp> file ~/test
/home/trainee/test: ASCII text
```

Command Line Switches

[stextbox id='black' image='null'] **To do** : Use the **–help** option of the **file** command to view the command line switches. [/stextbox]

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@SLES12SP1:/tmp> cat ~/test
fenestros
```

Command Line Switches

[stextbox id='black' image='null'] **To do** : Use the **–help** option of the **cat** command to view the command line switches. [/stextbox]

The mv Command

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

```
trainee@SLES12SP1:/tmp> mv test TeSt
trainee@SLES12SP1:/tmp> ls -l
total 12
```

```
drwxr-xr-x 1 root    root      8 Sep 30 10:26 hsperfdata_root
drwxr-xr-x 1 trainee users    48 Aug 18 13:14 inode
-rwxrwxrwx 1 root    root  50048 May  3 14:01 managera141126784165771523 5client
-rwxrwxrwx 1 root    root  50048 May  3 14:01 managera3336001029897679475server
-rwxrwxrwx 1 root    root  50048 May  3 14:01 managera484793894223296 4844client
-rwxrwxrwx 1 root    root  50048 May  3 14:01 managera5050357016347721452server
drwx------ 1 root    root      6 May  3 13:54 systemd-private-04f820fa26c745be8ddba814c6292f21-rtkit-
daemon.service-o4lKP5
-rw-r--r-- 1 root    root      0 May  3 14:01 systemicontmp5578677472245134133dat
drwxr-xr-x 1 root    root      0 May  3 14:01 systemicontmp708239220502080 2884dat
-rw-r--r-- 1 trainee users    10 Oct  1 06:06 TeSt
```

[stextbox id='black' image='null'] Note the use of the shortcut **.** which indicates the current working directory. [/stextbox]

Command Line Switches

[stextbox id='black' image='null'] **To do** : Use the **–help** option of the **mv** command to view the command line switches. [/stextbox]

The mkdir Command

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

```
trainee@SLES12SP1:/tmp> cd ~
trainee@SLES12SP1:~> mkdir testdir
trainee@SLES12SP1:~> ls
bin      Documents  Music     Public       Templates  Videos
Desktop  Downloads  Pictures  public_html  testdir    vitext
```

Command Line Switches

[stextbox id='black' image='null'] **To do** : Use the **–help** option of the **mkdir** command to view the command line switches. [/stextbox]

The rmdir Command

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

```
trainee@SLES12SP1:~> rmdir testdir
trainee@SLES12SP1:~> ls
bin      Documents  Music     Public       Templates  vitext
Desktop  Downloads  Pictures  public_html  Videos
```

Command Line Switches

[stextbox id='black' image='null'] **To do** : Use the **–help** option of the **rmdir** command to view the command line switches. [/stextbox]

The rm Command

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

```
trainee@SLES12SP1:~> mkdir testdir1
trainee@SLES12SP1:~> cd /tmp
trainee@SLES12SP1:/tmp> echo "fenestros" > TeSt
trainee@SLES12SP1:/tmp> cd ~
trainee@SLES12SP1:~> mv /tmp/TeSt ~/testdir1
trainee@SLES12SP1:~> ls -lR testdir1/
testdir1/:
total 4
-rw-r--r-- 1 trainee users 10 Oct  1 06:47 TeSt
trainee@SLES12SP1:~> rmdir testdir1/
rmdir: failed to remove ‘testdir1/’: Directory not empty
```

```
trainee@SLES12SP1:~> rm -rf testdir1/
trainee@SLES12SP1:~> ls
bin      Documents  Music     Public       Templates  vitext
Desktop  Downloads  Pictures  public_html  Videos
```

Command Line Switches

[stextbox id='black' image='null'] **To do** : Use the **–help** option of the **rm** command to view the command line switches. [/stextbox]

The sort Command

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

```
trainee@SLES12SP1:~> ls | sort
aac
abc
bca
bin
Desktop
Documents
Downloads
Music
Pictures
Public
public_html
Templates
Videos
vitext
xyz
trainee@SLES12SP1:~> ls | sort -r
xyz
```

```
vitext
Videos
Templates
public_html
Public
Pictures
Music
Downloads
Documents
Desktop
bin
bca
abc
aac
```

[stextbox id='black' image='null'] **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. [/stextbox]

Command Line Switches

[stextbox id='black' image='null'] **To do** : Use the **–help** option of the **sort** command to view the command line switches. [/stextbox]

The more Command

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

```
trainee@SLES12SP1:~> more /etc/services
#
# Network services, Internet style
#
# 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.
#
# This list could be found on:
#            http://www.iana.org/assignments/service-names-port-numbers/service-names-port-numbe
rs.xml
#
# See also: services(5)
#
#
# SERVICE NAME AND TRANSPORT PROTOCOL PORT NUMBER REGISTRY
#
# (last updated on 2011-11-23)
#
# ******************************************************************
# * Since we merged and converted this registry it loads more slowly. We *
# * know it should load faster and are working on ways to achieve that.  *
# * Thank you for your patience.                                         *
# ******************************************************************
#
--More--(0%)
```

[stextbox id='black' image='null'] **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. [/stextbox]

Command Line Switches

[stextbox id='black' image='null'] **To do** : Use the **–help** option of the **more** command to view the command line switches. [/stextbox]

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@SLES12SP1:~> less /etc/services
#
# Network services, Internet style
#
# 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.
#
# This list could be found on:
#            http://www.iana.org/assignments/service-names-port-numbers/service-names-port-numbers.xml
#
# See also: services(5)
#
#
# SERVICE NAME AND TRANSPORT PROTOCOL PORT NUMBER REGISTRY
#
# (last updated on 2011-11-23)
#
# ******************************************************************
# * Since we merged and converted this registry it loads more slowly. We *
# * know it should load faster and are working on ways to achieve that.  *
# * Thank you for your patience.                                         *
# ******************************************************************
/etc/services lines 1-22/16228 0%
```

Command Line Switches

[stextbox id='black' image='null'] **To do** : Use the **–help** option of the **less** command to view the command line switches. [/stextbox]

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@SLES12SP1:~> find acc
find: ‘acc’: No such file or directory
trainee@SLES12SP1:~> find aac
aac
```

[stextbox id='black' image='null'] **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. [/stextbox]

Command Line Switches

[stextbox id='black' image='null'] **To do** : Use the **–help** option of the **find** command to view the command line switches. [/stextbox]

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@SLES12SP1:~> su -
Password: fenestros
```

[stextbox id='black' image='null'] **Important** : Note that the password will not be visible. [/stextbox]

Command Line Switches

[stextbox id='black' image='null'] **To do** : Use the **–help** option of the **su** command to view the command line switches. [/stextbox]

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**:

```
SLES12SP1:~ # ls -l /var/lib/mlocate/mlocate.db
-rw-r--r-- 1 root root 3804323 Sep 30 10:30 /var/lib/mlocate/mlocate.db
```

[stextbox id='black' image='null'] **Important** : For information concerning the database format, please see **man 5 locatedb**. [/stextbox]

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

```
SLES12SP1:~ # cat /etc/updatedb.conf
# /etc/updatedb.conf: config file for mlocate

# This file sets variables that are used by updatedb.
# For more info, see the updatedb.conf(5) manpage.

# Filesystems that are pruned from updatedb database
PRUNEFS="afs anon_inodefs auto autofs bdev binfmt binfmt_misc cgroup cifs coda configfs cramfs cpuset debugfs
devfs devpts devtmps ecryptfs eventpollfs exofs futexfs ftpfs fuse fusectl gfs gfs2 hostfs hugetlbfs inotifyfs
iso9660 jffs2 lustre misc mqueue ncpfs nfs NFS nfs4 nfsd nnpfs ocfs ocfs2 pipefs proc ramfs rpc_pipefs securityfs
selinuxfs sfs shfs smbfs sockfs spufs sshfs subfs supermount sysfs tmpfs ubifs udf usbfs vboxsf vperfctrfs"

# Paths which are pruned from updatedb database
PRUNEPATHS="/tmp /var/tmp /var/cache /var/lock /var/run /var/spool /mnt /cdrom /usr/tmp /proc /media /sys
/.snapshots /var/run/media"

# Folder names that are pruned from updatedb database
PRUNENAMES=".git .hg .svn CVS"
```

```
# Skip bind mounts.
PRUNE_BIND_MOUNTS="yes"
```

Use of these two commands is very simple:

```
SLES12SP1:~ # locate aac
/lib/modules/3.12.49-11-default/kernel/drivers/scsi/aacraid
/lib/modules/3.12.49-11-default/kernel/drivers/scsi/aacraid/aacraid.ko
/usr/share/YaST2/scrconf/aaconf.scr
/usr/share/mime/audio/aac.xml
```

Command Line Switches

[stextbox id='black' image='null'] **To do** : Use the **–help** option of the **updatedb** and **locate** commands to view their command line switches. [/stextbox]

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:

```
SLES12SP1:~ # whereis passwd
passwd: /usr/bin/passwd /etc/passwd /etc/passwd.YaST2save /usr/share/man/man1/passwd.1ssl.gz
/usr/share/man/man1/passwd.1.gz /usr/share/man/man5/passwd.5.gz
```

Command Line Switches

[stextbox id='black' image='null'] **To do** : Use the **–help** option of the **whereis** command to view the command line switches. [/stextbox]

The which Command

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

```
SLES12SP1:~ # which passwd
/usr/bin/passwd
```

Command Line Switches

[stextbox id='black' image='null'] **To do** : Use the **–help** option of the **which** command to view the command line switches. [/stextbox]

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:

