

Introduction to virtualization- VirtualBox

PRACTICAL WORK 1

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I. First tests

1. Access network from guest

```
tub@ubuntu:~$ ping 8.8.8.8
PING 8.8.8.8 (8.8.8.8) 56(84) bytes of data:
64 bytes from 8.8.8.8: icmp_seq=1 ttl=113 time=45.8 ms
64 bytes from 8.8.8.8: icmp_seq=2 ttl=113 time=43.2 ms
64 bytes from 8.8.8.8: icmp_seq=3 ttl=113 time=40.2 ms
^C
```

2. IP addresses of host and guest

- Guest

```
inet 10.0.2.15/24 brd 10.0.2.255 scope global dynamic enp0s3
    inet 10.0.2.15/24 brd 10.0.2.255 scope global dynamic enp0s3
```

- Host

```
Ethernet adapter VirtualBox Host-Only Network:

Connection-specific DNS Suffix . : 
Link-local IPv6 Address . . . . . : fe80::5:2d85:b6e7:9ac2%19
IPv4 Address. . . . . : 192.168.56.1
Subnet Mask . . . . . : 255.255.255.0
Default Gateway . . . . . :
```

```
Wireless LAN adapter Wi-Fi:

Connection-specific DNS Suffix . : univ-reims.fr
Link-local IPv6 Address . . . . . : fe80::149a:a7d2:e63a:2ee1%9
IPv4 Address. . . . . : 10.145.11.73
Subnet Mask . . . . . : 255.255.224.0
Default Gateway . . . . . : 10.145.31.254
```

3. Access between host and guest

- From host to guest -> not reachable

```
Pinging 10.0.2.15 with 32 bytes of data:
Request timed out.
Request timed out.
Request timed out.
Request timed out.

Ping statistics for 10.0.2.15:
    Packets: Sent = 4, Received = 0, Lost = 4 (100% loss),
```

- From guest to host -> reachable

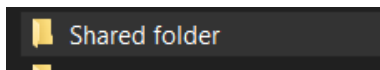
```
tub@ubuntu:~$ ping 10.145.11.73
PING 10.145.11.73 (10.145.11.73) 56(84) bytes of data:
64 bytes from 10.145.11.73: icmp_seq=1 ttl=127 time=1.00 ms
64 bytes from 10.145.11.73: icmp_seq=2 ttl=127 time=1.87 ms
64 bytes from 10.145.11.73: icmp_seq=3 ttl=127 time=1.84 ms
^C
--- 10.145.11.73 ping statistics ---
3 packets transmitted, 3 received, 0% packet loss, time 2003ms
rtt min/avg/max/mdev = 1.001/1.570/1.870/0.402 ms
tub@ubuntu:~$
```

4. [Installation web server](#)

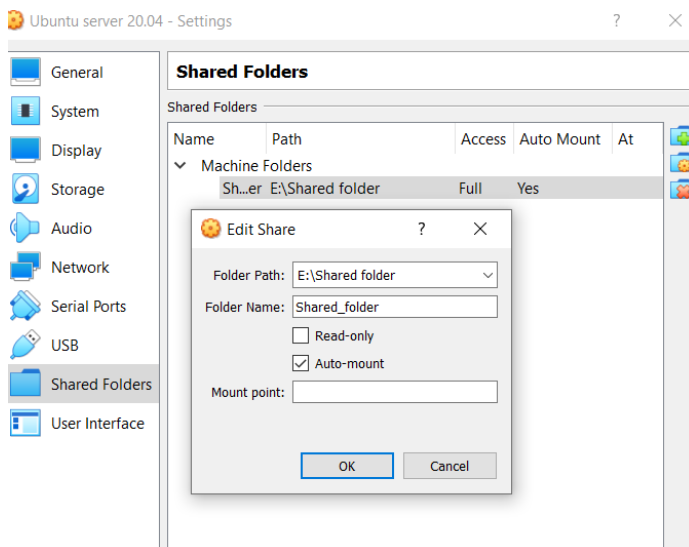
```
tub@ubuntu:~$ sudo apt-get install apache2
```

5. [Multiple user access shared folder between Host & Guest](#)

