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| **Access To Linux System** |

There are two different ways, by which we can access a Linux System.

Accessing Linux Systems

Console Access

Remote Access

* Direct access to a Linux device via HDMI, DVI or VGA cables i.e a physical computer
* Connect to a Linux device remotely over the network

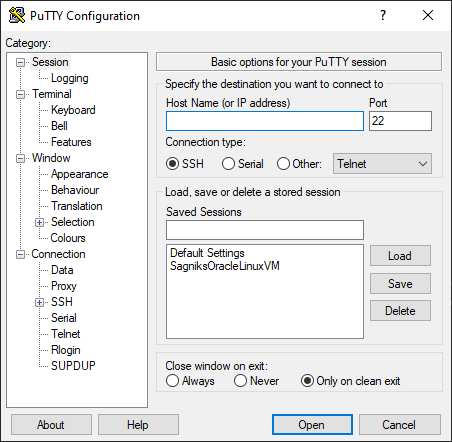
* **Ways To Remotely Connect To A Linux System**

|  |  |  |  |
| --- | --- | --- | --- |
| **Sl No** | **Source Machine** | **Destination Machine** | **Remote Connection Method** |
| 1 | Windows | Windows | Remote Desktop Client |
| 2 | Windows | Linux | Putty Client, SSH |
| 3 | Linux | Windows | SSH |
| 4 | Linux | Linux | SSH |

* **Putty Client ( Connecting To A Linux System From A Windows Machine)**

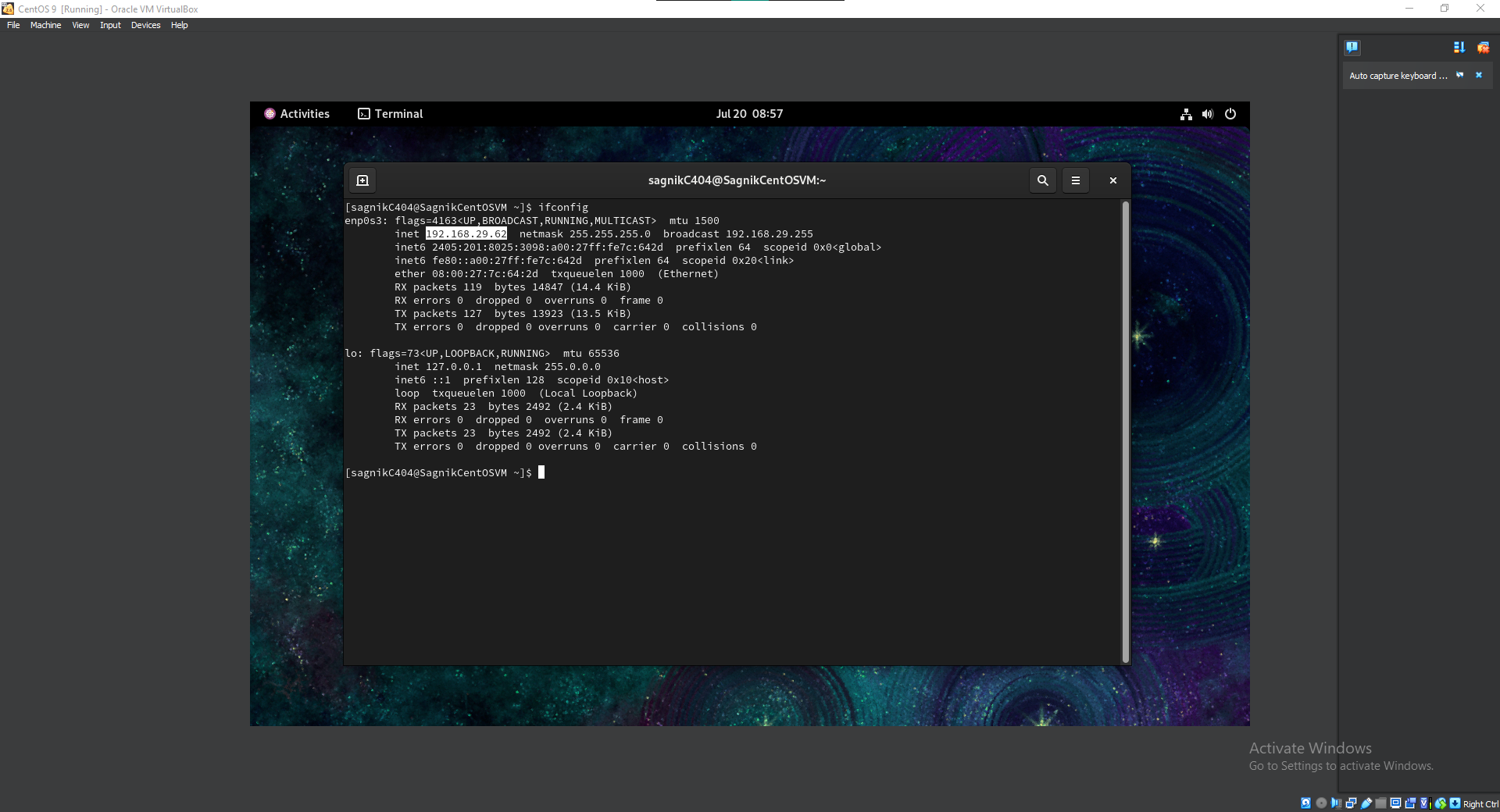
**Downloading Putty Client**

* First we need to download the Putty client from the official website using the following [link](https://www.chiark.greenend.org.uk/~sgtatham/putty/latest.html)
* Next we will need to install the program.
* After installation we need to open Putty



