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Course/Section:CPE31S2	**Date Submitted:8/25/24**
Instructor: Robin Valenzuela	**Semester and SY: 1st semester 2024-2025**

Activity 1: Configure Network using Virtual Machines

1. **Objectives:**

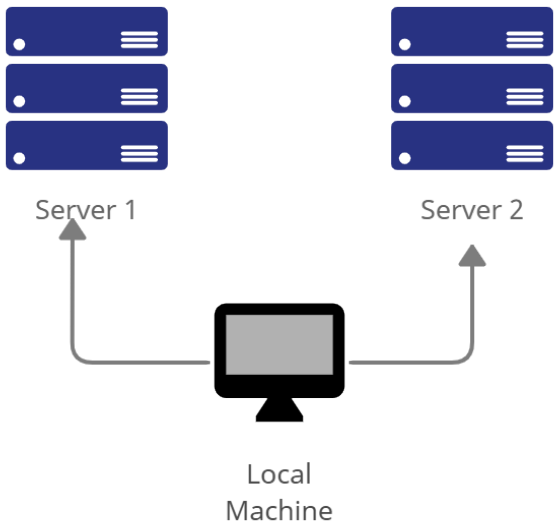
1.1. Create and configure Virtual Machines in Microsoft Azure or VirtualBox

1.2. Set-up a Virtual Network and Test Connectivity of VMs

2. **Discussion:**

Network Topology:

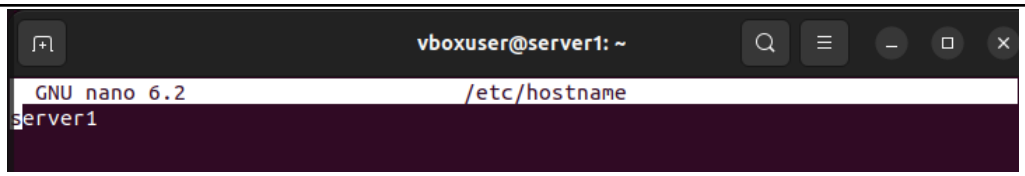
Assume that you have created the following network topology in Virtual Machines, *provide screenshots for each task*. (Note: *it is assumed that you have the prior knowledge of cloning and creating snapshots in a virtual machine*).

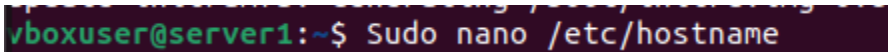


Task 1: Do the following on Server 1, Server 2, and Local Machine. In editing the file using nano command, press control + O to write out (save the file). Press enter when asked for the name of the file. Press control + X to end.

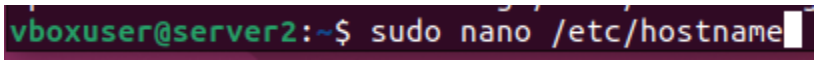
1. Change the hostname using the command *sudo nano /etc/hostname*

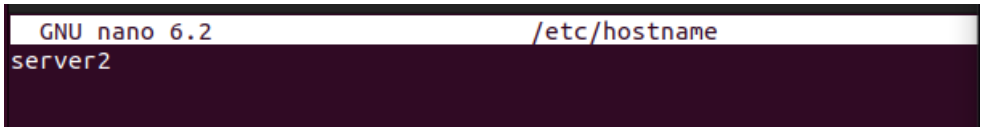
1.1 Use server1 for Server 1



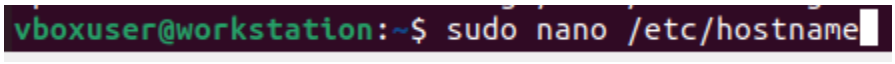


1.2 Use server2 for Server 2



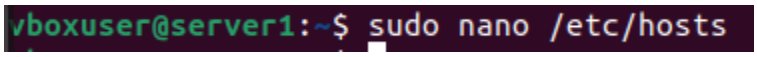


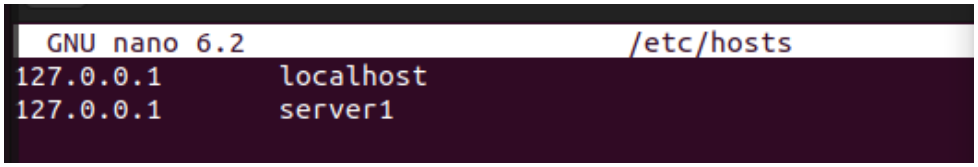
1.3 Use workstation for the Local Machine



