

VPN & Secure File Sharing

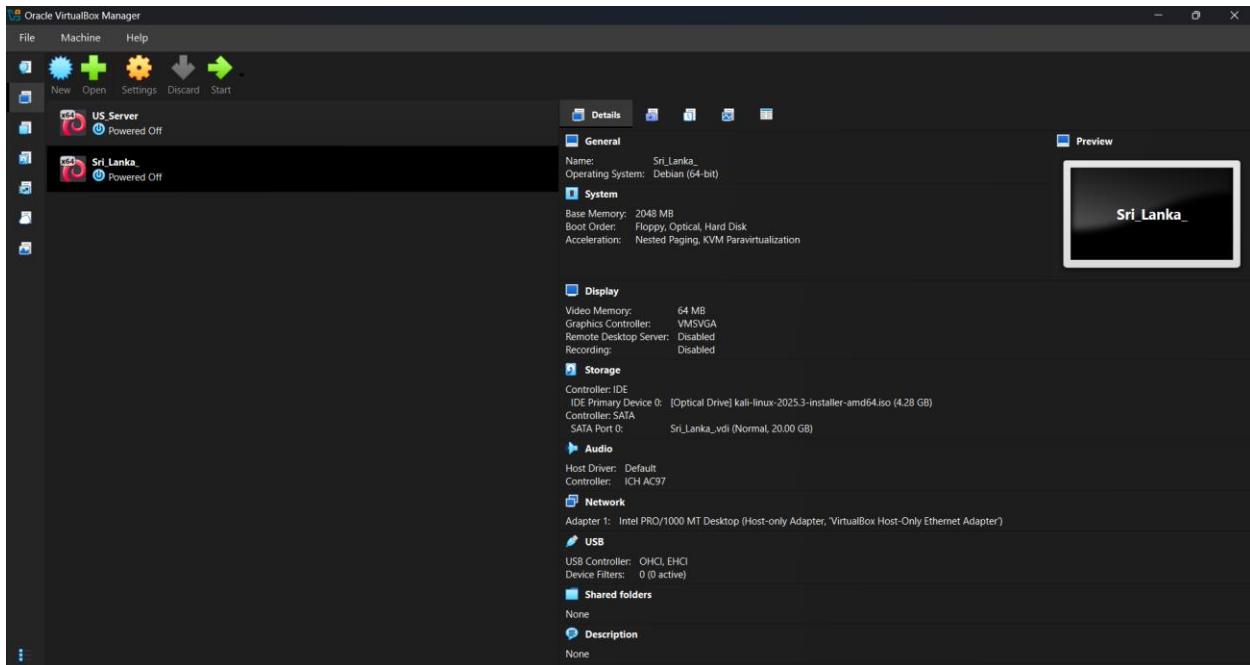
Implementation

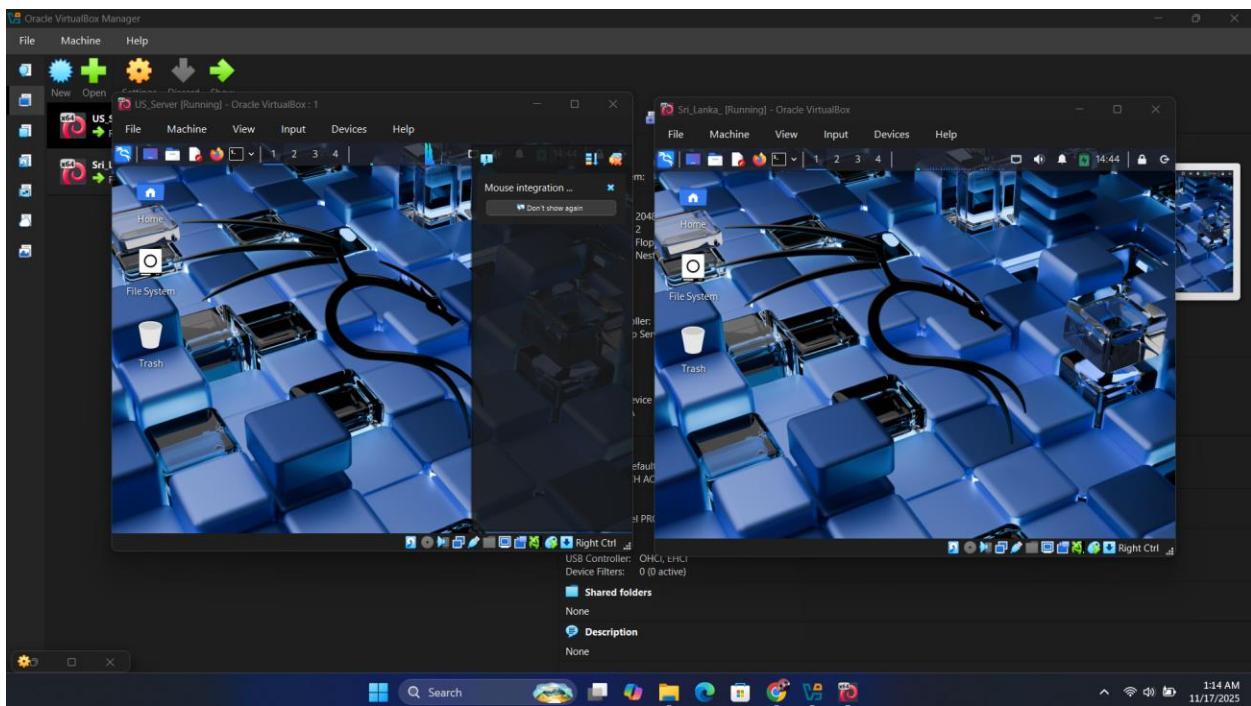
1. Introduction

- **US VM** – acts as the OpenVPN server and Samba file server
- **Sri Lanka VM** – acts as the OpenVPN client

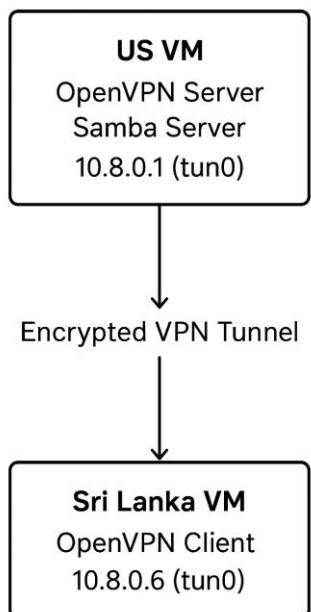
The tasks were:

1. Configure a secure VPN connection between Sri Lanka ↔ US using **OpenVPN**.
2. Configure a **Samba file server** on the US VM.
3. Access the Samba share **through the VPN tunnel** from Sri Lanka.