**Extracting The IP Address From The Linux VM**

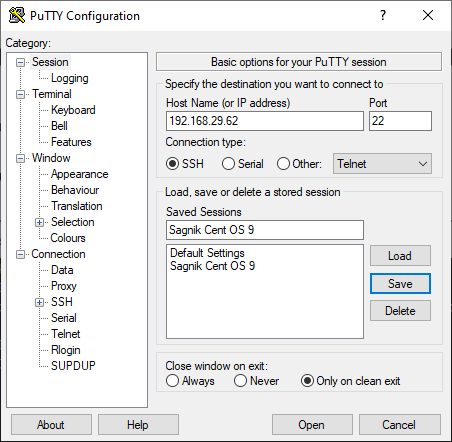
* First we need to open our VM
* Next we need to open up the terminal and type the following command
* ifconfig or ip addr



* As we can see in our output, the IP address of our VM Is 192.168.29.62.

**Connecting To The VM from Putty**

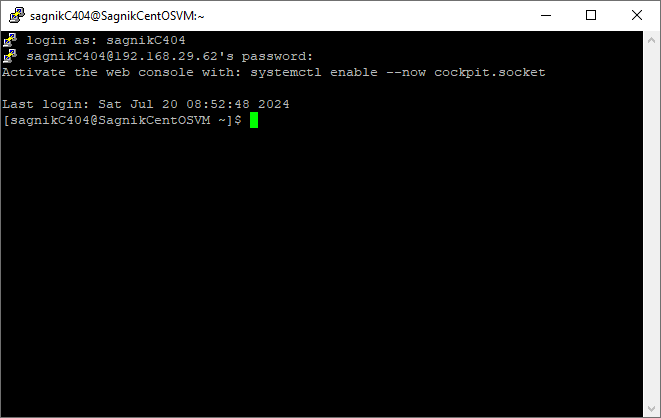
* First we need to open our Putty Client and fill in the extracted IP address and assign a name to the session
* Click on save.



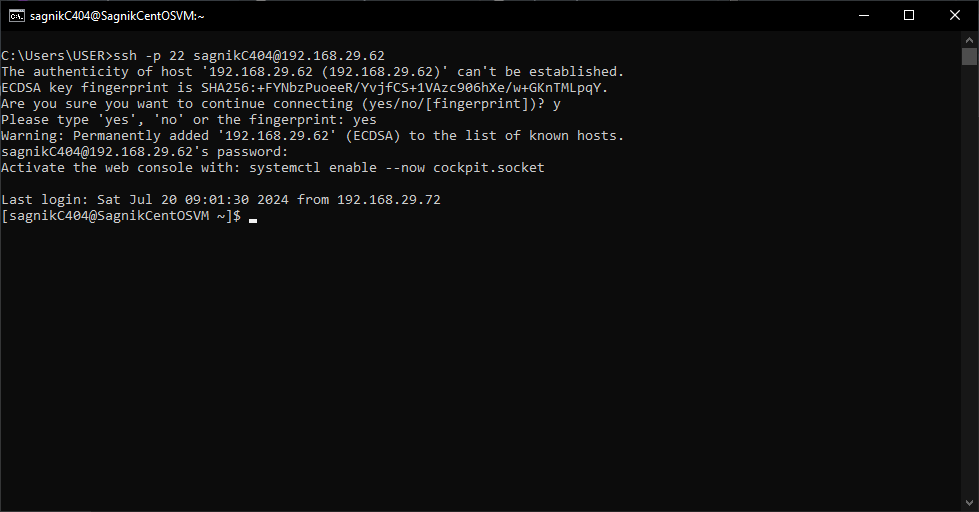
* Next we will need to click on open and we will see the connection establishing window which will ask for username and password



* Next we will need to fill in the username (Created During VM Set Up) followed by the password, which will be invisible.
* Hence we need to be precise while filling in the password.
* On successful authentication, we will see the following window



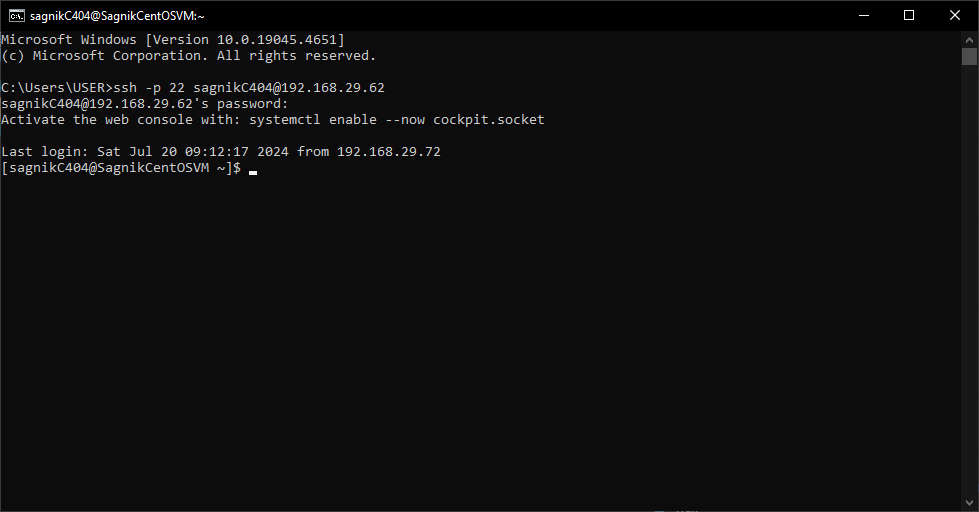
* We are ready to work in our VM.
* **SSH Client ( Connecting To A Linux System From A Windows Machine)**
* First we need to open our Console
* Next we need to type in the following command
* ssh -p 22 username@ipAddress
* It will ask for a confirmation. We have to write yes.
* Next it will ask for the password
* On successful authentication, we will see the following window



* SSH works only for Windows 10 and later version OS
* If we have anything below Windows 10, we will have to depend on Putty

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| **Prompts And How To Get Them Back** |

A command prompt, which is also simply referred to as a prompt is a short text which is seen at the beginning of the command line followed by a prompt symbol. It shows that the system is ready to take commands from us.