2. Edit the hosts using the command *sudo nano /etc/hosts*. Edit the second line.

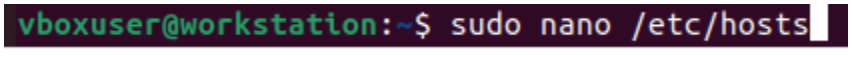
2.1 Type 127.0.0.1 server 1 for Server 1





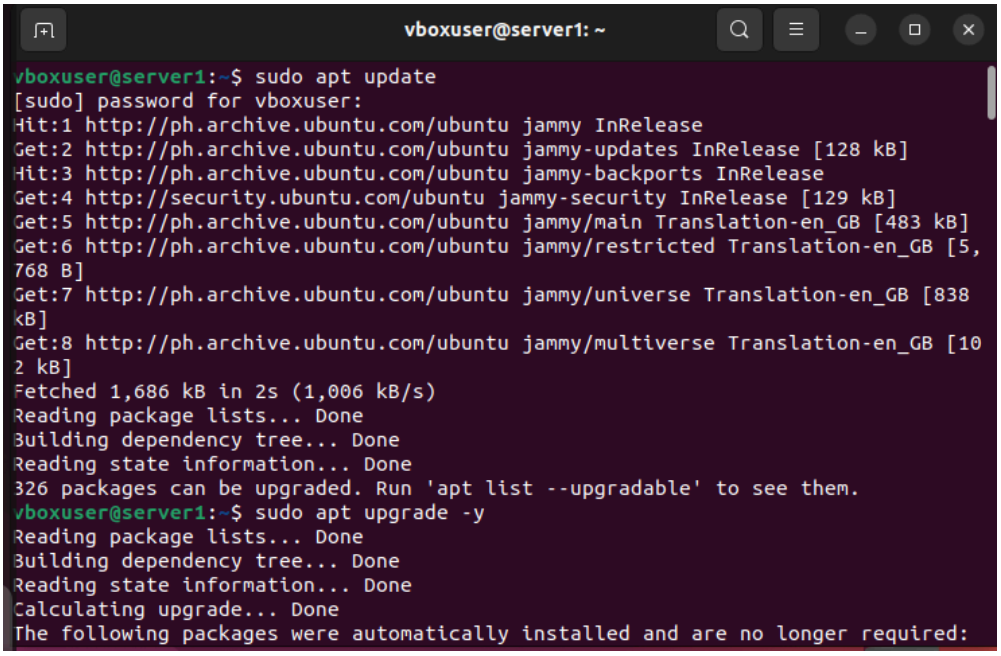
2.2 Type 127.0.0.1 server 2 for Server 2