```
SLES12SP1:~ # uptime
 07:48am  up  21:25,  1 user,  load average: 0.10, 0.05, 0.05
```

Command Line Switches

The switches associated with this command are:

[stextbox id='black' image='null'] **To do** : Use the **–help** option of the **uptime** command to view the command line switches. [/stextbox]

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**:

```
SLES12SP1:~ # w
 07:57:55 up 21:34,  1 user,  load average: 0.00, 0.03, 0.05
USER     TTY      FROM             LOGIN@   IDLE   JCPU   PCPU WHAT
trainee  pts/0    10.0.2.2         04:09    0.00s  0.12s  0.00s 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

[stextbox id='black' image='null'] **To do** : Use the **–help** option of the **w** command to view the command line switches. [/stextbox]

The uname Command

This command prints system information to the standard output:

```
SLES12SP1:~ # uname -a
Linux SLES12SP1 3.12.49-11-default #1 SMP Wed Nov 11 20:52:43 UTC 2015 (8d714a0) x86_64 x86_64 x86_64 GNU/Linux
SLES12SP1:~ # uname -s
Linux
SLES12SP1:~ # uname -n
SLES12SP1
SLES12SP1:~ # uname -r
3.12.49-11-default
SLES12SP1:~ # uname -v
#1 SMP Wed Nov 11 20:52:43 UTC 2015 (8d714a0)
SLES12SP1:~ # uname -m
```

```
x86_64
SLES12SP1:~ # uname -p
x86_64
SLES12SP1:~ # uname -i
x86_64
SLES12SP1:~ # uname -o
GNU/Linux
```

Command Line Switches

[stextbox id='black' image='null'] **To do** : Use the **–help** option of the **uname** command to view the command line switches. [/stextbox]

The du Command

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

```
SLES12SP1:~ # du -sh /* 2>/dev/null
5.1M    /bin
44M /boot
0   /dev
19M /etc
216K    /home
190M    /lib
16M /lib64
0   /mnt
151M    /opt
0   /proc
6.1M    /root
5.4M    /run
11M /sbin
0   /selinux
```

```
64K /srv
0   /sys
60K /tmp
2.6G    /usr
133M    /var
```

[stextbox id='black' image='null'] **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. [/stextbox]

Command Line Switches

[stextbox id='black' image='null'] **To do** : Use the **–help** option of the **du** command to view the command line switches. [/stextbox]

The clear Command

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

```
SLES12SP1:~ # clear

SLES12SP1:~ #
```

The exit Command

This command exits the current shell:

```
SLES12SP1:~ # exit
logout
trainee@SLES12SP1:~>
```

Command Line Switches

[stextbox id='black' image='null'] **To do** : Use the **help** command with **exit** option to view the command line switches. [/stextbox]

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

[stextbox id='black' image='null'] **To do** : Use the **help** command with **logout** option to view the command line switches. [/stextbox]

The sleep Command

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

Command Line Switches

[stextbox id='black' image='null'] **To do** : Use the **–help** option of the **sleep** command to view the command line switches. [/stextbox]

The wall Command

wall displays a message, or the contents of a file, or otherwise its standard input, on the terminals of all currently logged in users.The command will wrap lines that are longer than 79 characters. Short lines are whitespace padded to have 79 characters. The command will always put a carriage return and new line at the end of each line. Only the superuser can write on the terminals of users who have chosen to deny messages or are using a program which automatically denies messages. Reading from a file is refused when the invoker is not superuser and the program is suid or sgid.

Start a second session as trainee via ssh on your VM. Return to your first session as root and type :

```
trainee@SLES12SP1:~> su -
Password: fenestros
SLES12SP1:~ # wall this is a message from root
Broadcast message from trainee@SLES12SP1 (pts/1) (Sat Oct  1 18:39:50 2016):
this is a message from root
SLES12SP1:~ #
```

In the second session you should see the following message :

```
Broadcast message from trainee@SLES12SP1 (pts/1) (Sat Oct  1 18:39:50 2016):
this is a message from root
```

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 :

```
SLES12SP1:~ # seq 10
1
2
3
4
5
6
7
8
```

```
9
10
SLES12SP1:~ # seq 20 30
20
21
22
23
24
25
26
27
28
29
30
SLES12SP1:~ # seq 20 10 90
20
30
40
50
60
70
80
90
SLES12SP1:~ #
```

Command Line Switches

[stextbox id='black' image='null'] **To do** : Use the **–help** option of the **seq** command to view the command line switches. [/stextbox]

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.

```
SLES12SP1:~ # which screen
/usr/bin/screen
```

Create a session with screen:

```
SLES12SP1:~ # 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:

```
SLES12SP1:~ # screen -ls
There is a screen on:
        11827.mysession (Attached)
1 Socket in /var/run/screens/S-root.
```

Now enter the following commands:

```
SLES12SP1:~ # sleep 9999 &
[1] 19879
SLES12SP1:~ # jobs
[1]+  Running                 sleep 9999 &
SLES12SP1:~ #
```

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

```
[detached from 11827.mysession]
```

```
SLES12SP1:~ #
```

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

```
SLES12SP1:~ # screen -r
```

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

```
SLES12SP1:~ # jobs
[1]+  Running                 sleep 9999 &
```

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:

```
[detached from 11827.mysession]
SLES12SP1:~ #
```

Now create a new, non-nested screen:

```
SLES12SP1:~ # screen -S mysession1
```

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

```
SLES12SP1:~ # screen -ls
There are screens on:
        26655.mysession1        (Attached)
        11827.mysession (Detached)
2 Sockets in /var/run/screens/S-root.
```

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

```
SLES12SP1:~ # screen -r 11827
```

Finally, check out what has happened:

```
SLES12SP1:~ # sleep 9999 &
[1] 19879
SLES12SP1:~ # jobs
[1]+  Running                 sleep 9999 &
SLES12SP1:~ # jobs
[1]+  Running                 sleep 9999 &
SLES12SP1:~ # screen -ls
There are screens on:
        26655.mysession1        (Attached)
        11827.mysession (Attached)
2 Sockets in /var/run/screens/S-root.
```

Command Line Switches

[stextbox id='black' image='null'] **To do** : Use the **–help** option of the **screen** command to view the command line switches. [/stextbox]

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**:

```
SLES12SP1:~ # ls -lai /tmp
total 8
256 drwxrwxrwt 1 root    root    802 Oct  2 01:00 .
256 drwxr-xr-x 1 root    root    156 May  1 14:55 ..
258 drwxrwxrwt 1 root    root      0 May  3 13:54 .ICE-unix
261 drwxrwxrwt 1 root    root      0 May  2 15:56 .Test-unix
257 drwxrwxrwt 1 root    root      0 May  3 13:53 .X11-unix
259 drwxrwxrwt 1 root    root      0 May  2 15:56 .XIM-unix
373 drwx------ 1 trainee users    12 May  3 13:54 .esd-1000
279 drwx------ 1 gdm     gdm       0 May  3 13:54 .esd-486
260 drwxrwxrwt 1 root    root      0 May  2 15:56 .font-unix
502 srw------- 1 root    root      0 Sep 30 10:26 .java_pid2399
462 srw------- 1 root    root      0 Aug 18 12:48 .java_pid2546
448 srw------- 1 root    root      0 May  3 14:01 .java_pid3281
403 drwxr-xr-x 1 root    root      8 Sep 30 10:26 hsperfdata_root
488 drwxr-xr-x 1 trainee users    48 Aug 18 13:14 inode
444 -rwxrwxrwx 1 root    root  50048 May  3 14:01 managera141126784165771523 5client
439 -rwxrwxrwx 1 root    root  50048 May  3 14:01 managera333600102989767947 5server
440 -rwxrwxrwx 1 root    root  50048 May  3 14:01 managera484793894223296484 4client
443 -rwxrwxrwx 1 root    root  50048 May  3 14:01 managera505035701634772145 2server
388 drwx------ 1 root    root      6 May  3 13:54 systemd-private-04f820fa26c745be8ddba814c6292f21-rtkit-
daemon.service-o4lKP5
427 -rw-r--r-- 1 root    root      0 May  3 14:01 systemicontmp5578677472245134133dat
426 drwxr-xr-x 1 root    root      0 May  3 14:01 systemicontmp708239220502080288 4dat
SLES12SP1:~ # ls -ali /tmp
total 8
256 drwxrwxrwt 1 root    root    802 Oct  2 01:00 .
256 drwxr-xr-x 1 root    root    156 May  1 14:55 ..
258 drwxrwxrwt 1 root    root      0 May  3 13:54 .ICE-unix
261 drwxrwxrwt 1 root    root      0 May  2 15:56 .Test-unix
257 drwxrwxrwt 1 root    root      0 May  3 13:53 .X11-unix
```

```
259 drwxrwxrwt 1 root    root      0 May  2 15:56 .XIM-unix
373 drwx------ 1 trainee users    12 May  3 13:54 .esd-1000
279 drwx------ 1 gdm     gdm       0 May  3 13:54 .esd-486
260 drwxrwxrwt 1 root    root      0 May  2 15:56 .font-unix
502 srw------- 1 root    root      0 Sep 30 10:26 .java_pid2399
462 srw------- 1 root    root      0 Aug 18 12:48 .java_pid2546
448 srw------- 1 root    root      0 May  3 14:01 .java_pid3281
403 drwxr-xr-x 1 root    root      8 Sep 30 10:26 hsperfdata_root
488 drwxr-xr-x 1 trainee users    48 Aug 18 13:14 inode
444 -rwxrwxrwx 1 root    root  50048 May  3 14:01 managera14112678416577152 35client
439 -rwxrwxrwx 1 root    root  50048 May  3 14:01 managera3336001029897679475server
440 -rwxrwxrwx 1 root    root  50048 May  3 14:01 managera484793894223296 4844client
443 -rwxrwxrwx 1 root    root  50048 May  3 14:01 managera5050357016347721452server
388 drwx------ 1 root    root      6 May  3 13:54 systemd-private-04f820fa26c745be8ddba814c6292f21-rtkit-
daemon.service-o4lKP5
427 -rw-r--r-- 1 root    root      0 May  3 14:01 systemicontmp5578677472245134133dat
426 drwxr-xr-x 1 root    root      0 May  3 14:01 systemicontmp7082392205020802884dat
```

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