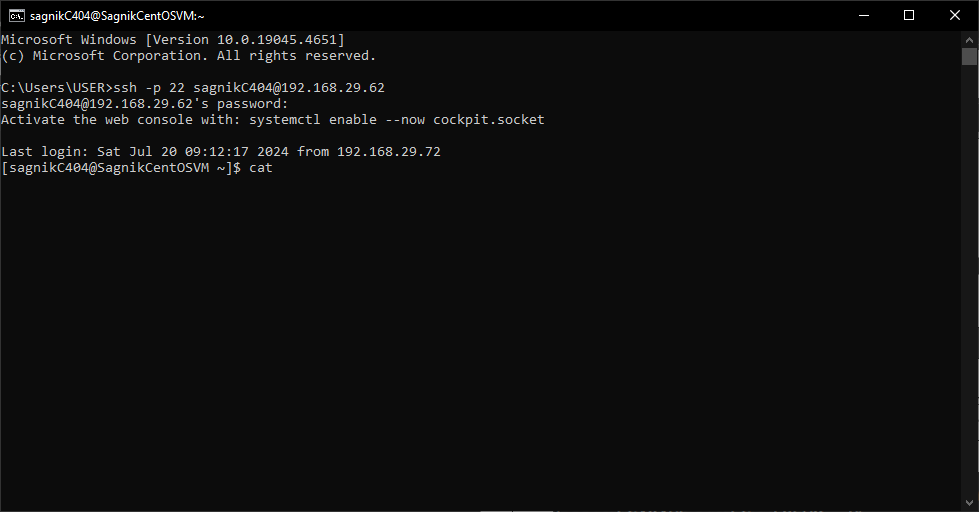


Username

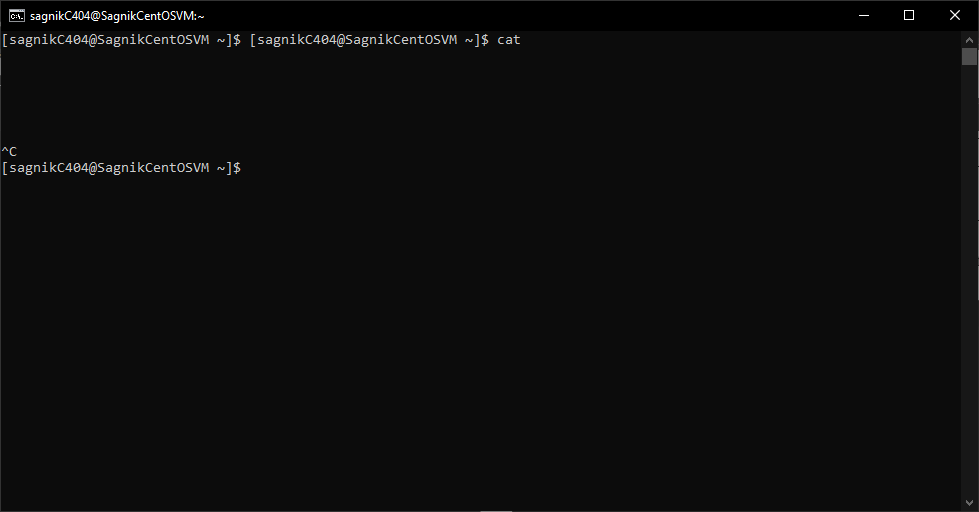
Hostname

Prompt Symbol

In case, while executing some operation, our prompt gets stuck and we feel like terminating the current process, we can hit Ctrl + C to get our prompt back



As we can see, we put in an invalid command and it is running endlessly. To get our prompt back, we can simply use Ctrl + C and we will see it come back



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| **Introduction To Linux File System** |

* **What is a file system?**

A file system is used by an operating system to manage files. The system controls how to save and retrieve files. File system stores files and directories in an organised manner.

Some examples of file systems are as follows

|  |  |  |
| --- | --- | --- |
| **Sl No** | **File System** | **Operating System** |
| 1 | ext3 | Linux |
| 2 | ext4 | Linux |
| 3 | xfs | Linux |
| 4 | NTFS | Windows |
| 5 | FAT | Windows |