- Creation shared folder in host



- Configuration on VB



- New group on guest created (cat /etc/group)

```
vboxsf:x:117:tub
```

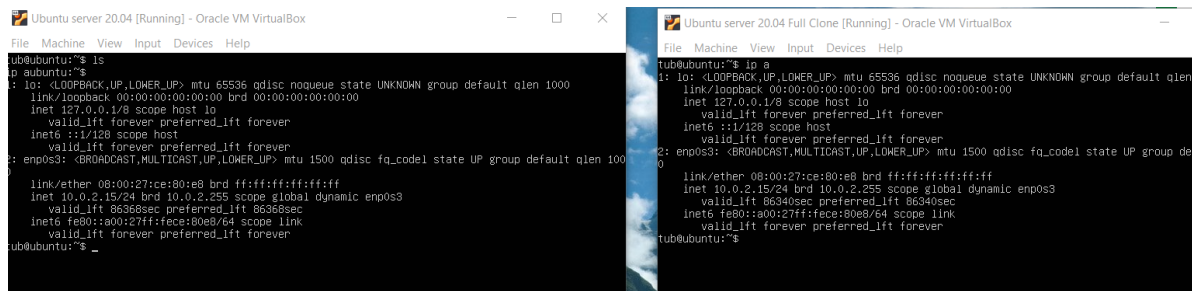
- Add users to the group -> usermod -a -G vboxsf user
- Go to the shared folder (cd /media)
- Check the right the group

```
tub@ubuntu:/media$ ls -al
total 8
drwxr-xr-x  3 root root  4096 Nov  9 13:00 .
drwxr-xr-x 20 root root  4096 Nov  9 09:32 ..
drwxrwx---  1 root vboxsf    0 Nov  9 13:09 sf_Shared_folder
tub@ubuntu:/media$
```

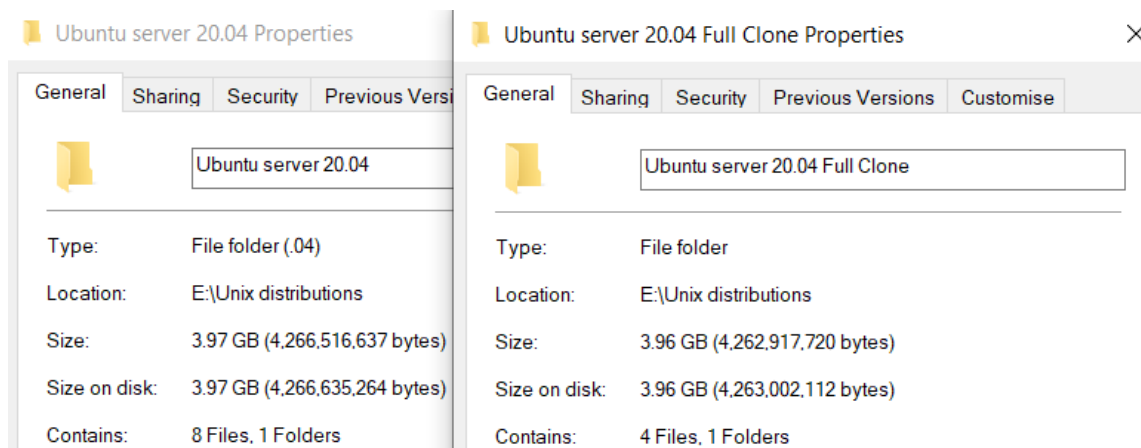
II. Machine duplication

6. [Full clone](#)

- The original and the cloned machine have the same MAC and IP address



- Plus, they have the same size

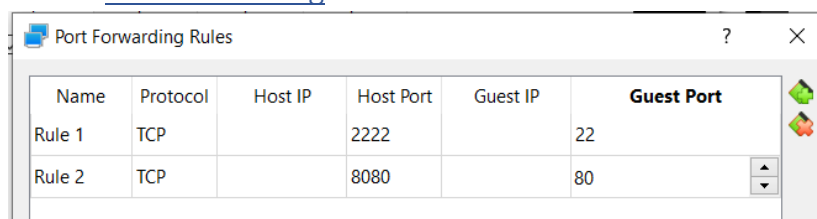


7. [Linked clone](#)

- The original and the cloned machine have the same MAC and IP address
- They have the same disk

III. Network

8. [Port forwarding](#)



- Test guest connection on port 22
 - `sudo apt-get install openssh-server`
 - `sudo systemctl status sshd.service`