```
SLES12SP1:~ # ls -l --all --inode /tmp
total 8
256 drwxrwxrwt 1 root    root    802 Oct  2 01:00 .
256 drwxr-xr-x 1 root    root    156 May  1 14:55 ..
258 drwxrwxrwt 1 root    root      0 May  3 13:54 .ICE-unix
261 drwxrwxrwt 1 root    root      0 May  2 15:56 .Test-unix
257 drwxrwxrwt 1 root    root      0 May  3 13:53 .X11-unix
259 drwxrwxrwt 1 root    root      0 May  2 15:56 .XIM-unix
373 drwx------ 1 trainee users    12 May  3 13:54 .esd-1000
279 drwx------ 1 gdm     gdm       0 May  3 13:54 .esd-486
260 drwxrwxrwt 1 root    root      0 May  2 15:56 .font-unix
502 srw------- 1 root    root      0 Sep 30 10:26 .java_pid2399
462 srw------- 1 root    root      0 Aug 18 12:48 .java_pid2546
448 srw------- 1 root    root      0 May  3 14:01 .java_pid3281
```

```
403 drwxr-xr-x 1 root    root      8 Sep 30 10:26 hsperfdata_root
488 drwxr-xr-x 1 trainee users    48 Aug 18 13:14 inode
444 -rwxrwxrwx 1 root    root  50048 May  3 14:01 managera141126784165771523 5client
439 -rwxrwxrwx 1 root    root  50048 May  3 14:01 managera333600102989767947 5server
440 -rwxrwxrwx 1 root    root  50048 May  3 14:01 managera484793894223296484 4client
443 -rwxrwxrwx 1 root    root  50048 May  3 14:01 managera505035701634772145 2server
388 drwx------ 1 root    root      6 May  3 13:54 systemd-private-04f820fa26c745be8ddba814c6292f21-rtkit-
daemon.service-o4lKP5
427 -rw-r--r-- 1 root    root      0 May  3 14:01 systemicontmp5578677472245134133dat
426 drwxr-xr-x 1 root    root      0 May  3 14:01 systemicontmp7082392205020802884dat

SLES12SP1:~ # ls -l --allinode /tmp
ls: unrecognized option '--allinode'
Try 'ls --help' for more information.
```

[stextbox id='black' image='null'] **Important** - You should **not** combine any short options that take an argument. [/stextbox]

Manipulating Text Files

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

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

Metacharacter	**Description**
^*string*	Match lines beginning with *string*

Metacharacter	Description
*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

Metacharacter	Description
+	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

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

[stextbox id='black' image='null'] **To do** : Use the **–help** option of the **grep** command to view the command line switches. [/stextbox]

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

[stextbox id='black' image='null'] **To do** : Use the **–help** option of the **egrep** command to view the command line switches. [/stextbox]

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.

[stextbox id='black' image='null'] **To do** : Use the **–help** option of the **fgrep** command to view the command line switches. [/stextbox]

LAB #1 - Using grep, egrep and fgrep

Download the following file by clicking on it's title:

greptest

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

Move the file to the **/tmp** directory:

```
SLES12SP1:~ # mv /home/trainee/Downloads/greptest /tmp/greptest
```

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

```
SLES12SP1:~ # 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:

```
SLES12SP1:~ # 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:

```
SLES12SP1:~ # 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:

```
SLES12SP1:~ # grep '^.$' /tmp/greptest
f
£
```

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

```
SLES12SP1:~ # grep '^\.' /tmp/greptest
.fenestros
.fe
```

[stextbox id='black' image='null'] 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”**. [/stextbox]

Download the following file by clicking on it's title:

greptest

```
# Starting comment
fenestrOS
fenestros
# Another comment
555-5555
f

.fenestros

.fe

£
# End comment
```

Move the file to the **/tmp** directory:

```
SLES12SP1:~ # mv /home/trainee/Downloads/greptest /tmp/greptest
```

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

```
SLES12SP1:~ # grep -E -v '^(#|$)' /tmp/greptest
fenestrOS
fenestros
555-5555
f
.fenestros
.fe
£
```

[stextbox id='black' image='null'] The expression **'^(#|$)'** matches all lines beginning with the **#** character OR all lines with zero characters between the start and the end of the line. [/stextbox]

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

```
SLES12SP1:~ # egrep -v '^(#|$)'  /tmp/greptest > /tmp/greptest1
SLES12SP1:~ # cat /tmp/greptest1
fenestrOS
fenestros
555-5555
f
.fenestros
.fe
£
```

[stextbox id='black' image='null'] **Important**: The above command is very useful when you want to quickly ascertain which directives are active in a very long configuration file. [/stextbox]

Download the following file by clicking on it's title:

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
```

Move the file to the **/tmp** directory:

```
SLES12SP1:~ # mv /home/trainee/Downloads/greptest /tmp/greptest
```

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

```
SLES12SP1:~ # 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:

```
SLES12SP1:~ # 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:

```
SLES12SP1:~ # 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

[stextbox id='black' image='null'] **To do** : Use the **–help** option of the **fgrep** command to view the command line switches. [/stextbox]

LAB #2 - Using sed

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

```
SLES12SP1:~ # sed '1,10d' /etc/services | more
# See also: services(5)
#
#
# SERVICE NAME AND TRANSPORT PROTOCOL PORT NUMBER REGISTRY
#
# (last updated on 2011-11-23)
#
# ***************************************************************************
# * Since we merged and converted this registry it loads more slowly. We *
# * know it should load faster and are working on ways to achieve that.  *
# * Thank you for your patience.                                          *
# ***************************************************************************
#
# Service names and port numbers are used to distinguish between different
# services that run over transport protocols such as TCP, UDP, DCCP, and
# SCTP.
#
# Service names are assigned on a first-come, first-served process, as
# documented in [RFC6335].
#
# Port numbers are assigned in various ways, based on three ranges: System
# Ports (0-1023), User Ports (1024-49151), and the Dynamic and/or Private
# Ports (49152-65535); the difference uses of these ranges is described in
```

```
--More--
```

Now display the same file without any commented lines:

```
SLES12SP1:~ # sed '/^#/d' /etc/services | more
tcpmux             1/tcp        # TCP Port Service Multiplexer  [Mark_Lottor]
tcpmux             1/udp        # TCP Port Service Multiplexer  [Mark_Lottor]
compressnet        2/tcp        # Management Utility
compressnet        2/udp        # Management Utility
compressnet        3/tcp        # Compression Process  [Bernie_Volz]
compressnet        3/udp        # Compression Process  [Bernie_Volz]
rje                5/tcp        # Remote Job Entry  [Jon_Postel]
rje                5/udp        # Remote Job Entry  [Jon_Postel]
echo               7/tcp        # Echo  [Jon_Postel]
echo               7/udp        # Echo  [Jon_Postel]
discard            9/tcp        # Discard  [Jon_Postel]
discard            9/udp        # Discard  [Jon_Postel]
discard            9/sctp       # Discard  [Randall_Stewart] [RFC4960]
discard            9/dccp       # Discard  [Eddie_Kohler] [RFC4340]
systat             11/tcp       # Active Users  [Jon_Postel]
systat             11/udp       # Active Users  [Jon_Postel]
daytime            13/tcp       # Daytime  [RFC867] [Jon_Postel]
daytime            13/udp       # Daytime  [RFC867] [Jon_Postel]
qotd               17/tcp       # Quote of the Day  [Jon_Postel]
qotd               17/udp       # Quote of the Day  [Jon_Postel]
msp                18/tcp       # Message Send Protocol (historic)  [Rina_Nethan
iel]
msp                18/udp       # Message Send Protocol (historic)  [Rina_Nethan
--More--
```

[stextbox id='black' image='null'] **Important**: Note that the BRE is preceeded and followed by the **/** character. [/stextbox]

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

```
SLES12SP1:~ # sed '1,2p' /etc/passwd
at:x:25:25:Batch jobs daemon:/var/spool/atjobs:/bin/bash
at:x:25:25:Batch jobs daemon:/var/spool/atjobs:/bin/bash
bin:x:1:1:bin:/bin:/bin/bash
bin:x:1:1:bin:/bin:/bin/bash
daemon:x:2:2:Daemon:/sbin:/bin/bash
ftp:x:40:49:FTP account:/srv/ftp:/bin/bash
ftpsecure:x:488:65534:Secure FTP User:/var/lib/empty:/bin/false
...
```

[stextbox id='black' image='null'] **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. [/stextbox]

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

```
SLES12SP1:~ # sed -n '1,2p' /etc/passwd
at:x:25:25:Batch jobs daemon:/var/spool/atjobs:/bin/bash
bin:x:1:1:bin:/bin:/bin/bash
```