* **File System Detailed Structure**

/

/bin

/sbin

/dev

/etc

/proc

/var

/tmp

/usr

/home

/boot

/root

/lib

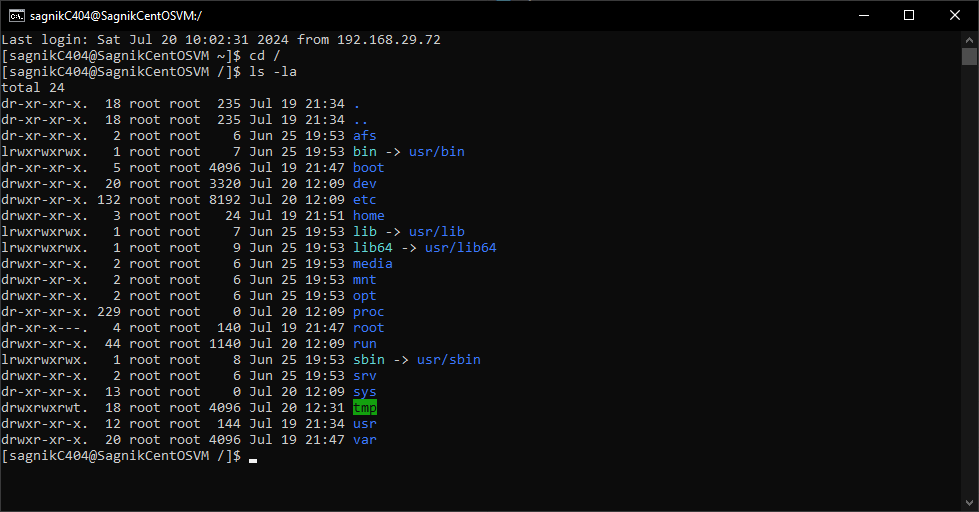
/opt

/mnt

/media

/srv v

If we cd into the root (/) directory and list out the contents over there, we will find all the above mentioned directories

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* **Purpose Of The Directories**

|  |  |  |
| --- | --- | --- |
| **Sl No** | **Directory** | **Purpose** |
| 1 | / | Every single file and directory begins from this directory. Only root user has privilege to write under this directory |
| 2 | /bin | Contains binary executables. Common linux commands you need to use in single-user modes are located under this directory.  Commands used by all the users of the system are located here. For example: ps, ls, ping, grep, cp. |
| 3 | /sbin | System Binaries. Just like /bin, /sbin also contains binary executables. But, the linux commands located under this directory are used typically by system administrator, for system maintenance purpose.  For example: iptables, reboot, fdisk, ifconfig, swapon |
| 4 | /etc | Contains configuration files required by all programs. • This also contains startup and shutdown shell scripts used to start/stop individual programs.  For example: /etc/resolv.conf, /etc/logrotate.conf |
| 5 | /proc | Contains information about system process. This is a pseudo filesystem contains information about running process.  For example: /proc/{pid} directory contains information about the process with that particular pid. This is a virtual filesystem with text information about system resources. For example: /proc/uptime |
| 6 | /var | var stands for variable files. Content of the files that are expected to grow can be found under this directory.  This includes — system log files (/var/log); packages and database files (/var/lib); emails (/var/mail); print queues (/var/spool); lock files (/var/lock); temp files needed across reboots (/var/tmp); |
| 7 | /tmp | Directory that contains temporary files created by system and users. Files under this directory are deleted when system is rebooted. |
| 8 | /usr | Contains binaries, libraries, documentation, and source-code for second level programs. /usr/bin contains binary files for user programs.  If you can’t find a user binary under /bin, look under /usr/bin.  For example: at, awk, cc, less, scp /usr/sbin contains binary files for system administrators.  If you can’t find a system binary under /sbin, look under /usr/sbin.  For example: atd, cron, sshd, useradd, userdel /usr/lib contains libraries for /usr/bin and /usr/sbin  /usr/local contains users programs that you install from source. For example, when you install apache from source, it goes under /usr/local/apache2 |
| 9 | /home | Home directory for all users for storing their files  /home/john /home/nikita |
| 10 | /boot | Bootloader files. Kernel initrd, vmlinux, grub files are located under /boot |
| 11 | /lib | System libraries. Contains library files that support libraries located under /sbin and /bin |
| 12 | /opt | Optional add on files. Contains add on applications from individual vendors |
| 13 | /media | Removable media device. Temporary mount directory for removable devices.  For examples, /media/cdrom for CD-ROM; /media/floppy for floppy drives; /media/cdrecorder for CD writer |
| 14 | /mnt | Temporary mount directory where sysadmins can mount filesystems. |
| 15 | /srv | srv stands for service. Contains server specific services related data.  For example, /srv/cvs contains CVS related data |
| 16 | /root | Home directory for the root user |

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| **File System Navigation Command** |

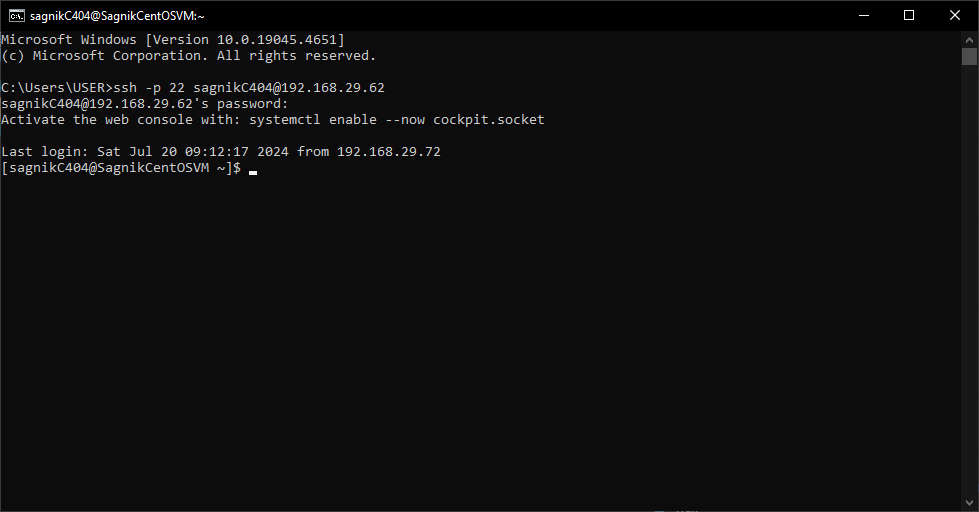
While navigating the Linux file system, we have three commands,

* pwd
* ls
* cd

|  |  |  |
| --- | --- | --- |
| **Sl No** | **Command** | **Purpose** |
| 1 | cd | cd stands for change directory |
| 2 | pwd | pwd stands for print working directory |
| 3 | ls | ls stands for list. It lists all files and directories present in a given directory |

* **Switching Between Normal And Root User**

We can take a look at the prompt and figure out, which user we are logged in as.

