Shell commands
Software Technologies - Lecture 1

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Contents

Outline

Filesystem related commands

pwd (Internal command, Also present in /bin/pwd)

'pwd' command can be used to see name of present working directory. Present working directory is also referred as current working directory.

Filesystem related commands

ls

'ls' command can be used to list names of files and directories present in current working directory.

Switches:

- -a : List all files and directories, including hidden files and directories whose name starts with '.'
- -l : Use Long listing which lists permissions, owners and last modification time.
- -d : Do not dereference directory. That is list directory name and not its contents. This is useful when we supply some pattern to ls for listing like '`ls -d a*`'

Filesystem related commands

mkdir

'mkdir' command can be used to create new directories.

Switches:

- -p : Create parent directories or create full path. Can also be used as do not print error if directory already exists
- -v : Verbose. Print names of directories created due to this mkdir command. Can be useful along with '-p' switch to see if directories are actually being created and how many.

Filesystem related commands

rmdir

'rmdir' command can be used to delete empty directories.

Switches:

-p : Delete parent directories given in path. The directories specified in the path should be empty with the only exception of one child directory in each parent directory. That is, if we create directories using '`mkdir -p a/b/c`'. Then we can remove all three directories using '`rmdir -p a/b/c`'.

-v : Verbose. Print names of directories being processed.

Filesystem related commands

cd (Internal command)

'cd' command can be used to change current working directory, also known as present working directory. If no argument is given then directory is changed to users home directory. If argument is present the current directory is changed to directory specified in argument.

Very interesting feature of 'cd' command is that it stores last pwd in shell variable named 'OLDPWD'. Using '`cd -`' command we can change current directory to previous pwd and store current directory in variable 'OLDPWD'. This way we can keep toggling between two directories using '`cd -`' command.

Filesystem related commands

cd (Internal command)

Note that there is no 'cd..' command in Linux as generally present in DOS/Windows. We can use relative path like 'cd ..' to go to parent directory or we can also use absolute path like 'cd /home' to go to parent or other directory of our choice.

Read 'man cd' for interesting information on variable named 'CDPATH' and how it affects 'cd' command.

Filesystem related commands

touch

'touch' command can be used to change the access and modification times of files and directories to current time.

Switches:

- -a : Change only access time
- -c : Do not create files. By default touch creates empty file if file does not exists. Hence touch is also often used to create empty files and not just for updating timestamps.
- -m : Change only modification time.
- -t : Use supplied [[CC]YY]MMDDhhmm[.ss] instead of current time

Filesystem related commands

rm

'rm' command can be used to delete files (and directories recursively).

Switches:

- -f : Force deletion do not cofirm.
- -r : Recursively delete files and directories. This is very often used to delete non-empty directories
- -i : Interactive. Confirm before deleting each object.
- -v : Verbose

Filesystem related commands

mv

'mv' command can be used to move files and directories

Switches:

- -b : Backup each destination file
- -f : Force overwriting of destination file if it already exists.
- -i : Interactive. Confirm before overwriting
- -u : Update. Move only if destination file is older than corresponding ' source file or missing
- -v : Verbose

Filesystem related commands

cp

'cp' command can be used to copy files and directories

Switches:

(Other then -b, -f, -i, -u, -v which are same as that for mv)

- -a : Archive. Preserves everthing links, dates, owners, etc.
- -l : Link files instead of copying
- -L : Dereference. Always follow symbolic links
- -P : No dereference. Don't follow symbolic links
- -p : Preserves mode, ownership and timestamp

Filesystem related commands

cp

Switches: (continued..)

-R or -r : Copy files and directories recursively

`--remove-destination` : Remove each destination file before attempting to open it. (Why is this required?)

-s : Create symbolic links instead of copying

-x : Stay on this filesystem

-c : Same as `--preserve=context`

Filesystem related commands

tree

'tree' command can be used to print files and directories present in current directory or directory given as argument in tree like structure.

Switches:

- -a : List all files including hidden files.
- -d : List only directories, that is, exclude files
- -f : Print full path (starting with /) or proper relative path (start with ./) for each item
- -i : Do not print indentation lines. Useful with -f if you want to use output of tree as input or argument to some other program.