2. Network Diagram

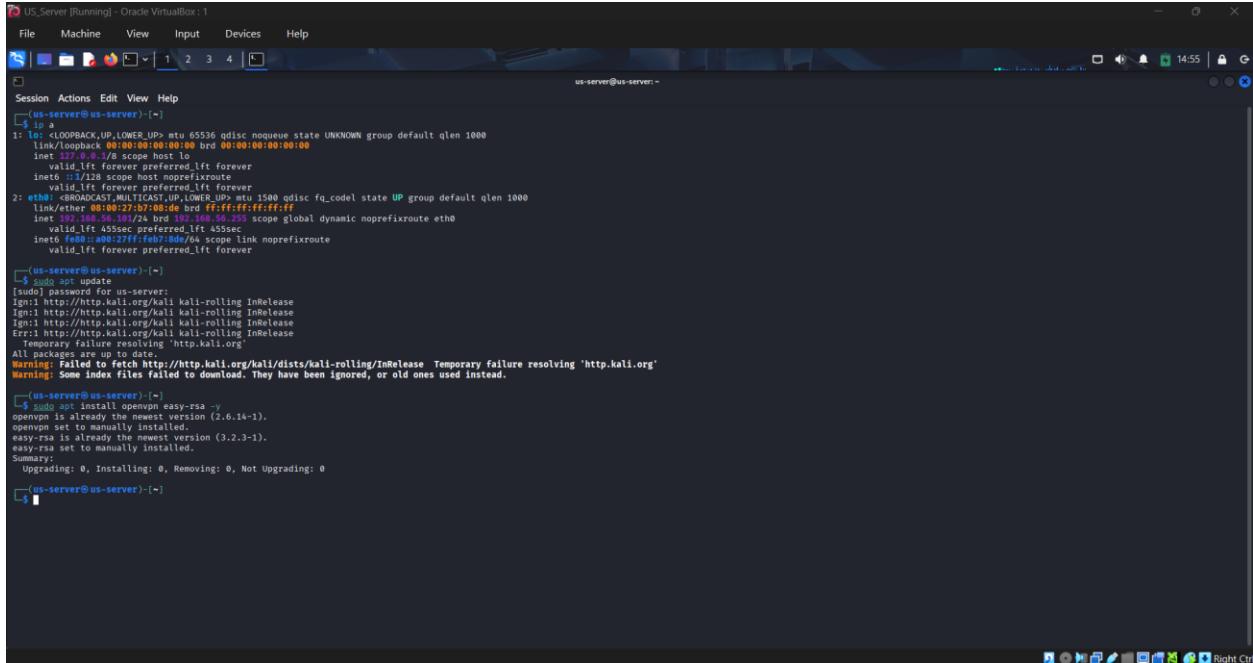


3. OpenVPN Server Setup (US VM)

3.1 Install OpenVPN & EasyRSA

```
sudo apt update
```

```
sudo apt install openvpn easy-rsa -y
```



The screenshot shows a terminal window titled "us-server [Running] - Oracle VirtualBox : 1". The session is "us-server@us-server". The terminal output is as follows:

```
File Machine View Input Devices Help
us-server@us-server:~$ ls
Session Actions Edit View Help
us-server@us-server:~$ ls
1: lo <LOOPBACK,UP,LOWER_UP> mtu 65536 qdisc noqueue state UNKNOWN group default qlen 1000
    link/loopback brd 00:00:00:00:00:00 brd 00:00:00:00:00:00
        valid_lft forever preferred_lft forever
    inet6 ::1/128 scope host noprefixroute
        valid_lft forever preferred_lft forever
2: eth0 <NO-CARRIER,BROADCAST,MULTICAST,UP> mtu 1500 qdisc fq_codel state UP group default qlen 1000
    link/ether 00:0c:27:b7:08:de brd ff:ff:ff:ff:ff:ff
        valid_lft 00:00:01:24 preferred_lft 00:00:01:24
    inet 192.168.56.101/24 brd 192.168.56.255 scope global dynamic noprefixroute eth0
        valid_lft 00:07:44 preferred_lft 00:07:44
    link 00:0c:27:ff:fe:de brd ff:ff:ff:ff:ff:ff
        valid_lft forever preferred_lft forever
us-server@us-server:~$ sudo apt update
[sudo] password for us-server:
Ign1: http://http.kali.org/kali kali-rolling InRelease
Ign1: http://http.kali.org/kali kali-rolling InRelease
Ign1: http://http.kali.org/kali kali-rolling InRelease
Err1: http://http.kali.org/kali kali-rolling InRelease
Temporary failure resolving 'http.kali.org'
All packages are up-to-date.
Warning: Failed to fetch http://http.kali.org/kali/dists/kali-rolling/InRelease  Temporary failure resolving 'http.kali.org'
Warning: Some index files failed to download. They have been ignored, or old ones used instead.
us-server@us-server:~$ sudo apt install openvpn easy-rsa -y
openvpn is already the newest version (2.6.14-1).
openvpn set to manually installed.
easy-rsa is already the newest version (3.2.3-1).
easy-rsa set to manually installed
Summary:
  Upgrading: 0,  Installing: 0,  Removing: 0,  Not Upgrading: 0
us-server@us-server:~$
```

3.2 Build CA and Server Certificates

```
make-cadir ~/openvpn-ca
cd ~/openvpn-ca
./easyrsa init-pki
./easyrsa build-ca
./easyrsa gen-req server nopass
./easyrsa sign-req server server
./easyrsa gen-dh
openvpn --genkey --secret ta.key
```



```
US_Server [Running] - Oracle VirtualBox : 1
File Machine View Input Devices Help
Session Actions Edit View Help
Using Easy-RSA 'vars' configuration:
* /home/us-server/openvpn-ca/vars
Generating DH parameters, 2048 bit long safe prime
.
.
.
*** DH parameters appear to be ok.
Notice
_____
DH parameters of size 2048 created at:
* /home/us-server/openvpn-ca/pki/dh.pem

[us-server@us-server: ~/openvpn-ca]
```

U5_Server [Running] - Oracle VirtualBox : 1

File Machine View Input Devices Help

Session Actions Edit View Help

us-server@us-server: ~/openvpn-ca

```
****  
DH parameters appear to be ok.  
Notice  
-----  
DH parameters of size 2048 created at:  
+ /home/us-server/openvpn-ca/pki/dh.pem  
  
(us-server@us-server) [~/openvpn-ca]  
- $ openvpn --genkey --secret ta.key  
2025-11-16 15:23:58 DEPRECATED OPTION: The option --secret is deprecated.  
2025-11-16 15:23:58 WARNING: Using --genkey --secret filename is DEPRECATED. Use --genkey secret filename instead.  
(us-server@us-server) [~/openvpn-ca]  
- $
```

3.3 Configure OpenVPN server

Copied example server.conf and edited paths.

```
U.S.Server [Running] - Oracle VirtualBox : 1
File Machine View Input Devices Help
Session Actions Edit View Help
us-server@us-server: ~/openvpn-ca

****

DH parameters appear to be ok.

Notice

DH parameters of size 2048 created at:
* /home/us-server/openvpn-ca/pki/dh.pem

[us-server@us-server]~/openvpn-ca
$ openvpn --genkey --secret ta.key
2025-11-16 15:23:58 DEPRECATED OPTION: The option --secret is deprecated.
2025-11-16 15:23:58 WARNING: Using --genkey --secret filename is DEPRECATED. Use --genkey secret filename instead.

[us-server@us-server]~/openvpn/
$ sudo cp pki/ca.crt /etc/openvpn/
[sudo] password for us-server:
[us-server@us-server]~/openvpn-ca
$
```

```
U.S.Server [Running] - Oracle VirtualBox : 1
File Machine View Input Devices Help
Session Actions Edit View Help
us-server@us-server: ~/openvpn-ca

****

DH parameters appear to be ok.

Notice

DH parameters of size 2048 created at:
* /home/us-server/openvpn-ca/pki/dh.pem

[us-server@us-server]~/openvpn-ca
$ openvpn --genkey --secret ta.key
2025-11-16 15:23:58 DEPRECATED OPTION: The option --secret is deprecated.
2025-11-16 15:23:58 WARNING: Using --genkey --secret filename is DEPRECATED. Use --genkey secret filename instead.

[us-server@us-server]~/openvpn-ca
$ sudo cp pki/ca.crt /etc/openvpn/
[sudo] password for us-server:
[us-server@us-server]~/openvpn-ca
$ sudo cp pki/issued/server.crt /etc/openvpn/
[us-server@us-server]~/openvpn-ca
$ sudo cp pki/private/server.key /etc/openvpn/
[us-server@us-server]~/openvpn-ca
$ sudo cp pki/dh.pem /etc/openvpn/
[us-server@us-server]~/openvpn-ca
$ sudo cp ta.key /etc/openvpn/
[us-server@us-server]~/openvpn-ca
$ sudo nano /etc/openvpn/Server.conf
[us-server@us-server]~/openvpn-ca
$ echo "net.ipv4.ip_forward=1" | sudo tee -a /etc/sysctl.conf
net.ipv4.ip_forward=1

[us-server@us-server]~/openvpn-ca
$ sudo sysctl -p
net.ipv4.ip_forward = 1

[us-server@us-server]~/openvpn-ca
$
```