2.3 Type 127.0.0.1 workstation for the Local Machine

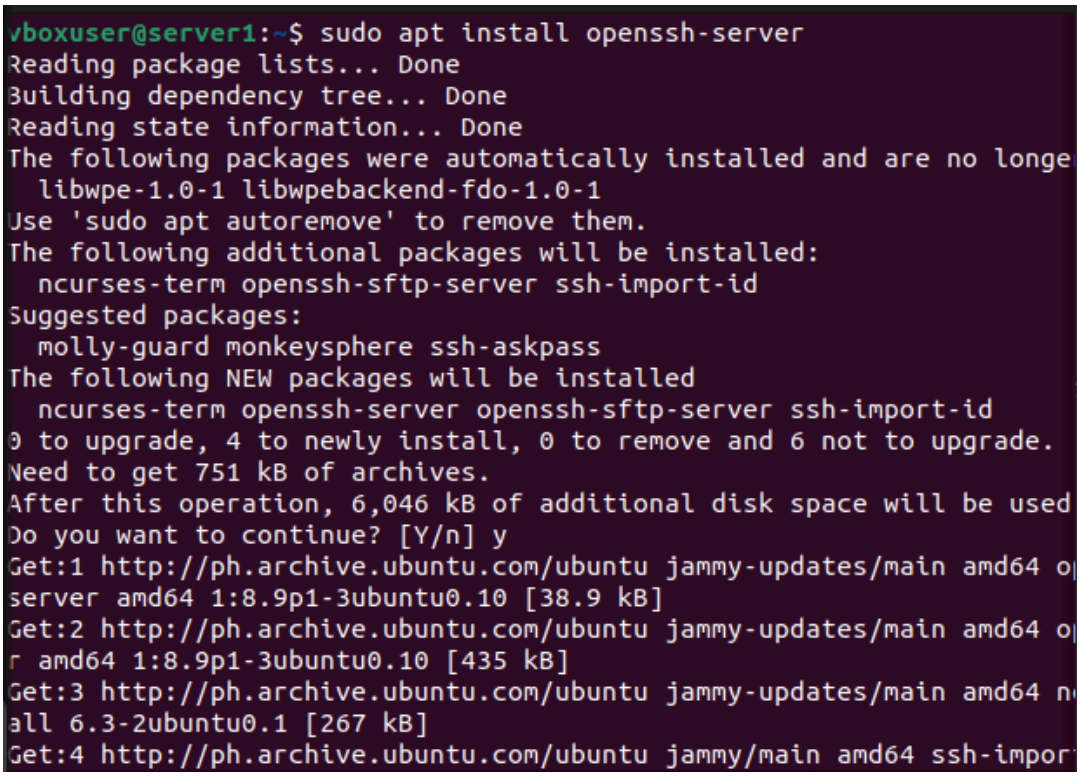


Task 2: Configure SSH on Server 1, Server 2, and Local Machine. Do the following:

1. Upgrade the packages by issuing the command *sudo apt update* and *sudo apt upgrade* respectively.



2. Install the SSH server using the command *sudo apt install openssh-server*.



3. Verify if the SSH service has started by issuing the following commands:
   3.1 sudo service ssh start

3.2 sudo systemctl status ssh

```
vboxuser@server1:~$ sudo service ssh start
vboxuser@server1:~$ sudo systemctl status ssh
● ssh.service - OpenBSD Secure Shell server
     Loaded: loaded (/lib/systemd/system/ssh.service; enabled
     Active: active (running) since Sun 2024-08-25 16:07:48 C
       Docs: man:sshd(8)
             man:sshd_config(5)
   Main PID: 32013 (sshd)
      Tasks: 1 (limit: 2272)
     Memory: 1.7M
        CPU: 24ms
     CGroup: /system.slice/ssh.service
             └─32013 "sshd: /usr/sbin/sshd -D [listener] 0 of

Aug 25 16:07:48 server1 systemd[1]: Starting OpenBSD Secure S
Aug 25 16:07:48 server1 sshd[32013]: Server listening on 0.0.
Aug 25 16:07:48 server1 sshd[32013]: Server listening on :: p
Aug 25 16:07:48 server1 systemd[1]: Started OpenBSD Secure Sh
lines 1-16/16 (END)
```

4. Configure the firewall to all port 22 by issuing the following commands:
   4.1 sudo ufw allow ssh
   4.2 sudo ufw enable
   4.3 sudo ufw status

```
vboxuser@server1:~$ sudo ufw allow ssh
Rules updated
Rules updated (v6)
vboxuser@server1:~$ sudo ufw enable
Firewall is active and enabled on system startup
vboxuser@server1:~$ sudo ufw status
Status: active

To                         Action      From
--                         ------      ----
22/tcp                     ALLOW       Anywhere
22/tcp (v6)                ALLOW       Anywhere (v6)

vboxuser@server1:~$
```

Task 3: Verify network settings on Server 1, Server 2, and Local Machine. On each device, do the following:

1. Record the ip address of Server 1, Server 2, and Local Machine. Issue the command *ifconfig* and check network settings. Note that the ip addresses of all the machines are in this netwDork 192.168.31.XX.

2.

```
vboxuser@server1:~$ ifconfig
enp0s3: flags=4163<UP,BROADCAST,RUNNING,MULTICAST>  mtu 1500
        inet 192.168.31.75  netmask 255.255.255.0  broadcast 19
        inet6 fe80::b2f9:59ae:199c:1ebb  prefixlen 64  scopeid
        ether 08:00:27:6e:45:54  txqueuelen 1000  (Ethernet)
        RX packets 16522  bytes 4133361 (4.1 MB)
        RX errors 0  dropped 0  overruns 0  frame 0
        TX packets 1046  bytes 88671 (88.6 KB)
        TX errors 0  dropped 0 overruns 0  carrier 0  collision

lo: flags=73<UP,LOOPBACK,RUNNING>  mtu 65536
        inet 127.0.0.1  netmask 255.0.0.0
        inet6 ::1  prefixlen 128  scopeid 0x10<host>
        loop  txqueuelen 1000  (Local Loopback)
        RX packets 225  bytes 21275 (21.2 KB)
        RX errors 0  dropped 0  overruns 0  frame 0
        TX packets 225  bytes 21275 (21.2 KB)
        TX errors 0  dropped 0 overruns 0  carrier 0  collision

vboxuser@server1:~$
```