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:

```
SLES12SP1:~ # sed -n '/^#/!w /tmp/sedtest' /etc/services
SLES12SP1:~ # more /tmp/sedtest
tcpmux             1/tcp       # TCP Port Service Multiplexer  [Mark_Lottor]
tcpmux             1/udp       # TCP Port Service Multiplexer  [Mark_Lottor]
compressnet        2/tcp       # Management Utility
compressnet        2/udp       # Management Utility
compressnet        3/tcp       # Compression Process  [Bernie_Volz]
compressnet        3/udp       # Compression Process  [Bernie_Volz]
rje                5/tcp       # Remote Job Entry  [Jon_Postel]
rje                5/udp       # Remote Job Entry  [Jon_Postel]
echo               7/tcp       # Echo  [Jon_Postel]
echo               7/udp       # Echo  [Jon_Postel]
```

```
discard             9/tcp        # Discard  [Jon_Postel]
discard             9/udp        # Discard  [Jon_Postel]
discard             9/sctp       # Discard  [Randall_Stewart] [RFC4960]
discard             9/dccp       # Discard  [Eddie_Kohler] [RFC4340]
systat              11/tcp       # Active Users  [Jon_Postel]
systat              11/udp       # Active Users  [Jon_Postel]
daytime             13/tcp       # Daytime  [RFC867] [Jon_Postel]
daytime             13/udp       # Daytime  [RFC867] [Jon_Postel]
qotd                17/tcp       # Quote of the Day  [Jon_Postel]
qotd                17/udp       # Quote of the Day  [Jon_Postel]
msp                 18/tcp       # Message Send Protocol (historic)  [Rina_Nethan
iel]
msp                 18/udp       # Message Send Protocol (historic)  [Rina_Nethan
--More--(0%)
```

[stextbox id='black' image='null'] **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. [/stextbox]

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

```
SLES12SP1:~ # echo "user1,user2,user3" > /tmp/sedtest1
SLES12SP1:~ # cat /tmp/sedtest1 | sed 's/,/ /g'
user1 user2 user3
```

[stextbox id='black' image='null'] **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. [/stextbox]

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:

```
SLES12SP1:~ # ls -l | awk '{print $8 $3 $4}'

06:55traineeusers
06:55traineeusers
06:55traineeusers
09:04traineeusers
15:41traineeusers
2016traineeusers
2016traineeusers
14:00traineeusers
15:59traineeusers
16:16traineeusers
16:16traineeusers
```

```
17:00traineeusers
16:14traineeusers
2016traineeusers
2016traineeusers
2016traineeusers
2016traineeusers
2016traineeusers
15:46traineeusers
03:59traineeusers
2016traineeusers
10:27traineeusers
06:55traineeusers
```

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:

```
SLES12SP1:~ # ls -l | awk '{print $8 " " $3 " " $4}'
06:55 trainee users
06:55 trainee users
06:55 trainee users
09:04 trainee users
15:41 trainee users
2016 trainee users
2016 trainee users
14:00 trainee users
15:59 trainee users
16:16 trainee users
16:16 trainee users
17:00 trainee users
16:14 trainee users
2016 trainee users
2016 trainee users
2016 trainee users
```

```
2016 trainee users
2016 trainee users
15:46 trainee users
03:59 trainee users
2016 trainee users
10:27 trainee users
06:55 trainee users
```

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
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:

```
SLES12SP1:~ # cat > awkscript
BEGIN {
  print "List of the currently mounted file systems"}
{print $0}
END {
  print "==========================================="}
```

```
[^D]
```

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

```
SLES12SP1:~ # awk -f awkscript /etc/fstab
List of the currently mounted file systems
UUID=9e0e4497-5e47-419a-8ff4-9e2dd7d6a11b swap swap defaults 0 0
UUID=65337196-2d6b-4c8b-b917-30c3867bf265 / btrfs defaults 0 0
UUID=65337196-2d6b-4c8b-b917-30c3867bf265 /boot/grub2/i386-pc btrfs subvol=@/boot/grub2/i386-pc 0 0
UUID=65337196-2d6b-4c8b-b917-30c3867bf265 /boot/grub2/x86_64-efi btrfs subvol=@/boot/grub2/x86_64-efi 0 0
UUID=65337196-2d6b-4c8b-b917-30c3867bf265 /home btrfs subvol=@/home 0 0
UUID=65337196-2d6b-4c8b-b917-30c3867bf265 /opt btrfs subvol=@/opt 0 0
UUID=65337196-2d6b-4c8b-b917-30c3867bf265 /srv btrfs subvol=@/srv 0 0
UUID=65337196-2d6b-4c8b-b917-30c3867bf265 /tmp btrfs subvol=@/tmp 0 0
UUID=65337196-2d6b-4c8b-b917-30c3867bf265 /usr/local btrfs subvol=@/usr/local 0 0
UUID=65337196-2d6b-4c8b-b917-30c3867bf265 /var/crash btrfs subvol=@/var/crash 0 0
UUID=65337196-2d6b-4c8b-b917-30c3867bf265 /var/lib/libvirt/images btrfs subvol=@/var/lib/libvirt/images 0 0
UUID=65337196-2d6b-4c8b-b917-30c3867bf265 /var/lib/mailman btrfs subvol=@/var/lib/mailman 0 0
UUID=65337196-2d6b-4c8b-b917-30c3867bf265 /var/lib/mariadb btrfs subvol=@/var/lib/mariadb 0 0
UUID=65337196-2d6b-4c8b-b917-30c3867bf265 /var/lib/mysql btrfs subvol=@/var/lib/mysql 0 0
UUID=65337196-2d6b-4c8b-b917-30c3867bf265 /var/lib/named btrfs subvol=@/var/lib/named 0 0
UUID=65337196-2d6b-4c8b-b917-30c3867bf265 /var/lib/pgsql btrfs subvol=@/var/lib/pgsql 0 0
UUID=65337196-2d6b-4c8b-b917-30c3867bf265 /var/log btrfs subvol=@/var/log 0 0
UUID=65337196-2d6b-4c8b-b917-30c3867bf265 /var/opt btrfs subvol=@/var/opt 0 0
UUID=65337196-2d6b-4c8b-b917-30c3867bf265 /var/spool btrfs subvol=@/var/spool 0 0
UUID=65337196-2d6b-4c8b-b917-30c3867bf265 /var/tmp btrfs subvol=@/var/tmp 0 0
UUID=65337196-2d6b-4c8b-b917-30c3867bf265 /.snapshots btrfs subvol=@/.snapshots 0 0
==========================================
```

[stextbox id='black' image='null'] **Important**: Note the use of the **-f** switch which instructs awk to use the script. [/stextbox]

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

[stextbox id='black' image='null'] **To do** : Use the **–help** option of the **awk** command to view the command line switches. [/stextbox]

LAB #3 - Using awk

Download the file **sales.txt** by clicking on the title below:

sales.txt

```
# FenestrOs.com
# 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 download the awk script **sales.awk** by clicking on the title below:

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:

```
SLES12SP1:~ # awk -f /home/trainee/Downloads/sales.awk /home/trainee/Downloads/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
```

Other Useful Commands

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.

Download the following file:

expand.txt

```
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
```

Move the file to the /root folder:

```
SLES12SP1:~ # mv /home/trainee/Downloads/expand.txt /root/expand
```

Use the **cat** command to view the contents of the file:

```
SLES12SP1:~ # 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:

```
SLES12SP1:~ # 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$
```

[stextbox id='black' image='null'] **Important** : As you can see the tabulations are shown as **^I** and the end of each line as a **$**. [/stextbox]

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

```
SLES12SP1:~ # expand expand > expand1
```

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

```
SLES12SP1:~ # 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$
```

[stextbox id='black' image='null'] **Important** : As you can see, the tabulations have been changed into spaces. [/stextbox]

Command Line Switches

[stextbox id='black' image='null'] **To do** : Use the **–help** option of the **expand** command to view the command line switches. [/stextbox]

La Commande unexpand

The **expand** 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 **expand** command to convert the spaces in the **expand1** file into tabulations and send the result to the **expand2** file:

```
SLES12SP1:~ # 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$
SLES12SP1:~ # unexpand -a expand1 > expand2
SLES12SP1:~ # 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$
```

[stextbox id='black' image='null'] **Important** : Note that the spaces have been replaced by tabulations. [/stextbox]

Command Line Switches

[stextbox id='black' image='null'] **To do** : Use the **–help** option of the **unexpand** command to view the command line switches. [/stextbox]

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:

```
SLES12SP1:~ # cut -c1-7 /etc/passwd
at:x:25
bin:x:1
daemon:
ftp:x:4
ftpsecu
games:x
gdm:x:4
lp:x:4:
mail:x:
man:x:1
message
news:x:
nobody:
nscd:x:
ntp:x:7
openslp
polkitd
postfix
pulse:x
root:x:
```

```
rpc:x:4
rtkit:x
scard:x
sshd:x:
statd:x
usbmux:
uucp:x:
vnc:x:4
wwwrun:
trainee
```

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

```
SLES12SP1:~ # cut -c1-5,10-15,30- /etc/passwd
at:x:5:Batc/var/spool/atjobs:/bin/bash
bin:x:bin:/
daemo2:2:Dan/bash
ftp:x49:FTPftp:/bin/bash
ftpse:x:488FTP User:/var/lib/empty:/bin/false
games2:100:/var/games:/bin/bash
gdm:x:485:Ganager daemon:/var/lib/gdm:/bin/false
lp:x:Printi/spool/lpd:/bin/bash
mail:12:Mair/spool/clientmqueue:/bin/false
man:x62:Maner:/var/cache/man:/bin/bash
messas:x:49 D-Bus:/var/run/dbus:/bin/false
news:13:Newnews:/bin/bash
nobod65534:var/lib/nobody:/bin/bash
nscd:6:495:/run/nscd:/sbin/nologin
ntp:x492:NTlib/ntp:/bin/false
opens:494:2n:/var/lib/empty:/sbin/nologin
polki:497:4lkitd:/var/lib/polkit:/sbin/nologin
postf:51:51n:/var/spool/postfix:/bin/false
pulse90:489emon:/var/lib/pulseaudio:/sbin/nologin
root:0:rootsh
```

```
rpc:x:65534ind:/var/lib/empty:/sbin/nologin
rtkit91:490proc:/bin/false
scard87:487ader:/var/run/pcscd:/usr/sbin/nologin
sshd:8:498:r/lib/sshd:/bin/false
statd89:655aemon:/var/lib/nfs:/sbin/nologin
usbmu493:65emon:/var/lib/usbmuxd:/sbin/nologin
uucp::14:Uny system:/etc/uucp:/bin/bash
vnc:x:491:uar/lib/empty:/sbin/nologin
wwwru30:8:Whe:/var/lib/wwwrun:/bin/false
train:1000:ome/trainee:/bin/bash
```