3.4 Start the server

```
sudo systemctl start openvpn@server  
sudo systemctl enable openvpn@server
```

The screenshot shows a terminal window titled "us-server [Running] - Oracle VirtualBox: 1". The terminal session starts with the user navigating to the OpenVPN configuration directory:

```
Session Actions Edit View Help  
[us-server@us-server:~/openvpn-ca]  
$ sudo cp ta.key /etc/openvpn/  
[us-server@us-server:~/openvpn-ca]  
$ sudo nano /etc/openvpn/server.conf
```

Then, the user adds a line to the configuration file to forward IPv4 traffic:

```
[us-server@us-server:~/openvpn-ca]  
$ echo "net.ipv4.ip_forward=1" | sudo tee -a /etc/sysctl.conf  
net.ipv4.ip_forward=1
```

Next, the user applies the changes by running sysctl:

```
[us-server@us-server:~/openvpn-ca]  
$ sudo sysctl -p  
net.ipv4.ip_forward = 1
```

The user then starts the OpenVPN service:

```
[us-server@us-server:~/openvpn-ca]  
$ sudo systemctl start openvpn@server  
[us-server@us-server:~/openvpn-ca]  
$ sudo systemctl enable openvpn@server
```

A message indicates that a symlink was created:

```
Created symlink /etc/systemd/system/multi-user.target.wants/openvpn@server.service → '/usr/lib/systemd/system/openvpn@service'.
```

The user then checks the status of the OpenVPN service:

```
[us-server@us-server:~/openvpn-ca]  
$ sudo systemctl status openvpn@server  
● openvpn@server.service - OpenVPN connection to server  
  Loaded: loaded (/etc/systemd/system/openvpn@.service; enabled; preset: disabled)  
  Active: active (running) since Sun 2023-11-19 15:51:21 EST; 1min 9s ago  
  Invocation ID: 612ccc645ea14ac08a0a4695fe0dd8f  
  Docs: man:openvpn(8)  
        https://community.openvpn.net/openvpn/wiki/OpenVPN24ManPage  
        https://community.openvpn.net/openvpn/wiki/Howto  
 Main PID: 32322 (openvpn)  
 Status: "Initialization Sequence Completed"  
   Tasks: 1 (pid: 32322)  
  Memory: 2M (peak: 2.3M)  
    CPU: 42ms  
   CGroup: /system.slice/system-openvpn.slice/openvpn@server.service  
          └─32322 /usr/bin/openvpn --daemon openvpn-server --status /run/openvpn/server.status 10 --cd /etc/openvpn --config /etc/openvpn/server.conf --writepid /run/openvpn/server.pid
```

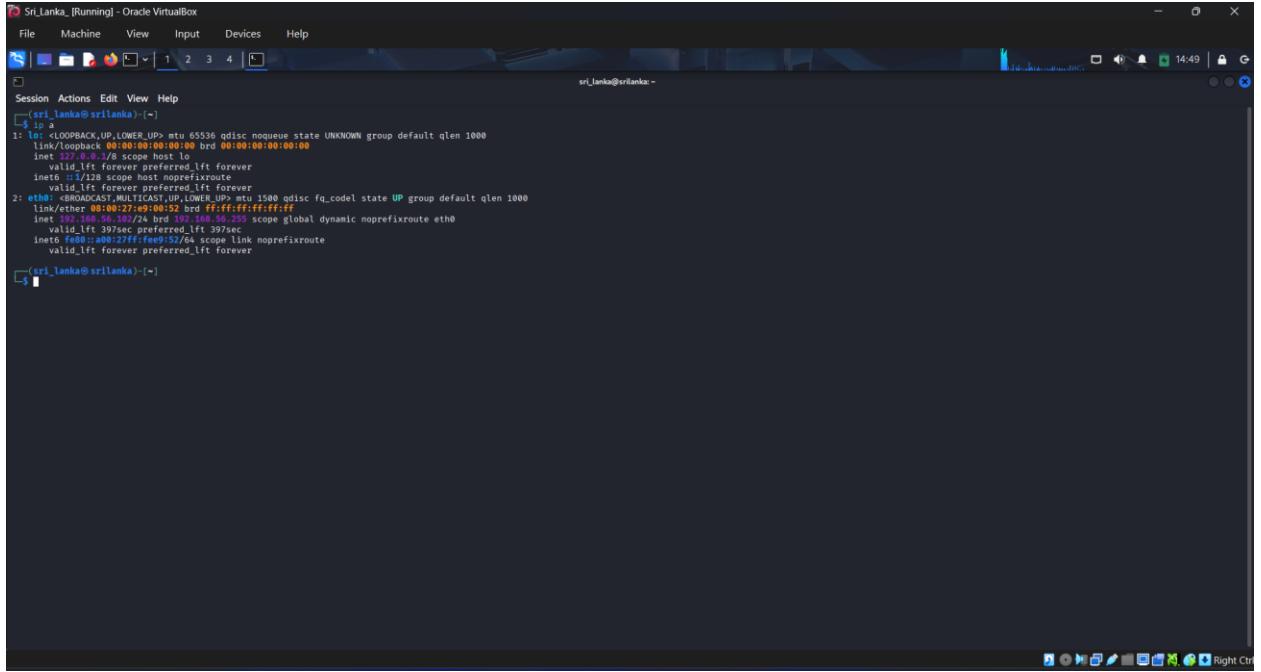
The terminal then shows the log output of the OpenVPN daemon starting up, including the creation of the tun interface and the establishment of the VPN connection:

```
Nov 19 15:51:21 us-server openvpn[32322]: net_iface_up: set tun up  
Nov 19 15:51:21 us-server openvpn[32322]: net_iface_up: ifname=tun0, peer_ip=10.8.0.2, dev tun0  
Nov 19 15:51:21 us-server openvpn[32322]: net_if_route_wk_add: 10.8.0.2/24 via 10.8.0.2 dev [NULL] table 0 metric -1  
Nov 19 15:51:21 us-server openvpn[32322]: Could not determine IPv4/IPv6 protocol. Using AF_INET  
Nov 19 15:51:21 us-server openvpn[32322]: Socket Buffers: R=[212992->212992] S=[212992->212992]  
Nov 19 15:51:21 us-server openvpn[32322]: bind() to local port (bind(2) error: [INET][undef]:1194)  
Nov 19 15:51:21 us-server openvpn[32322]: UDPv4 link monitor [INET]  
Nov 19 15:51:21 us-server openvpn[32322]: MULTI: multi_init called, r=256 v=256  
Nov 19 15:51:21 us-server openvpn[32322]: IFCONFIG POOL IP4: base=10.8.0.4 size=6  
Nov 19 15:51:21 us-server openvpn[32322]: Initialization Sequence Completed
```

The terminal ends with the user navigating back to the OpenVPN configuration directory:

```
[us-server@us-server:~/openvpn-ca]
```

4. OpenVPN Client Setup (Sri Lanka VM)



```
sri_lanka@sriLanka: ~
```

```
[sri_lanka@sriLanka] ~
```

```
1: lo <LOOPBACK,UP,LOWER_UP> mtu 1500 qdisc noqueue state UNKNOWN group default qlen 1000
    link/loopback brd 00:00:00:00:00:00
    inet 127.0.0.1/8 brd 00:00:00:00:00:00 scope host lo
        valid_lft forever preferred_lft forever
    inet6 ::1/128 brd ff00::1 scope host loopback
        valid_lft forever preferred_lft forever
2: eth0: <BROADCAST,MULTICAST,UP,LOWER_UP> mtu 1500 qdisc fq_codel state UP group default qlen 1000
    link/ether 00:00:27:e9:00:52 brd ff:ff:ff:ff:ff:ff
    inet 192.168.1.10 brd 192.168.1.255 scope global dynamic noprefixroute eth0
        valid_lft 397sec preferred_lft 397sec
    inet6 fe80::a00:27ff:fe00:52/64 scope link noprefixroute
        valid_lft forever preferred_lft forever
```

```
[sri_lanka@sriLanka] ~
```