1.1 Server 1 IP address: 192.168.31.75
1.2 Server 2 IP address: 192.168.31.133
1.3 Server 3 IP address: 192.168.31.58

3. Make sure that they can ping each other.
   Connectivity test for Local Machine 1 to Server 1: ☐ Successful ☐ Not Successful

```
vboxuser@workstation:~$ ping -c 4 192.168.31.75
PING 192.168.31.75 (192.168.31.75) 56(84) bytes of data.
64 bytes from 192.168.31.75: icmp_seq=1 ttl=64 time=2.74 ms
64 bytes from 192.168.31.75: icmp_seq=2 ttl=64 time=0.563 ms
64 bytes from 192.168.31.75: icmp_seq=3 ttl=64 time=0.928 ms
64 bytes from 192.168.31.75: icmp_seq=4 ttl=64 time=0.769 ms

--- 192.168.31.75 ping statistics ---
4 packets transmitted, 4 received, 0% packet loss, time 3009ms
rtt min/avg/max/mdev = 0.563/1.250/2.741/0.870 ms
vboxuser@workstation:~$ SS
```

☐ Connectivity test for Local Machine 1 to Server 2: ☐ Successful ☐ Not Successful

```
vboxuser@workstation:~$ ping -c 4 192.168.31.133
PING 192.168.31.133 (192.168.31.133) 56(84) bytes of data.
64 bytes from 192.168.31.133: icmp_seq=1 ttl=64 time=1.63 ms
Terminal
64 bytes from 192.168.31.133: icmp_seq=2 ttl=64 time=1.14 ms
64 bytes from 192.168.31.133: icmp_seq=3 ttl=64 time=0.893 ms
64 bytes from 192.168.31.133: icmp_seq=4 ttl=64 time=0.642 ms
```

☐ Connectivity test for Server 1 to Server 2: ☐ Successful ☐ Not Successful

```
vboxuser@server1:~$ ping -c 4 192.168.31.58
PING 192.168.31.58 (192.168.31.58) 56(84) bytes of data.
64 bytes from 192.168.31.58: icmp_seq=1 ttl=64 time=0.933 ms
64 bytes from 192.168.31.58: icmp_seq=2 ttl=64 time=1.90 ms
64 bytes from 192.168.31.58: icmp_seq=3 ttl=64 time=0.573 ms
64 bytes from 192.168.31.58: icmp_seq=4 ttl=64 time=0.598 ms

--- 192.168.31.58 ping statistics ---
4 packets transmitted, 4 received, 0% packet loss, time 3022ms
rtt min/avg/max/mdev = 0.573/0.999/1.895/0.536 ms
```

ATask 4: Verify SSH connectivity on Server 1, Server 2, and Local Machine.