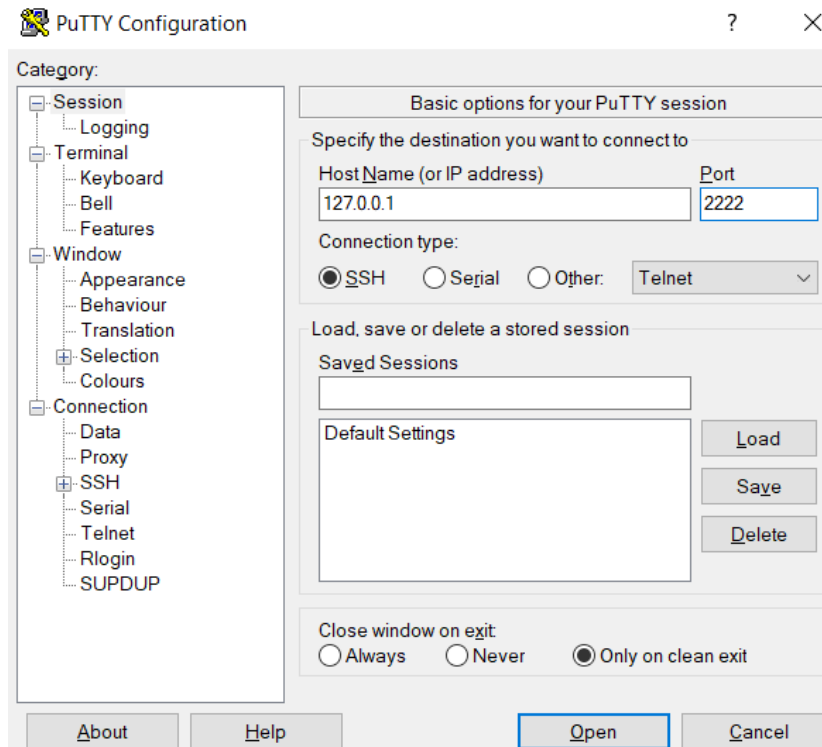
```
tub@ubuntu:~$ systemctl status sshd.service
● ssh.service - OpenBSD Secure Shell server
   Loaded: loaded (/lib/systemd/system/ssh.service; enabled; vendor preset: enabled)
   Active: active (running) since Tue 2021-11-09 14:19:05 UTC; 5min ago
     Docs: man:sshd(8)
           man:sshd_config(5)
    Main PID: 1629 (sshd)
      Tasks: 1 (limit: 2279)
     Memory: 2.4M
    CGroup: /system.slice/ssh.service
            └─1629 sshd: /usr/sbin/sshd -D [listener] 0 of 10-100 startups
```

- `sudo apt-get install net-tools`

- netstat -an | grep 22

```
tub@ubuntu:~$ netstat -an | grep 22
tcp        0      0 0.0.0.0:22          0.0.0.0:*        LISTEN
tcp6       0      0 :::22              :::*              LISTEN
```

- Test using Putty



- Forwarding successful

```
tub@ubuntu: ~
login as: tub
tub@127.0.0.1's password:
Welcome to Ubuntu 20.04.3 LTS (GNU/Linux 5.4.0-90-generic x86_64)

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

System information as of Tue 09 Nov 2021 02:38:19 PM UTC

System load: 0.0          Processes:              113
Usage of /:  24.8% of 18.57GB Users logged in:          1
Memory usage: 11%         IPv4 address for enp0s3: 10.0.2.15
Swap usage:  0%

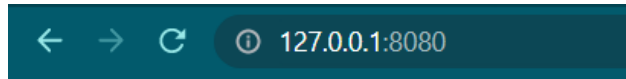
0 updates can be applied immediately.

Last login: Tue Nov  9 14:30:18 2021 from 10.0.2.2
tub@ubuntu:~$
```

- Test guest connection on port 80

- netstat -an | grep 80

```
tub@ubuntu:~$ netstat -an | grep 80
tcp6      0      0 :::80          :::*           LISTEN
unix      2      0      0 DGRAM         26280         /run/user/1000/systemd/
```



- Successful connection

Apache2 Ubuntu Default Page

It works!

This is the default welcome page used to test the correct operation of the Apache2 server after installation on Ubuntu systems. It is based on the equivalent page on Debian, from which the Ubuntu Apache packaging is derived. If you can read this page, it means that the Apache HTTP server installed at this site is working properly. You should **replace this file** (located at `/var/www/html/index.html`) before continuing to operate your HTTP server.

If you are a normal user of this web site and don't know what this page is about, this probably means that the site is currently unavailable due to maintenance. If the problem persists, please contact the site's administrator.

Configuration Overview

Ubuntu's Apache2 default configuration is different from the upstream default configuration, and split into several files optimized for interaction with Ubuntu tools. The configuration system is **fully documented in `/usr/share/doc/apache2/README.Debian.gz`**. Refer to this for the full documentation. Documentation for the web server itself can be found by accessing the **manual** if the `apache2-doc` package was installed on this server.

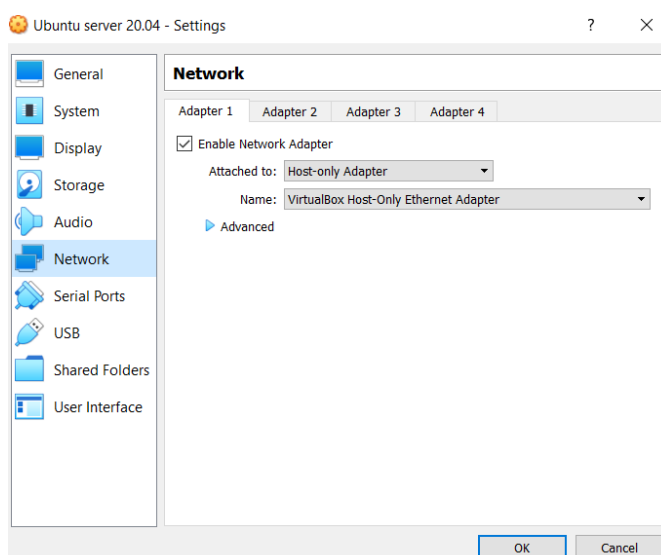
The configuration layout for an Apache2 web server installation on Ubuntu systems is as follows:

```
/etc/apache2/
|-- apache2.conf
|   |-- ports.conf
|-- mods-enabled
|   |-- *.load
|   |-- *.conf
|-- conf-enabled
|   |-- *.conf
|-- sites-enabled
|   |-- *.conf
```

- `apache2.conf` is the main configuration file. It puts the pieces together by including all remaining configuration files when starting up the web server.