4.1 Copy certificates from the server

Files copied:

- ca.crt
- client.key
- client.crt
- ta.key
- Sri-Lanka-Client.ovpn

```
Sri_Lanka_[Running] - Oracle VirtualBox
File Machine View Input Devices Help
Session Actions Edit View Help
[sri_lanka@sriLanka: ~]
$ sudo apt update
[sudo] password for sri_lanka:
ign1: http://http.kali.org/kali kali-rolling InRelease
ign1: http://http.kali.org/kali kali-rolling InRelease
ign1: http://http.kali.org/kali kali-rolling InRelease
Err1: http://http.kali.org/kali kali-rolling InRelease
Temporary failure resolving 'http.kali.org'
All packages are up-to-date.
Warning: Failed to fetch http://http.kali.org/kali/dists/kali-rolling/InRelease  Temporary failure resolving 'http.kali.org'
Warning: Some index files failed to download. They have been ignored, or old ones used instead.

[sri_lanka@sriLanka: ~]
$ sudo apt install openssh easy-rsa -y
openssh is already the newest version (2.6.14-1).
openssh set to manually installed.
easy-rsa is already the newest version (3.2.3-1).
easy-rsa set to manually installed.
Summary:
Upgrading: 0, Installing: 0, Removing: 0, Not Upgrading: 0

[sri_lanka@sriLanka: ~]
```

```

Sri.Lanka_(Running) - Oracle VirtualBox
File Machine View Input Devices Help
sri_lanka@srilanka: ~/openvpn-ca
Session Actions Edit View Help
Using Easy-RSA configuration:
* /home/sri_lanka/openvpn-ca/vars
$ ./easyrsa gen-req nopass
Using Easy-RSA 'vars' configuration:
* /home/sri_lanka/openvpn-ca/vars
.....
You are about to be asked to enter information that will be incorporated
into your certificate request.
There are quite a few fields but you can leave some blank
For some fields there will be a default value.
If you enter '.', the field will be left blank.

Common Name (e.g: your user, host, or server name) [client]:Sri-Lanka-Client
Notice

Private-Key and Public-Certificate-Request files created.
Your files are:
* req: /home/sri_lanka/openvpn-ca/pki/reqs/client.req
* key: /home/sri_lanka/openvpn-ca/pki/private/client.key

[sri_lanka@srilanka] ~ /openvpn-ca
$ scp ->openvpn-ca/pki/reqs/client.req us-server@192.168.56.101:/home/us-server/
ssh: connect to host 192.168.56.101 port 22: Connection refused
scp: Connection closed

[sri_lanka@srilanka] ~ /openvpn-ca
$ scp ->openvpn-ca/pki/reqs/client.req us-server@192.168.56.101:/home/us-server/
ssh: connect to host 192.168.56.101 port 22: Connection refused
scp: Connection closed

[sri_lanka@srilanka] ~ /openvpn-ca
$ scp ->openvpn-ca/pki/reqs/client.req us-server@192.168.56.101:/home/us-server/
The authenticity of host '192.168.56.101' (192.168.56.101) can't be established.
ED25519 key fingerprint is SHA256:GAEP/OvI8QmF5oWMyJjy71IZXHMsj2MuWhb8.
This key is not known by any other names.
Are you sure you want to continue connecting (yes/no/[fingerprint])? yes
Warning: Permanently added '192.168.56.101' (ED25519) to the list of known hosts.
us-server@192.168.56.101's password:
client.req

[sri_lanka@srilanka] ~ /openvpn-ca

```

```

Sri.Lanka_(Running) - Oracle VirtualBox
File Machine View Input Devices Help
sri_lanka@srilanka: ~/openvpn-ca
Session Actions Edit View Help
100% 899 632.4KB/s 00:00
$ scp ->openvpn-ca/pki/reqs/client.req us-server@192.168.56.101:/home/us-server/
The authenticity of host '192.168.56.101' (192.168.56.101) can't be established.
ED25519 key fingerprint is SHA256:GAEP/OvI8QmF5oWMyJjy71IZXHMsj2MuWhb8.
This key is not known by any other names.
Are you sure you want to continue connecting (yes/no/[fingerprint])? yes
Warning: Permanently added '192.168.56.101' (ED25519) to the list of known hosts.
us-server@192.168.56.101's password:
client.req

[sri_lanka@srilanka] ~ /openvpn-ca
$ scp us-server@192.168.56.101:/home/us-server/openvpn-ca/pki/issued/Sri-Lanka-Client.crt ~/
us-server@192.168.56.101's password:
Sri-Lanka-Client.crt

[sri_lanka@srilanka] ~ /openvpn-ca
$ scp us-server@192.168.56.101:/home/us-server/openvpn-ca/pki/issued/ca.crt ~/
us-server@192.168.56.101's password:
scp: /home/us-server/openvpn-ca/pki/issued/ca.crt: No such file or directory

[sri_lanka@srilanka] ~ /openvpn-ca
$ scp us-server@192.168.56.101:/home/us-server/openvpn-ca/pki/ca.crt ~/
us-server@192.168.56.101's password:
ca.crt

[sri_lanka@srilanka] ~ /openvpn-ca
$ scp us-server@192.168.56.101:/etc/openvpn/tak.key ~/
us-server@192.168.56.101's password:
scp: remote open '/etc/openvpn/tak.key': Permission denied

[sri_lanka@srilanka] ~ /openvpn-ca
$ scp us-server@192.168.56.101:/etc/openvpn/tak.key ~/
us-server@192.168.56.101's password:
scp: remote open '/etc/openvpn/tak.key': Permission denied

[sri_lanka@srilanka] ~ /openvpn-ca
$ scp us-server@192.168.56.101:/home/us-server/tak.key ~/
us-server@192.168.56.101's password:
scp: remote open '/home/us-server/tak.key': Permission denied

[sri_lanka@srilanka] ~ /openvpn-ca
$ scp us-server@192.168.56.101:/home/us-server/tak.key ~/
us-server@192.168.56.101's password:
scp: remote open '/home/us-server/tak.key': Permission denied

[sri_lanka@srilanka] ~ /openvpn-ca
$ scp us-server@192.168.56.101:/home/us-server/tak.key ~/
us-server@192.168.56.101's password:
scp: remote open '/home/us-server/tak.key': Permission denied

[sri_lanka@srilanka] ~ /openvpn-ca
$ ta.key
100% 636 144.0KB/s 00:00