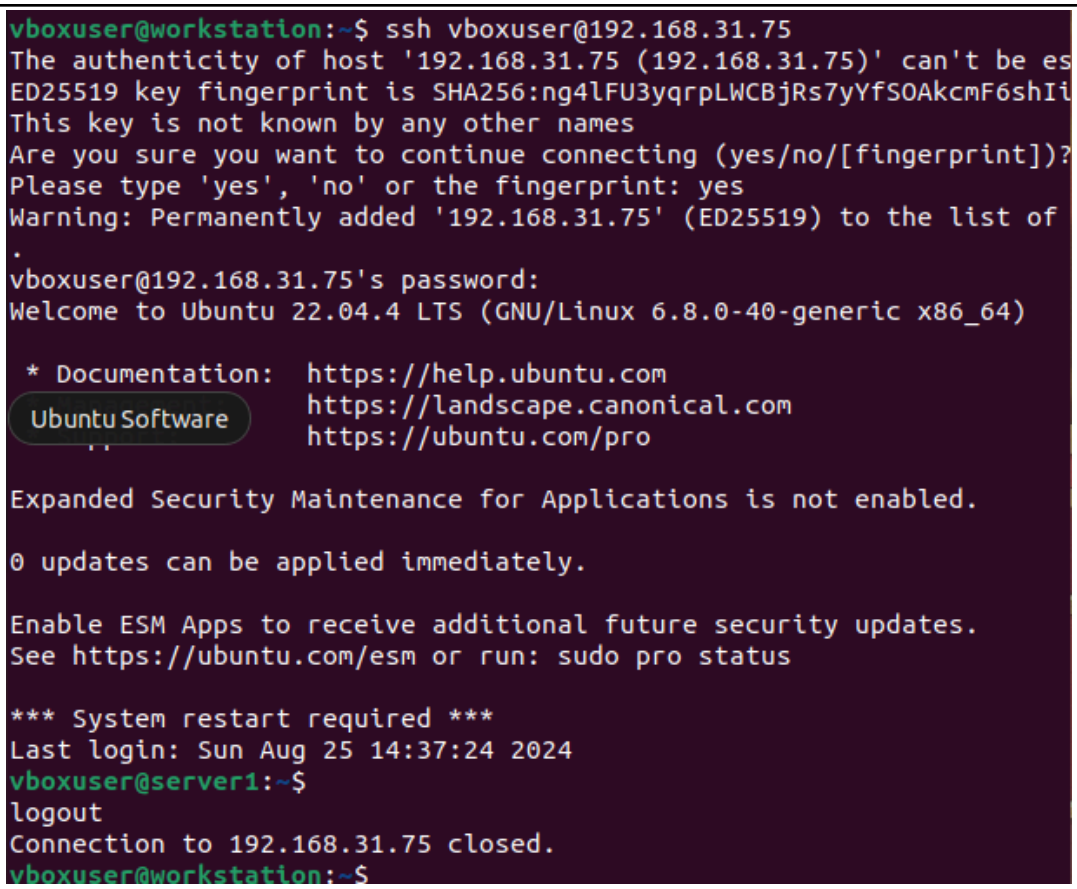
1. On the Local Machine, issue the following commands:

1.1 ssh username@ip_address_server1 for example, *ssh jvtaylar@192.168.56.120*

1.2 Enter the password for server 1 when prompted

1.3 Verify that you are in server 1. The user should be in this format user@server1. For example, *jvtaylar@server1*

2. Logout of Server 1 by issuing the command *control + D.*



3. Do the same for Server 2.

```
vboxuser@workstation:~$ ssh vboxuser@192.168.31.133
The authenticity of host '192.168.31.133 (192.168.31.133)' can't be
.
ED25519 key fingerprint is SHA256:Plx4E2QYrDewfeqXhhlAdXhdDDAiBf4c29
This key is not known by any other names
Are you sure you want to continue connecting (yes/no/[fingerprint])?
Warning: Permanently added '192.168.31.133' (ED25519) to the list of
s.
vboxuser@192.168.31.133's password:
Welcome to Ubuntu 22.04.4 LTS (GNU/Linux 6.8.0-40-generic x86_64)

 * Documentation:  https://help.ubuntu.com
 * Management:     https://landscape.canonical.com
 * Support:        https://ubuntu.com/pro

Expanded Security Maintenance for Applications is not enabled.

0 updates can be applied immediately.

Enable ESM Apps to receive additional future security updates.
See https://ubuntu.com/esm or run: sudo pro status

*** System restart required ***
Last login: Sun Aug 25 14:37:24 2024
vboxuser@server2:~$
logout
Connection to 192.168.31.133 closed.
vboxuser@workstation:~$
```

4. Edit the hosts of the Local Machine by issuing the command *sudo nano /etc/hosts.* Below all texts type the following:

4.1 IP_address server 1 (provide the ip address of server 1 followed by the hostname)

4.2 IP_address server 2 (provide the ip address of server 2 followed by the hostname)

4.3 Save the file and exit.

```
  GNU nano 6.2                                /etc/hosts *
127.0.0.1       localhost
127.0.0.1       workstation
192.168.31.75   server1
192.168.31.133  server2
# The following lines are desirable for IPv6 capable hosts
::1     ip6-localhost ip6-loopback
fe00::0 ip6-localnet
ff00::0 ip6-mcastprefix
ff02::1 ip6-allnodes
ff02::2 ip6-allrouters
```