9. DHCP

- Change Network from NAT to Host private network



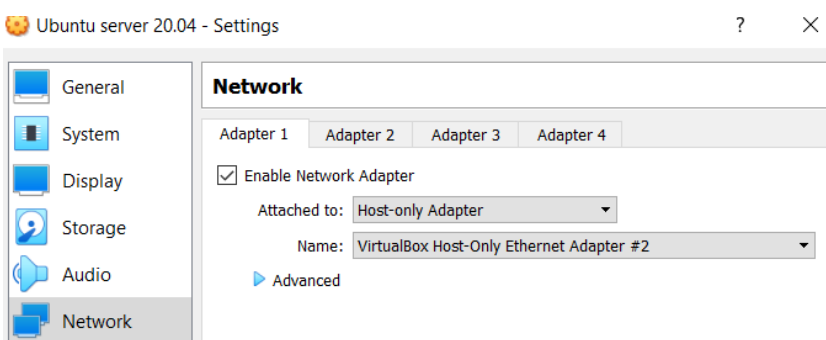
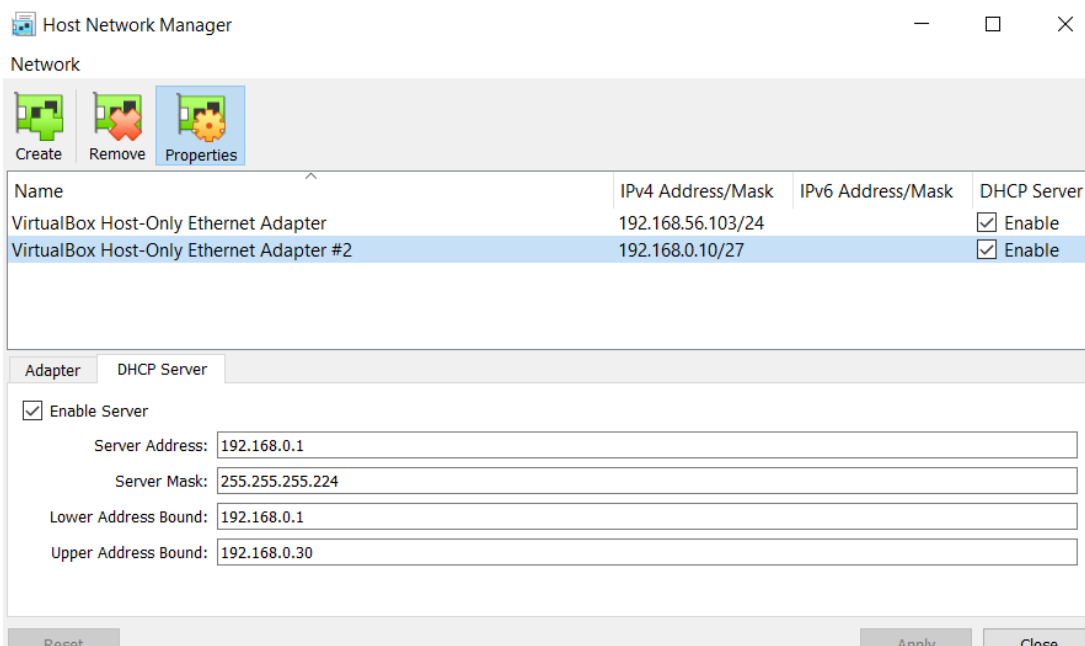
- The IP address of the guest is now : 192.168.56.102

```

2: enp0s3: <BROADCAST,MULTICAST,UP,LOWER_UP> mtu 1500 qdisc fq_codel state U
    link/ether 08:00:27:ce:80:e8 brd ff:ff:ff:ff:ff:ff
    inet 192.168.56.102/24 brd 192.168.56.255 scope global dynamic enp0s3
        valid_lft 555sec preferred_lft 555sec
    inet6 fe80::a00:27ff:fece:80e8/64 scope link
        valid_lft forever preferred_lft forever
tub@ubuntu:~$

```

- Creating a new network to the DHCP server can deliver IP addresses between 192.168.0.1 – 192.168.0.30



- IP guest : 192.168.0.2

```

link/ether 08:00:27:ce:80:e8 brd ff:ff:ff:ff:ff:ff
inet 192.168.0.2/27 brd 192.168.0.31 scope global dynamic enp0s3
    valid_lft 575sec preferred_lft 575sec
inet6 fe80::a00:27ff:fece:80e8/64 scope link
    valid_lft forever preferred_lft forever