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

```
SLES12SP1:~ # cut -d: -f2,4,6 /etc/passwd
x:25:/var/spool/atjobs
x:1:/bin
x:2:/sbin
x:49:/srv/ftp
x:65534:/var/lib/empty
x:100:/var/games
x:485:/var/lib/gdm
x:7:/var/spool/lpd
x:12:/var/spool/clientmqueue
x:62:/var/cache/man
x:499:/var/run/dbus
x:13:/etc/news
x:65533:/var/lib/nobody
x:495:/run/nscd
x:492:/var/lib/ntp
x:2:/var/lib/empty
x:496:/var/lib/polkit
x:51:/var/spool/postfix
x:489:/var/lib/pulseaudio
x:0:/root
```

```
x:65534:/var/lib/empty
x:490:/proc
x:487:/var/run/pcscd
x:498:/var/lib/sshd
x:65534:/var/lib/nfs
x:65534:/var/lib/usbmuxd
x:14:/etc/uucp
x:491:/var/lib/empty
x:8:/var/lib/wwwrun
x:100:/home/trainee
```

[stextbox id='black' image='null'] **Important**: Note the use of the **-d** switch to change the default seperator. [/stextbox]

Command Line Switches

[stextbox id='black' image='null'] **To do** : Use the **–help** option of the **cut** command to view the command line switches. [/stextbox]

The uniq Command

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

```
SLES12SP1:~ # cut -d: -f4 /etc/passwd | sort -n | uniq
0
1
2
7
8
12
13
14
25
```

```
49
51
62
100
485
487
489
490
491
492
495
496
498
499
65533
65534
```

[stextbox id='black' image='null'] **Important**: Note the use of the **uniq** command to remove duplicates from the list. [/stextbox]

Command Line Switches

[stextbox id='black' image='null'] **To do** : Use the **–help** option of the **uniq** command to view the command line switches. [/stextbox]

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):

```
SLES12SP1:~ # cat /etc/passwd | tr "[a-z]" "[A-Z]"
AT:X:25:25:BATCH JOBS DAEMON:/VAR/SPOOL/ATJOBS:/BIN/BASH
BIN:X:1:1:BIN:/BIN:/BIN/BASH
DAEMON:X:2:2:DAEMON:/SBIN:/BIN/BASH
```

```
FTP:X:40:49:FTP ACCOUNT:/SRV/FTP:/BIN/BASH
FTPSECURE:X:488:65534:SECURE FTP USER:/VAR/LIB/EMPTY:/BIN/FALSE
GAMES:X:12:100:GAMES ACCOUNT:/VAR/GAMES:/BIN/BASH
GDM:X:486:485:GNOME DISPLAY MANAGER DAEMON:/VAR/LIB/GDM:/BIN/FALSE
LP:X:4:7:PRINTING DAEMON:/VAR/SPOOL/LPD:/BIN/BASH
MAIL:X:8:12:MAILER DAEMON:/VAR/SPOOL/CLIENTMQUEUE:/BIN/FALSE
MAN:X:13:62:MANUAL PAGES VIEWER:/VAR/CACHE/MAN:/BIN/BASH
MESSAGEBUS:X:499:499:USER FOR D-BUS:/VAR/RUN/DBUS:/BIN/FALSE
NEWS:X:9:13:NEWS SYSTEM:/ETC/NEWS:/BIN/BASH
NOBODY:X:65534:65533:NOBODY:/VAR/LIB/NOBODY:/BIN/BASH
NSCD:X:496:495:USER FOR NSCD:/RUN/NSCD:/SBIN/NOLOGIN
NTP:X:74:492:NTP DAEMON:/VAR/LIB/NTP:/BIN/FALSE
OPENSLP:X:494:2:OPENSLP DAEMON:/VAR/LIB/EMPTY:/SBIN/NOLOGIN
POLKITD:X:497:496:USER FOR POLKITD:/VAR/LIB/POLKIT:/SBIN/NOLOGIN
POSTFIX:X:51:51:POSTFIX DAEMON:/VAR/SPOOL/POSTFIX:/BIN/FALSE
PULSE:X:490:489:PULSEAUDIO DAEMON:/VAR/LIB/PULSEAUDIO:/SBIN/NOLOGIN
ROOT:X:0:0:ROOT:/ROOT:/BIN/BASH
RPC:X:495:65534:USER FOR RPCBIND:/VAR/LIB/EMPTY:/SBIN/NOLOGIN
RTKIT:X:491:490:REALTIMEKIT:/PROC:/BIN/FALSE
SCARD:X:487:487:SMART CARD READER:/VAR/RUN/PCSCD:/USR/SBIN/NOLOGIN
SSHD:X:498:498:SSH DAEMON:/VAR/LIB/SSHD:/BIN/FALSE
STATD:X:489:65534:NFS STATD DAEMON:/VAR/LIB/NFS:/SBIN/NOLOGIN
USBMUX:X:493:65534:USBMUXD DAEMON:/VAR/LIB/USBMUXD:/SBIN/NOLOGIN
UUCP:X:10:14:UNIX-TO-UNIX COPY SYSTEM:/ETC/UUCP:/BIN/BASH
VNC:X:492:491:USER FOR VNC:/VAR/LIB/EMPTY:/SBIN/NOLOGIN
WWWRUN:X:30:8:WWW DAEMON APACHE:/VAR/LIB/WWWRUN:/BIN/FALSE
TRAINEE:X:1000:100:TRAINEE:/HOME/TRAINEE:/BIN/BASH
```

Command Line Switches

[stextbox id='black' image='null'] **To do** : Use the **–help** option of the **tr** command to view the command line switches. [/stextbox]

The paste Command

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

```
SLES12SP1:~ # paste -d: /etc/passwd /etc/shadow
at:x:25:25:Batch jobs daemon:/var/spool/atjobs:/bin/bash:at:!:16922::::::
bin:x:1:1:bin:/bin:/bin/bash:bin:*:16765::::::
daemon:x:2:2:Daemon:/sbin:/bin/bash:daemon:*:16765::::::
ftp:x:40:49:FTP account:/srv/ftp:/bin/bash:ftp:*:16765::::::
ftpsecure:x:488:65534:Secure FTP User:/var/lib/empty:/bin/false:ftpsecure:!:16922::::::
games:x:12:100:Games account:/var/games:/bin/bash:games:*:16765::::::
gdm:x:486:485:Gnome Display Manager daemon:/var/lib/gdm:/bin/false:gdm:!:16922::::::
lp:x:4:7:Printing daemon:/var/spool/lpd:/bin/bash:lp:*:16765::::::
mail:x:8:12:Mailer daemon:/var/spool/clientmqueue:/bin/false:mail:*:16765::::::
man:x:13:62:Manual pages viewer:/var/cache/man:/bin/bash:man:*:16765::::::
messagebus:x:499:499:User for D-Bus:/var/run/dbus:/bin/false:messagebus:!:16765::::::
news:x:9:13:News system:/etc/news:/bin/bash:news:*:16765::::::
nobody:x:65534:65533:nobody:/var/lib/nobody:/bin/bash:nobody:*:16765::::::
nscd:x:496:495:User for nscd:/run/nscd:/sbin/nologin:nscd:!:16765::::::
ntp:x:74:492:NTP daemon:/var/lib/ntp:/bin/false:ntp:!:16922::::::
openslp:x:494:2:openslp daemon:/var/lib/empty:/sbin/nologin:openslp:!:16765::::::
polkitd:x:497:496:User for polkitd:/var/lib/polkit:/sbin/nologin:polkitd:!:16765::::::
postfix:x:51:51:Postfix Daemon:/var/spool/postfix:/bin/false:postfix:!:16922::::::
pulse:x:490:489:PulseAudio daemon:/var/lib/pulseaudio:/sbin/nologin:pulse:!:16922::::::
root:x:0:0:root:/root:/bin/bash:root:$6$g0tHJ9vyIfFt$rbm.rf7p6XZMxMqbqa/BGDeA7E7RkC9n89w8cWdpAxkUmwk7BPcMv7Zy9nVA
n7f/7zQJzcRcsIqp5bRx1e8iX/:16922::::::
rpc:x:495:65534:user for rpcbind:/var/lib/empty:/sbin/nologin:rpc:!:16765::::::
rtkit:x:491:490:RealtimeKit:/proc:/bin/false:rtkit:!:16922::::::
scard:x:487:487:Smart Card Reader:/var/run/pcscd:/usr/sbin/nologin:scard:!:16922::::::
sshd:x:498:498:SSH daemon:/var/lib/sshd:/bin/false:sshd:!:16765::::::
statd:x:489:65534:NFS statd daemon:/var/lib/nfs:/sbin/nologin:statd:!:16922::::::
usbmux:x:493:65534:usbmuxd daemon:/var/lib/usbmuxd:/sbin/nologin:usbmux:!:16922::::::
uucp:x:10:14:Unix-to-Unix CoPy system:/etc/uucp:/bin/bash:uucp:*:16765::::::
```

```
vnc:x:492:491:user for VNC:/var/lib/empty:/sbin/nologin:vnc:!:16922::::::
wwwrun:x:30:8:WWW daemon apache:/var/lib/wwwrun:/bin/false:wwwrun:*:16765::::::
trainee:x:1000:100:trainee:/home/trainee:/bin/bash:trainee:$6$OZyVqj4ekgmu$Cw0T.n6gNv.vTdAT6dFxrrSeHW/V3r43jWFczP
G0lxg5SB9iMUcQ6MFLz9NuTTas289xe/ULsJhE2HdJbraGA.:16922:0:99999:7:::
```