```

4.2 Run the VPN

sudo openvpn Sri-Lanka-Client.ovpn

Sri_Lanka_[Running] - Oracle VirtualBox

File Machine View Input Devices Help

Session Actions Edit View Help

/usr/share/doc/openvpn/examples/sample-keys/ca.crt
/home/sri_lanka/ca.crt

```
[sri_lanka@sri_lanka] ~ [~/openvpn-ca]
$ cp /home/sri_lanka/ca.crt .
[sri_lanka@sri_lanka] ~ [~/openvpn-ca]
$ cp /home/sri_lanka/Sri-Lanka-Client.crt .
[sri_lanka@sri_lanka] ~ [~/openvpn-ca]
$ cp /home/sri_lanka/openvpn-ca/pki/private/client.key .

[sri_lanka@sri_lanka] ~ [~/openvpn-ca]
$ cp /home/sri_lanka/ca.key .

[sri_lanka@sri_lanka] ~ [~/openvpn-ca]
$ ls -l
total 48
-rw----- 1 sri_lanka sri_lanka 1208 Nov 16 17:14 ca.crt
-rw----- 1 sri_lanka sri_lanka 1704 Nov 16 17:16 client.key
-rwxrwxrwx 1 sri_lanka sri_lanka 27 Nov 16 15:08 easyrsa
-rwxrwxrwx 1 sri_lanka sri_lanka 511 Nov 16 15:08 easyrsa.cnf
drwx--- 5 sri_lanka sri_lanka 4096 Nov 16 15:59 pkcs11-easyrsa
drwx--- 5 sri_lanka sri_lanka 4096 Nov 16 15:59 pkcs11-easyrsa.cnf
-rw-r--r-- 1 sri_lanka sri_lanka 4522 Nov 16 17:15 Sri-Lanka-Client.crt
-rw-r--r-- 1 sri_lanka sri_lanka 251 Nov 16 17:15 Sri-Lanka-Client.ovpn
-rw-r--r-- 1 sri_lanka sri_lanka 4536 Nov 16 17:17 Sri-Lanka-Client.ovpn
-rw-r--r-- 1 sri_lanka sri_lanka 9839 Nov 16 15:05 vars
lrwxrwxrwx 1 sri_lanka sri_lanka 30 Nov 16 15:03 x509-types → /usr/share/easy-rsa/x509-types

[sri_lanka@sri_lanka] ~ [~/openvpn-ca]
$ nano Sri-Lanka-Client.ovpn
```

```
[sri_lanka@sri_lanka] ~ [~/openvpn-ca]
$ sudo openvpn --config Sri-Lanka-Client.ovpn
[sudo] password for sri_lanka:
2025-11-16 17:41:38 Note: --cipher is not set. OpenVPN versions before 2.5 defaulted to BF-CBC as fallback when cipher negotiation failed in this case. If you need this fallback please add '--data-ciphers-fallback BF-CBC' to your config
2025-11-16 17:41:38 OpenVPN 2.6.14 X86_64-pc-linux-gnu [SSL (OpenSSL)] [LZO] [LZ4] [EPOLL] [PKCS11] [MH/PKTINFO] [AEAD] [DCO]
2025-11-16 17:41:38 library versions: OpenSSL 3.5.2 5 Aug 2025, LZO 2.10
2025-11-16 17:41:38 DEO version: N/A
2025-11-16 17:41:38 Using certificate verification method has been enabled. See http://openvpn.net/howto.html#mitm for more info.
2025-11-16 17:41:38 TCP/UDP: Preserving recently used remote address: [AF_INET]192.168.56.101:1194
2025-11-16 17:41:38 UDPv4 link local: (not bound)
2025-11-16 17:41:38 UDPv4 link remote: [AF_INET]192.168.56.101:1194
2025-11-16 17:41:38 TLS: Initial handshake completed with [AF_INET]192.168.56.101:1194
2025-11-16 17:41:38 TUN/TAP device tun0 opened
2025-11-16 17:41:38 net_iface_mtu_set: mtu 1500 for tun0
2025-11-16 17:41:38 net_iface_up: set tun0 up
2025-11-16 17:41:38 net_addr_ip6_v6_andr 10.0.0.6 peer 10.0.0.5 dev tun0
2025-11-16 17:41:38 Initialization Sequence Completed
```

4.3 Successful Connection Output

- ✓ Initialization Sequence Completed
 - ✓ tun0 created

- ✓ Client IP: **10.8.0.6**
 - ✓ Server IP: **10.8.0.1**

4.4 Verify VPN with ping

ping 10.8.0.1

Output: 0% packet loss → VPN working.

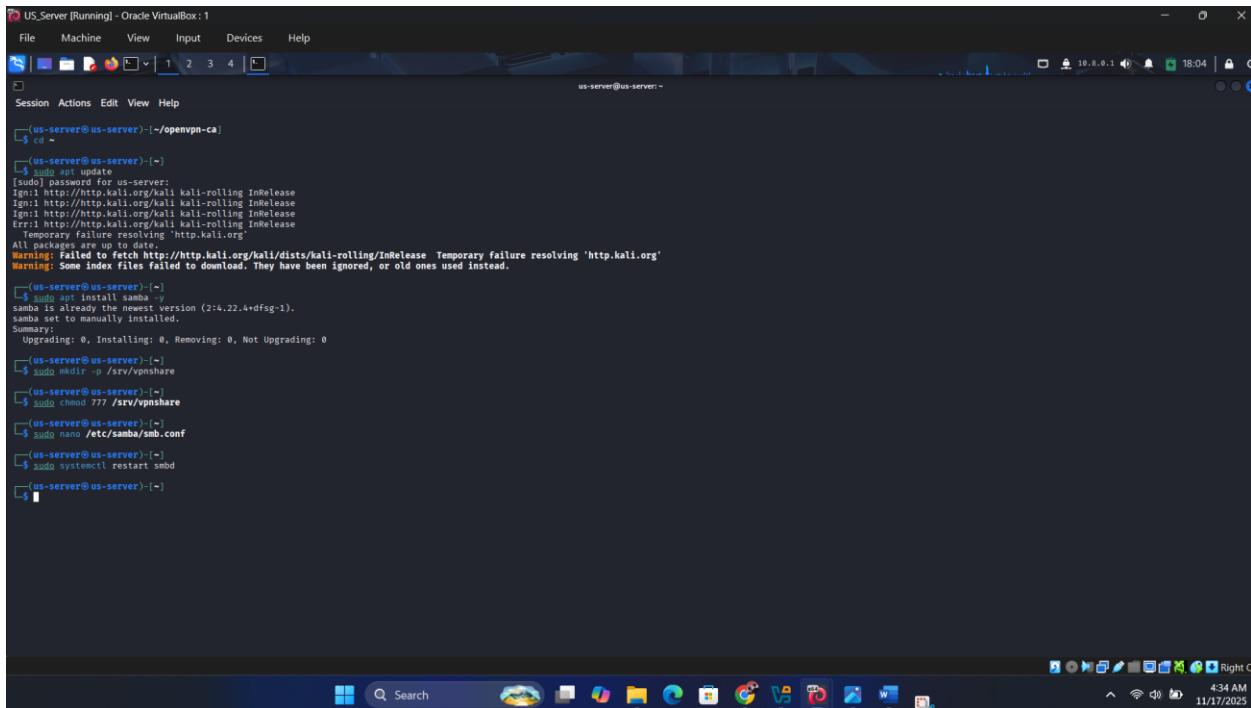
```
Sri.Lanka_ [Running] - Oracle VirtualBox
File Machine View Input Devices Help
sri_lanka@sriLanka: ~
Session Actions Edit View Help
└$ ip a show tun0
4: tun: <NOQUEUE,BROADCAST,MULTICAST,NOARP,UP,LOWER_UP> mtu 1500 qdisc fq_codel
    state UNKNOWN group default qlen 500
    link/none
        int 10.8.0.0 peer 10.8.0.5/32 scope global tun0
            valid_lft forever preferred_lft forever
        inet6 fe80::c6d7:27ff:feebab/64 brd ff:ff:ff:ff:ff:ff scope link stable-privacy proto kernel
            linklayer
            valid_lft forever preferred_lft forever
└$ ping 10.8.0.1
PING 10.8.0.1 (10.8.0.1) 56(84) bytes of data.
64 bytes from 10.8.0.1: icmp_seq=1 ttl=64 time=3.03 ms
64 bytes from 10.8.0.1: icmp_seq=2 ttl=64 time=2.00 ms
64 bytes from 10.8.0.1: icmp_seq=3 ttl=64 time=1.73 ms
64 bytes from 10.8.0.1: icmp_seq=4 ttl=64 time=1.42 ms
64 bytes from 10.8.0.1: icmp_seq=5 ttl=64 time=1.41 ms
64 bytes from 10.8.0.1: icmp_seq=6 ttl=64 time=2.30 ms
64 bytes from 10.8.0.1: icmp_seq=7 ttl=64 time=2.54 ms
64 bytes from 10.8.0.1: icmp_seq=8 ttl=64 time=2.54 ms
64 bytes from 10.8.0.1: icmp_seq=9 ttl=64 time=2.13 ms
64 bytes from 10.8.0.1: icmp_seq=10 ttl=64 time=1.77 ms
64 bytes from 10.8.0.1: icmp_seq=11 ttl=64 time=2.03 ms
64 bytes from 10.8.0.1: icmp_seq=12 ttl=64 time=2.03 ms
64 bytes from 10.8.0.1: icmp_seq=13 ttl=64 time=1.68 ms
64 bytes from 10.8.0.1: icmp_seq=14 ttl=64 time=1.37 ms
64 bytes from 10.8.0.1: icmp_seq=15 ttl=64 time=2.66 ms
64 bytes from 10.8.0.1: icmp_seq=16 ttl=64 time=2.05 ms
64 bytes from 10.8.0.1: icmp_seq=17 ttl=64 time=1.41 ms
64 bytes from 10.8.0.1: icmp_seq=18 ttl=64 time=1.25 ms
64 bytes from 10.8.0.1: icmp_seq=19 ttl=64 time=1.63 ms
64 bytes from 10.8.0.1: icmp_seq=20 ttl=64 time=1.39 ms
64 bytes from 10.8.0.1: icmp_seq=21 ttl=64 time=1.97 ms
64 bytes from 10.8.0.1: icmp_seq=22 ttl=64 time=2.53 ms
64 bytes from 10.8.0.1: icmp_seq=23 ttl=64 time=2.29 ms
64 bytes from 10.8.0.1: icmp_seq=24 ttl=64 time=2.09 ms
64 bytes from 10.8.0.1: icmp_seq=25 ttl=64 time=2.22 ms
64 bytes from 10.8.0.1: icmp_seq=26 ttl=64 time=2.70 ms
64 bytes from 10.8.0.1: icmp_seq=27 ttl=64 time=1.95 ms
64 bytes from 10.8.0.1: icmp_seq=28 ttl=64 time=2.09 ms
64 bytes from 10.8.0.1: icmp_seq=29 ttl=64 time=1.78 ms
64 bytes from 10.8.0.1: icmp_seq=30 ttl=64 time=1.26 ms
64 bytes from 10.8.0.1: icmp_seq=31 ttl=64 time=1.59 ms
64 bytes from 10.8.0.1: icmp_seq=32 ttl=64 time=1.55 ms
64 bytes from 10.8.0.1: icmp_seq=33 ttl=64 time=1.62 ms
64 bytes from 10.8.0.1: icmp_seq=34 ttl=64 time=1.14 ms
64 bytes from 10.8.0.1: icmp_seq=35 ttl=64 time=1.05 ms
64 bytes from 10.8.0.1: icmp_seq=36 ttl=64 time=1.64 ms
64 bytes from 10.8.0.1: icmp_seq=37 ttl=64 time=1.26 ms
sri_lanka@sriLanka: ~
```

```
Sri.Lanka_ [Running] - Oracle VirtualBox
File Machine View Input Devices Help
sri_lanka@sriLanka: ~
Session Actions Edit View Help
└$ ip a show tun0
4: tun: <NOQUEUE,BROADCAST,MULTICAST,NOARP,UP,LOWER_UP> mtu 1500 qdisc fq_codel
    state UNKNOWN group default qlen 500
    link/none
        int 10.8.0.0 peer 10.8.0.5/32 scope global tun0
            valid_lft forever preferred_lft forever
        inet6 fe80::c6d7:27ff:feebab/64 brd ff:ff:ff:ff:ff:ff scope link stable-privacy proto kernel
            linklayer
            valid_lft forever preferred_lft forever
└$ sri_lanka@sriLanka: ~
```