```

- IP host : 192.168.0.3


```
Ethernet adapter VirtualBox Host-Only Network #2:

Connection-specific DNS Suffix . : 
Link-local IPv6 Address . . . . . : fe80::3030:700d:7e25:49e9%76
IPv4 Address. . . . . : 192.168.0.3
Subnet Mask . . . . . : 255.255.255.224
Default Gateway . . . . . :
```

10. Bridge

- Bridge NAT mode
 - Host to guest > **unreachable**
 - Guest to host > **reachable**
 - Guest to internet > **reachable**
 - Guest to guest > **unreachable (... ?)**
- Full Bridge mode
 - Host to guest > **reachable**
 - Guest to host > **unreachable**
 - Guest to internet > **reachable**
 - Guest to guest > **reachable**
- Private Bridge mode
 - Host to guest > **reachable**
 - Guest to host > **unreachable**
 - Guest to internet > **unreachable**
 - Guest to guest > **reachable**

11. Network mount

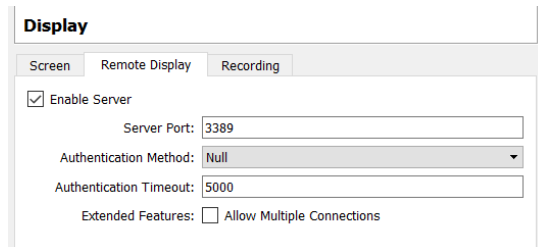
- The guest has 2 network adapters (NAT + Private Bridge)
- -> Edit Yaml file & write the command (sudo netplan apply):

```
# This is the network config written
network:
  ethernets:
    enp0s3:
      dhcp4: true
    enp0s8:
      dhcp4: true
  version: 2
```

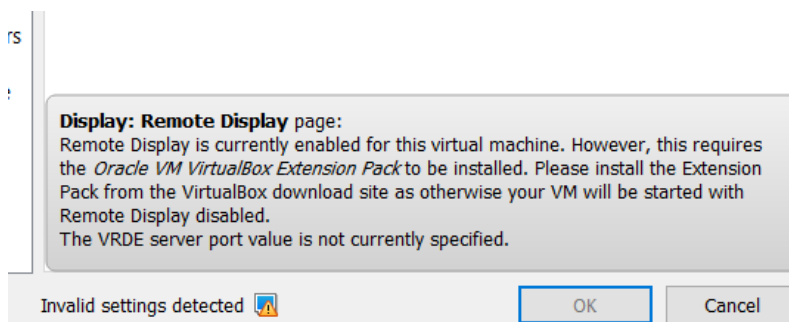
```
tub@ubuntu:~$ ip -c -h a
1: lo: <LOOPBACK,UP,LOWER_UP> mtu 65536 qdisc noqueue state UNKNOWN group default qlen 1000
    link/loopback 00:00:00:00:00:00 brd 00:00:00:00:00:00
    inet 127.0.0.1/8 scope host lo
        valid_lft forever preferred_lft forever
    inet6 ::1/128 scope host
        valid_lft forever preferred_lft forever
2: enp0s3: <BROADCAST,MULTICAST,UP,LOWER_UP> mtu 1500 qdisc fq_codel state UP group default qlen 1000
    link/ether 08:00:27:ce:80:e8 brd ff:ff:ff:ff:ff:ff
    inet 10.0.2.15/24 brd 10.0.2.255 scope global dynamic enp0s3
        valid_lft 86258sec preferred_lft 86258sec
    inet6 fe80::a00:27ff:fece:80e8/64 scope link
        valid_lft forever preferred_lft forever
3: enp0s8: <BROADCAST,MULTICAST,UP,LOWER_UP> mtu 1500 qdisc fq_codel state UP group default qlen 1000
    link/ether 08:00:27:5d:14:ef brd ff:ff:ff:ff:ff:ff
    inet 192.168.56.104/24 brd 192.168.56.255 scope global dynamic enp0s8
        valid_lft 458sec preferred_lft 458sec
    inet6 fe80::a00:27ff:fe5d:14ef/64 scope link
        valid_lft forever preferred_lft forever
tub@ubuntu:~$
```

12. Access to the guest

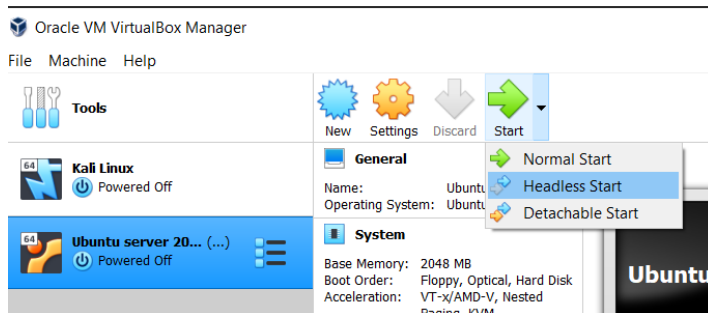
- From the Hypervisor using RDP
 - Enable Remote Display on VB