[stextbox id='black' image='null'] **Important**: Note that you need to become root to be able to execute this command. The reason is that normal users do not have the right to read the **/etc/shadow** file. [/stextbox]

Command Line Switches

[stextbox id='black' image='null'] **To do** : Use the **–help** option of the **paste** command to view the command line switches. [/stextbox]

The split Command

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

```
SLES12SP1:~ # dd if=/dev/zero of=/file bs=1024k count=250
250+0 records in
250+0 records out
262144000 bytes (262 MB) copied, 3.50609 s, 74.8 MB/s
```

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

```
SLES12SP1:~ # split -b 50m /file filepart
SLES12SP1:~ # ls -l | grep filepart
-rw-r--r-- 1 root    root  52428800 Dec 14 15:10 filepartaa
-rw-r--r-- 1 root    root  52428800 Dec 14 15:10 filepartab
-rw-r--r-- 1 root    root  52428800 Dec 14 15:10 filepartac
-rw-r--r-- 1 root    root  52428800 Dec 14 15:10 filepartad
-rw-r--r-- 1 root    root  52428800 Dec 14 15:10 filepartae
```

[stextbox id='black' image='null'] **Important**: Note that the 5 files were created in the current working directory. [/stextbox]

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

```
SLES12SP1:~ # cat fileparta* > newfile
SLES12SP1:~ # ls -l | grep newf
-rw-r--r-- 1 root    root  262144000 Dec 14 15:11 newfile
```

Command Line Switches

[stextbox id='black' image='null'] **To do** : Use the **–help** option of the **split** command to view the command line switches. [/stextbox]

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:

```
SLES12SP1:~ # cp /etc/passwd /root
```

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

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

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

```
...
Linux is great!
```

Now compare the two files:

```
SLES12SP1:~ # diff /etc/passwd /root/passwd
27d26
< uucp:x:10:14:Unix-to-Unix CoPy system:/etc/uucp:/bin/bash
30c29,30
< trainee:x:1000:100:trainee:/home/trainee:/bin/bash
---
> trainee10:x:1000:100:trainee:/home/trainee:/bin/bash
> Linux is great!
```

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 **27d26** means that line 27 needs to be deleted form /etc/passwd because it does not exist in /root/passwd.

The output **30c29,30** means that line 30 needs to be changed in /etc/passwd so that is the same as line 29 in /root/passwd.

Command Line Switches

[stextbox id='black' image='null'] **To do** : Use the **–help** option of the **diff** command to view the command line switches. [/stextbox]

The cmp Command

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

```
SLES12SP1:~ # cmp /root/passwd /etc/passwd
/root/passwd /etc/passwd differ: char 1413, line 27
```

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

```
SLES12SP1:~ # cmp -l /root/passwd /etc/passwd | more
cmp: EOF on /root/passwd
1413 166 165
1414 156 165
1416  72 160
1417 170  72
1418  72 170
1419  64  72
1420  71  61
1421  62  60
1423  64  61
1424  71  64
1425  61  72
1426  72 125
1427 165 156
1428 163 151
1429 145 170
1430 162  55
1431  40 164
1432 146 157
1433 157  55
1434 162 125
1435  40 156
1436 126 151
1437 116 170
--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

[stextbox id='black' image='null'] **To do** : Use the **–help** option of the **cmp** command to view the command line switches. [/stextbox]

The patch Command

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.

If you recall, you made some changes to the original **greptest** file that you downloaded:

```
SLES12SP1:~ # 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
```

You also used egrep to remove all the comments and empty lines and save the result to **/tmp/greptest1**:

```
SLES12SP1:~ # 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:

```
SLES12SP1:~ # cd /tmp
SLES12SP1:/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:

```
SLES12SP1:/tmp # cat /tmp/greptest.patch
--- greptest    2016-12-14 14:00:32.987471124 +0100
+++ greptest1   2016-12-14 13:59:12.319471124 +0100
@@ -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:

```
SLES12SP1:/tmp # patch < greptest.patch
patching file greptest
```

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

```
SLES12SP1:/tmp # cat greptest
fenestrOS
fenestros
555-5555
f
.fenestros
.fe
£
```

Command Line Switches

[stextbox id='black' image='null'] **To do** : Use the **–help** option of the **patch** command to view the command line switches. [/stextbox]

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:

```
SLES12SP1:/tmp # strings /usr/bin/passwd | more
/lib64/ld-linux-x86-64.so.2
cHc`
libpam.so.0
```

```
_ITM_deregisterTMCloneTable
__gmon_start__
_Jv_RegisterClasses
_ITM_registerTMCloneTable
pam_start
pam_strerror
pam_chauthtok
pam_end
libpam_misc.so.0
misc_conv
libselinux.so.1
_init
is_selinux_enabled
security_getenforce
context_user_get
security_compute_av
matchpathcon
freecon
context_free
setfscreatecon
--More--
```

Print the offset within the file before each string:

```
SLES12SP1:/tmp # strings -t d /usr/bin/passwd | more
    568 /lib64/ld-linux-x86-64.so.2
    650 cHc`
   4977 libpam.so.0
   4989 _ITM_deregisterTMCloneTable
   5017 __gmon_start__
   5032 _Jv_RegisterClasses
   5052 _ITM_registerTMCloneTable
   5078 pam_start
   5088 pam_strerror
```

```
   5101 pam_chauthtok
   5115 pam_end
   5123 libpam_misc.so.0
   5140 misc_conv
   5150 libselinux.so.1
   5166 _init
   5172 is_selinux_enabled
   5191 security_getenforce
   5211 context_user_get
   5228 security_compute_av
   5248 matchpathcon
   5261 freecon
   5269 context_free
   5282 setfscreatecon
--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:

```
SLES12SP1:/tmp # strings -t d -n 15 /usr/bin/passwd | more
    568 /lib64/ld-linux-x86-64.so.2
   4989 _ITM_deregisterTMCloneTable
   5032 _Jv_RegisterClasses
   5052 _ITM_registerTMCloneTable
   5123 libpam_misc.so.0
   5150 libselinux.so.1
   5172 is_selinux_enabled
   5191 security_getenforce
```

```
   5211 context_user_get
   5228 security_compute_av
   5510 __stack_chk_fail
   5671 __errno_location
   6106 __libc_start_main
   6202 LIBPAM_MISC_1.0
  34104 Usage: %s [options] [LOGIN]
  34144   -a, --all                     report password status on all accounts
  34216   -d, --delete                  delete the password for the named account
  34296   -e, --expire                  force expire the password for the named account
  34384   -h, --help                    display this help message and exit
  34456   -k, --keep-tokens             change password only if expired
  34528   -i, --inactive INACTIVE       set password inactive after expiration
--More--
```

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

```
SLES12SP1:/tmp # strings -f /bin/* | grep "(c)"
/bin/btrace: # Copyright (c) 2005 Silicon Graphics, Inc.
/bin/csh: @(#) Copyright (c) 1991 The Regents of the University of California.
/bin/ping: @(#) Copyright (c) 1989 The Regents of the University of California.
/bin/ping6: @(#) Copyright (c) 1989 The Regents of the University of California.
/bin/tcsh: @(#) Copyright (c) 1991 The Regents of the University of California.
```

Command Line Switches

[stextbox id='black' image='null'] **To do** : Use the **–help** option of the **strings** command to view the command line switches. [/stextbox]

The comm Command

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

```
SLES12SP1:/tmp # comm /etc/passwd /root/passwd
        at:x:25:25:Batch jobs daemon:/var/spool/atjobs:/bin/bash
        bin:x:1:1:bin:/bin:/bin/bash
        daemon:x:2:2:Daemon:/sbin:/bin/bash
        ftp:x:40:49:FTP account:/srv/ftp:/bin/bash
        ftpsecure:x:488:65534:Secure FTP User:/var/lib/empty:/bin/false
        games:x:12:100:Games account:/var/games:/bin/bash
        gdm:x:486:485:Gnome Display Manager daemon:/var/lib/gdm:/bin/false
        lp:x:4:7:Printing daemon:/var/spool/lpd:/bin/bash
        mail:x:8:12:Mailer daemon:/var/spool/clientmqueue:/bin/false
        man:x:13:62:Manual pages viewer:/var/cache/man:/bin/bash
        messagebus:x:499:499:User for D-Bus:/var/run/dbus:/bin/false
        news:x:9:13:News system:/etc/news:/bin/bash
        nobody:x:65534:65533:nobody:/var/lib/nobody:/bin/bash
        nscd:x:496:495:User for nscd:/run/nscd:/sbin/nologin
        ntp:x:74:492:NTP daemon:/var/lib/ntp:/bin/false
        openslp:x:494:2:openslp daemon:/var/lib/empty:/sbin/nologin
        polkitd:x:497:496:User for polkitd:/var/lib/polkit:/sbin/nologin
        postfix:x:51:51:Postfix Daemon:/var/spool/postfix:/bin/false
        pulse:x:490:489:PulseAudio daemon:/var/lib/pulseaudio:/sbin/nologin
        root:x:0:0:root:/root:/bin/bash
        rpc:x:495:65534:user for rpcbind:/var/lib/empty:/sbin/nologin
        rtkit:x:491:490:RealtimeKit:/proc:/bin/false
        scard:x:487:487:Smart Card Reader:/var/run/pcscd:/usr/sbin/nologin
        sshd:x:498:498:SSH daemon:/var/lib/sshd:/bin/false
        statd:x:489:65534:NFS statd daemon:/var/lib/nfs:/sbin/nologin
        usbmux:x:493:65534:usbmuxd daemon:/var/lib/usbmuxd:/sbin/nologin
uucp:x:10:14:Unix-to-Unix CoPy system:/etc/uucp:/bin/bash
        vnc:x:492:491:user for VNC:/var/lib/empty:/sbin/nologin
        wwwrun:x:30:8:WWW daemon apache:/var/lib/wwwrun:/bin/false
comm: file 1 is not in sorted order
comm: file 2 is not in sorted order
    trainee10:x:1000:100:trainee:/home/trainee:/bin/bash
    Linux est super
```