5. Samba Server Setup (US VM)

5.1 Install Samba

```
sudo apt install samba -y
```



The screenshot shows a Kali Linux desktop environment with a terminal window open. The terminal session starts with a password entry for 'root'. The user then runs several commands to update the package list, install Samba, create a directory for sharing, change its permissions, edit the Samba configuration file, and restart the Samba service. The terminal window has a dark background with white text. The desktop interface includes a taskbar with various application icons at the bottom.

```
us-server@us-server: ~
```

```
[root@us-server ~] cd ~
```

```
[root@us-server ~] sudo apt update
```

```
[root@us-server ~] Ign1: http://http.kali.org/kali kali-rolling InRelease  
Ign1: http://http.kali.org/kali kali-rolling InRelease  
Ign1: http://http.kali.org/kali kali-rolling InRelease  
Err1: http://http.kali.org/kali kali-rolling InRelease  
Temporary failure resolving 'http.kali.org'  
All packages are up to date.  
Warning: Failed to fetch http://http.kali.org/kali/dists/kali-rolling/InRelease Temporary failure resolving 'http.kali.org'  
Warning: Some index files failed to download. They have been ignored, or old ones used instead.
```

```
[root@us-server ~] sudo apt install samba -y
```

```
samba is already the newest version (2:4.22.4+dfsg-1).  
samba0 is not manually installed.  
Summary:  
Upgrading: 0, Installing: 0, Removing: 0, Not Upgrading: 0
```

```
[root@us-server ~] sudo mkdir /srv/vpnshare
```

```
[root@us-server ~] sudo chmod 777 /srv/vpnshare
```

```
[root@us-server ~] sudo nano /etc/samba/smb.conf
```

```
[root@us-server ~] sudo systemctl restart smbd
```

```
[root@us-server ~]
```

5.2 Create Samba share directory

```
sudo mkdir /vpnshare  
sudo chmod 0777 /vpnshare
```

The screenshot shows a terminal window titled 'U.S.Server [Running] - Oracle VirtualBox :1'. The terminal session is running on a Kali Linux system, with the command prompt being 'us-server@us-server:~\$'. The user has run several commands to set up a Samba share:

```
us-server@us-server:~$ cd ~
us-server@us-server:~$ sudo apt update
[sudo] password for us-server:
ign1: http://http.kali.org/kali kali-rolling InRelease
ign1: http://http.kali.org/kali kali-rolling InRelease
ign1: http://http.kali.org/kali kali-rolling InRelease
Err1: http://http.kali.org/kali kali-rolling InRelease
Temporary failure resolving 'http.kali.org'
All packages are up to date.
Warning: Failed to fetch http://http.kali.org/kali/dists/kali-rolling/InRelease Temporary failure resolving 'http.kali.org'
Warning: Some index files failed to download. They have been ignored, or old ones used instead.
us-server@us-server:~$ sudo apt install samba -y
samba is already the newest version (2:4.22.4+dfsg-1).
samba is set to manually installed.
ign1: http://http.kali.org/kali kali-rolling InRelease
Upgrading: 0, Installing: 0, Removing: 0, Not Upgrading: 0
us-server@us-server:~$ sudo mkdir -p /srv/vpnshare
us-server@us-server:~$ sudo chmod 777 /srv/vpnshare
us-server@us-server:~$ sudo nano /etc/samba/smb.conf
us-server@us-server:~$ sudo systemctl restart smbd
us-server@us-server:~$
```