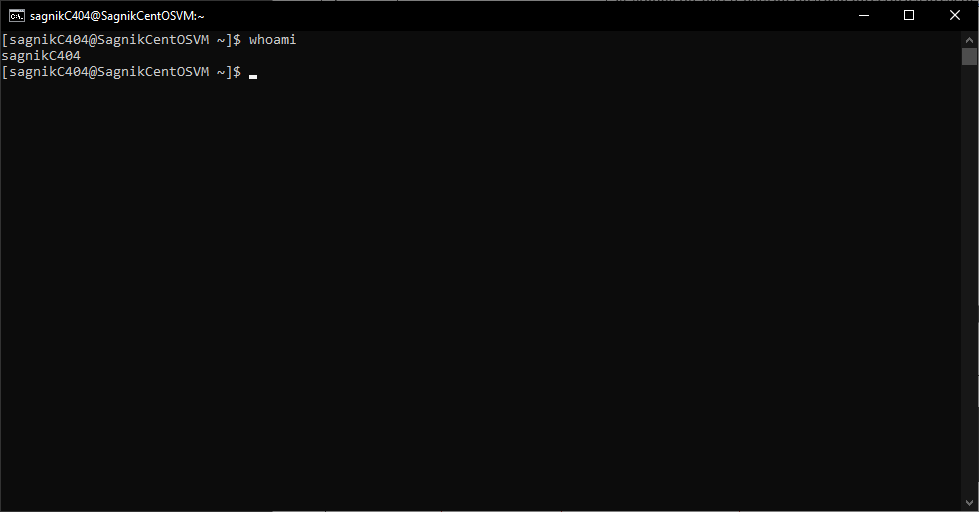


Username

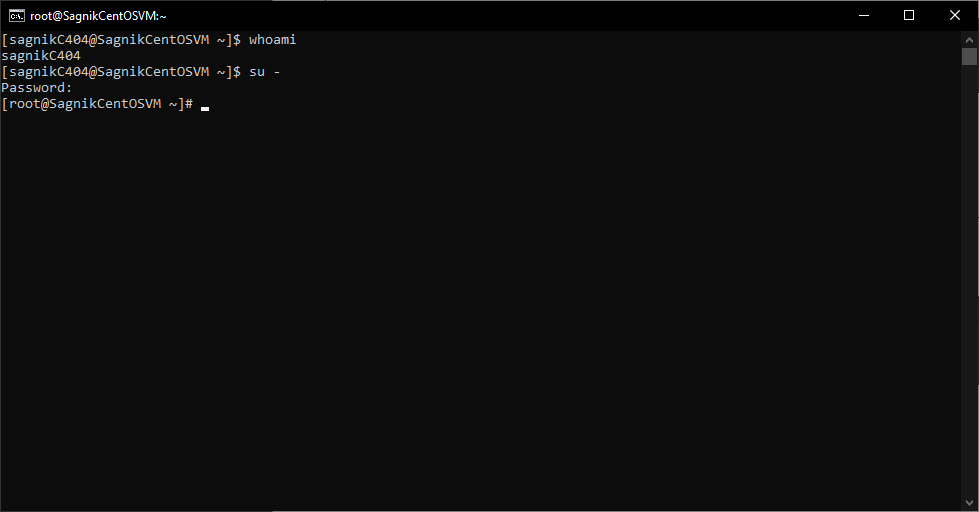
Hostname

Prompt Symbol

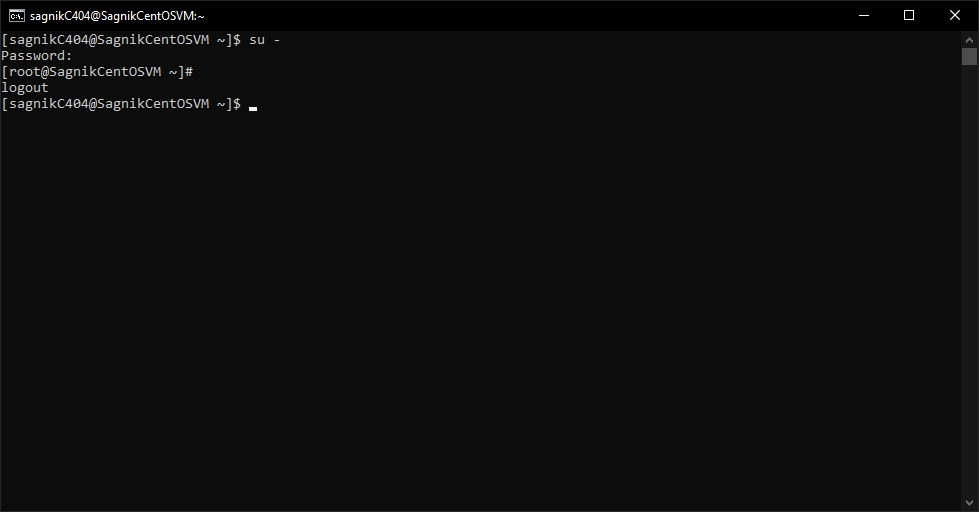
Also we can use the command whoami to show the username we are logged in as.