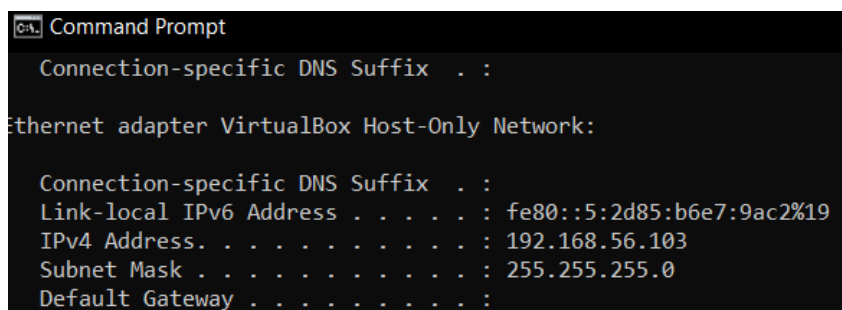
- Download & install VB extension pack



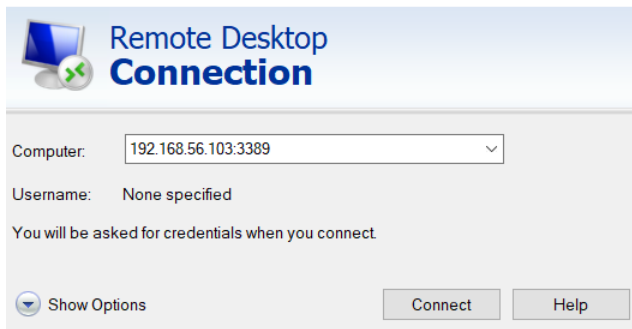
- Start the guest in Headless mode



- Check the IP address of the adapter of the Host-Only network



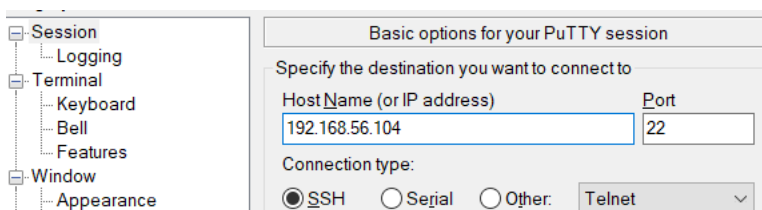
- Connect to the guest terminal using Remote Desktop Connection



- Successful connection

```
tub@ubuntu:~$ pwd
/home/tub
ip aubuntu:~$
1: lo: <LOOPBACK,UP,LOWER_UP> mtu 65536 qdisc noqueue state UNKNOWN group default qlen 1000
    link/loopback 00:00:00:00:00:00 brd 00:00:00:00:00:00
    inet 127.0.0.1/8 scope host lo
        valid_lft forever preferred_lft forever
    inet6 ::1/128 scope host
        valid_lft forever preferred_lft forever
2: enp0s3: <BROADCAST,MULTICAST,UP,LOWER_UP> mtu 1500 qdisc fq_codel state UP group default qlen 1000
    link/ether 08:00:27:ce:80:e8 brd ff:ff:ff:ff:ff:ff
    inet 10.0.2.15/24 brd 10.0.2.255 scope global dynamic enp0s3
        valid_lft 86359sec preferred_lft 86359sec
    inet6 fe80::a00:27ff:fece:80e8/64 scope link
        valid_lft forever preferred_lft forever
3: enp0s8: <BROADCAST,MULTICAST,UP,LOWER_UP> mtu 1500 qdisc fq_codel state UP group default qlen 1000
    link/ether 08:00:27:5d:14:ef brd ff:ff:ff:ff:ff:ff
    inet 192.168.56.104/24 brd 192.168.56.255 scope global dynamic enp0s8
        valid_lft 559sec preferred_lft 559sec
    inet6 fe80::a00:27ff:fe5d:14ef/64 scope link
        valid_lft forever preferred_lft forever
tub@ubuntu:~$
```

- SSH connection to access to guest
 - Make sure that SSH service is running on the guest
 - Run the guest in headless mode
 - Use PuTTY to connect to the guest with SSH and IP address of the guest