5.3 Edit Samba configuration

```
[vpnshare]
path = /vpnshare
browseable = yes
read only = no
guest ok = yes
```

```

US.Server [Running] - Oracle VirtualBox :1
File Machine View Input Devices Help
Session Actions Edit View Help
GNU nano 8.6
; comment = Network Logon Service
; path = /home/samba/netlogon
; security = share
; read only = yes
# Unc comment the following and create the profiles directory to store
# users profiles (see the "logon path" option above)
# (you need to configure Samba to act as a domain controller too.)
# The path below should be writable by all users so that their
# profile directory may be created the first time they log on
[users]
; comment = Users profiles
; path = /home/samba/profiles
; browseable = no
; printable = yes
; guest ok = no
; read only = yes
; create mask = 0600
; directory mask = 0700

[printers]
comment = All Printers
browseable = no
path = /var/lib/samba/printers
printable = yes
guest ok = yes
read only = yes
create mask = 0700

# Windows clients look for this share name as a source of downloadable
# printer drivers
[printers]
comment = Printer Drivers
path = /var/lib/samba/printers
browseable = yes
read only = yes
guest ok = no
# Unc comment to allow remote administration of Windows print drivers.
# You may need to replace 'Administrator' with the name of the group your
# administrators members of.
# Please note that you also need to set appropriate Unix permissions
# to the drivers directory for these users to have write rights in it
; write list = root, @Administrator

[vpnshare]
path = /srv/vpnhare
writable = yes
browseable = yes
guest ok = yes

us-server@us-server: ~

```

5.4 Restart Samba

sudo systemctl restart smbd

```

US.Server [Running] - Oracle VirtualBox :1
File Machine View Input Devices Help
Session Actions Edit View Help
us-server@us-server: ~
us-server@us-server: ~
$ cd ~
us-server@us-server: ~
$ sudo apt update
[sudo] password for us-server:
ign1: http://http.kali.org/kali kali-rolling InRelease
ign1: http://http.kali.org/kali kali-rolling InRelease
ign1: http://http.kali.org/kali kali-rolling InRelease
ign1: http://http.kali.org/kali kali-rolling InRelease
Temporary failure resolving 'http.kali.org'
ALL: Failed to fetch http://http.kali.org/kali/dists/kali-rolling/InRelease  Temporary failure resolving 'http.kali.org'
Warning: Failed to fetch http://http.kali.org/kali/dists/kali-rolling/InRelease  Temporary failure resolving 'http.kali.org'
Warning: Some index files failed to download. They have been ignored, or old ones used instead.

us-server@us-server: ~
$ sudo apt install samba -y
samba is already the newest version (2:4.22.4+dfsg-1).
samba0 is manually installed.
Summary:
Upgrading: 0, Installing: 0, Removing: 0, Not Upgrading: 0

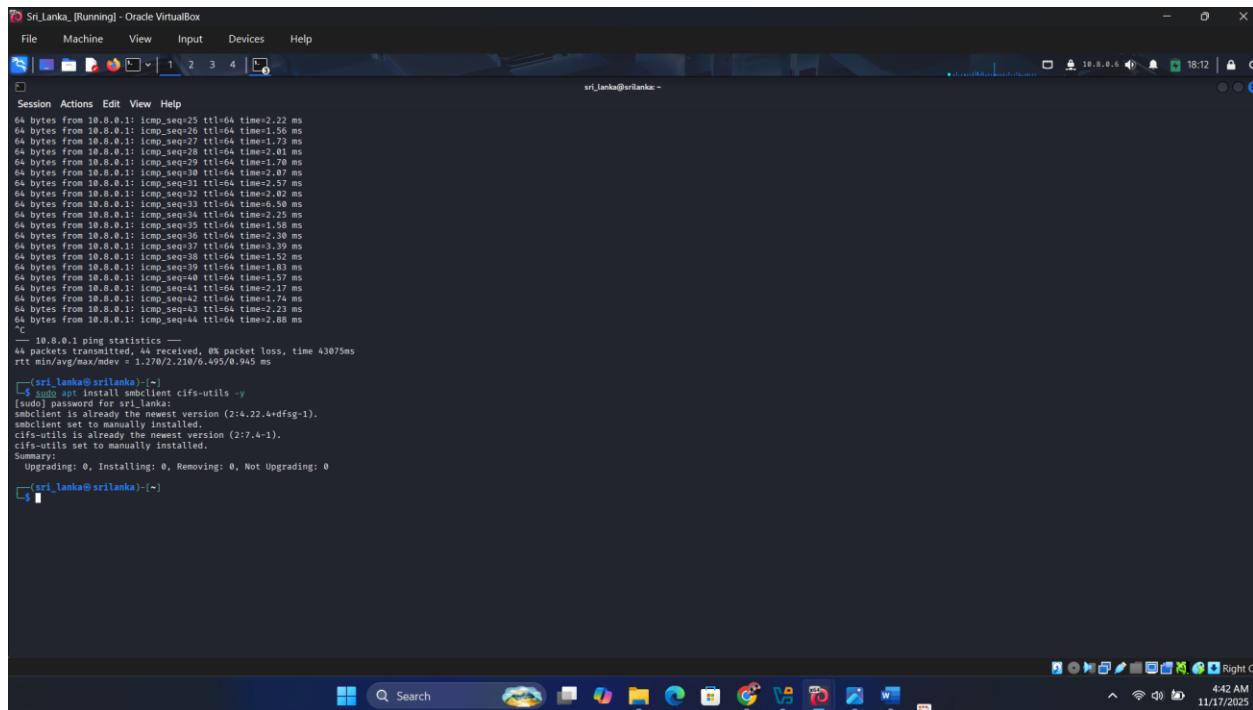
us-server@us-server: ~
$ sudo mkdir -p /srv/vpnhare
us-server@us-server: ~
$ sudo chmod 777 /srv/vpnhare
us-server@us-server: ~
$ sudo nano /etc/samba/smb.conf
us-server@us-server: ~
$ sudo systemctl restart smbd
us-server@us-server: ~

```

6. Accessing Samba Share from Sri Lanka VM (over VPN)

6.1 Install smbclient

```
sudo apt install smbclient cifs-utils -y
```



The screenshot shows a Linux desktop environment with a terminal window open. The terminal window title is "Sri_Lanka_ [Running] - Oracle VirtualBox". The terminal content shows the output of the command "sudo apt install smbclient cifs-utils -y". The output includes network statistics for a ping to 10.8.0.1 and the results of the apt command, which indicates that smbclient and cifs-utils are already at their newest versions and are set to manually install. The desktop background is dark, and the taskbar at the bottom shows various application icons.

```
Sri_Lanka_ [Running] - Oracle VirtualBox
File Machine View Input Devices Help
sri_lanka@sriLanka: ~
Session Actions Edt View Help
64 bytes from 10.8.0.1: icmp_seq=25 ttl=64 time=2.22 ms
64 bytes from 10.8.0.1: icmp_seq=26 ttl=64 time=1.56 ms
64 bytes from 10.8.0.1: icmp_seq=27 ttl=64 time=1.73 ms
64 bytes from 10.8.0.1: icmp_seq=28 ttl=64 time=2.01 ms
64 bytes from 10.8.0.1: icmp_seq=29 ttl=64 time=1.70 ms
64 bytes from 10.8.0.1: icmp_seq=30 ttl=64 time=1.77 ms
64 bytes from 10.8.0.1: icmp_seq=31 ttl=64 time=2.57 ms
64 bytes from 10.8.0.1: icmp_seq=32 ttl=64 time=2.02 ms
64 bytes from 10.8.0.1: icmp_seq=33 ttl=64 time=6.50 ms
64 bytes from 10.8.0.1: icmp_seq=34 ttl=64 time=1.55 ms
64 bytes from 10.8.0.1: icmp_seq=35 ttl=64 time=1.58 ms
64 bytes from 10.8.0.1: icmp_seq=36 ttl=64 time=2.30 ms
64 bytes from 10.8.0.1: icmp_seq=37 ttl=64 time=3.39 ms
64 bytes from 10.8.0.1: icmp_seq=38 ttl=64 time=1.55 ms
64 bytes from 10.8.0.1: icmp_seq=39 ttl=64 time=1.83 ms
64 bytes from 10.8.0.1: icmp_seq=40 ttl=64 time=1.57 ms
64 bytes from 10.8.0.1: icmp_seq=41 ttl=64 time=2.17 ms
64 bytes from 10.8.0.1: icmp_seq=42 ttl=64 time=1.44 ms
64 bytes from 10.8.0.1: icmp_seq=43 ttl=64 time=2.23 ms
64 bytes from 10.8.0.1: icmp_seq=44 ttl=64 time=2.88 ms
```
10.8.0.1 ping statistics --
44 packets transmitted, 44 received, 0% packet loss, time 43075ms
rtt min/avg/max/mdev = 1.270/2.210/6.495/0.945 ms
```
[sri_lanka@sriLanka: ~]
$ sudo apt install smbclient cifs-utils -y
[sudo] password for sri_lanka:
smbclient is already the newest version (2:4.22.4+dfsg-1).
cifs-utils is to be installed.
cifs-utils is already the newest version (2:7.4-1).
cifs-utils set to manually installed.
Summary:
Upgrading: 0, Installing: 0, Removing: 0, Not Upgrading: 0
[sri_lanka@sriLanka: ~]
```