To switch to the root user, we can use the command su- . Next it will ask for the root user password. If the authentication is successful, we will be elevated as the root user.

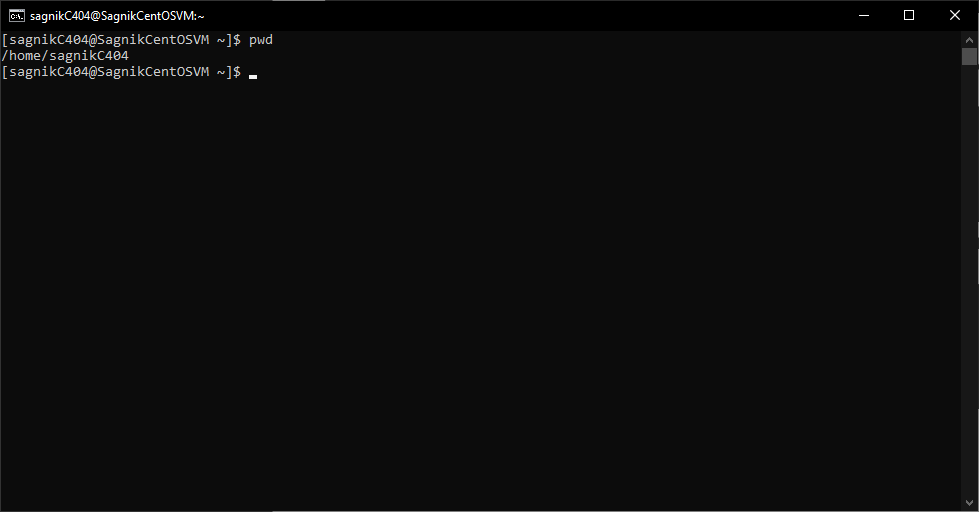


To relegate ourselves to a normal user from the root user mode, we can use Ctrl + D. We will be switched back to the normal user.

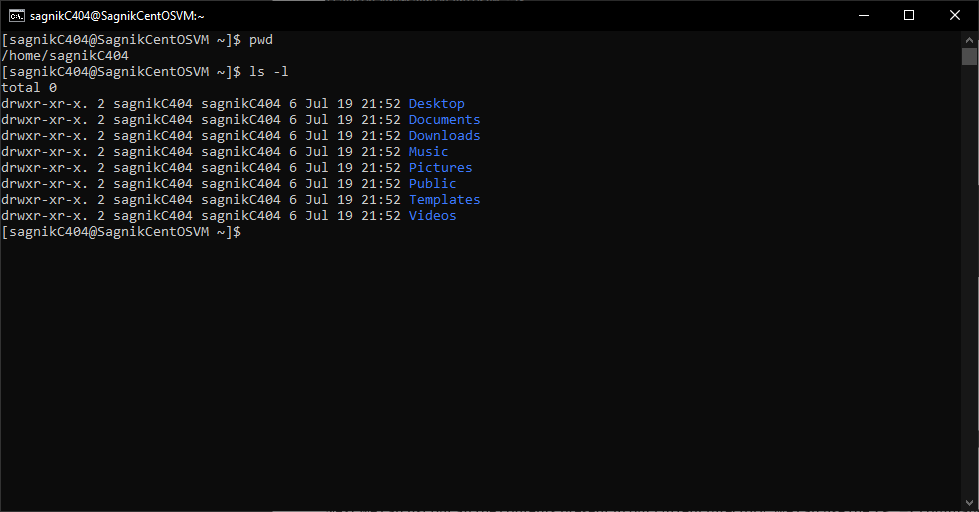


* **Using The pwd, cd and ls Command**

First let us use the pwd command to figure out the location we are currently at.

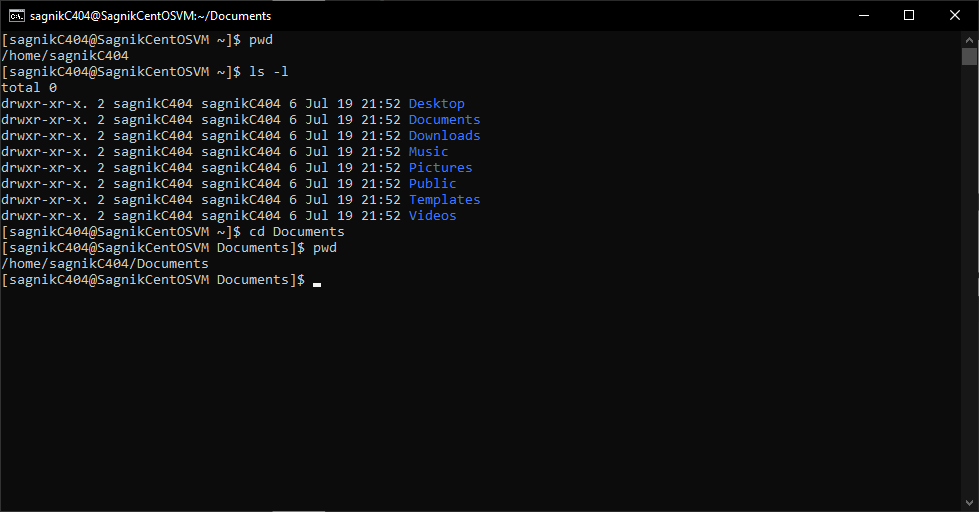


Next we can list out all the contents present in our current directory. We can use the ls -l command