Filesystem related commands

tree

Switches: (continued..)

-l : Follow symbolic links

-x : Stay on same filesystem

-P : List only those files that match shell type wild card pattern

-I : Exclude files that match shell type wild card pattern

`--noreport` : Omit printing of total number of files and directories at end

Filesystem related commands

tree

Switches: (continued..)

- -p : Print protections for each file/directory (similar to ls -l)
- -s : Print size of each file along with name
- -u : Print username of owner
- -g : Print groupname of owner
- -D : Print last modification date and time of each file/directory

Filesystem related commands

tree

Switches: (continued..)

`--inodes` : Print the inode numbers of files/directories

`--device` : Print the device number on which file/directory is present

-F : Append a / to name for directories, = for socket files, * for executable files and | for FIFOs (similar to ls -F)

-C : Show colored output

-L : Go only up to specified levels deep

Filesystem related commands

du

'du' command can be used to see disk usage current directory or directories specified in argument. It recursively prints disk usage of all child directories also by default.

Switches:

- -s : Summarize and do not print size of child directories.
- -h : Print sizes in human readable format

Filesystem related commands

df

'df' command can be used to see file system usage.

Switches:

- -h : Print sizes in human readable format
- -T : Print filesystem type
- -a : Include all filesystems (including dummy filesystems like proc)

Outline

File or file content related commands

cat

'cat' command can be used to display contents of small files or to concatenate binary files. By default cat copies data from standard input to standard output. We can supply names of files as command line arguments to be printed on standard output. Special filename '–' can be used among name of files to indicate standard input.

The output can be piped to another program like gzip or can be redirected using shell redirection to output file.

File or file content related commands

more

'more' command can be used to display contents of ASCII file or output of other commands one screenful at a time. It is very useful for seeing output of commands which generate output more then one screenful.

We can use 'space bar' to see next screen of output lines, 'enter' or 'return' to display one extra line of output and 'q' to quit from more, ignoring rest of the contents.

File or file content related commands

less

'less' command can be used to display contents of ASCII file or output of other commands in something like read-only vi editor kind of screen. We can scroll up or down in less window and even search for specific words.

'less' starts faster then editors like 'vi' as it does not reads entire file before starting.

File or file content related commands

head

'head' command can be used to display only first few lines of ASCII text file. By default head displays only first 10 lines of file.

Switches:

-n : Number of lines to display

File or file content related commands

tail

'tail' command can be used to display only last few lines of ASCII text file. By default last displays only last 10 lines of file.

Switches:

-n :	Number of lines to display
-f :	Keep printing new lines that are being added to end of file. This option is very useful in seeing output of log files of servers/services/programs which are running.
--pid :	End program when process with given PID dies
-s :	Use given sleep interval between successive iterations

File or file content related commands

tar

'tar' command can be used to create, list or extract files from '`.tar`' archives. The command also supports these operations over '`.tar.bz2`' and '`.tar.gz`' archives.

Operations:

- -a : Append files to existing archive
- -c : Create new archive
- -t : List files in existing archive
- -u : Update files in existing archive
- -x : Extract archive

File or file content related commands

tar

Switches:

- -f : File to be used for operations
- -j : Perform operation on `.tar.bz2` file
- -z : Perform operation on `.tar.gz` file
- -v : Verbose. List files being added/updated/extracted.
- -p : Preserve permissions

File or file content related commands

gzip

'gzip' command can be used to compress files to gzip format. gzip files have .gz extension.

Syntax:

```
gzip <uncompressed_filename>
```

Note that above syntax will automatically create compressed file with .gz extension and remove the original file.

File or file content related commands

gunzip

'gunzip' command can be used to decompress files compressed using gzip format.

Syntax:

`gunzip <compressed_filename>`

Note that above syntax will create uncompressed file and remove the original compressed file.

File or file content related commands

bzip2

'bzip2' command can be used to compress files to bzip2 format. bzip2 files have `.bz2` extension.

Syntax:

`bzip2 <uncompressed_filename>`

Note that above syntax will automatically create compressed file with `.bzip2` extension and remove the original file. We can also specify compression level using switches between `-1` (fastest) and `-9` (best).