```
trainee:x:1000:100:trainee:/home/trainee:/bin/bash
```

[stextbox id='black' image='null'] **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. [/stextbox]

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

```
SLES12SP1:/tmp # comm -12 /etc/passwd /root/passwd
at:x:25:25:Batch jobs daemon:/var/spool/atjobs:/bin/bash
bin:x:1:1:bin:/bin:/bin/bash
daemon:x:2:2:Daemon:/sbin:/bin/bash
ftp:x:40:49:FTP account:/srv/ftp:/bin/bash
ftpsecure:x:488:65534:Secure FTP User:/var/lib/empty:/bin/false
games:x:12:100:Games account:/var/games:/bin/bash
gdm:x:486:485:Gnome Display Manager daemon:/var/lib/gdm:/bin/false
lp:x:4:7:Printing daemon:/var/spool/lpd:/bin/bash
mail:x:8:12:Mailer daemon:/var/spool/clientmqueue:/bin/false
man:x:13:62:Manual pages viewer:/var/cache/man:/bin/bash
messagebus:x:499:499:User for D-Bus:/var/run/dbus:/bin/false
news:x:9:13:News system:/etc/news:/bin/bash
nobody:x:65534:65533:nobody:/var/lib/nobody:/bin/bash
nscd:x:496:495:User for nscd:/run/nscd:/sbin/nologin
ntp:x:74:492:NTP daemon:/var/lib/ntp:/bin/false
openslp:x:494:2:openslp daemon:/var/lib/empty:/sbin/nologin
polkitd:x:497:496:User for polkitd:/var/lib/polkit:/sbin/nologin
postfix:x:51:51:Postfix Daemon:/var/spool/postfix:/bin/false
pulse:x:490:489:PulseAudio daemon:/var/lib/pulseaudio:/sbin/nologin
root:x:0:0:root:/root:/bin/bash
rpc:x:495:65534:user for rpcbind:/var/lib/empty:/sbin/nologin
rtkit:x:491:490:RealtimeKit:/proc:/bin/false
scard:x:487:487:Smart Card Reader:/var/run/pcscd:/usr/sbin/nologin
sshd:x:498:498:SSH daemon:/var/lib/sshd:/bin/false
statd:x:489:65534:NFS statd daemon:/var/lib/nfs:/sbin/nologin
usbmux:x:493:65534:usbmuxd daemon:/var/lib/usbmuxd:/sbin/nologin
```

```
vnc:x:492:491:user for VNC:/var/lib/empty:/sbin/nologin
wwwrun:x:30:8:WWW daemon apache:/var/lib/wwwrun:/bin/false
comm: file 1 is not in sorted order
comm: file 2 is not in sorted order
```

Command Line Switches

[stextbox id='black' image='null'] **To do** : Use the **–help** option of the **comm** command to view the command line switches. [/stextbox]

The head Command

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

```
SLES12SP1:/tmp # head /etc/passwd
at:x:25:25:Batch jobs daemon:/var/spool/atjobs:/bin/bash
bin:x:1:1:bin:/bin:/bin/bash
daemon:x:2:2:Daemon:/sbin:/bin/bash
ftp:x:40:49:FTP account:/srv/ftp:/bin/bash
ftpsecure:x:488:65534:Secure FTP User:/var/lib/empty:/bin/false
games:x:12:100:Games account:/var/games:/bin/bash
gdm:x:486:485:Gnome Display Manager daemon:/var/lib/gdm:/bin/false
lp:x:4:7:Printing daemon:/var/spool/lpd:/bin/bash
mail:x:8:12:Mailer daemon:/var/spool/clientmqueue:/bin/false
man:x:13:62:Manual pages viewer:/var/cache/man:/bin/bash
```

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

```
SLES12SP1:/tmp # head -n 15 /etc/passwd
at:x:25:25:Batch jobs daemon:/var/spool/atjobs:/bin/bash
bin:x:1:1:bin:/bin:/bin/bash
daemon:x:2:2:Daemon:/sbin:/bin/bash
```

```
ftp:x:40:49:FTP account:/srv/ftp:/bin/bash
ftpsecure:x:488:65534:Secure FTP User:/var/lib/empty:/bin/false
games:x:12:100:Games account:/var/games:/bin/bash
gdm:x:486:485:Gnome Display Manager daemon:/var/lib/gdm:/bin/false
lp:x:4:7:Printing daemon:/var/spool/lpd:/bin/bash
mail:x:8:12:Mailer daemon:/var/spool/clientmqueue:/bin/false
man:x:13:62:Manual pages viewer:/var/cache/man:/bin/bash
messagebus:x:499:499:User for D-Bus:/var/run/dbus:/bin/false
news:x:9:13:News system:/etc/news:/bin/bash
nobody:x:65534:65533:nobody:/var/lib/nobody:/bin/bash
nscd:x:496:495:User for nscd:/run/nscd:/sbin/nologin
ntp:x:74:492:NTP daemon:/var/lib/ntp:/bin/false
```

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

```
SLES12SP1:/tmp # head -c 150 /etc/passwd
at:x:25:25:Batch jobs daemon:/var/spool/atjobs:/bin/bash
bin:x:1:1:bin:/bin:/bin/bash
daemon:x:2:2:Daemon:/sbin:/bin/bash
ftp:x:40:49:FTP account:/srvSLES12SP1:/tmp #
```

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

```
SLES12SP1:/tmp # head -c -150 /etc/passwd
at:x:25:25:Batch jobs daemon:/var/spool/atjobs:/bin/bash
bin:x:1:1:bin:/bin:/bin/bash
daemon:x:2:2:Daemon:/sbin:/bin/bash
ftp:x:40:49:FTP account:/srv/ftp:/bin/bash
ftpsecure:x:488:65534:Secure FTP User:/var/lib/empty:/bin/false
games:x:12:100:Games account:/var/games:/bin/bash
gdm:x:486:485:Gnome Display Manager daemon:/var/lib/gdm:/bin/false
lp:x:4:7:Printing daemon:/var/spool/lpd:/bin/bash
mail:x:8:12:Mailer daemon:/var/spool/clientmqueue:/bin/false
man:x:13:62:Manual pages viewer:/var/cache/man:/bin/bash
```

```
messagebus:x:499:499:User for D-Bus:/var/run/dbus:/bin/false
news:x:9:13:News system:/etc/news:/bin/bash
nobody:x:65534:65533:nobody:/var/lib/nobody:/bin/bash
nscd:x:496:495:User for nscd:/run/nscd:/sbin/nologin
ntp:x:74:492:NTP daemon:/var/lib/ntp:/bin/false
openslp:x:494:2:openslp daemon:/var/lib/empty:/sbin/nologin
polkitd:x:497:496:User for polkitd:/var/lib/polkit:/sbin/nologin
postfix:x:51:51:Postfix Daemon:/var/spool/postfix:/bin/false
pulse:x:490:489:PulseAudio daemon:/var/lib/pulseaudio:/sbin/nologin
root:x:0:0:root:/root:/bin/bash
rpc:x:495:65534:user for rpcbind:/var/lib/empty:/sbin/nologin
rtkit:x:491:490:RealtimeKit:/proc:/bin/false
scard:x:487:487:Smart Card Reader:/var/run/pcscd:/usr/sbin/nologin
sshd:x:498:498:SSH daemon:/var/lib/sshd:/bin/false
statd:x:489:65534:NFS statd daemon:/var/lib/nfs:/sbin/nologin
usbmux:x:493:65534:usbmuxd daemon:/var/lib/usbmuxd:/sbin/nologin
uucp:x:10:14:Unix-to-Unix CoPy system:/etc/uucp:/bin/bash
vnc:x:492:491:usSLES12SP1:/tmp #
```

Both x and y can accept multipliers:

```
SLES12SP1:/tmp # head -c 1b /etc/passwd
at:x:25:25:Batch jobs daemon:/var/spool/atjobs:/bin/bash
bin:x:1:1:bin:/bin:/bin/bash
daemon:x:2:2:Daemon:/sbin:/bin/bash
ftp:x:40:49:FTP account:/srv/ftp:/bin/bash
ftpsecure:x:488:65534:Secure FTP User:/var/lib/empty:/bin/false
games:x:12:100:Games account:/var/games:/bin/bash
gdm:x:486:485:Gnome Display Manager daemon:/var/lib/gdm:/bin/false
lp:x:4:7:Printing daemon:/var/spool/lpd:/bin/bash
mail:x:8:12:Mailer daemon:/var/spool/clientmqueue:/bin/false
man:x:13:62:Manual pages viewer:/var/cache/man:/bin/basSLES12SP1:/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