6.2 Connect to US samba share

```
smbclient //10.8.0.1/vpnshare -U '
```

```
Sri_Lanka_ [Running] - Oracle VirtualBox
File Machine View Input Devices Help
Session Actions Edit View Help
sri_lanka@srilanka: ~
```

```
64 bytes from 10.8.0.1: icmp_seq=31 ttl=64 time=2.57 ms
64 bytes from 10.8.0.1: icmp_seq=32 ttl=64 time=2.02 ms
64 bytes from 10.8.0.1: icmp_seq=33 ttl=64 time=6.50 ms
64 bytes from 10.8.0.1: icmp_seq=34 ttl=64 time=2.25 ms
64 bytes from 10.8.0.1: icmp_seq=35 ttl=64 time=1.58 ms
64 bytes from 10.8.0.1: icmp_seq=36 ttl=64 time=2.30 ms
64 bytes from 10.8.0.1: icmp_seq=37 ttl=64 time=3.39 ms
64 bytes from 10.8.0.1: icmp_seq=38 ttl=64 time=1.52 ms
64 bytes from 10.8.0.1: icmp_seq=39 ttl=64 time=1.83 ms
64 bytes from 10.8.0.1: icmp_seq=40 ttl=64 time=1.57 ms
64 bytes from 10.8.0.1: icmp_seq=41 ttl=64 time=2.17 ms
64 bytes from 10.8.0.1: icmp_seq=42 ttl=64 time=1.74 ms
64 bytes from 10.8.0.1: icmp_seq=43 ttl=64 time=2.23 ms
64 bytes from 10.8.0.1: icmp_seq=44 ttl=64 time=2.88 ms
^C
— 10.8.0.1 ping statistics —
44 packets transmitted, 44 received, 0% packet loss, time 43075ms
rtt min/avg/max/mdev = 1.270/2.210/6.495/0.945 ms

(sri_lanka@srilanka)~]
$ sudo apt install smbclient cifs-utils -y
[sudo] password for sri_lanka:
smbclient is already the newest version (2:4.22.4+dfsg-1).
smbclient set to manually installed.
cifs-utils is already the newest version (2:7.4-1).
cifs-utils set to manually installed.
Summary:
Upgrading: 0, Installing: 0, Removing: 0, Not Upgrading: 0

(sri_lanka@srilanka)~]
$ smbclient //10.8.0.1/vpnshare -N
Try "help" to get a list of possible commands.
smb: \> ^C

(sri_lanka@srilanka)~]
$ smbclient //10.8.0.1/vpnshare -U ''
Password for [WORKGROUP]:
session setup failed: NT_STATUS_CONNECTION_DISCONNECTED

(sri_lanka@srilanka)~]
$ smbclient //10.8.0.1/vpnshare -U ''
Password for [WORKGROUP\]:
Try "help" to get a list of possible commands.
smb: \> ls
.
D          0  Sun Nov 16 18:01:36 2025
..
D          0  Sun Nov 16 18:01:36 2025
19353424 blocks of size 1024. 3741260 blocks available
smb: \> 
```

6.3 Verify by listing directory

```
ls
```

successfully received directory listing AND space info:

19353424 blocks of size 1024

```
Sri_Lanka_ [Running] - Oracle VirtualBox
File Machine View Input Devices Help
Session Actions Edit View Help
sri_lanka@srilanka: ~
64 bytes from 10.8.0.1: icmp_seq=31 ttl=64 time=2.57 ms
64 bytes from 10.8.0.1: icmp_seq=32 ttl=64 time=2.02 ms
64 bytes from 10.8.0.1: icmp_seq=33 ttl=64 time=6.50 ms
64 bytes from 10.8.0.1: icmp_seq=34 ttl=64 time=2.25 ms
64 bytes from 10.8.0.1: icmp_seq=35 ttl=64 time=1.58 ms
64 bytes from 10.8.0.1: icmp_seq=36 ttl=64 time=2.30 ms
64 bytes from 10.8.0.1: icmp_seq=37 ttl=64 time=3.39 ms
64 bytes from 10.8.0.1: icmp_seq=38 ttl=64 time=1.52 ms
64 bytes from 10.8.0.1: icmp_seq=39 ttl=64 time=1.83 ms
64 bytes from 10.8.0.1: icmp_seq=40 ttl=64 time=1.57 ms
64 bytes from 10.8.0.1: icmp_seq=41 ttl=64 time=2.17 ms
64 bytes from 10.8.0.1: icmp_seq=42 ttl=64 time=1.74 ms
64 bytes from 10.8.0.1: icmp_seq=43 ttl=64 time=2.23 ms
64 bytes from 10.8.0.1: icmp_seq=44 ttl=64 time=2.88 ms
^C
— 10.8.0.1 ping statistics —
44 packets transmitted, 44 received, 0% packet loss, time 43075ms
rtt min/avg/max/mdev = 1.270/2.210/6.495/0.945 ms

(sri_lanka@srilanka) [~]
$ sudo apt install smbclient cifs-utils -y
[sudo] password for sri_lanka:
smbclient is already the newest version (2:4.22.4+dfsg-1).
smbclient set to manually installed.
cifs-utils is already the newest version (2:7.4-1).
cifs-utils set to manually installed.
Summary:
Upgrading: 0, Installing: 0, Removing: 0, Not Upgrading: 0

(sri_lanka@srilanka) [~]
$ smbclient //10.8.0.1/vpnshare -N
Try "help" to get a list of possible commands.
smb: \> ^C

(sri_lanka@srilanka) [~]
$ smbclient //10.8.0.1/vpnshare -U ..
Password for [WORKGROUP\]:
session setup failed: NT_STATUS_CONNECTION_DISCONNECTED

(sri_lanka@srilanka) [~]
$ smbclient //10.8.0.1/vpnshare -U ..
Password for [WORKGROUP\]:
Try "help" to get a list of possible commands.
smb: \> ls
.
D 0 Sun Nov 16 18:01:36 2025
..
D 0 Sun Nov 16 18:01:36 2025
19353424 blocks of size 1024. 3741260 blocks available
smb: \>
```

6.4 Create a folder inside Samba share

mkdir test2

7. Results

- ✓ VPN between Sri Lanka and US established
- ✓ tun0 interface configured correctly
- ✓ Ping successful between machines
- ✓ Samba share accessible ONLY through VPN
- ✓ File operations performed successfully

8. Conclusion

A secure OpenVPN tunnel between two remote Linux VMs and the configuration of a Samba file server accessible through this encrypted network.

All requirements of the assignment were met:

- VPN works
- File server works
- Access works
- Security measures (certificates, HMAC key) implemented