File or file content related commands

bunzip2

'bunzip2' command can be used to decompress files compressed using bzip2 format.

Syntax:

`bunzip2 <compressed_filename>`

Note that above syntax will create uncompressed file and remove the original compressed file. No need to specify any compression level while extracting file.

File or file content related commands

rar

'rar' command can be used to create files using 'rar' compression method. By default 'rar' command is not present in most Linux distributions as 'rar' is not an open format.

Syntax:

```
rar a <name_of_rar_file>
[<files_and_directories_to_compress>]
```

File or file content related commands

unrar

'unrar' command can be used to extract files created using 'rar' compression method. By default 'unrar' command is not present in most Linux distributions as 'rar' is not an open format.

Syntax:

`unrar x <name_of_rar_file>`

File or file content related commands

zip

'zip' command can be used to create files using 'zip' compression method.

Syntax:

```
zip <name_of_zip_file>
[<files_and_directories_to_compress>]
```

File or file content related commands

unzip

'unzip' command can be used to extract files created using 'zip' compression method.

Syntax:

`unzip <name_of_zip_file>`

Outline

Miscellaneous commands

clear

'clear' command can be used to clear terminal so that when we give new command we see only its output in screen without getting affected by previous contents. This does not deletes any old content present on terminals. We can always scroll up and see some portion of output of old commands even after giving clear command.

Miscellaneous commands

man

'man' command can be used to find help in topic, shell command, C function or sometimes even configuration files.

Switches:

- -a : Show all man pages with given name, do not stop after first.
- -f : Search for given keyword in NAME section of man page before hypen and match full word.
- -a : Search for given keyword in entire NAME section of man page, partial matches are also printed.

Miscellaneous commands

whatis

'whatis' command can be used to search whatis database for full word match of given keyword. whatis database is made from 'NAME' section of all man pages by '`makewhatis`' program. '`whatis`' command is equivalent to '`man -f`' command. It searches within text in NAME section only till first hypen is encountered.

Miscellaneous commands

apropos

'apropos' command can be used to search whatis database for partial word match of given keyword. whatis database is made from 'NAME' section of all man pages by '`makewhatis`' program. '`whatis`' command is equivalent to '`man -k`' command. It searches entire name section and does not stops search at first '-' like whatis command.

Contents

Outline

System status commands

date

'date' command can be used to change system date and time. It can also display current system date and time in user defined formats. Only super user can change date.

System status commands

runlevel

'runlevel' command can be used to see current and previous system runlevel. In case no previous runlevel exists then 'N' will be printed in place of previous runlevel.

System status commands

uptime

'uptime' gives a one line display of the following information. The current time, how long the system has been running, how many users are currently logged on, and the system load averages for the past 1, 5, and 15 minutes.

This is the same information contained in the header line displayed by `w` command.

System status commands

w

'w' command displays information about the users currently on the machine, and their processes. The information about machine is same as displayed by uptime.

Login name, tty, remote host, login time, idle time, CPU time utilized by all processes(JCPU), CPU time utilized by current process(PCPU) and the command line of their current process are displayed for each user.

We can also optionally give username as argument to print information about specific user only.

System status commands

who

'who' command can be used to see list of users who have logged in in case detailed output as given by 'w' is not required.

System status commands

whoami

'whoami' command can be used to see name of current user.

System status commands

id

'id' command can be used to see user id, user name, primary group id, primary group name, other group ids and other group names for the current user.

System status commands

last

'last' command can be used to see list of successful logins of this month and IP addresses from which users logged in, and when did they logged of. The currently logged in users are also shown.
For information of previous month, we can use older log files present in '`/var/log`' folder

Switches:

- -x : Show information about system shutdown and other run level changes too.
- -f : Use specified log file

System status commands

lastb

'lastb' command can be used to see list of bad login attempts on system, and also from where the bad login attempt was made and what username was used to try to login. The information is shown only of last one month, for older information we can manually specify older log files stored in '`/var/log`' folder.

Switches:

-f : Use specified log file

System status commands

free

'free' command can be used to how much RAM and swap is used and how much is left free.