[stextbox id='black' image='null'] **To do** : Use the **–help** option of the **head** command to view the command line switches. [/stextbox]

The tail Command

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

```
SLES12SP1:/tmp # tail /etc/passwd
rpc:x:495:65534:user for rpcbind:/var/lib/empty:/sbin/nologin
rtkit:x:491:490:RealtimeKit:/proc:/bin/false
scard:x:487:487:Smart Card Reader:/var/run/pcscd:/usr/sbin/nologin
sshd:x:498:498:SSH daemon:/var/lib/sshd:/bin/false
statd:x:489:65534:NFS statd daemon:/var/lib/nfs:/sbin/nologin
usbmux:x:493:65534:usbmuxd daemon:/var/lib/usbmuxd:/sbin/nologin
uucp:x:10:14:Unix-to-Unix CoPy system:/etc/uucp:/bin/bash
vnc:x:492:491:user for VNC:/var/lib/empty:/sbin/nologin
wwwrun:x:30:8:WWW daemon apache:/var/lib/wwwrun:/bin/false
trainee:x:1000:100:trainee:/home/trainee:/bin/bash
```

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

```
SLES12SP1:/tmp # tail -n 15 /etc/passwd
openslp:x:494:2:openslp daemon:/var/lib/empty:/sbin/nologin
polkitd:x:497:496:User for polkitd:/var/lib/polkit:/sbin/nologin
postfix:x:51:51:Postfix Daemon:/var/spool/postfix:/bin/false
pulse:x:490:489:PulseAudio daemon:/var/lib/pulseaudio:/sbin/nologin
root:x:0:0:root:/root:/bin/bash
rpc:x:495:65534:user for rpcbind:/var/lib/empty:/sbin/nologin
rtkit:x:491:490:RealtimeKit:/proc:/bin/false
scard:x:487:487:Smart Card Reader:/var/run/pcscd:/usr/sbin/nologin
sshd:x:498:498:SSH daemon:/var/lib/sshd:/bin/false
statd:x:489:65534:NFS statd daemon:/var/lib/nfs:/sbin/nologin
usbmux:x:493:65534:usbmuxd daemon:/var/lib/usbmuxd:/sbin/nologin
uucp:x:10:14:Unix-to-Unix CoPy system:/etc/uucp:/bin/bash
vnc:x:492:491:user for VNC:/var/lib/empty:/sbin/nologin
wwwrun:x:30:8:WWW daemon apache:/var/lib/wwwrun:/bin/false
trainee:x:1000:100:trainee:/home/trainee:/bin/bash
```

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

```
SLES12SP1:/tmp # tail -c 150 /etc/passwd
er for VNC:/var/lib/empty:/sbin/nologin
wwwrun:x:30:8:WWW daemon apache:/var/lib/wwwrun:/bin/false
trainee:x:1000:100:trainee:/home/trainee:/bin/bash
```

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

```
SLES12SP1:/tmp # tail -c 150 /etc/passwd
er for VNC:/var/lib/empty:/sbin/nologin
wwwrun:x:30:8:WWW daemon apache:/var/lib/wwwrun:/bin/false
trainee:x:1000:100:trainee:/home/trainee:/bin/bash
SLES12SP1:/tmp # tail -c +150 /etc/passwd
v/ftp:/bin/bash
ftpsecure:x:488:65534:Secure FTP User:/var/lib/empty:/bin/false
games:x:12:100:Games account:/var/games:/bin/bash
```

```
gdm:x:486:485:Gnome Display Manager daemon:/var/lib/gdm:/bin/false
lp:x:4:7:Printing daemon:/var/spool/lpd:/bin/bash
mail:x:8:12:Mailer daemon:/var/spool/clientmqueue:/bin/false
man:x:13:62:Manual pages viewer:/var/cache/man:/bin/bash
messagebus:x:499:499:User for D-Bus:/var/run/dbus:/bin/false
news:x:9:13:News system:/etc/news:/bin/bash
nobody:x:65534:65533:nobody:/var/lib/nobody:/bin/bash
nscd:x:496:495:User for nscd:/run/nscd:/sbin/nologin
ntp:x:74:492:NTP daemon:/var/lib/ntp:/bin/false
openslp:x:494:2:openslp daemon:/var/lib/empty:/sbin/nologin
polkitd:x:497:496:User for polkitd:/var/lib/polkit:/sbin/nologin
postfix:x:51:51:Postfix Daemon:/var/spool/postfix:/bin/false
pulse:x:490:489:PulseAudio daemon:/var/lib/pulseaudio:/sbin/nologin
root:x:0:0:root:/root:/bin/bash
rpc:x:495:65534:user for rpcbind:/var/lib/empty:/sbin/nologin
rtkit:x:491:490:RealtimeKit:/proc:/bin/false
scard:x:487:487:Smart Card Reader:/var/run/pcscd:/usr/sbin/nologin
sshd:x:498:498:SSH daemon:/var/lib/sshd:/bin/false
statd:x:489:65534:NFS statd daemon:/var/lib/nfs:/sbin/nologin
usbmux:x:493:65534:usbmuxd daemon:/var/lib/usbmuxd:/sbin/nologin
uucp:x:10:14:Unix-to-Unix CoPy system:/etc/uucp:/bin/bash
vnc:x:492:491:user for VNC:/var/lib/empty:/sbin/nologin
wwwrun:x:30:8:WWW daemon apache:/var/lib/wwwrun:/bin/false
trainee:x:1000:100:trainee:/home/trainee:/bin/bash
```

Both x and y can accept multipliers:

```
SLES12SP1:/tmp # tail -c 1b /etc/passwd
kit:x:491:490:RealtimeKit:/proc:/bin/false
scard:x:487:487:Smart Card Reader:/var/run/pcscd:/usr/sbin/nologin
sshd:x:498:498:SSH daemon:/var/lib/sshd:/bin/false
statd:x:489:65534:NFS statd daemon:/var/lib/nfs:/sbin/nologin
usbmux:x:493:65534:usbmuxd daemon:/var/lib/usbmuxd:/sbin/nologin
uucp:x:10:14:Unix-to-Unix CoPy system:/etc/uucp:/bin/bash
```

```
vnc:x:492:491:user for VNC:/var/lib/empty:/sbin/nologin
wwwrun:x:30:8:WWW daemon apache:/var/lib/wwwrun:/bin/false
trainee:x:1000:100:trainee:/home/trainee:/bin/bash
```

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

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

```
SLES12SP1:/tmp # tail -f /var/log/messages
2016-12-14T20:45:01.238708+01:00 SLES12SP1 systemd: pam_unix(systemd-user:session): session opened for user root
by (uid=0)
2016-12-14T20:45:01.275146+01:00 SLES12SP1 CRON[17392]: pam_unix(crond:session): session closed for user root
2016-12-14T20:45:01.288315+01:00 SLES12SP1 systemd: pam_unix(systemd-user:session): session closed for user root
2016-12-14T20:45:41.689270+01:00 SLES12SP1 sh[1320]: Sleeping '' ''
2016-12-14T20:58:07.757988+01:00 SLES12SP1 sh[1320]: message repeated 4 times: [ Sleeping '' '']
2016-12-14T21:00:01.284105+01:00 SLES12SP1 cron[23239]: pam_unix(crond:session): session opened for user root by
(uid=0)
2016-12-14T21:00:01.291722+01:00 SLES12SP1 systemd: pam_unix(systemd-user:session): session opened for user root
by (uid=0)
2016-12-14T21:00:01.338305+01:00 SLES12SP1 CRON[23239]: pam_unix(crond:session): session closed for user root
2016-12-14T21:00:01.351426+01:00 SLES12SP1 systemd: pam_unix(systemd-user:session): session closed for user root
2016-12-14T21:01:14.285113+01:00 SLES12SP1 sh[1320]: Sleeping '' ''
^C
```

Command Line Switches

[stextbox id='black' image='null'] **To do** : Use the **–help** option of the **head** command to view the command line switches. [/stextbox]

LAB #4 - Use the grep, tr and cut to extract your IP address from the output of ifconfig

```
SLES12SP1:/tmp # ifconfig eth0
eth0      Link encap:Ethernet  HWaddr 08:00:27:10:B5:86
          inet addr:10.0.2.15  Bcast:10.0.2.255  Mask:255.255.255.0
          inet6 addr: fe80::a00:27ff:fe10:b586/64 Scope:Link
          UP BROADCAST RUNNING MULTICAST  MTU:1500  Metric:1
          RX packets:8226 errors:0 dropped:0 overruns:0 frame:0
          TX packets:16490 errors:0 dropped:0 overruns:0 carrier:0
          collisions:0 txqueuelen:1000
          RX bytes:588832 (575.0 Kb)  TX bytes:1303594 (1.2 Mb)

SLES12SP1:/tmp # ifconfig eth0 | grep "inet"
          inet addr:10.0.2.15  Bcast:10.0.2.255  Mask:255.255.255.0
          inet6 addr: fe80::a00:27ff:fe10:b586/64 Scope:Link

SLES12SP1:/tmp # ifconfig eth0 | grep "inet" | grep -v "inet6"
          inet addr:10.0.2.15  Bcast:10.0.2.255  Mask:255.255.255.0

SLES12SP1:/tmp # ifconfig eth0  | grep "inet" | grep -v "inet6" | tr -s " " ":"
:inet:addr:10.0.2.15:Bcast:10.0.2.255:Mask:255.255.255.0

SLES12SP1:/tmp # ifconfig eth0 | grep "inet" | grep -v "inet6" | tr -s " " ":" | cut -d: -f4
10.0.2.15
```

[stextbox id='black' image='null'] **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. [/stextbox]

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