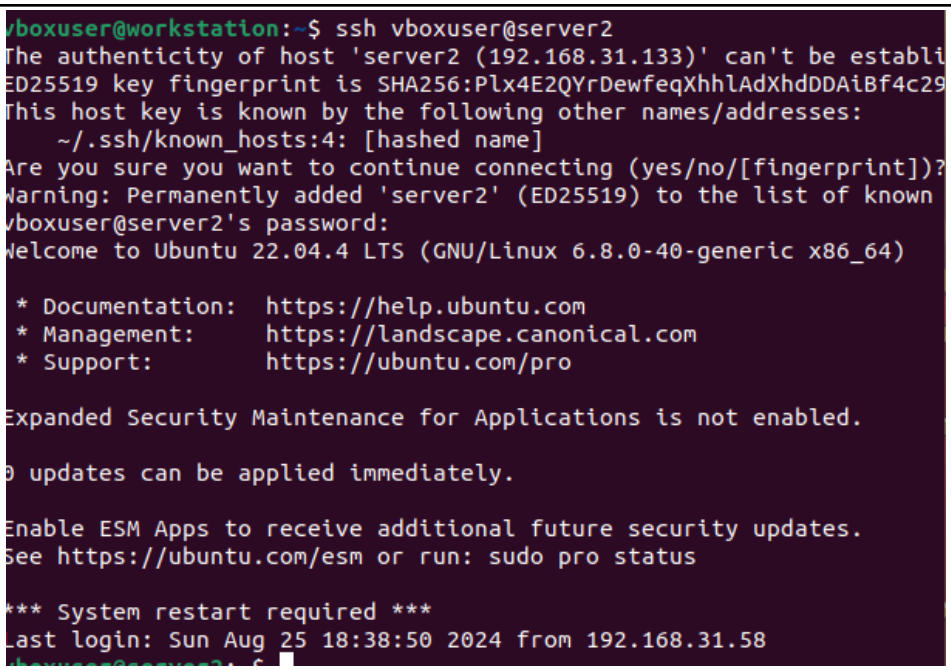
5. On the local machine, verify that you can do the SSH command but this time, use the hostname instead of typing the IP address of the servers. For example, try to do *ssh jvtaylar@server1*. Enter the password when prompted. Verify that you have entered Server 1. Do the same for Server 2.

   server 1

```
vboxuser@workstation:~$ ssh vboxuser@server1
The authenticity of host 'server1 (192.168.31.75)' can't be establis
ED25519 key fingerprint is SHA256:ng4lFU3yqrpLWCBjRs7yYfSOAkcmF6shI
This host key is known by the following other names/addresses:
    ~/.ssh/known_hosts:1: [hashed name]
Are you sure you want to continue connecting (yes/no/[fingerprint])?
Warning: Permanently added 'server1' (ED25519) to the list of known
vboxuser@server1's password:
Permission denied, please try again.
vboxuser@server1's password:
Permission denied, please try again.
vboxuser@server1's password:
                                u 22.04.4 LTS (GNU/Linux 6.8.0-40-generic x86_64)
 * Documentation:  https://help.ubuntu.com
 * Management:     https://landscape.canonical.com
 * Support:        https://ubuntu.com/pro

Expanded Security Maintenance for Applications is not enabled.

0 updates can be applied immediately.

Enable ESM Apps to receive additional future security updates.
See https://ubuntu.com/esm or run: sudo pro status

*** System restart required ***
Last login: Sun Aug 25 18:36:36 2024 from 192.168.31.58
vboxuser@server1:~$
```

   LibreOffice Writer

   server 2



Reflections:

Answer the following:

1. How are we able to use the hostname instead of IP address in SSH commands?

Using the hostname instead of the IP address in SSH commands works because the hostname is mapped to the correct IP address in the /etc/hosts file or via DNS. When you set up the /etc/hosts file with the server's IP address and hostname on your local machine, it enables the system to resolve the hostname to the appropriate IP, allowing you to use the hostname in SSH commands.

2. How secured is SSH?

SSH is very secure due to its encryption of data between the client and server, which prevents interception and tampering. It also supports robust authentication methods, including passwords, public keys, and two-factor authentication, adding extra security layers. Moreover, SSH safeguards against various network threats like IP spoofing and DNS spoofing.