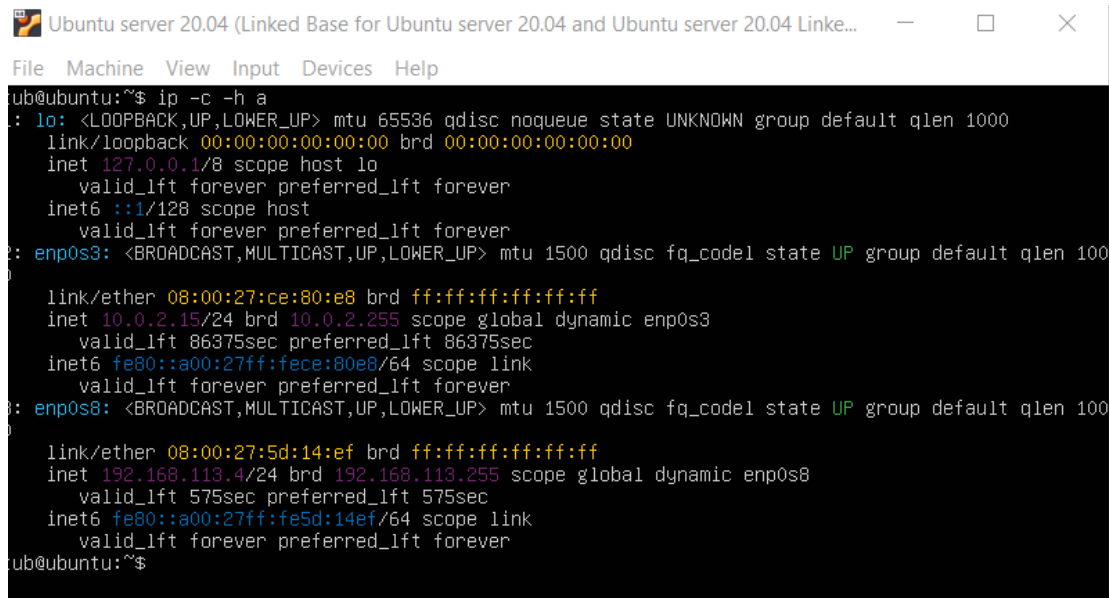


- Successful connection

```
tub@ubuntu:~$ ip a
1: lo: <LOOPBACK,UP,LOWER_UP> mtu 65536 qdisc noqueue state UNKNOWN group default qlen 1000
    link/loopback 00:00:00:00:00:00 brd 00:00:00:00:00:00
    inet 127.0.0.1/8 scope host lo
        valid_lft forever preferred_lft forever
    inet6 ::1/128 scope host
        valid_lft forever preferred_lft forever
2: enp0s3: <BROADCAST,MULTICAST,UP,LOWER_UP> mtu 1500 qdisc fq_codel state UP group default qlen 1000
    link/ether 08:00:27:ce:80:e8 brd ff:ff:ff:ff:ff:ff
    inet 10.0.2.15/24 brd 10.0.2.255 scope global dynamic enp0s3
        valid_lft 86247sec preferred_lft 86247sec
    inet6 fe80::a00:27ff:fece:80e8/64 scope link
        valid_lft forever preferred_lft forever
3: enp0s8: <BROADCAST,MULTICAST,UP,LOWER_UP> mtu 1500 qdisc fq_codel state UP group default qlen 1000
    link/ether 08:00:27:5d:14:ef brd ff:ff:ff:ff:ff:ff
    inet 192.168.56.104/24 brd 192.168.56.255 scope global dynamic enp0s8
        valid_lft 447sec preferred_lft 447sec
    inet6 fe80::a00:27ff:fe5d:14ef/64 scope link
        valid_lft forever preferred_lft forever
tub@ubuntu:~$
```

13. Starting without terminal

- Make sure a web server is running on the guest
- Configure a static IP address on the guest and power it off

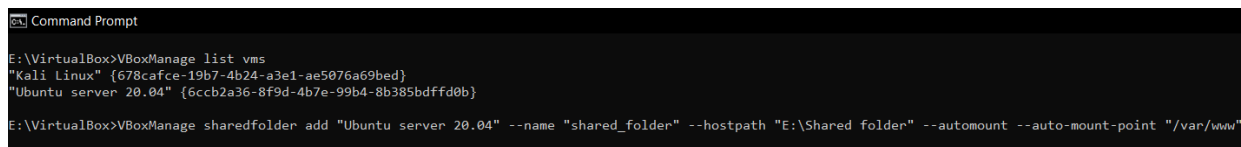


```

ub@ubuntu:~$ ip -c -h a
lo: <LOOPBACK,UP,LOWER_UP> mtu 65536 qdisc noqueue state UNKNOWN group default qlen 1000
    link/loopback 00:00:00:00:00:00 brd 00:00:00:00:00:00
    inet 127.0.0.1/8 scope host lo
        valid_lft forever preferred_lft forever
    inet6 ::1/128 scope host
        valid_lft forever preferred_lft forever
enp0s3: <BROADCAST,MULTICAST,UP,LOWER_UP> mtu 1500 qdisc fq_codel state UP group default qlen 1000
    link/ether 08:00:27:ce:80:e8 brd ff:ff:ff:ff:ff:ff
    inet 10.0.2.15/24 brd 10.0.2.255 scope global dynamic enp0s3
        valid_lft 86375sec preferred_lft 86375sec
    inet6 fe80::a00:27ff:fece:80e8/64 scope link
        valid_lft forever preferred_lft forever
enp0s8: <BROADCAST,MULTICAST,UP,LOWER_UP> mtu 1500 qdisc fq_codel state UP group default qlen 1000
    link/ether 08:00:27:5d:14:ef brd ff:ff:ff:ff:ff:ff
    inet 192.168.113.4/24 brd 192.168.113.255 scope global dynamic enp0s8
        valid_lft 575sec preferred_lft 575sec
    inet6 fe80::a00:27ff:fe5d:14ef/64 scope link
        valid_lft forever preferred_lft forever
ub@ubuntu:~$
  