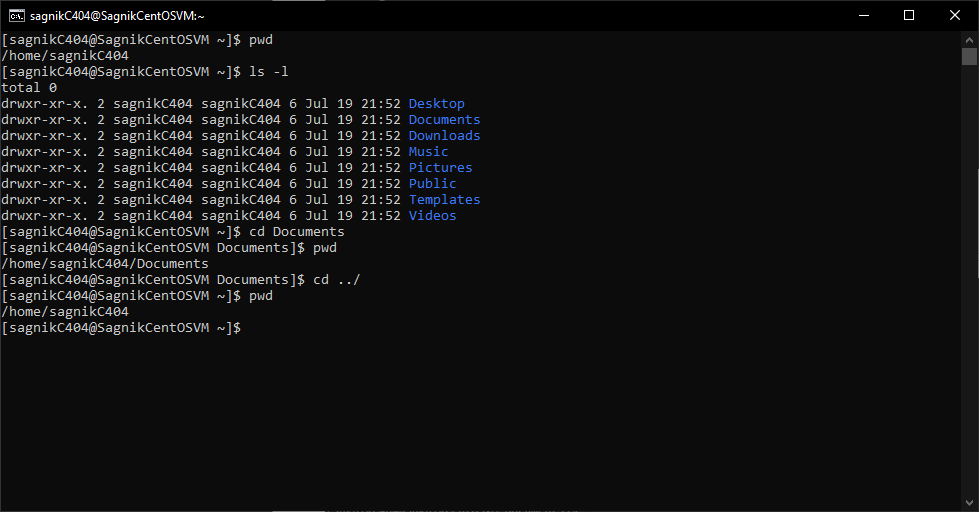


Next if we want to move into the Documents directory, we can use the command cd Documents.

To check if we were able to change the directory or not, we can check our location using the pwd command

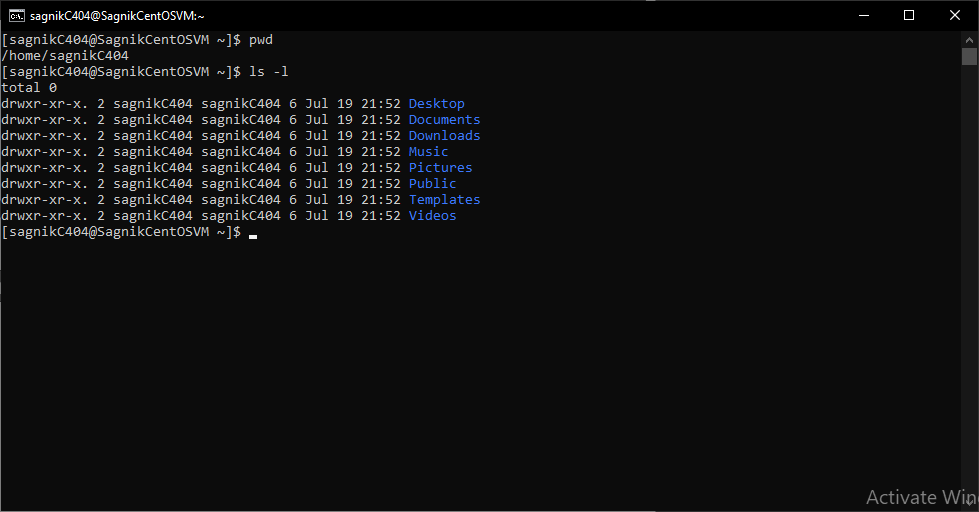


To comeback to the original user home directory we can use the cd ../



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| **Linux File Or Directory Properties** |

If we take a look at listing of the contents of a directory, we will see a lot of information being shown to us. Which are the properties of these files/directories



Let us take an example and analyse it

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Type Of File | No Of Links | Owner | Group | Size | Month | Day | Time | Name |
| drwxr-xr-x | 2 | sagnikC404 | sagnikC404 | 6 | Jul | 19 | 21:52 | Desktop |
| drwxr-xr-x | 2 | sagnikC404 | sagnikC404 | 6 | Jul | 19 | 21:52 | Documents |

* The first column tells us about the type of the file and the associated file permissions. Anything that starts with a ‘d’ is a directory. Anything that starts with a ‘l’ it is a link. If it has nothing, (-) it is a normal text file.
* The second column tells us about the number of hard links it has. It is the total number of parent directories and the sub directories it has.
* The third column tells us about the owner.
* The fourth column tells us about the group it belongs to
* The fifth column tells us about the size of the file.
* The sixth , seventh and eighth column tells us about the month, the date and the time when the file was created
* The ninth and the final column tells us the name of the file or directory.

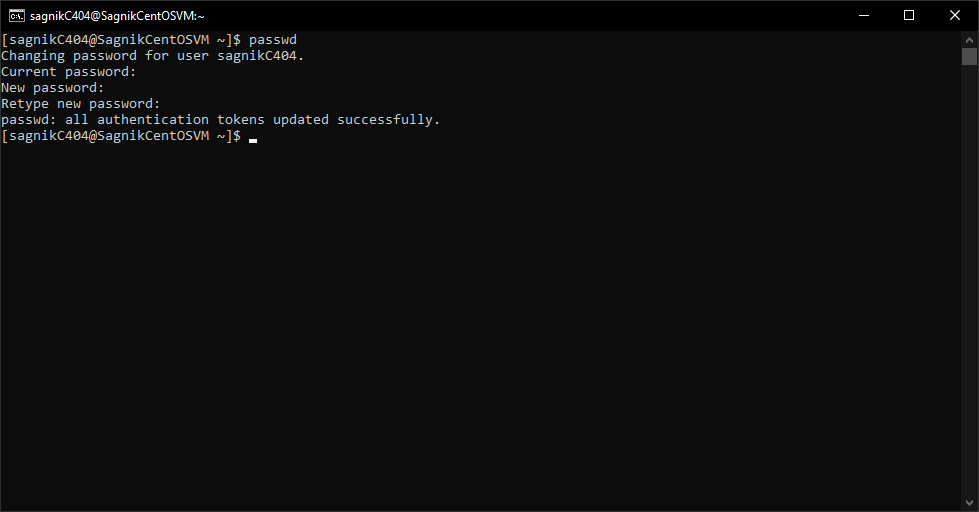
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| **Linux File Types** |