Switches:

-m : Print values in megabytes

System status commands

top

'top' command can be used to see information on running processes, cpu usage and load average. We can sort the list of processes by cpu usage, memory usage, etc. parameters to find the information we are interested in.

Press 'h' key after running top to see help and then you can explore various things that can be done with top. For example, we can kill process from top by pressing 'k' key and giving process 'pid'.

Install and use 'htop' if you want to see top output with nice colors using ncurses support.

Outline

Network related commands

ifconfig

'ifconfig' command can be used to see interface configuration information for current system. All wired, wireless, virtual, bridge, tap and tunnel devices information is shown by ifconfig command. We can also use ifconfig command with below syntax to configure system ip address:

Syntax:

```
ifconfig <device> <ip_address> netmask
<subnet_mask>
```

Network related commands

route

'route' command can be used to see kernel routing table. We can also use route command to modify routing table.

Syntax:

```
route (add | del) (default | -net <network>)
(netmask <subnet_mask>) gw <gateway_address>
```

Switches:

-n : Do not reverse lookup IP addresses

Network related commands

netstat

'netstat' command can be used to network statistics, specially information on currently listening processes and established network connections.

Switches:

- -r : Display kernel routing table
- -s : Display basic network statistics
- -i : Display basic interface statistics
- -v : Verbose output
- -n : Do not try to reverse lookup hostnames, or convert port number to service names.

Network related commands

netstat

Switches: (continued..)

- -c : Display output after every one second. (Use break sequence to end)
- -a : Show all sockets (including listening sockets)
- -l : Show only listening sockets
- -o : Include timer information
- -p : Include program pid and name information

Network related commands

ping

'ping' command can be used to send ICMP echo packets to destination IP address and receive reply. It also calculated statistics on delay and packet loss.

Switches:

- -c : Send given number of echo request packets
- -f : Flood ping. Send packets as fast as possible or 100 packets per second (whichever is more)
- -i : Send packets after every given interval seconds. Interval can be float value
- -I : Send packets using given IP address
- -n : Do not reverse lookup IP addresses

Network related commands

ping

Switches: (continued..)

- -q : Quiet output. Only display summary at end
- -R : Record route. Nice alternative to traceroute but mostly people block IP options using firewall/IPS/etc.
- -s : Used specified packet size
- -S : Keep specified number of packets in send buffer
- -t : Set TTL on ICMP packets

Network related commands

ping

Switches: (continued..)

- -v : Verbose output
- -w : Specify timeout for entire program in seconds
- -W : Specify timeout for receiving ICMP reply for ICMP echo messages in seconds

Network related commands

traceroute

'traceroute' command can be used to find all layer 3 devices between current node and some target destination IP address. It is not necessary that traceroute will list all devices in between. Passive devices, bridges (IPS) and hosts which drop ICMP/UDP packets may not get shown in traceroute.

Switches:

- -I : Use ICMP echo for probes
- -T : Use TCP SYN for probes
- -U : Use UDP datagrams for probes
- -m : Max hops to probe. (Default 30)

Network related commands

traceroute

Switches: (continued..)

- -N : Number of queries that can be sent in parallel (Default 15)
- -n : Do not reverse lookup IP addresses
- -p : Port number or staring port number to be used for queries.
- -w : Timeout in seconds for response
- -q : Number of probe packets per hop. (Default 3)
- -A : Lookup AS numbers and print them.

Network related commands

tracepath

'tracepath' command can be used to find MTU between current host and destination. This can be used to determine ideal packet size between two hosts such that is no or very less fragmentation.

Network related commands

nslookup

'nslookup' command can be used to do very basic DNS queries. It automatically performs reverse lookup if we give IP address

Syntax:

```
nslookup <hostname> [<DNS_server>]
```

Network related commands

dig

'dig' command can be used to do advanced DNS queries including queries for TXT/MX records and zone transfers.

Example query - 1:

```
dig @ns.iiit.ac.in -t any iiit.ac.in
```

Example query - 2:

```
dig @ns3.iiit.ac.in -t AXFR iiit.ac.in
```