```

ALL following instructions must be executed with the command line :

- Set up a shared folder between host and guest

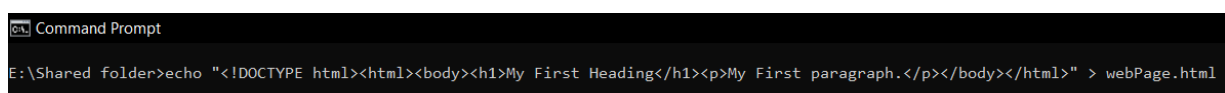


```

E:\VirtualBox>VBoxManage list vms
"Kali Linux" {678cafce-19b7-4b24-a3e1-ae5076a69bed}
"Ubuntu server 20.04" {6ccb2a36-8f9d-4b7e-99b4-8b385bdfdf0b}

E:\VirtualBox>VBoxManage sharedfolder add "Ubuntu server 20.04" --name "shared_folder" --hostpath "E:\Shared folder" --automount --auto-mount-point "/var/www"
  
```

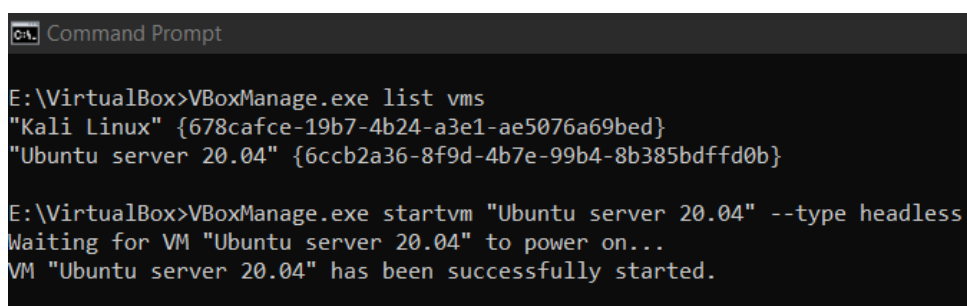
- Add an HTML file inside the folder



```

E:\Shared folder>echo "<!DOCTYPE html><html><body><h1>My First Heading</h1><p>My First paragraph.</p></body></html>" > webPage.html
  
```

- Start up the VM guest with the command line



```

E:\VirtualBox>VBoxManage.exe list vms
"Kali Linux" {678cafce-19b7-4b24-a3e1-ae5076a69bed}
"Ubuntu server 20.04" {6ccb2a36-8f9d-4b7e-99b4-8b385bdfdf0b}

E:\VirtualBox>VBoxManage.exe startvm "Ubuntu server 20.04" --type headless
Waiting for VM "Ubuntu server 20.04" to power on...
VM "Ubuntu server 20.04" has been successfully started.
  
```

- Test the SSH connection

```
tub@ubuntu: ~
E:\VirtualBox>ssh tub@192.168.113.4
tub@192.168.113.4's password:
Welcome to Ubuntu 20.04.3 LTS (GNU/Linux 5.4.0-90-generic x86_64)

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

System information as of Wed 10 Nov 2021 12:29:04 PM UTC

System load:  0.54               Processes:           120
Usage of /:   26.8% of 18.57GB   Users logged in:    1
Memory usage: 10%               IPv4 address for enp0s3: 10.0.2.15
Swap usage:   0%                IPv4 address for enp0s8: 192.168.113.4

 * Super-optimized for small spaces - read how we shrank the memory
   footprint of MicroK8s to make it the smallest full K8s around.

   https://ubuntu.com/blog/microk8s-memory-optimisation

0 updates can be applied immediately.

Last login: Wed Nov 10 12:28:33 2021 from 192.168.113.3
tub@ubuntu:~$
```

- Test access to HTML file (Permissions problem)

Forbidden

You don't have permission to access this resource.

Apache/2.4.41 (Ubuntu) Server at 192.168.113.4 Port 80

- Power off the guest

```
Command Prompt

E:\VirtualBox>VBoxManage list vms
"Kali Linux" {678cafce-19b7-4b24-a3e1-ae5076a69bed}
"Ubuntu server 20.04" {6ccb2a36-8f9d-4b7e-99b4-8b385bdfdf0b}

E:\VirtualBox>VBoxManage controlvm "Ubuntu server 20.04" poweroff
0%...10%...20%...30%...40%...50%...60%...70%...80%...90%...100%
```