|  |  |  |
| --- | --- | --- |
| **Sl No** | **Name** | **File Symbol** |
| 1 | Regular File | - |
| 2 | Directory | d |
| 3 | Special File or Device File | c |
| 4 | Socket | s |
| 5 | Named Pipe | p |
| 6 | Blocked Device | b |
| 7 | Link | l |
| **Root** | | | | |

There are 3 things which are addressed as root on a linux system

|  |  |  |
| --- | --- | --- |
| **Sl No** | **Name** | **Explanation** |
| 1 | Root User (Account) | Root is the most powerful account on a Linux machine which has access to all the files and commands |
| 2 | Root Directory (/) | The very first and the top most directory in the Linux file system is also referred to as the Root |
| 3 | Root Home Directory (/root) | The root user account also has a directory named /root which is the home directory of the root user |

* **Changing Password Of Our Account**
* First we have to type the command passwd
* Next it will ask for the old password
* After successfully entering old password for the user account, it will prompt for new password
* After confirmation, the password will be successfully changed

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| **Absolute And Relative Paths** |

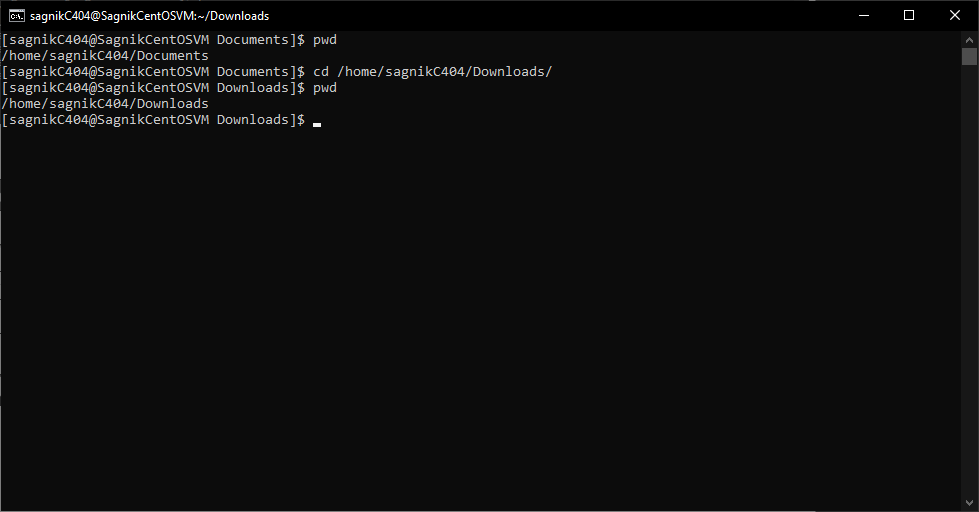
There are two ways to navigate a file system.

|  |  |
| --- | --- |
| Absolute Path | Absolute path starts from root. It has a ‘/’ in the beginning |
| Relative Path | Relative path to a file/directory depends on our present location. It is relative to our current position. It doesn’t start with a ‘/’ |

Let us suppose we are in the Documents Directory, and we want to move to the Downloads.

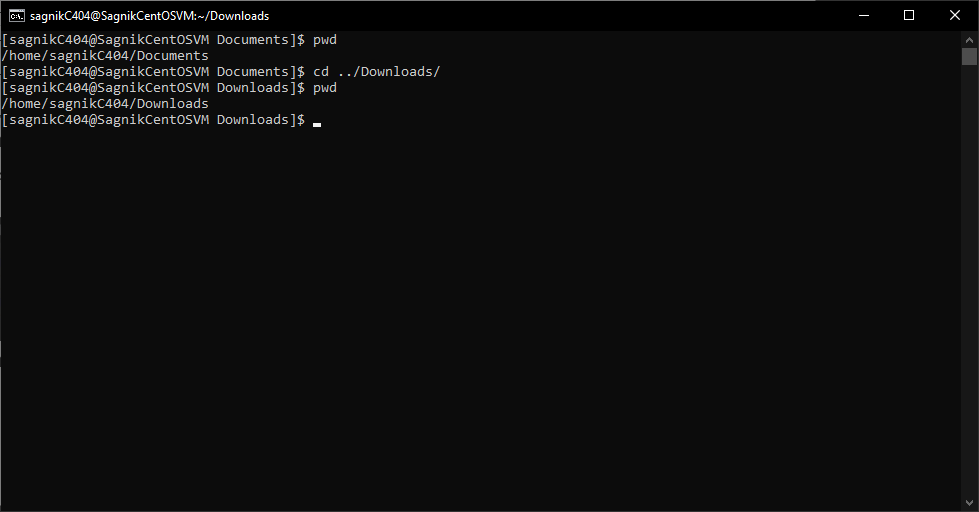
If we want to do it using the absolute path, we will do the following

cd /home/sagnikC404/Downloads/



If we want to do it using the relative path, we will do the following

cd ../Downloads/



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| **Creating Files And Directories** |